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The Fall and Rise of the Kishon River

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Abstract: This paper recounts the environmental history of a main waterway in Northern Israel—the Kishon, and deploys this history to examine the evolution of Israel water policy as it struggled to bridge the growing gap between its ambitions of development and the realities of its limited water supply. The first part of the paper describes the decay of the Kishon since the early 1950s, and the multiple scientific, political and legal attempts to alleviate its misfortunes, and discusses the reasons for their failings. Some of these reasons were administrative by nature, but the paper suggests a deeper reason, rooted in the ideological core of the infant state that was overwhelmingly concerned with the development of its infrastructure, and invited the pioneering Israeli society to consider the demise of the Kishon as a necessary sacrifice for progress. The second part of the paper describes the late-20th century developments that allowed for the recovery of the ailing river. Changing social mores, the growing importance of environmental politics, the advance of Israel's water technologies, and an environmental scandal that endowed the rehabilitation of the Kishon with a new political and moral meaning, have all contributed to the rehabilitation of the river. Once a testament for the sacrifices involved in a struggle to create a viable state, the Kishon has become a theater for a confident society that has triumphed in its struggle against nature.

Keywords: Kishon River; Israel water policy; environmental politics; water technologies

1. Introduction

What drives the ubiquitous conflict between national interests of development and environmental protection, and how is it best managed? This paper describes how Israel's water policy makers have struggled to answer these questions, and analyzes how their answers were shaped by the evolving relations between nature, society, ideology, technology, and the young state. Israel deserves our attention because its subjects its water to intense regulation [1]. Well aware of the country's limited supply, Israeli legislators developed, early on, a powerful legal framework to administrate Israel's water resources [2]. However, this powerful machinery could not prevent the destruction of Israel's natural waterways system [3]. Their headwaters redirected to quench the thirst of the growing population and agricultural-based economy, Israel rivers and streams languished and their flow became dominated by the wastewater of the thriving modern nation: Agricultural runoff, industrial waste and urban sewage [4].

The paper focuses on the environmental history of a main waterway in Northern Israel—the Kishon. The first part of the paper describes the decay of the river since the early 1950s, and the multiple scientific, political and legal attempts made to alleviate its misfortunes, and discusses the reasons for their failings. Some of the obstacles were administrative by nature, but the paper suggests a deeper reason, rooted in the ideological core of the infant state that was overwhelmingly concerned with the development of its infrastructure [5]. The Zionist policy of aggressive development, the paper suggests, paid little attention to water it could not use, and invited the pioneering Israeli society to consider, and even celebrate, the demise of the Kishon as a necessary sacrifice for progress [6].

The second part of the paper describes the late-20th century developments that finally allowed for the recovery of the ailing river [7]. By the 1990s, Israel was a developed country that had reached a

per capita income level approaching that of the long-independent Western nations. Changing social mores and the growing importance of environmental politics have improved regulation and reduced pollution. Meanwhile, the advance of Israel's water technologies—dripping, recycling, and lately desalination—have increased Israel's stock of good-quality water, reduced wastewater, as well as the state dependency on fresh water, and allowed Israel to return some of its old flow to the river, even in hot summer months. The recovery was further expedited by a scandal extraordinaire that erupted in 2000, when veterans of one of Israel's elite military units claimed that they contracted cancer from their trainings in the polluted river. The military denied the claim and the dispute escalated into a bitter public dispute that endowed the rehabilitation of the Kishon with a new political and moral meaning [8].

2. The 1950s and 1960s: A Necessary Price for Progress

The Kishon rises in the northern part of the Samaria mountain ridge and flows north-westerly for about 70 km through the Jezareel Valley and into the Haifa Bay. On its way to the sea, the river first runs through the agricultural Valley of Jezareel, where it collects the runoff water, heavy with fertilizers and pesticides, from the intensely-cultivated fields. It then cuts through the northern metropolitan area, where it collects the ever-growing urban load. Finally, on the last leg of its journey to the sea, the river rubs backs with Israel's largest industrial port, at the Haifa Bay, where it is greeted by a dense cluster of heavy industries–shipyard, refineries, petrochemical plants, etc.—all of which have been discharging their wastewater directly into its course [9].

Perennial for centuries, the Kishon might have been able to carry its heavy load to the open sea. However, in 1953, as part of the its National Water Carrier project, Israel's national water company, Mekorot, dammed the Kishon's upper watershed, in the Jezareel Valley, and redirected its flow into an artificial lake, to be stored for irrigation during the long dry summer season. The capturing of the headwater transformed the lower Kishon into an ephemeral stream that occasionally receives natural flow during wet winters [10]. After that, the lower Kishon quickly deteriorated into an outright sewage conduit. The river continued to languish for half a century, until the late 1990s when the state finally decided to rehabilitate the river.

The first warnings about the deteriorating condition of the Kishon were sounded in 1953, just a few months after the river was robbed of its headwater. Scientists from the Sea Fisheries Research Station (SFRS), a research unit within the Ministry of Agriculture (MoA) that studied fisheries of commercial importance, and monitored physical, chemical and biological parameters of the Israeli coastal water, detected the pollution in the lower Kishon and warned of the "great physical and financial damages" it could cause to submerged structures and vessels porting the river [11]. By 1956, the warnings led to the creation of a technical committee, the first in a long lineage, to inquire into the problems of the Kishon. The committee brought together technical, scientific and administrative personnel from the Ministries of Transportation and Agriculture, the City of Haifa, Navy, Technion (Haifa's Technological Institute), and the SFRS. Lacking political clout, the committee succeeded, after repeated requests, to secure a small budget that allowed the SFRS to initiate a research program that monitored the pollution in the Kishon and looked into its sources [12–14]. Seven, and later, eleven, monitoring stations were established along the Kishon, and SFRS scientists began to collect weekly samples and analyze them. By the end of the 1950s, enough scientific evidence had accumulated to portray a clear picture of an ailing watercourse, dominated by toxic waste and raw sewage [15].

In 1961, a regional sewage treatment plant was erected on the banks of the lower Kishon, to treat the urban wastewater deposited into the Kishon by the growing population in the region. The first to operate in the country, the Haifa Sewage Treatment Plant was designed to serve a population of 255,000. However, its capacity was quickly outstripped by the growing population, and, as the overload built up, the plants' output deteriorated and malfunctions multiplied. Ending up in the Kishon, the plant's hefty discharge soon equaled the entire natural flow of the river, turning it into an outright sewage conduit, especially in the summer months when natural flow was minimal [10].

The results, once again, were quickly noticed. By the end of the decade, the SRFS's yearly reports documented, not only increase of industrial wastes, but also a dramatic increase of organic wastes, accompanied by enormous levels of pathogens and massive fish kills [16].

In January 1962, off-the-chart concentrations of *E. coli* bacteria and other pathogens in the water of the Kishon prompted the Health Ministry to assemble a high-level administrative committee to address the troubles of the ailing river [17]. Chaired by the Health Ministry's chief engineer, the committee included representatives from the two bodies charged with national water management—the Water Commissioner and the National Water Planning Authority—and from local stakeholder, such as Haifa's Port Administration, City Engineer, and Health Services. Ordered to present their report within three months, the committee bravely took a boat trip down the Kishon, visited some of the implicated plants and met with their respective management; assembled reports from the Haifa city engineering department, SFRS, Haifa port administration, and Haifa health services; consulted hydrological and sanitation experts; heard the representatives from six of the accused plants, and digested reports submitted by other plants. Finally, in May 1962, two months behind schedule, the committee presented its official report [18].

The committee framed the problem in administrative terms. The pollution at the Kishon was cast as a public nuisance, to be controlled by the local authorities via the licensing process. The 1958 *Statute of Arts and Industries* empowered the local authorities to permit licensed businesses in their jurisdiction to discharge their wastewater into the municipal sewer system or natural waterways, provided their wastewater satisfied certain criteria that delimited their injurious effects [19]. However, the local authorities had neither the technical facilities, nor the trained personnel, needed to monitor the various sources of wastewater. Moreover, local authorities were often among the main polluters and had little incentive to abate it. The committee identified twenty-nine plants that discharged their wastewater directly into the Kishon, and all of them were properly licensed to do so, even though none of them met their license criteria. The local authorities never bothered to monitor the plants, let along take action to force the plants to comply with the license terms. This feeble political will, the committee further noted, was further weakened by an incoherent political structure. The lower part of the Kishon region was not controlled by any single authority. The oil refineries, by the terms of their old British license, constituted a special zone, free from municipal jurisdiction; Kishon harbor was also out of municipal control, while other parts of the Kishon were controlled by various local municipalities, each operating independently and uncoordinated with the others [10].

To vitalize the political will, if not the river, the committee prescribed the creation of a permanent council that will consist of representatives from all relevant government ministries and local authorities, and would coordinate the scientific, administrative and legal efforts needed for the proper functioning of the Kishon [10]. Similar statutory bodies—composed of representatives from a wide range of stakeholders, and equipped with sufficient power to prevent pollution and promote restoration along their designated streams—had been proven useful in other countries [20]. In 1965, the Israeli Parliament did its part and passed the *Stream and Springs Authority Bill*, which allowed for the creation of such Israeli boards [21]. Unfortunately, the territory of this new administrative species overlapped with that of another, well-established authority—the Drainage Authorities, which oversaw the proper drainage of these same streams. The Drainage Authorities were controlled by the powerful MoA, which saw no reason to share its powers and budgets. Consequently, the ministries of agriculture and the interior, which were given control over the new law, did not implement it. Not a single stream authority was created for the next 30 years.

Still, it would be a mistake to reduce this leniency to political paralysis or administrative turf wars. Well aware of the country's limited water supply, Israeli legislators had developed, early on, a powerful legal framework to administrate Israel's water resources. Topping these efforts was the 1959 Water Law, which, as one commentator out it, "established a water management program for other countries to envy [22]." The Water Law had a vested ownership of each and all water resources in the state, and provided a strong administrative framework, supported by a comprehensive water code, for

a centralized state control over the development, regulation, conservation, supply, and protection of all water resources. The Water Law further fashioned a Water Commissioner (WC) executive position and equipped it with draconian powers to oversee the execution of the law. The WC was authorized to allocate water to all users, set conditions for the protection of all water sources, take measures to prevent any damage to water sources, and restore polluted water resources to their original state at the expanse of the polluter [23].

The Israeli water market was, therefore, subjected to intense government regulation, and plenty of legal and administrative means existed to protect Israel's water resources from pollution. However, neither the powerful WC, nor any other authority, made any attempt to force industries to treat their effluent. However, what the 1962 committee diagnosed as a lack of political will could be considered as the potent manifestation of a different political will; one deeply rooted in the ideological core of the infant state, which was overwhelmingly concerned with the development of its infrastructure. The millions of Jews who heeded the Zionist call to settle in Israel needed housing, food, jobs, and security; and the development of the infrastructure that would meet these challenges was given a carte blanche by political decision-makers. "We shall plant for you and build for you," promised one of Israel's most prominent poets. "We shall beautify you greatly. We shall cloth you in a robe of cement and concrete [24]".

The establishment, in 1966, of a new government-owned plant, Haifa Chemicals (HC), on the bank of the lower Kishon, illustrates the dictates of the ideology of aggressive development and their environmental implications. Using originally-patented processes, HC converted Israeli phosphate rock, mined and shipped from Southern Israel, into products of high added-value for use in agriculture, industry and food production. Nothing came closer to the Zionist dream of a flourishing and sophisticated industry built upon Jewish brilliance and local resources [25,26]. Still, producing fertilizers and industrial chemicals, HC quickly emerged as one of the Kishon's worst polluters, discharging large volumes of toxic waste, daily, into the river [27].

3. The 1970s: New Expertise, Old Ideology

Their resources overextended by the massive activities involved in the National Water Carrier project, Israeli planning authorities paid little attention during the 1960s to the decay of the natural waterways system. That began to change in 1970, when a cholera epidemic erupted in Jerusalem, killing a few children, and was quickly traced to the illegal irrigation of crops with Jerusalem's free-flowing wastewater [28]. The outbreak disrupted agricultural export and tourism, and moved policy makers to pay attention to the potential dangers flowing down Israel's riverbeds [29]. Prompt by the epidemic and alarmed by the extreme levels of pathogens measured in the Kishon, the Haifa regional health authorities launched a comprehensive public-health study of the Kishon and its tributaries. Put together over two years by a team of sanitation engineers, the ensuing report carried a no-nonsense tone. "Many governmental agencies have shown their concern", it noted, "but nothing was done, and the condition of the Kishon has deteriorated from year to year. The political view that the Kishon could serve the industry without causing damages to the shipping and fishing facilities located at its mouth, as well as becoming a place of recreation and leisure, is far detached from reality". In reality, the report dryly stated, the lower Kishon could only be referred to as a severe public nuisance; a body of mostly standing water "so heavily contaminated with industrial wastes that it wiped out any sign of biological life [10] p. 1".

The report stayed away from political and legal analyses. Instead, the authors analyzed four possible strategies to rehabilitate the Kishon: (1) Reduce the pollution to a volume the Kishon could handle; (2) force each plant to treat its own wastewater before dumping into the Kishon; (3) collect and treat all industrial effluents at the Haifa's Sewage Treatment Plant; (4) bypass the Kishon all together by conveying the effluents directly to the sea with a dedicated pipeline. What is urgently needed next, the authors concluded, is a feasibility study that would carefully examine these options and determine the best one. It would then be the politicians' turn to force the solution on industry [10] pp. 90–92.

The Haifa Regional Union of Cities and the local industries jointly hired Balasha-Jalon Infrastructure Systems, a private consulting company that specialized in hydraulic and agricultural planning to perform the feasibility study. Published in 1975, the Balasha-Jalon report clarified early on that, if the Kishon was to be rehabilitated, the industry must cease dumping its effluents into its waters. That is because no matter how well the industrial wastes were treated, some of the toxic constituents were simply too difficult to remove [30]. Instead, Balasha-Jalon recommended the construction of a dedicated pipeline that would collect and carry the industrial effluents far away from the coast into the deep sea. The report developed two alternative schemes for the hypothetical pipeline. In the first scheme, effluents would first be sorted, and the more toxic effluents would undergo a primary treatment and then be conveyed to the sea via a dedicated pipeline. The less-toxic effluents would be treated to a level that could be reused for irrigation, or be discharged back into the Kishon. In the second scheme, all industrial effluents were to be collected in a central facility, where they would undergo a primary treatment before being conveyed to the sea via a three-kilometer-long pipeline. Balasha-Jalon recommended the second scheme. Dumping all industrial effluents into the deep sea, the report concluded, would be cheaper to maintain, and produce the best results for the Kishon. Still, expectations should be kept low. For even the best option would not restore the Kishon to its former glory. It would cease to be a public nuisance, and its basin may be able to support life again. However, the Kishon's water will remain dangerous for many years to come, and direct human contact with the water would have to be strictly forbidden [30].

This last bleak warning hinted at a disturbing finding published a year earlier, while the Balasha-Jalon study was still in the making. In 1974, two young researchers, Joel Kronfeld and Jerzy Navrot, decided to take a close look, not at the water—the focus of all previous attention—but at the thick sludge that had steadily accumulated at the riverbed of the lower Kishon. Using advanced spectro-photometrical techniques, the two detected substantial amounts of various heavy metal constituents in the sludge. The finding was somewhat perplexing since the Kishon's water showed almost no trace of these toxic metals. This, Kronfeld and Navrot noted, was fools' luck. The high pH levels of the Sewage Treatment Plant's effluent prevented the heavy metals from dissolving in the water. Consequently, the heavy metals settled and got trapped in the riverbed sediment. Ironically, Kronfeld and Navrot concluded, that any significant reduction in Treatment Plant's output may actually add to the "biological menace" of the Kishon, and further endanger the entire Haifa Bay [31,32].

The authors of the Balasha-Jalon report were aware of these new findings [33]. They were also aware of the impending plan for a major upgrade of Haifa's Sewage Treatment Plant. According to this plan, the treated effluent would be collected in a seasonal impound some 20 km away, where it would be diluted with agricultural runoff and be used for summer irrigation. Devoid of the large wastewater discharge, the Balasha-Jalon report warned, the flow in the Kishon would be significantly reduced, which would worsen its condition and heighten the perils [30], p. 2.

The improvement plan of the Haifa's Sewage Treatment Plant was part of an overall reorientation of the national water policy that gained momentum through the 1970s and gave priority to the development of wastewater recycling projects [34]. The impetus for this reorientation was the growing realization in the late 1960s, among Israeli water planners, that the country was approaching its limits in developing freshwater resources. The demand for water, nevertheless, continued to grow, and predictions indicated that the gap between demand and supply could reach 300 million cubic meters by 1990 [35,36]. The gap was temporarily covered by over-pumping water from the main aquifers, but a long-term solution was still in need. Seawater desalination was first considered as the preferred strategy to increase water supply, but the available technology was found to be immature and too expensive [37]. A consensus evolved that, until the arrival of cheap desalination, any major addition to the water supply would have to come from the reclamation of wastewater. Meanwhile, the activities involved in the National Water Carrier and the associated regional water development projects had come to their conclusion, and the massive water resources development program had almost ground to a halt. Consequently, the entire water community threw their full weight behind the development

of a wastewater-recycling plan. The design of a national plan began in 1970, and by 1973 it came into effect as the Israel Sewerage Project (ISP) [38].

ISP dictated a comprehensive change. The national water company had used a single supply system for both domestic and agricultural use. However, a more complex system had to be built, and conventional thinking among water planners had to change, from using a single high standard of water quality to a hierarchical system that classifies, transports, stores, distributes and monitors water of varying qualities. High-quality water was to be protected and utilized for higher quality purposes, such as drinking, while lower quality water should be used for all other purposes, including agriculture. The 1970s saw Israel entering a new era of innovative research and development concerning all aspects of wastewater reclamation and reuse. By the end of the decade, Israel had already become a world leader in wastewater recycling, having developed sizable technoscientific expertise and an elaborate administrative capacity for water quality management and conservation [39]. However, the new program was driven by the same old ideology. That is, not by environmental concerns, but by the growing gap between the ideological ambition of development and the realities of inadequate water supply. The goal was not to clean the polluted streams, but to have treated wastewater supplying the greater part of agricultural irrigation by the 1990s.

The new water recycling policy made it possible to look for solutions for the ongoing contamination of the country's waterways with sewage flows. Seasonal effluents impoundments, like the one planned for the Haifa's Sewage Treatment Plant, provided a feasible solution to the recovered wastewater for agricultural use, coupled with the reduction of the pollution discharged into streams, such as the Kishon. Still, as the Balsha-Yalon report made clear, the industrial effluents were freighted with toxic materials that were difficult to filter out. The planning authorities preferred however to focuse on the bulk of the wastewater that could be recycled for agricultural purposes and refrained from forcing the polluting plant to introduce expensive technologies for the flows lost to the sea. Without political wind in its sails, the Balasha-Jalon report was ignored and soon forgotten. The dedicated pipe that would divert the industrial effluent from the Kishon and transport it into the deep sea did not materialize. The government did not want to finance it; and, in spite of the powerful administrative and legal mechanisms available, no attempt was made to force the industry to do so.

4. 1980: Delays and Evasions

Considered an acceptable price, necessary perhaps, for progress, the ailing Kishon had little choice but patiently wait for a change in values. That change started in the late 1970s, with the fall from power of the ruling socialist coalition that had been at the helm since the early days of the century. The newly-elected liberal-nationalist coalition, known as the Likud, carried no special attachment to the socialists-dominated agriculture sector. Some of the implications of this change were clarified early by Joseph Tamir, an urban, liberal politician, who played a central role in the 1975 establishment of *Life and Environment*, an umbrella organization that coordinated activities among Israel's fledgling non-governmental environmental organizations (NGOs). When the Likud rose to power in late 1977, Tamir became the new Chair of the Knesset's powerful *Internal Affairs Committee*. He quickly added the "Environment" to the committee's title and dominion, held a series of hearings concerning the Kishon, reprimanded the WC for its neglect of the Kishon, which "has turned during the years to a lifeless sewage conduit that constitutes a severe ecological and environmental nuisance", and ordered the WC to take immediate actions, using all the means in its possession, to reduce the severe pollution in the Kishon [40].

Ordered to report back every six months to the *Internal Affairs and the Environment Committee* (IAEC), the WC reluctantly moved into action. In early 1978, the commissioner issued a series of edicts to about fifteen small plants located along the Gedura stream, the Kishon's main tributary. The edicts demanded that the plants comply with the terms of their license, cease dumping their effluent into the stream, and to connect to the local sewage system. The bigger plants located along the Kishon's Banks, posed a more difficult problem, as their waste contained toxic ingredients that could not be treated by

the municipal sewage treatment system. A different set of edicts was therefore issued to ten of these plants, which included a new standard that specified maximum thresholds for six commonly used water quality indicators: Acidity, suspended solids, oxygen demand, ammonia, detergents, and oils. The edicts demanded that all industrial effluents dumped into the Kishon must comply with the new standard [41].

The edicts presented, for the first time, a clear set of official parameters for the plants to comply with [42]. The demands were anything but harsh. The standards mentioned neither the hard-to-remove heavy metals, nor other significant pollutants, such as phosphates, fluorides or nitrates. The maximum thresholds permitted for the six mentioned indicators were also relatively lenient. Nevertheless, compliance was not an easy task for the plants, which had gotten used to having their way for so long. To comply, significant technological changes had to be made. New filtering technologies had to be installed, and, possibly, even fundamental changes in the production processes were needed. All these involved a financial burden that the plants were reluctant to carry alone without significant government help, which was not forthcoming.

On his part, the powerful WC, was hesitant to enforce the new standard on the plants, many of which were owned directly by the government and were central to Israel's economy. The refineries, for example, provided crucial energy to Israel's rapidly growing population and its modernizing economy. The petrochemical industries were among Israel major exporters, providing it with much needed foreign currency. Moreover, the plants provided livelihood to thousands in the Haifa area, and were backed by the *Histadrut*, Israel's powerful umbrella labor union, which controlled much of local politics. In this context, any attempt to enforce regulation that added to the cost of production, was conceived as a threat, not only to the viability of the plants, but also to the nation's economy, and would be met with resistance, not only from the plants' managements, who resisted any change in the status quo, but also from the powerful labor unions, as well as local and national politicians. Neither the WC, nor the plants, were, therefore, ready to make the difficult decisions needed to meet the challenges set by the edicts.

The edicts required the plants to present a preliminary plan within six months from the issuance date; a final plan within twelve month from the date of the approval of the preliminary plan; and full compliance within three years from the date of the approval of the final plan. In July 1979, a year after the issuance of the edicts, the WC reported back to the IAEC that most of the smaller factories along the Gedura tributary have complied with the edicts and began to deliver their waste to the municipal sewage treatment facility. That was not the case, however, with the bigger plants along the Kishon, "where real progress was yet to be made". Tellingly, instead of pressing the plants, the WC chose to plead their case before the committee. "These are large plants", the WC, Ben Meir, explained to the IAEC, "each unique in kind in Israel, facing difficult problems in treating their effluents. Taking note of this objective situation, we gave them long period (up to five years) to solve their problems and stop dumping their wastes into the Kishon". Even then, predicted Ben Meir, only few of the plants will comply with the prescribed timetable [43].

The plants took advantage of a loophole in the edicts, which did not set absolute dates for compliance. Instead, each phase in the time-table was conditional on the successful completion of the previous one. That opened the door for repeated delays, as each stage was put off until the successful completion of the previous stage. Consequently, four and half years after the issuance of the edicts, at the theoretical date of final compliance, all the big polluters were still far from compliance [44]. Facing noncompliance, the WC chose to avoid confrontation and abstained from taking punitive actions against any of the polluting plants. Instead, it sought to cultivate cooperation through ongoing negotiation. The WC's main argument against the plants was its control over their water allocation. The plants' water allocation had to be annually approved by the WC, and the WC refused to approve it unless the plants showed some advancement in their treatment plans. The plants responded by doing just enough to persuade the WC not to cut off their water supply, but never enough to comply with the demands of the 1978 edicts.

The actions of the biggest polluter, Haifa Chemicals (HC), may serve as an example. In October 1978, the date set by the edicts for the completion of the preliminary plans, HC asked for an extension. The WC extended the deadline by three months to December 1979. By January 1980, HC still failed to present the WC with the requested plans, and the WC agreed to give HC another three-month extension, until March 1980. In March, HC finally presented the WC with a treatment plan that fell short of the required standard. In the accompanying letter, HC explained that full compliance would necessitate too large of an investment and intimated that it could jeopardize the existence of the plant and the livelihood of its 580 workers. The WC rejected the alternative plan and the two sides negotiated the hiring of an external arbitrator. A company specializing in environmental technology was contracted, which after a great deal of research concluded what everybody had already suspected. An adequate solution would necessitate great expenditure and fundamental changes in the production processes themselves. HC rejected this option as impractical and resubmitted its previous plan. Unless a practical solution could be found, it reiterated, it will have to consider the possibility of shutting down its operation and dismissing its 580 workers [45–48].

A solution was finally unearthed from the long-forgotten recommendations of the 1975 Balasha-Jalon study—a dedicated pipeline that would divert HC's highly toxic effluent away from the Kishon and into the Mediterranean Sea. Both sides seemed content with this elegant solution that promised to hide everybody's problems deep in the sea. Best of all, there was plenty of work to be done before the pipeline could materialize. Detailed surveys of the Haifa Bay had to be performed, followed by studies of potential influences on the marine environment. Plans had to be made, and data be collected to satisfy the demands of the various planning and municipal authorities. The physical course of the pipeline had to be negotiated, and objections from the various authorities had to be considered. All this was to take a long time and HC was in no hurry. By the early 1990s it was still knee deep in the preliminary stages of the pipeline planning. As long as the bureaucratic process was in motion, temporal solutions could be legitimated. These fell far short from satisfying the standard demanded by the 1978 edicts. However, HC could always pull out its ace, the marine pipeline, and promise that the final solution was well on its way [49,50].

Other plants followed similar strategies. Many of them investing a substantial amount of money and implemented various apparatuses to reduce their pollution. Still, by 1993, fifteen years after the issuance of the edicts, none of the plants along the Kishon had met the required standard. Moreover, while the plants may have somewhat improved the quality of their effluents, they were also generating much more of it, as both industry and population continued to grow. The condition of the Kishon continued, therefore, to deteriorate during the 1980s, with no clear solution in sight [51].

5. 1990s: New Champions for the Old River

Some things, nevertheless, had changed by the 1990s, not the least of which was the global rise of environmental politics. American President Richard Nixon declared the 1970s to be "the decade of the environment", and established the Environmental Protection Agency [52]. The 1970s saw also the appearance on the political stage of NGOs, such as Friends of the Earth and Greenpeace, which kept steady pressure on authorities to keep good on their environmental commitments. A defining moment of this growing international environmentalism took place in 1972, in Stockholm, Sweden, where 113 countries attended the first global conference on the environment, organized by United Nations. Israel sent a high-level delegation to Stockholm, headed by the foreign minister, Abba Eban, who assured the assembly of Israel's commitment to sound environmental policy [53]. Inspired by the historic event, the Israeli delegation members lobbied, upon their return, to Israel for the creation of a full-fledged environmental ministry, but had to settle for a small department within the Prime Minister's office, equipped with an amorphous mandate to advise the government on environmental issues and coordinate relevant activities among the various ministries. It took another decade and a half for Israel to finally establish a Ministry of the Environment (MoE), which remained poorly funded and enjoyed neither political cooperation nor public support. Eight ministers came and went

by the end of the century and none of them stayed long enough to make a significant mark on Israeli politics [54].

The municipalities along the Kishon and the industrial complex at its basin, continued to dump their effluents into the Kishon with little interruption. By the end of the 1980s, scientists from the *National Oceanographic and Limnological Research Institute*, who have been monitoring the river since the 1950s, began to warn the authorities that the toxic sedimentation accumulating at the Kishon's bottom was slowly chocking it and diminishing its capacity to channel large flows to the sea [55]. No one paid attention until the lower Kishon overflew during the exceptionally wet winter of 1992, and covered extensive residential and industrial areas with thick toxic sludge and transported massive quantities of it into the bay [56]. The flooding and its high cleaning costs increased the pressures on the political system to find a solution to the Kishon ills [57]. In 1994, thirty-two years after it was originally recommended, the Kishon Authority (KA) was finally created to administer the political, legal, scientific, and administrative efforts needed for the rehabilitation of the Kishon [58].

Facing formidable resistance, the KA continued to avoid confrontation, abstained from taking punitive actions against any of the big polluting plants, and sought instead to cultivate cooperation by ongoing negotiation. The plants, almost all of them privatized by now, responded with delay and evasion, doing just enough to avoid sanctions, but never enough to fully comply. The stage was set, therefore, for the continuation of the status quo between government and industry, were it not for the surprising appearance of a new kid in town—a young NGO called the *Israeli Union for Environmental Defense* (IUED).

Founded in 1991 by an American immigrant, Alon Tal, and funded by private, largely American donors, the new NGO struggled to take root in Israeli society, which lacked a tradition of grassroots civic activism, constantly occupied itself with existential threats, and preferred to negotiate its collective problems through state channels and consensual politics [59]. The IUED looked for a dramatic case that will allow it to raise Israeli environmental consciousness by using the legal courts as a public stage for dramatizing Israel's growing environmental problems. The Kishon came up early and often on the IUED agenda as a possible candidate [60]. It was the most polluted waterway in Israel, the polluters were known, and plenty of evidence was available. Alas, IUED did not have the legal standing required to prosecute the polluters. Israeli law provided powerful tools to prosecute water pollution, but these tools were all concentrated in the hands of the state. Some of them were deposited with the WC, who refused to go to battle with powerful rivals over water lost to the sea. Others were in the hands of the local municipalities, which were among the largest polluters and did little to stop it.

The government's grip over water regulation began to loosen up in the late 1980s, under the pressure of growing international environmental law. During the previous decade, Israel was privy to the negotiations that culminated in the 1976 Barcelona Convention for the Protection of Mediterranean Sea against Pollution, and the following years saw Israel's executive and legislative branches ratifying the protocols of the Barcelona Convention [61]. One of these was the *Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources* (LBS Protocol), which was adopted in 1980, legislated by the Israeli Parliament in 1988, and ratified in 1990 [62]. The LBS Statute is a criminal statute that forbids the discharge or disposal of any substances into the sea without a permit. Most importantly, among its various provisions, the new legislation allowed for the first time for interest groups, properly certified as such by the Ministry of the Interior, to enter complaints in the name of the public.

In 1993, the Ministry of the Interior certified IUED to represent the public under the LBS Statue. Shortly after, another passage, this time to the powerful Water Law, was opened when IUED learned of a group of fishermen who ported at the Kishon and complained that the polluted water had caused great physical and financial damages to their fishing boats. The revised Water Law allowed the fishermen to pursue legal action to protect their property and livelihood. Still, taking on the mighty plants was not an easy task, and none of the lawyers the fishermen turned to thought that the amount of damage that could be proven and compensated for, justified the expense and effort required to fight

the powerful plants. The fishermen were therefore delighted when IUED contacted them and offered a barter deal: Free legal representation in return for incorporating environmental concerns into the suit. The fishermen agreed and the young NGO finally found the legal showdown it was looking for.

In December 1994, IUED entered criminal charges against the two biggest polluters at the Kishon Basis: Haifa Chemicals and Deshanim, for violating the Water Law and the LBS Statue by dumping dangerous wastewater into to the Kishon, and from there to the Mediterranean [63]. Caught off-guard by the aggressive suits, the plants hired some of the top Israeli law firms in attempt to shake them off. A long and stormy battle ensued. IUED provided the courts with samples taken from the plants' outpour to the Kishon, which showed grave violations of the 1978 industrial wastewater standard [64]. Deshanim's lawyers successfully shook off the suit by arguing that that IUED test results, which found detergents 676 times the maximum permitted level, indicated that the sample was mistakenly taken from a stream that belonged to their next-door neighbor, a detergents plant [65]. HC was not so lucky. Unable to shake off the suit, its lawyers conducted a campaign of attrition designed to run down the fledgling IUED through legal costs. They insisted on detailed and lengthy discoveries, asked for repeated delays, and altogether launched a steady barrage of procedural missiles at the suit. However, IUED enjoyed the good fortune of a sympathetic Magistrate Judge, Yitzhak Dar, who ruled time and again in IUED's favor.

HC tried also to dismiss the suit through its political connections. It pleaded with the Attorney General for a delay in the case until a proper solution could be found [66]. It emphasized the plant's importance to Israel's economy and hinted to the possibility that the suit may force it to close shop, bringing ruin to hundreds of families in the Haifa Metropolitan area. However, the General Attorney refused to intervene in the proceedings. The LBS statue mandated that every discharge into the Mediterranean must be registered and authorized by an inter-ministerial committee headed by a representative of the Minister of the Environment [62]. Haifa Chemicals had never bothered to ask for such a permit, but now it desperately tried to get one, as a legal shield against the IUED suit. It summoned its best political allies to plead with MoE to provide it with a temporary permit, until a solution for their wastewater could be found. However, this time, it was MoE's turn to turn a deaf ear. Permits, the ministry insisted, could only be given in return for concrete plans and guarantees for future improvement. Haifa Chemicals had no such plans to present, apart from its hypothetical marine pipeline proposal, for which they had no tangible plan or timetable, and which was strongly objected to by the MoE. The requested permit was not given [67].

Finally, after two more years, in November 1996, the court approved a consent agreement in which Haifa Chemicals agreed to cover the full costs of the damage to fishermen's boats, fully cover IUED's legal expenses, and create a $250,000 environmental protection fund that would finance the monitoring of the Kishon and relevant education activities. More importantly, the legal settlement set, for the first time, a detailed industrial-waste standard for HC to abide by, with a clear time-table to do so, and a crowded list of sanctions if it failed to do so [68]. Thus, after more than two decades of firmly insisting that it had no other financially-feasible solutions for its industrial wastes, except for the dedicated marine pipeline, HC moved quickly to introduce the necessary changes to its production processes. HC began to import raw materials that were more expensive but with less impurities and invested more than ten million dollars into new treatment facilities. Other plants at the Kishon basin followed course and upgraded their treatment facilities in order to secure their LBS permit. The local municipalities along the river's banks also combined forces to improve their sewage infrastructure.

Meanwhile, in 1999, after a severe drought, the Israeli government finally decided that the cost of desalination had come down enough, and approved a massive desalination program that would meet the growing urban, domestic, and industrial demands, and perhaps some of its natural waterways' needs as well [69]. Thus, by the final years of the second millennium, through the combined efforts of a polite administration, aggressive civil activism, and technological advances, the Kishon finally had something to look forward to. Aquatic life and recreational parks slowly began to appear along its banks. Only the warning signs that were spread along the banks, bluntly forbidding any bodily

contact with water, served as a reminder that not all past sins can be easily washed to the sea, and that under the façade of the lazy clean water still lay toxic sludge.

6. The 2000s: A Proving Ground for the Neo-Liberal Regime

In the spring of 2000, a public scandal erupted that brought the gloomy Kishon out from the obscurity of scientific journals and political backrooms and endowed its rehabilitation with new moral meanings and political urgency. It all started when veterans of the Israeli Navy Seals, an elite military unit, disclosed to the media that their unit has secretly trained in the Kishon's port for half a century [70]. The veterans claimed that the trainings in the polluted water caused a rash of cancers among them, and demanded that the Ministry of Defense (MoD) take responsibility for their illness, finance their medical treatments, and support their families if they should die. Worried about opening a floodgate of similar claims from soldiers in other units, the military denied any causal connection between the training in the polluted river and the veterans' cancers, and rejected the veterans' demands [8].

The dispute between the military and some of its elite soldiers quickly escalated into a bitter public controversy. Military service constitutes a central unifying narrative within Israeli society. Most young Jewish citizens are required to serve in the military, during which time they must follow orders, sometimes to the extent of risking their lives. In return, the State, by means of the MoD, guarantees full care of them and their families in case of injury or death in the line of duty. Trust is at the core of this vital contract between the State, the soldiers and their families. The elite military units, the Navy Seals prime among them, embodied the very essence of this contract, as their soldiers took the greatest risks and in return received society's highest appreciation. The notion, therefore, that this trust had been compromised—and, of all soldiers, with the elite Navy Seals—mesmerized the public. Newspapers, radio stations, and TV channels alike raced for the personal stories of the distressed soldiers and their families, and dug out the long history of disregard and neglect of the Kishon, and highlighted the refusal of the government to take responsibility for the misfortunes of both her young soldiers and old river.

A high-rank committee led by President Emeritus of the Israeli Supreme Court Meir Shamgar, and two prominent scientists, toxicologist Meir Wilchek and epidemiologist Gad Rennert, were called upon to investigate the disputed causal connection between the polluted water and divers' cancers. It did not take long for the committee's members to realize the scale of the calamity they were dealing with. The evidence quickly mounted and left little doubt that the lower Kishon River had been heavily polluted for many years with impunity. The Commission decided, therefore, not to wait for the completion of its entire inquiry, which included a large-scale retrospective risk study that would take almost two years, but to go ahead and publish an interim report that would address the urgent needs of both the sick soldiers and the sick river.

Published in July 2001, the preliminary report spared no party involved: The plants that took the river hostage and pumped their toxic wastes into it; the municipalities that did the same with their domestic sewage; the administrators and politicians who knew but looked the other way; the naval commanders who ignored the warnings and failed to guard the safety of their soldiers. All of them were privy to this scandalous affair, and each of them could and should have taken action to stop it. Indeed, the Commission found the neglect to be so widespread and systematic that it saw no purpose in pointing fingers. Instead it concluded its preliminary report with two sets of recommendations. The first set addressed the military: All activities involving physical contact with the Kishon must be immediately suspended; the sick soldiers and their families should receive interim medical and financial help, pending final resolution; and future training sites should be tested for environmental safety before soldiers be allowed to train there. The second set addressed the disturbing state of public affairs the committee encountered during its investigation. The culture of disregard towards the environment must not be tolerated anymore. The civil authorities must exercise the legal and technical means available to prevent further pollution of the environment at large, and the Kishon in particular [71].

In November 2001, the government officially adopted the recommendations of the preliminary report and instructed the MoD to implement the first set of the military recommendations, and the MoE to follow up on the second set [72]. The military ceased operations in the Kishon and appointed professional teams to study the environmental safety of its extensive network of training sites [73], while an inter-ministerial committee headed by the MoE embraced an ambitious master program proposed by the KA to stop all wastewater discharge into the Kishon, increase its share of good-quality water, dredge and remove the toxic sludge accumulated at its bottom, and vastly expand the parks around it [74].

In April 2003, the Commission published its final report. To the dismay of all, after nearly three years of intense inquiries the committee failed to resolve the main issue of contention. Having found no statistically-significant correlation between the cancer among the veterans and the water they trained in, the two scientists rejected the veterans' claim. The jurist, on the other hand, found the accumulated evidence, which included also direct testimonies and other non-quantifiable data, strong enough to support a causal connection. Conflicted, the committee's final report failed to put a closure to the painful rapture between the state and its elite soldiers. Once a public reminder for the sacrifices that the Zionists had to endure in their struggles to reinvent Jewish society, the polluted Kishon turned into a monument for the state's neglect and betrayal of its soldiers and rivers [75].

The political reaction came quickly. Within days of the publication of the final report, the Minister of Defense announced that the government decided to embrace the jurist's minority opinion and give the veterans and their families all the help they needed [76]. The ailing river received its share as well. Three months earlier, in January 2003, Israel opened the largest reverse-osmosis desalination facility in the world, the first in a series of five plants erected in Israel in the next decade, which produce about 600 million cubic meters of desalinated seawater per year, at a reasonable cost of under $0.60 per cubic meter—enough, not only to meet the growing urban demand, but also to make it economically feasible to start rehabilitating the depleted water aquifers and replenish the natural waterways with good–quality water. The dredging of the toxic sludge proved to be more challenging, but in April 2011, the government finally launched a larger-scale project to clean up the Kishon's riverbed. In June 2012 the Kishon Drainage Authority issued an international tender for the excavation of 400,000 cubic meters of contaminated sediment along a seven-kilometer route of the river [77]. In January 2013, the Canadian firm, EnGlobe Corp, was selected to perform the dredging, and, in February 2015, the project began, with a 20-month time-table [78].

So stands at the moment the story about the fall and rise of the Kishon. The old river has been domesticated by the grace of the modern state. Its flow is strong again and its water and banks show new signs of life. Visitors who happen upon the lower Kishon these days are treated with lavish recreational parks, fully furnished with lawns, BBQs, swings, and walking, running and biking paths. The long-range plan includes also an upscale residential zone that will look over the rehabilitated waterway, which will enjoy a public amphitheater, as well as a tourist-oriented nursery, fruit orchards and a produce market [79]. Once a testament for the sacrifices involved in a struggle to overcome a hostile nature and create a viable state, the rehabilitated Kishon has now become a theater for a confident society that has triumphed in its struggle against nature.

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Abbreviations

KCF	Kishon Commission Files
MoA	Ministry of Agriculture
MoD	Ministry of Defense
MoE	Ministry of the Environment

References and Notes

1. Galnoor, I. Water policymaking in Israel. *Policy Anal.* **1978**, *4*, 339–367.
2. Lester, R. Legal Aspects of Water Quality Management in Israel. In *Water Quality Management under Conditions of Scarcity: Israel as a Case Study*; Shuval, H., Ed.; Academic Press: New York, NY, USA, 1980.
3. Tal, A. *Pollution in the Promise Land: An Environmental History of Israel*; University of California Press: Berkeley, CA, USA, 2002.
4. Zaslavski, D. *Below the Red Line, or Water as an Allegory*; Technion Press: Haifa, Israel, 2002.
5. Blass, S. *Water in Strife and Action*; Massada: Ramat Gan, Israel, 1973. (In Hebrew)
6. Alatout, S. States of scarcity: Water, space, and identity politics in Israel, 1948–1959. *Environ. Plan. D* **2008**, *26*, 959–982. [CrossRef]
7. Feitelson, E. The Four Eras of Israeli Water Policies. In *Water Policy in Israel: Context, Issues and Options*; Becker, N., Ed.; Springer: Berlin, Germany, 2013; pp. 15–32.
8. Golan, T. The Kishon Affair: Science, Law, and the Politics of Causation. *Sci. Context* **2012**, *23*, 535–569. [CrossRef]
9. For Maps and Additional Information (in Hebrew) about the Kishon, Visit the Kishon River Authority Site. Available online: http://www.kishon.org.il (accessed on 14 March 2016).
10. Avital, Y.M.; Shelef, G.; Braskin, A.; Kazer, M.; Shemesh, D.; Noy, Y.; Yuls, D. *Public Health Survey of the Kishon and Its Brooks*; Ministry of Health: Haifa, Israel, 1972.
11. Oren, H. Letter to the Director of the Fishing Department. In *KCF*; Military Archives: Jerusalem, Israel, 29 November 1953.
12. Oren, H. Letter to the Director of the Fishing Department and the Ministry of Agriculture. In *KCF*; Military Archives: Jerusalem, Israel, 3 February 1957.
13. Oren, H. Letter from the Navy's headquarters to the Fishing Department and the Ministry of Agriculture. In *KCF*; Military Archives: Jerusalem, Israel, 13 February 1957.
14. Oren, H. The Technical Committee on the Kishon Pollution, Protocol. In *KCF*; Military Archives: Jerusalem, Israel, 14 October 1956.
15. Oren, H. The Kishon's water around the Harbor. In *Alon Miktzo'ee La'Dayag (Fishermen 's Professional Bulletin)*; MoA: Haifa, Israel, 27 March 1959.
16. Komarovsky, B.; Litay, E. *Survey of Polluted Waterways: Summery Report for the Period 30.9.1970–1.4.1971*; MoA: Haifa, Israel, 1971; pp. 10–14.
17. Peper, A. *Letter to Engineer Watson*; MoH: Jerusalem, Israel, 1961.
18. The Kishon Pollution Committee. *Intermediary Report*; The Kishon Pollution Committee: Haifa, Israel, 1962.
19. *Local Municipalities Statue*; State of Israel: Jerusalem, Israel, 1958.
20. Porter, E. *Water Management in England and Wales*; Cambridge University Press: Cambridge, UK, 1978.
21. Kensset. Rivers and Stream Authorities Statue. 1965. Available online: http://fs.knesset.gov.il//5/law/5_lsr_210348.PDF (accessed on 27 June 2016).
22. Lester, R. Israel. In *International Encyclopedia of Laws Environmental Law*; Blanpin, R., Boes, M., Eds.; Kluwer: Cambridge, MA, USA, 1973; p. 52.
23. Water Law. In *Kovetz Takanot*; State of Israel: Jerusalem, Israel, 1991; p. 470.
24. Alterman, N. A Morning Song to the Homeland. Available online: http://www.zemereshet.co.il/song.asp?id=3292 (accessed on 14 March 2016).
25. Herzl, T. *Altneuland*; Hermann Seemann Nachfolger: Leipzig, Germany, 1902.
26. Barell, A. *Engineer-King: David Ben Gurion, Science, and National Building*; Ben Gurion University Press: Sede Boker, Israel, 2014.
27. The Kishon Enterprises. Available online: http://www.sviva.gov.il/subjectsEnv/SeaAndShore/MarinePollutionLand/ProjectionSources/Pages/KishonPlants.aspx (accessed on 14 March 2016).
28. Haaretz. 1970. Available online: http://www.haaretz.co.il/news/education/1.1278551 (accessed on 14 March 2016).
29. Shuval, H. Quality Management Aspects of Wastewater Reuse in Israel. In *Water Quality Management under Conditions of Scarcity: Israel as a Case Study*; Shuval, H., Ed.; Academic Press: New York, NY, USA, 1980; p. 222.

30. Balasha-Jalon Infrastructure Systems. *Prevention of the Kishon's Pollution by Industrial Wastes: A Preliminary Report*; Balasha-Jalon Infrastructure Systems: Haifa, Israel, 1975.
31. Kronfeld, J.; Navarot, J. Transitional Metal Contamination in the Qishon River System, Israel. *Environ. Pollut.* **1974**, *6*, 281–288. [CrossRef]
32. Kronfeld, J.; Navarot, J. Aspects of Trace Metal Contamination in the Coastal Rivers in Israel. *Water Air Soil Pollut.* **1974**, *4*, 127–134. [CrossRef]
33. Kronfeld's and Navarot's paper was included in the Balasha-Jalon bibliography.
34. Selbst, N. Economic, Social and Administrative Considerations in Reuse of Wastewater. In *Water Quality Management under Conditions of Scarcity: Israel as a Case Study*; Shuval, H., Ed.; Academic Press: New York, NY, USA, 1980; pp. 243–262.
35. Vardi, Y. National Water Resources Planning and Development in Israel—The Endangered Resource. In *Water Quality Management under Conditions of Scarcity: Israel as a Case Study*; Shuval, H., Ed.; Academic Press: New York, NY, USA, 1980.
36. Bone, Y. The Historical Development of Underground Water Production. In *Water in Israel*; Grinvald, Z., Ed.; Ministry of Agriculture: Jerusalem, Israel, 1973; Part A.
37. Hofman, D. *Desalination and Its Application in Israel*; National Water Authority: Jerusalem, Israel, 2011.
38. Gabbay, S. *The Environment in Israel*; Ministry of the Environment: Jerusalem, Israel, 1992.
39. Shuval, H. *Water Quality Management under Conditions of Scarcity: Israel as a Case Study*; Academic Press: New York, NY, USA, 1980.
40. Internal Affairs and Environment Committee. *Conclusions of the Knesset's Internal Affairs and Environment Committee Concerning the Kishon's Pollution*; Knesset Records: Jerusalem, Israel, 4 July 1978.
41. Ben Meir, M. *Treatment of the Kishon's Pollution Problem: Half-Annual Report by the Water Commissioner to the Knesset's Internal Affairs Committee*; Knesset Records: Jerusalem, Israel, 10 July 1979.
42. The indices seemed to be based on the 1976 Water Quality Standards published by the American Environmental Protection Agency, which included more than fifty indicators. The Water commissioner edicts chose six of the most commonly used indicators and specified a maximum threshold for each. The indices chosen were easy and cheap to implement and provided a good picture on the overall conditions. (1) Biological Oxygen Demand (BOD < 30 mg/L). Moderately polluted rivers may have BODs in the range 2–8 mg/L. Efficiently treated municipal sewage will have a BOD value of about 20 mg/L. The threshold set by the edicts, 30 mg/L, was a sad reminder that about half of the Kishon's water came from Haifa's sewage treatment plant; (2) Total Suspended Solids (TSS< 60 mg/L) The threshold specified by the edicts, 60 mg/L, was very lenient. In heavily urbanized and industrialized areas, such as in Haifa, a river may be fishless with TSS concentration as law as 15 mg/L; (3) Ammonia (<12 mg/L). Ammonia nitrogen (N) is a product of microbiological activity, as well as a key ingredient in fertilizers. When found in natural water it is indicative of sanitary pollution. However; (4) Detergents (<1 mg/L). Detergents were environmentally targeted in the 1970s and 80s because they contained large amounts of phosphates, which can promote excessive growth in algae and aquatic plants that disrupts normal functioning of the ecosystem and cause variety of problems, from odors to killing fish and increasing pathogenic populations; (5) Oils and Mineral Oils (<1 mg/L). Concentrations as law as 0.1 ml/L were shown to be lethal to marine organisms, so the threshold of 1 mg/L, specified in the edicts is, again, quite lenient; (6) pH levels (between 6 and 9). The pH levels specified in the edicts were a little more lenient that EPA's (between 6.5 and 9), probably to accommodate the prevalence of HC's effluent.
43. Ben Meir, M. *Report of the Water Commissioner to Mr. Joshua Barazani, Secretary of the Internal Affairs and Environment Committee Concerning the Kishon Pollution*; Knesset Records: Jerusalem, Israel, 4 July 1979.
44. Environmental Protection Agency. *1981 Annual Report*; Environmental Protection Agency: Jerusalem, Israel, 1982; p. 151.
45. Water Commissioner to Haifa Chemicals LTD. In *KCF*; Military Archives: Jerusalem, Israel, 30 October 1978 & 15 January 1978.
46. Haifa Chemicals to the Water Commissioner. In *KCF*; Military Archives: Jerusalem, Israel, 12 March 1980 & 4 May 1981.
47. Forrer, Z. Letter to Haifa Chemicals LTD. In *KCF*; Military Archives: Jerusalem, Israel, 4 April 1984.

48. Forrer, Z. Letters to the Water Commissioner. In *KCF*; Military Archives: Jerusalem, Israel, 8 February 1989 & 9 February 1990.
49. Letters from Haifa Chemicals to Forrer, Z. In *KCF*; Military Archives: Jerusalem, Israel, 21 October 1990 & 1 November 1990.
50. Letter from B. Flikstein, Vice to the Ministry of the Environment. In *KCF*; Military Archives: Jerusalem, Israel, 6 August 1991.
51. Reports of the Israel Oceanographic and Limnological Research from the Late 1980s to Mid 1990s. In *KCF*; Military Archives: Jerusalem, Israel, 2001.
52. Reorganization Plan No. 3 of 1970. In *U.S. Code, Congressional and Administrative News*; 91st Congress—2nd Session, 1970; Volume 3.
53. Eban in Stockholm. *Yediot Achronot*, 7 June 1972.
54. Tal, A. *Pollution in the Promise Land: An Environmental History of Israel*; University of California Press: Berkeley, CA, USA, 2002; pp. 259–262.
55. Hornung, H.; Kres, N.; Krumgalz, M. *The Presence of Heavy Metals in Sediments Taken from the Kishon's Bed and the Docks*; Israel Oceanographic and Limnological Research Reports; Jerusalem, Israel, October 1990.
56. *Kishon Authority Annual Report*; Ministry of the Environment: Jerusalem, Israel, 2000; p. 90.
57. See for the protracted litigation between insurance companies and the various local authorities regarding liability, in Haifa District Court, see cases 404/93 and 307/99. The litigation later reached the Israeli Supreme Court. See cases 2906/01, 3049/01, and 3139/01.
58. Kishon River Authority. Available online: http://www.kishon.org.il/ (accessed on 14 March 2016).
59. Morag-Levine, N. The Politics of Imported Rights: Transplantation and Transformation in an Israeli Environmental Cause Lawyering Organization. In *Cause Lawyering and the State in a Global Era*; Sarat, A., Scheingold, S., Eds.; Oxford University Press: Oxford, UK, 2001; pp. 334–352.
60. Interview with Alon Tal. 11 March 2014.
61. Convention for the Protection of Mediterranean Sea against Pollution. Available online: http://195.97.36.231/dbases/webdocs/BCP/BC76_Eng.pdf (accessed on 27 June 2016).
62. Regulations for the Prevention of Marine Pollution from Land Based Sources. Available online: http://www.sviva.gov.il/English/Legislation/Documents/Seas%20and%20Coasts%20Laws%20and%20Regulations/PreventionOfSeaPollutionFromLand-basedSourcesLaw1988.pdf (accessed on 27 June 2016).
63. Israeli Union for Environmental Defense v. Haifa Chemicals. Haifa Peace Court records, criminal complaint # 5790/94. 1994.
64. Mona Nuffi. *Expert Report*, Haifa Peace Court records, criminal complaint #5790/94. 1994.
65. Protocols; Haifa Peace Court records, criminal complaint # 5790/94. 1994.
66. Request for delay of procedures, Haifa Chemicals' letter to the Attorney General. In *KCF*; Military Archives: Jerusalem, Israel, 11 November 1995.
67. Adler, E. Testimony before the Shamgar Committee of Inquiry. In *KCF*; Military Archives: Jerusalem, Israel, 2001.
68. The agreement is attached to the protocol of the 25 November 1996 meeting; Haifa Peace Court records: criminal complaint # 5790/94. 1994.
69. *Government Decision #4895*; State of Israel: Jerusalem, Israel, 1999. Available online: https://www.knesset.gov.il/mmm/data/pdf/m02176.pdf (accessed on 14 March 2016).
70. Tal-Shir, A.; Yechezkely, T. Cancerous Diving; Investigative Report. *Yediot Aharonoth*, 25 May 2000.
71. Kishon Commission. *Interim Report*; State of Israel: Jerusalem, Israel, 2001; pp. 235–242.
72. *Government Decision #969*; State of Israel: Jerusalem, Israel, 2001.
73. Almog, S.; Amitai, Y. Diving in Polluted Water: Proposed Guidelines Report of the Israeli Expert Committee. In Proceedings of the Conference on Diving in Polluted/Contaminated Water, Washington, DC, USA, 25 July 2006; pp. 25–26.
74. *Protocols*; Government decision #1509; State of Israel: Jerusalem, Israel, 2002.
75. Kishon Commission. *Final Report*; State of Israel: Jerusalem, Israel, 2003.
76. Protocols. In *Proceedings of Government Meetings*; State of Israel: Jerusalem, Israel, 27 April 2003.
77. Dredging and Sediment Remediation in the Kishon River. Available online: http://www.sviva.gov.il/English/env_topics/RiversAndStreams/Documents/EnvBulletin-DredgingAndSedimentRemediationInTheKishonRiver-July2013.pdf (accessed on 14 March 2016).

78. Israel Begins Sediment Dredging in One of Its Most Notorious Waterways. Available online: http://www.imsdredge.com/blog/river-dredging/israel-begins-sediment-dredging.html (accessed on 14 March 2016).
79. Kishon River: From Poison to Pristine. Available online: http://www.israel21c.org/kishon-river-from-poison-to-pristine/ (accessed on 14 March 2016).