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# Water Pollution Control Legislation in Israel: Understanding Implementation Processes from an Actor-Centered Approach

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**Abstract:** In the State of Israel, advanced legislation for the management of scarce water resources, including legislation to prevent water pollution, were put in place in the early stages of the State's formation. Despite that, on-going uncontrolled pollution has deteriorated the quality of water sources for decades, with the main source of pollution being untreated or partially treated domestic wastewater. This has been mainly the result of lack of enforcement of the existing laws. During the 1990s and onwards, a shift to forceful enforcement has been observed and wastewater treatment substantially improved. The paper analyzes the implementation processes of the pollution control legislations (the lack-of and the shift to forceful enforcement) based on an actor-centered approach, using the contextual interaction theory.

**Keywords:** water pollution prevention; pollution control legislation; wastewater management; contextual interaction theory; Israel

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## 1. Introduction

The State of Israel has promulgated in its early years extensive legislation to protect its water sources and prevent their pollution. According to Laster [1] (p. 437), these were "some of the most forward looking legislations in the world concerning protection of water sources". Such laws are vital in this water-scarce semi-arid country with currently ca. 250 cubic meters per capita per annum [2]. Despite that, on-going uncontrolled pollution has been the common practice for decades, with the main source

of pollution being untreated or partially treated wastewater, resulting in deterioration in quality of the scarce water resources [3].

Focusing on rapid development, adequate sewerage facilities were made available to most of the population from the early stages, removing wastewater from the population centers. In 1963, for example, 72% of the generated wastewater was collected; in 1967, 84% [4]. Wastewater treatment, however, was much neglected [5]. In 1971, only 37% of the generated wastewater was treated, mostly by primary treatment, and in 1982, only 55%. By the end of the 1980s, over 20% of the wastewater generated was discharged untreated into the environment, mainly to adjutant streams and riverbeds [6]. Almost all the country's flowing streams and dry riverbeds carried heavy flows of wastewater, becoming, in fact, conduits of wastewater and heavily polluting the surface and groundwater resources [7,8].

Since the beginning of the 1990s and onwards, however, prevention of water pollution by wastewater received much attention and advanced wastewater treatment plants were being built throughout the country [9]. By 2012, *ca.* 95% of the generated wastewater was treated of which 49% to a secondary level and an additional 39% to a tertiary level [2]. This is, no doubt, a substantial improvement in comparison to previous decades.

Since in Israel wastewater management—*i.e.*, collection, treatment and disposal—is the legal responsibility of municipal authorities [9] (as is the case in many countries), the long-term neglect has traditionally been attributed to them. However, a study of the historical development of the wastewater resource regime in Israel reveals that the central government's policies regarding wastewater management highly influenced that of the municipal level and can explain both the long-term neglect as well as the paradigm shift of the 1990s. While the subject is highly complex and involves many factors [10], this paper focuses on the enforcement tools as their use is one of the main factors in the shift.

Since advanced legislation was in place, the continuous pollution was not the result of lack of legal tools, but rather lack of their enforcement [3]. In accordance, the shift observed starting in the 1990s can be mainly attributed to forceful enforcement of the existing laws for the first time [10]. Thus, both phases can be linked to and explained by the implementation processes of the water pollution control legislation, the focus of this paper. The question arises, why in previous decades were the laws not enforced, whereas starting in the 1990s, they were? Building upon previous works—e.g., Laster [11] referring to the institutional structure and particularly to the Ministry of Agriculture's vast authority over water management, and Adam [3] pointing, in addition, also to public indifference to the on-going pollution—this paper analyzes the implementation processes from an actor-centered approach.

The paper aims to analyze the interaction processes between the relevant actors in the policy network as explaining the mechanism for implementation processes using the Contextual Interaction Theory. The analysis addresses implementation processes of water pollution control legislation, with focus on domestic wastewater treatment—the main source of pollution. Section 2 presents the theoretical framework used for the purpose of this analysis; in Section 3, the relevant legislative framework for pollution control in Israel is presented and the interaction processes between key actors are analyzed; conclusions are drawn in Section 4.

## 2. Theoretical Framework and Methodology

In policy studies, a distinction is made between 'policy formation' and 'policy implementation' processes [12]. During policy formation, goals are set and instruments—such as laws and regulations—are made available in order to attain the policy goals [13,14] whereas policy implementation is seen as the "processes that concern the application of relevant policy instruments" [12] (p. 284). In practice, however, the actual outcome of a given policy does not always match the policy goals as implementation of policy instruments may be hindered or lacking [15]. Thus, when looking at possible changes intended by a given policy, one needs to analyze the implementation of the policy instruments. Since implementation of policy instruments is usually the responsibility of relevant actors in the policy network, its processes can be seen as a social interaction between these key-actors [16], leading to the development of the Contextual Interaction Theory.

The Contextual Interaction Theory (in its latest conceptualization/adaptation based on [12,16,17]) focuses on policy implementation and perceives policy processes (including policy implementation) as actor-interaction processes, meaning processes that are influenced by activities and interactions of the relevant actors. Actors are individuals, representing themselves or their organizations, and within the context of the implementation process, they include the responsible government officials (implementers) and the target group of the policy. The Theory's basic assumption is that the characteristics of the actors involved, particularly their motivation, information and power, are crucial in understanding courses and outcomes of policy processes [12]. This is based on the acknowledgement that for the accomplishment of any given task one needs a motivating objective, expertise, and capacity/resources [15]. Motivation can incorporate both internal/own goals (values, self-interests) as well as external factors (such as those from higher authorities). It can also be influenced by self-effectiveness assessment whereby an actor can become de-motivated if he perceives his preferred course of action to be beyond his capacity [17]. Information includes interpretation, frames of reference, as well as knowledge and accessibility to information required for execution of the task. Power incorporates available resources and control/authority [16]. Owens [15] analyzed implementation literature reflecting important implementation variables, and found that in dozens of them the important implementation variables can be directly linked to the characteristics of motivation, information and power, thus validating these characteristics as suitable.

According to the Contextual Interaction Theory, these characteristics influence the standpoint of a given actor regarding the policy in question and in turn his position and activities within the interaction process with other actors in the policy network. The characteristics of the actors are also influenced by external contexts such as the structural context of the governance regime, the specific context of the policy (former decisions, specific circumstances), and the wider context (such as political, economic, cultural and others). The interaction between the key characteristics as well as between the actors in the policy process can also change over time [16].

The theory further assumes that policy implementation includes not only achieving implementation but also avoiding implementation. Interaction types may include: cooperation, either active (when actors have joint ambition), passive (e.g., when one actor is impartial about the implementation) or forced (when passive cooperation is imposed by a dominant actor); opposition, when one actor attempts to prevent implementation by other actors; and joint learning when only insufficient

information prevents implementation [12,15]. The theory also distinguishes between two situations: lack of (or insufficient) implementation and failed/inadequate implementation ('adequate' with respect to the specific policy goals) [12]. As such, the theory is suitable for actor-centered analysis such as the one carried out in this paper.

To summarize, the characteristics of motivation, information and power of each actor and the dynamics between them influence the interaction process between the relevant actors (implementers and target group), which in turn influence the output and outcome of the policy process. Based on this, the Israeli case is analyzed. In this case, the Theory is also used to analyze the dynamics between the key characteristics and actors as explaining changes in the process over time (e.g., the shift from lack of enforcement and continuous pollution to forceful enforcement and pollution control). The analysis includes the actors; the interactions between them; and the outcome as a result.

### *2.1. Methodology*

The findings presented in this paper are based on a doctoral research and thus form a part of a larger study. The data collection includes documents' review and analysis as well as in-depth semi-structured interviews. The former includes review and analysis of relevant documents such as correspondences between position holders within relevant ministries and other actors, minutes of meetings, relevant legislation, *etc*., using the State Archive, relevant reports and literature. The latter includes interviews with relevant stakeholders and position holders such as government officials from all ministries and agencies involved, environmental non-governmental organizations, academic experts, and private consultants, which have fulfilled relevant roles at any time since the establishment of the State. This is found suitable for the qualitative approach used in the research. At times, the author relies on dated literature sources. This is due to the historical perspective and is used for the purpose of the analysis.

## 3. Water Pollution Control and Its Implementation, the Israeli Case

In this section, the relevant legislation is presented, following which the relevant actors and the interaction between them are analyzed as to explain the implementation processes of the pollution control legislation. It should be noted that the relevant legal system and policy-network are highly complex, and only the most relevant laws/regulations and actors related to domestic wastewater are presented and discussed.

### *3.1 Relevant Legislative Framework*

As above-mentioned, Israel has extensive legislations that can ensure the protection of its water sources [3]. The two most relevant and direct laws regarding protection of the water sources and domestic wastewater treatment are: the Water Law (1959) and the Local Authorities (Sewerage) Law (1962). Three additional laws that should be mentioned include the Public Health Ordinance (1940) (promulgated by the British Mandate to Palestine prior to the establishment of the State), the Streams and Springs Authorities Law (1965) and the Planning and Building Law (1965).

The Water Law, promulgated in 1959, establishes the framework for the control and protection of Israel's water resources. It is the principal law regulating freshwater sources in Israel and is regarded

by Laster [1] (p. 441) as "a brilliant legislative code to protect all aspects of Israel's water and the recipe for its proper management". The Law defines the water sources (natural or man-made, including wastewater), and their ownership (public property, subject to the control of the State) as well as creates Israel's water institutions. It creates the Water Commission (later on: Water Authority) and the position of the Water Commissioner (later on: the Director of the Water Authority) as the higher authority with respect to water management, giving him vast authority to manage the water affairs of the state [1,18]. Significant sections of the Law deal with pollution prevention and control of all water sources. The Law prescribes that water sources must be protected by the prevention of their: a. depletion and b. pollution (defined as any action that makes the water less suitable for its intended use, including the degradation of its qualities). In 1971, the Law was amended to include prohibitions against direct or indirect water pollution, regardless of the state of the water beforehand. Water pollution was more specifically defined as change to any of the qualities of the water (physical, chemical, biological, *etc*.) that endangers human health as well as flora and fauna, and that makes it less suitable for its intended purpose. This amendment empowers the responsible minister (initially the Minister of Agriculture) to set water quality standards for all sources and to promulgate regulations to prevent water pollution [7,19]. The Water Commissioner further receives sanctioning power over polluters. For example, the power to require any person polluting water source to repair the situation within a reasonable amount of time and at the expense of the polluter (Article 11) [20]. Specific to wastewater pollution, the Law authorizes the Water Commissioner to order any polluter to provide him with a disposal plan. Failure to submit a plan or deviate from the plan can result in fine and loss of water supply, except for drinking purposes. The Water Commissioner can also bring criminal charges against a polluter, e.g., a mayor [18,19].

The Local Authorities (Sewerage) Law was promulgated in 1962 to enable local municipalities to construct sewerage works. The Law prescribes the rights and duties of local authorities in the design, construction and maintenance of sewage systems [2]. According to the Law, a local authority may (and upon the demand of the Minister of Interior, must) install a sewerage system within its boundaries [21]. The Law requires each local authority to maintain its sewage system in proper condition to the satisfaction of the health authority [2]. The Law enables the local authorities to collect charges for the construction and maintenance of the facilities. Initially, the Law addressed the sewerage systems only; in 1972, it was amended to include also the construction of wastewater treatment plants.

The Public Health Ordinance (1940), based on its amendment of 1970, provides the Ministry of Health a framework for the protection of the quality of drinking water including at the water source. Later amendments further prohibit any activities that cause environmental nuisances, including pollution by sewage [22]. Several regulations under this law were promulgated over the years including the 1981 regulations "for effluent intended for use in irrigation", restricting irrigation with effluent in accordance with the treatment level and the type of crops. These regulations, however, did not specify the required effluent quality and were thus difficult to enforce. In 1992, regulations for effluent standards (base-line quality defining the permissible concentrations of organic matter and suspended solids) were promulgated by the Minister of Health. These are considered a milestone in wastewater treatment processes in Israel. In 2010 new regulations were promulgated by the Minister of Environmental Protection and the Minister of Health, to include stricter requirements for effluent

quality. These regulations set much higher treatment levels in existing and future wastewater treatment plants than were previously in force, for unrestricted irrigation and discharge to rivers [2].

The Streams and Springs Authorities Law, established in 1965, empowers the responsible minister (initially the Ministers of Agriculture and Interior-dual control) [7] to establish an authority for a particular stream or part of a stream, spring, or other water source [2]. Once created, a stream authority has the power to abate sanitary hazards and prevent pollution of the stream.

The Planning and Building Law (1965) establishes a comprehensive legislative framework which regulates all building and land-use activities in Israel by creating three tiers of planning commissions (national, regional and local) [9]. The commissions are composed of representatives of many organizations, many of which represent governmental ministries [18] (In addition to representatives of ministries, the regional commissions include also five representatives of local authorities (to be appointed by the Interior Minister based on the recommendations of the local authorities); representative of the Israel Land Authority; the Regional Planner; an independent architect (not a civil servant); and a representative of the Environmental Organizations). The Law, administrated by the Ministry of Interior, is "in theory, the backbone of environmental policy in Israel" [3] (p. 272) as environmental considerations are allowed to be considered in the permission process of any development [3].

### *3.2. Actors in the Policy Network*

Several actors can be mentioned with respect to implementation of the relevant legislation: implementers of the policy, actors not directly participating in the process but facilitating and providing support to other actors, and the target group of the policy.

The Water Commissioner was the highest authority regarding management of the water sources including prevention of their pollution (until the transfer of the responsibility for prevention of water pollution to the Ministry of Environmental Protection upon its establishment in 1989). The Water Commissioner, however, was until 1996 affiliated with the Ministry of Agriculture. Furthermore, all but two of the Water Commissioners since the establishment of the State were clear representatives of the agricultural sector. The Water Commissioner of 1977–1981 was appointed as the Director General of the Ministry of Agriculture in 1980 and served as both positions for several months [23]. As such, and with regards to the analysis offered by this paper regarding motivation, information and power of main actors, the Water Commissioner and the Ministry of Agriculture are considered as one actor (until 1996).

The Ministry of Agriculture was initially entrusted with the ministerial responsibilities over the Water Law (1959) and the Water Authority/Water Commissioner. As such, the Ministry of Agriculture had the highest authority and influence over the protection of water sources. In addition, it had a shared responsibility over the Streams and Springs Authorities Law (1965) and some influence via the Local Authorities (Sewerage) Law (1962), as plans for the establishment of wastewater treatment plants require the approval of the Minister of Agriculture (Article 13) [21]. It was also involved via the Public Health Ordinance: according to article 65A when establishing regulations regarding effluent use for irrigation or other economic activity the Ministry of Health is to consult with the Ministry of Agriculture. Therefore, this Ministry was one of the main implementers of the relevant legislations.

The Ministry of Health was entrusted with the responsibility to protect the county's drinking water and as such had various powers to control water pollution, mainly under Chapter 6 of the Public Health Ordinance (this was also transferred to the Ministry of Environmental Protection upon its establishment), defining sewage as "nuisance". It also had the responsibility for the quality and use of effluent for irrigation [3]. Via the Local Authorities (Sewerage) Law (1962) it was involved in approving sewerage works. As such, was also in a position to prevent water pollution.

The Ministry of Interior, as the Ministry responsible for the municipal sector, was entrusted with the ministerial responsibility over the Local Authorities (Sewerage) Law (1962) and can demand that a local authority will construct a wastewater treatment plant (Article 2) [21]. It was, and still is, also the main Ministry involved in the Planning and Building Law (1965). In addition, together with the Ministry of Agriculture, it initially had the responsibility over the Streams and Springs Authorities Law (1965). The Ministry of Interior was also to be consulted with, according to the Public Health Ordinance (1940), concerning issues with implications for the local authorities (Article 3a) [22].

The Ministry of Environmental Protection was established in 1989. Upon its establishment it assumed the responsibility—previously under other ministries mainly the Ministry of Agriculture and Ministry of Health—for protecting the water sources and preventing their pollution. It now had the ministerial responsibility over the water pollution sections of the Water Law (1959) (Article A1 "prevention of water pollution") [20]; the sections related to nuisances in the Public Health Ordinance; some responsibilities regarding wastewater treatment via the Local Authorities (Sewerage) Law (1962); and over the Streams and Springs Authorities Law (1965). As such, it became one of the main implementers of water pollution control in the subsequent years.

The Ministry of Infrastructures was established in 1996 and received the jurisdiction over the Water Authority/Water Commissioner and the Administration for the Development of Sewage Infrastructures. With its establishment, the link between water management and the agricultural sector was broken for the first time.

The Treasury Ministry, while not being a formal implementer, had a facilitating role via budgets allocated for this purpose, as elaborated in the following.

The Prime Minister's Office during the Rabin Government (established in 1992) prioritized development of infrastructure, wastewater treatment included. This government promoted relevant organizational change, allocated high budgets, as well as provided financial incentives for municipalities to treat wastewater, as elaborated in the following. As such it had a strong supportive and facilitating role.

As for the target group, since the paper focuses on pollution from untreated domestic wastewater, and as the legal responsibility for wastewater collection, treatment and sanitary disposal is of the local authorities, the target group is defined as the municipalities/mayors. While the number of involved ministries and state agencies is so large, part of the relevant interaction is not in the relationship between state government actors and target group, but also between these state agencies. The relevant legislations and the ministries responsible for their implementation are presented in Tables 1 and 2.

**Table 1.** Relevant legislation for water pollution control and the actors entrusted with the ministerial responsibilities over them, 1948–1989.

| Legislation | The Ministry of Agriculture | The Ministry of Health | The Ministry of Interior |
|---|---|---|---|
| The Water Law (1959) | + | | |
| The Local Authorities (Sewerage) Law (1962) | + | + | + |
| The Public Health Ordinance (1940) | | + | |
| The Streams and Springs Authorities (1965) | + | | + |
| The Planning and Building Law (1965) | | | + |

**Table 2.** Relevant legislation for water pollution control and the actors entrusted with the ministerial responsibilities over them, 1989–present.

| Legislation | Ministry of Environmental Protection | The Ministry of Health | The Ministry of Interior | The Ministry of Agriculture (until 1996)/the Ministry of Infrastructures (from 1996) |
|---|---|---|---|---|
| The Water Law (1959) | + | | | + |
| The Local Authorities (Sewerage) Law (1962) | + | + | + | |
| The Public Health Ordinance (1940) | + | + | | |
| The Streams and Springs Authorities (1965) | + | | | |
| The Planning and Building Law (1965) | | | + | |

Note: Tables 1 and 2 are based also on [3].

### *3.3. Interaction Processes between Key Actors*

With respect to pollution of water sources by wastewater, two phases can be defined based on the enforcement of the relevant laws: (1) 1948 (the establishment of the State) until 1989; and (2) 1989 until the present. In the following, each actor's motivation, information and power are analyzed to explain the interaction processes between the main implementers and the target group, which in turn can explain the implementation processes of the pollution control legislation.

#### 3.3.1. 1948–1989

This phase is characterized by lack of enforcement. Only five court cases were filed by the Ministry of Health during the 1960s of which three addressed pollution by domestic wastewater. These, as Adam [3] notes, were all the work of one official and were a rare exception. The Water Law (1959), with the vast authority it provides for pollution prevention, was never enforced and sanctions prescribed by it, such as bringing criminal charges against polluters, went unused [18]. The Springs and Streams Authorities Law (1965) was not implemented until 1989 when a stream authority was created for the first time with the establishment of the Yarkon River Authority [7]. Indeed, the grim

condition of the water sources (especially the streams), spoke for itself. Since relevant legislation was in place, had there been enforcement, this would have not been the case.

The main actor with this respect is the Ministry of Agriculture, as established above. Entrusted with the responsibility for the Water Law (1959) and with the sanctioning authority that the Law provides, as well as via its roles in other relevant legislations, it had vast authority and power to implement and enforce pollution control. With the Water Commission under its jurisdiction, it also had access to the relevant expertise as well as the information regarding the state of the water resources. It is, after all, the Water Commissioner that was empowered to manage the State's water resources and had the means to do so. However, what about its motivation? In the new State, agriculture was a very important economic sector but more than this, it became a national and political objective behind which stood the Zionistic ideologies of settling the land, the right to work own land in own country, *etc*. As such, the Ministry of Agriculture enjoyed vast political support across the political spectrum. It is against this background that the management of the water sources was entrusted to this Ministry. The Ministry of Agriculture, in fact, became the most important actor with respect to water management (with responsibilities also over other important water legislations such as the Water Drilling Law, 1955, and the Water Metering Law, 1955) and according to a parliamentary enquiry committee, managed the water sources exclusively and almost nothing could have been changed in water management without its cooperation [23].

This Ministry's prime goal, however, is to promote the agricultural sector and production, not to preserve the water sources as such [3]. In the semi-arid country, agriculture on large scale requires irrigation, and the agricultural sector is the largest water consumer with ca. 70% of the water allocation and as such, utilization of water sources in support of agricultural production outweighed other water management aspects [18]. With a strong agricultural lobby, the Water Commissioners were mostly affiliated with the agricultural sector, as above-mentioned, with preference to short term agricultural interests over long term water considerations [3]. As wastewater is defined by the Water Law (1959) as a water source, it was indeed perceived in this period by the Water Commissioners primarily as an additional (cheap/free-of-cost) water resource to be utilized by farmers. The position of the Ministry of Agriculture was that wastewater—being first and foremost a water source for irrigation—should be managed and fall within the authority of the Water Commission, thus the Ministry of Agriculture [24]. To reduce costs involved and encourage farmers to utilize effluent, the Water Commission's/Ministry of Agriculture's officials advocated the method of 'agro-sanitation'. This method was mainly advocated by a key and very influential position holder in the National Sewerage Project (1972–1992). According to 'argo-sanitation', low-cost and low-tech facilities for primary treatment such as oxidation ponds, and often only reservoirs, were constructed, following which the low-quality effluent was to be utilized for irrigation with further natural treatment at the root of the plant and the soil [25–28]. This method, however, contributed heavily to the pollution of the water sources. Not only that it produced low quality effluent which was utilized for irrigation, but when not utilized, surplus effluents were discharged into the nearest stream. The facilities themselves became a source of pollution as they were not properly maintained and upgraded. Furthermore, wastewater treatment for the purpose of pollution prevention was grossly neglected. Since budgets were limited, municipal plans for construction of treatment facilities that did not include concrete plans for effluent reuse for irrigation, were rejected and not funded despite continuous pollution to water sources or to the environment. Examples include

the cases of the towns of Nahariya and Zichron Ya'aquov [29–31]. All these resulted in steadily growing pollution. To conclude, the prime interest of the Ministry of Agriculture—the most influential actor—conflicted with the interests of preserving the water sources, and within this inner conflict of interest, the prime interests related to utilization of wastewater, prevailed. As such, this Ministry had vast power and information but no motivation to enforce pollution control laws.

The Ministry of Health was another important actor via the sanitary aspect of wastewater treatment and its responsibility to protect drinking water and public health. The Ministry, however, had insufficient information, power (in practice) and motivation to enforce the laws. Regarding information, the Local Authorities (Sewerage) Law (1962), for example, requires that a municipality maintains its sewage system in proper condition 'to the satisfaction of the health authority'. The Law, however, does not specify the type and amount of compliance required, nor does it specify which sanctions can be imposed, making its enforcement difficult. The Ministry of Health lacked also sufficient power to enforce the laws. Documents and correspondents' analysis reveals an on-going dispute between the Ministry of Agriculture and the Ministry of Health with respect to the authority related to wastewater management. The Ministry of Health, however, was smaller and weaker in comparison to the Ministry of Agriculture and in practice had little influence over the matter [24]. For example, in 1953 the Minister of Agriculture established the Sewage Committee—an inter-ministerial committee that would coordinate the different positions regarding wastewater solutions, and approve sewage plans. However, the Committee was to report to the Minister of Agriculture and out of 11 governmental members of the Committee, six represented the Ministry of Agriculture (including the Chair) and only two the Ministry of Health, reflecting the power imbalance. Eventually, despite the different positions, the Ministry of Health approved the low-tech low-costs solutions that were advocated by the Committee, revealing passive cooperation in the inter-ministerial interaction process. With respect to financial resources, the Ministry of Health did not have its own budgets for this topic [32]. Finally, the Ministry of Health also lacked sufficient motivation. The Ministry of Health had other priorities to look after and within the Ministry, wastewater treatment received low priority. Pollution prevention and wastewater treatment were not considered a prime objective of this Ministry [29,33,34]. For example, the Public Health Ordinance allows the Minister to promulgate relevant regulations. However, the relevant regulations—'effluent intended for use in irrigation'—were only promulgated in 1981. The regulations restrict effluent irrigation but with respect to protection of public health, not the water sources, and were promulgated only in relation to a cholera outbreak that occurred in 1970 due to consumption of raw vegetables that were irrigated with untreated wastewater. The regulations allow irrigation with effluent based on permit system and for crops that are not meant for human consumption only, thus allowing irrigation of other crops (e.g., cotton). Moreover, the regulations did not specify the required effluent quality and merely prescribe that the dissolved oxygen concentration will be at least half a milligram per liter and that the effluent must not contain toxic compounds that may danger, in the view of the Director General of the Ministry of Health, the health of those that who come in contact with the effluent or with the irrigated crop [7]. The fact that such regulations were promulgated at a relatively late stage, do not address pollution of water sources and do not specify the required effluent quality, all reflects the lack of interest thus motivation to enforce water pollution control by this Ministry. Their promulgation, however, shows that the relevant authorities were able to use the existing legislations to develop the

means for enforcement, had they wanted to. This lack of motivation can further explain the Ministry's weaker position in the actors' network and thus its passive cooperation.

The Ministry of Interior had a central role in the enforcement of the Local Authorities (Sewerage) Law (1962) and as such could have been an important actor. Entrusted with the authority to order municipalities to install proper treatment facilities, this Ministry had the power to enforce the Law and protect the water sources from pollution. This Ministry was also in a position to prevent pollution via the Planning and Building Law (1965). The Ministry of Interior lacked, however, sufficient information. While the Ministry had a department of water and sewerage and was represented in inter-ministerial committees such as the Sewage Committee, in practice it was a marginal actor and accepted the position of the Water Commissioner and the Ministry of Agriculture with respect to their approach to wastewater treatment [35]. For example, following the above-mentioned cholera outbreak the government established a new inter-ministerial committee for wastewater management which was meant to define relevant policy, as well as the National Sewage Project—its operative arm, meant to execute this policy. The Director General of the Ministry of Interior was appointed as the formal Chair of the inter-ministerial committee based on the Ministry's responsibility for the municipal sector and as wastewater treatment is an obligation of the municipalities. This, however, was a formal appointment only; the Director General admitted to have little information on the subject and in practice it was the Water Commissioner that ran the committee [36]. It was the Water Commissioner that also ran the operative arm and controlled the budgets as well as dictated the approved solutions for wastewater treatment. Most importantly, though, the Ministry of Interior lacked motivation. According to Adam [3], the use of the authority given to it by the Local Authorities (Sewerage) Law (1962) would have prevented or reduced water pollution caused by discharge of untreated wastewater to the streams. However, she notes, the Ministry of Interior chose not to exercise this authority. Being the Ministry responsible for the municipal sector, the Ministry's primary goal is to support the local authorities. The low-tech low-cost facilities that were advocated by the Ministry of Agriculture meant lower costs for the municipalities and with little interest and expertise in this topic, the Ministry of Interior accepted them as suitable solutions [35]. An example of the Ministry's prime interest in the state of the municipalities rather than in wastewater treatment can be seen in the following. Following the cholera outbreak, the Israeli Government signed in 1972 an agreement with the World Bank concerning a loan for the purpose of upgrading wastewater treatment facilities. As per this agreement, the World Bank required, among other things, that the local authorities will ensure that the funds they raise with wastewater charges will be used for wastewater management, allowing them to repay the loan as well as maintain and operate the facilities. To comply, the Ministry of Interior issued an order by the General Director stating that local authorities are required to do so. This, however, was never enforced [28]. In practice, many of the local authorities used income from water and wastewater charges for other purposes, especially when in fiscal stress [18]. Both the Ministry of Interior and the Treasury Ministry realized that enforcing this order would mean financial burden for the local authorities, and ignored it [35]. This too reveals that the Ministry of Interior's prime interest was to support the local authorities and not to protect the water sources. With respect to the Planning and Building Law (1965), Adam, [3], notes that while environmental issues could have been considered, "the Ministry of Interior—whose primary interests are the implementations of national and local policy for

development—interprets the Law mainly as a mechanism for furthering the development necessary for maximizing the county's growth" [3] (p. 272).

An additional actor that should be mentioned is the Environmental Protection Service. The Service was established in 1973 as a department in the Prime Minister's office following the Stockholm Declaration of 1972. In 1976, it was transferred to the Ministry of Interior, mainly in order to affect local authorities' handling of sewage. The Environmental Protection Service, however, had mainly a research position and while it was represented in scientific forums, it had no decision-making power [33]. As such, it had the motivation and the information, but not the power. Nonetheless, it prepared the ground for the Ministry of the Environmental Protection that would be established at a much later stage.

The Treasury Ministry has a facilitating role via budgets. However, prior to the agreement with the World Bank, separate national budgets were not allocated for wastewater treatment. The position of the Treasury Ministry was that the local authorities are expected to finance sewerage works by themselves, and that the wastewater solutions should be the cheapest ones available [38]. Following the cholera outbreak and per the agreement with the World Bank, the Treasury Ministry was to provide 60% of the projects' costs. With a clear interest to reduce costs, it followed the approach for low-cost facilities led by the Ministry of Agriculture.

The target group is defined as the local authorities and their mayors, as they were given the formal responsibility for wastewater treatment and could be legally charged for pollution of the water sources. The municipalities had insufficient information to carry out this task. The Local Authorities (Sewerage) Law (1962), as established above, did not specify the type and amount of compliance required, as long the health authorities were 'satisfied'. In addition, most of the local authorities in these years were small and had little or no access to the required technical expertise (own personnel), and relied heavily on relevant central authorities such as the Sewage Committee. More importantly, they had insufficient resources. While based on the Local Authorities (Sewerage) Law (1962) municipalities could have collected charges for wastewater infrastructure (initially for collection systems only, and after 1972, for treatment plants as well), these charges could have not provided the municipalities with the needed capital to construct facilities but rather to repay a loan that would have been needed either from the Central Government or from other sources. Prior to 1972, however, the government did not allocate separate budgets for wastewater treatment. Such funds became available after 1972 following the agreement with the World Bank, but these were assigned to the Central Government (the National Sewage Project, chaired by the Water Commissioner), which decided how to allocate the funds. Municipalities remained dependent on the central authorities to access these public funds. Raising private capital required the approval of the Treasury Ministry. This, however, was not considered acceptable during this phase. The only mayor at the time trying to raise private capital was the mayor of the coastal city of Haifa. Initiating the construction of a biological treatment plant (activated sludge) during the 1950s, this mayor was a front-runner and ahead of his time. After establishing an inter-municipal cooperation and preparing the technical plans for the treatment plant, the final hurdle to overcome was the needed funds. The mayor, being extremely committed, managed to interest two French companies that would construct the plant with their own capital, creating, in fact, a pioneer Build Operate Transfer (BOT) construction. The Treasury Minister, however, refused to approve this agreement, and only due to the mayor's determination, this was eventually approved. The Haifa

treatment plant went into operation in 1961, decades before other municipalities followed. Other less determined and less capable mayors would have not succeeded [38]. Finally, the local authorities had no motivation. Most of the municipalities had little or no inner motivation and focused on housing and economic development. Sewerage systems were constructed in early stages to remove hazards from the population centers, thus any pollution that was caused by wastewater, was—in most cases—not felt by the local inhabitants. In the cases that the inhabitants did experience the nuisances, such as in the city of Tel Aviv via the Yarkon Stream or the city of Hadera via the Hadera Stream, mayors were more pressed to take action. External pressure, by higher authorities, e.g., by law enforcement, was completely non-existent. The central authorities reflected that the lack of action was tolerated. Therefore, the target group had little information, very few capacities (power) and hardly any motivation to comply with the law and treat wastewater. The main findings for this phase are presented in Table 3.

**Table 3.** Characteristics and interaction processes, key actors; 1948–1989 (lack of implementation).

| Actors | Motivation | Information | Power | Position in the interaction processes |
|---|---|---|---|---|
| Ministry of Agriculture | − | + | + | Most powerful actor with access to power and information via the Water Commissioner. However, lacked the motivation as its own goals conflicted with pollution control. As such, chose to interpret the laws based on its own goals and dominated the policy network accordingly. |
| Ministry of Health | − | − | −/+ | Weak position in the policy network; lacking motivation and information (e.g., specification of the type and amount of compliance required), as well as resources and authority (power) in practice, thus had little influence over the process due to passive cooperation |
| Ministry of Interior | − | − | + | Despite access to power/authority had little motivation and no information. Thus, impartial actor (by choice) with little influence over the process |
| Environmental Protection Service | + | + | − | Despite having high motivation and sufficient information, was a marginal actor in the policy network due to lack of power. |
| Target group: Municipalities/mayors | − | − | − | With low motivation, little information and very limited access to resources, had a weak position in the actors network with little influence over the process |

To conclude, several actors were given the authority to implement water pollution prevention—which had been a problem in itself due to fragmentation of the authority—but none of them did so. Some actors lacked access to power and information while others had access; however none of them had the motivation. The main reason for this is that protection of water sources is not a primal goal for any of them. The Water Commissioner at this phase had the formal task and authority to protect the water sources and prevent their pollution, thus is given the power and the information. However, subordinated to the Ministry of Agriculture and appointed as a representative of the

agricultural sector, lacked the motivation to enforce the Law. The Ministry of Agriculture's prime values and interests are to promote agriculture, and securing water for irrigation was a high priority. Implementation of pollution control instruments was not perceived as contributing to these goals. This Ministry is the most powerful actor in the policy network and in fact used its access to power and information to dominate the process for its own interests. Within the interaction process, this Ministry was not keen on sharing the vast powers it possessed over the management of the water sources. According to Laster and Livney [18], for example, Stream Authorities were not established as the Water Commissioner did not intend to share its power with another authority and the Minister of Agriculture supported this position. All this reflects the influence of this Ministry over the implementation process. Other actors with some responsibilities and authority could have improved the state of affairs, but would or could not do so. They lack the motivation, information, and power in various degrees, and with the Ministry of Agriculture being the most powerful actor, consciously allow it to take the lead as wastewater treatment is not a primal goal for any of them. Most of them, especially the Ministry of Interior and the Treasury Ministry, accept the approach advocated by the Ministry of Agriculture as it suits their own interests, and the only actor that shows some attempts to promote pollution control—the Ministry of Health—has a weaker position in the interaction process and eventually passively cooperates with the Ministry of Agriculture's approach. The target group lacks information and power, and with no access to funds was highly dependent on central authorities. Municipalities also lack motivation due to low internal motivation and lack of external pressure. Furthermore, mayors' lack of motivation can also be explained by the self-effectiveness assessment concept. With little influence over the process and its outcomes, even mayors that may have preferred to take action, such as in the cases of Nahariya and Zichron Ya'aquov, realized they have no capacity to take such actions and became de-motivated. The above-mentioned mayor of Haifa is a rare exception.

As a result, the implementation process can be defined as avoiding/lack of implementation by the main actor with passive cooperation by the other actors in the policy network. Most of the actors were impartial and passively cooperated with the standpoint of the more dominant actor—the Ministry of Agriculture—by neither hindering nor stimulating the implementation of the Laws. As such, they have little influence over the interaction process and thus on the policy outcome. The target group is also in a weak position in the interaction between the actors and has little influence over the process as well.

#### 3.3.2. 1989–Present

Starting in 1989, a new trend can be seen and most of the municipalities throughout the country, including ones that have neglected wastewater treatment for decades, such as the city of Jerusalem, Be'er Sheva, Karmiel and others, began constructing highly advanced wastewater treatment plants. Many of the new facilities were built by an inter-municipal cooperation that was based on topographic (basin management) and economic (economy of scales) reasons. Several factors aligned to explain the shift, including the growing water pollution that could have not been ignored any longer; a rise in environmental awareness; the major cut-downs in potable water for irrigation resulting in higher demand for high quality effluent for irrigation, and the massive immigration waves from the former Soviet Union and the rapid development this instigated. However, in parallel, a major development is

the introduction of law enforcement for the first time [10]. Several factors can explain this, of which the establishment of the Ministry of Environmental Protection is the most important one.

The Ministry of Environmental Protection was established in 1989 as a small ministry, meant to provide a solution for a coalition crisis (in the 1988 elections, neither of the two leading parties could form a majority government, leading to the formation of a unity government based on an equal number of ministerial positions. The need arose to form an additional new Ministry. Initially, a "Sport Ministry" was almost created but pressure from environmentalists resulted in the establishment of the Ministry of Environmental Protection, which was believed to be more popular with the public [3]). It soon after, however, became a crucial actor in pollution control enforcement. As above mentioned, it assumed the responsibility for protecting the water sources and preventing their pollution from other Ministries. As such, it received the power to enforce relevant laws. It also has the relevant information. Although the Ministry started as a small low-budget Ministry, it was staffed by a highly trained team of professionals, also based on the Environmental Protection Service which laid down the groundwork and provided the newly established Ministry with the professional expertise needed for the new tasks. Therefore, the Ministry had access to power and information. This, however, were proven in the previous phase to be insufficient in the absence of motivation. More importantly, thus, the establishment of this new Ministry created for the first time an institution with an exclusive mandate to and interest in protecting the environment and the water sources [3]. Furthermore, the Ministry's personnel and especially its first General Director were fully committed to create a change, and the first ministers were environmentally-oriented and supported the development of relevant strategies and policies [39]. As such, this Ministry had clear motivation to enforce the laws. Its immediate actions with this respect clearly reveal that.

Acknowledging that previous enforcement was non-existent, the Ministry's first action was to begin developing a comprehensive policy of forceful enforcement and the enforcement mechanism. As municipal wastewater was the main source of pollution the Ministry turned to establish a policy against polluting local authorities. The main law this policy could have been built on was the Water Law (1959) (Article A1) [20]. The maximum penalty for water pollution according to this article, however, was very low: only 4500 NIS (approximately $450 at the time [3]), with no provisions for imprisonment. These sanctions were insufficient to deter polluting local authorities. The Ministry's first action was to amend the Law to allow more meaningful penalties. The amendment was completed in 1991, following which any polluter could have been penalized with a one year imprisonment or a fine of 150,000 NIS, and in case of continued violation of the law, seven days of imprisonment and an additional fine of 10,000 NIS for each day of continuous pollution after a written warning was issued (in 2008, the Law was amended to further increase the fines to 350,000 and 23,000 for each day of continuous pollution). Furthermore, the amendment to the Water Law (1959) included also a provision for citizen suits, allowing an additional route for enforcement. Soon after, the Ministry's officials started issuing warning letters to mayors demanding that they take actions to prevent pollution [3,39]. In many cases, the warning letters were proven to be sufficient, but in others lawsuits were filed. By 1995, 51 lawsuits were filed by the Ministry of Environmental Protection against polluters, of which 17 were against local authorities for violations of the Water Law (1959) [40]. An additional enforcement measure was taken by the Ministry of Environmental Protection once its representative was added to the planning commissions (under the Planning and Building Law, 1965). The Ministry used an

administrative measure of refusal to permit housing of newly built housing units unless the local authority in question had a proper wastewater treatment plant or advanced plans to construct one. In the beginning of the 1990s, massive waves of immigrants from the former Soviet Union immigrated to Israel resulting in rapid development in most of the local authorities. At this point in time, taking such administrative enforcement measures put heavy pressure on mayors to treat wastewater [33]. In addition, the Ministry promulgated regulations on a wide range of issues related to water pollution [3], further enabling enforcement. The Ministry also promoted a policy towards stream rehabilitation. This includes establishing local administrations for stream restoration (30 such administrations were established by 2008) and regulating effluent discharge to streams. The latter—non-existent prior to the establishment of this Ministry—aims to enable base-line flow when potable water is unavailable, by permits system and by requiring stricter effluent quality when discharged to streams [2].

The Ministry's policy of enforcement, however, was not easily implemented and met objections from other Ministries, such as the Ministry of Housing. Furthermore, until 1993 the Ministry of Environmental Protection did not have its own prosecutors and it relied on the Attorney General and the district attorneys to file lawsuits. These, however, were not keen on cooperating due to work load, low priority for environmental issues, and the availability of administrative measures of enforcement. Finally, bringing criminal charges against mayors can meet political objections and on occasions the Ministry's staff was unable to file suits against a mayor. Determined to enforce the laws and promote a change, the Ministry's officials turned to other solutions when needed, including transferring material to an environmental non-governmental organization so that it can file a civil law suit against the polluter, in case of political pressure against the Ministry of Environmental Protection taking such action. All these reveal that the newly established Ministry of Environmental Protection had a strong motivation to enforce water pollution control measures. This strong motivation enabled the Ministry's officials to strengthen the power and information initially available to them by amendment of the Water Law to create a meaningful enforcement mechanism. Small and low-budget, and often facing political opponents and objections by other ministries, the Ministry's strong motivation to enforce the law gave it a strong position in the policy network.

The Ministry of Health became a more meaningful actor in this phase. In 1992, the Ministry promulgated the base-line quality regulations for effluent standards. These regulations served as an important tool for enforcement as for the first time the local authorities could have been required to treat wastewater to meet clear standards. The new regulations compelled municipalities to establish advanced wastewater treatment plants in order to meet these standards. As such these regulations provided the Ministry of Health more access to power—with more authority and information at hand, with a clear frame of reference for enforcement. It should be noted that the regulations were co-initiated by the Ministry of Agriculture which by the end of the 1980s acknowledged for the first time the need to divert high quality effluent for non-restricted irrigation for the agricultural sector [10]. In 2010, the regulations were amended by the Ministry of Health and the Ministry of Environmental Protection to include stricter standards. With respect to motivation, it seems that in this phase, the Ministry of Health has developed higher motivation to enforce the law. This can be explained by the drastic reduction in the power of the Ministry of Agriculture on one hand and by the establishment of the Ministry of Environmental Protection on the other. By the end of the 1980s, in the fast growing market economy, agriculture lost both its ideological status and its economic significance. As such, the

agricultural sector and the Ministry of Agriculture lost its political power. Regarding water management, with the transfer of the responsibility for water pollution control to the Ministry of Environmental Protection, and in 1996 with the transfer of the Water Commission (by then: Water Authority) to the newly established Ministry of Infrastructure, the Ministry of Agriculture lost most of its power over water management. This cleared the way for the Ministry of Health—traditionally a weaker opponent and passive cooperator of the Ministry of Agriculture with respect to wastewater treatment—to be in a stronger position to enforce the relevant laws. On the other hand, the establishment of the Ministry of Environmental Protection and the transfer of some of the Ministry of Health's authority over water pollution control and wastewater treatment to this Ministry, resulted in a new rivalry, this time between these two Ministries. It seems that this rivalry and the enforcement actions taken by the Ministry of Environmental Protection gave the Ministry of Health additional motivation to enforce the laws and establish its own position with this respect, as well [30,41]. As such, the Ministry of Health in this phase has better access to information and power, and higher motivation to enforce wastewater treatment.

The Ministry of Agriculture, as abovementioned, lost most of its power, both in general and specific to water pollution control. In addition to the above-mentioned, in 1992 under the Rabin Government, the Administration for the Development of Sewage Infrastructure was established to replace the previous inter-municipal Sewage Committee and its operative arm. In contrast to the past, whereby the Water Commissioners were traditionally—officially or not—chairing the National Sewage Committee, the new Administration was subordinated to the Ministry of Interior and represented by different Ministries, excluding the Ministry of Agriculture [40]. Furthermore, its operative arm was headed by professional wastewater engineers with a clear affiliation to advanced technologies rather than to agricultural interests. The advocated technical solutions were now advanced treatment technologies [42]. All these resulted in loss of power by this Ministry in this phase. At the same time, an interesting development was that the Ministry of Agriculture—for the first time—showed more motivation for a higher effluent quality and high level treatment, from its own interests. By the end of the 1980s, consecutive droughts resulted in major cut-downs in potable water allocation for irrigation. At the same time, the global price of cotton—previously a very lucrative crop—dropped drastically. This forced farmers to shift to more profitable crops, which require high quality effluent. These two factors resulted in the high interest of the agricultural sector in a reliable alternative source of water for non-restricted irrigation, *i.e.*, high quality effluent, and farmers became more and more willing to pay for effluent, providing municipalities with further income from effluent sales, thus providing further incentive to invest in advanced treatment [the willingness of farmers to pay higher prices for effluent, however, took time as farmers were used to receiving effluent free of charge or in low cost. As a result, there were many disputes between municipalities and the farmers in their hinterland regarding the issue. In 2000, the Water Commissioner at the time published a brief stating that only the Water Commissioner has the authority to allocate effluent and determine its price, meaning that the municipal sector is not allowed to sell its effluent. As a response, the Ayalon Town Union (an inter-municipal cooperation) appealed to the Water Court claiming that the brief denies them of their right to sell the effluent. The Court supported their appeal and established that municipalities are entitled, by law, to sell effluent and that the Water Commissioner has no authority over the issue of effluent price. This and other such cases indeed set a new trend, and farmers became more willing to pay higher prices for

effluent; however, it took time and can be seen as a continuation of the shift that started years before.] This explains the co-initiation of the base-line effluent quality regulations. To conclude, at the start of this phase, a shift in the Ministry's motivation is observed, revealing higher motivation to treat wastewater to a high level, in combination with a drastic reduction in power, thus having much less influence over the enforcement process and a weaker position in the actors' network.

The Prime Minister's Office should be mentioned with respect to Prime Minister Rabin. The Rabin Government established in 1992 prioritized development of infrastructure in general, wastewater infrastructure included, in light of the massive waves of immigrants from the former Soviet Union. Apart from establishing the Sewage Administration mentioned above, this government allocated substantially increased budgets for wastewater treatment plants. If prior to 1992 the annual budget for wastewater treatment was 15–20 million NIS, this grew to 180 million NIS in 1993, 250 in 1994, 450 in 1995, *etc*. Moreover, in order to provide incentives for municipalities to engage in advanced wastewater treatment and apply for loans, partial grants up to 25% (25% for municipalities applying for a loan in the first year, 20% second year, 15% third year) of the overall loan became available for municipalities that submitted plans and received their approval within the first three years [43]. This provided local authorities with more motivation on one hand, and sufficient resources (power) on the other.

With respect to the Ministry of Interior, its involvement in enforcement remains unchanged. While it still maintains the ministerial responsibility for the Local Authorities (Sewerage) Law (1962), it still lacks motivation.

The Ministry of Infrastructures was established in 1996 and received the jurisdiction over the Water Authority/Water Commissioner and the Administration for the Development of Sewage Infrastructures. This Ministry does not have power regarding enforcement of water pollution prevention legislation, but has a clear mandate and objective to upgrade the State's infrastructure. Via the Sewage Administration it has control over the national budgets for wastewater treatment and has the professional staff to advise municipalities on that matter. As such, it has a facilitating and supportive role.

The target group in this phase is facing a different situation. In terms of motivation, it now has a very strong motivation to treat wastewater, mainly due to external pressure from enforcement authorities. Many mayors received warning notifications that a law suit would be filed against them, and in some cases lawsuits were indeed filed. In parallel and as abovementioned, in the midst of a massive building and developmental phase, they were not allowed to populate the newly built neighborhoods unless they had an existing or planned wastewater treatment plant in line with the new regulations. This enforcement tool, which was led by the Ministry of Environmental Protection, seemed to have been very powerful. Mayors realized that for the first time not treating wastewater is no longer tolerated by the relevant authorities. With the environmental movement and public awareness for environmental protection on the rise, many municipalities were also pressured to take action by their own inhabitants and in few cases faced civil law suits by environmental non-governmental organizations. Using enforcement tools alone, however, would have been insufficient without providing the municipalities with access to financial and other resources. Indeed, at the same time, municipalities are given the resources and the means to comply with the law. Regarding information, the municipalities now have clear standards to meet, thus have a frame of reference for what is asked of them. Most of the municipalities at this phase also have access to professional staff

either via their own water departments, via inter-municipal cooperation, or private consultants. In any case, with the new Sewage Administration staffed with professionals not affiliated with the agricultural lobby, municipalities now have access to relevant information. Finally, municipalities now have access to financial resources, either in the form of loans from the government or by raising private capital which by the end of the 1990s was encouraged by the government and the Treasury Ministry. This gives municipalities more power in comparison to the previous phase, in which most of them were highly dependent on the central authorities. This can also be seen as influencing their self-effectiveness assessment, thus further motivating them. Nonetheless, it is interesting to note that the availability of such support was, by itself, not enough and in some cases only the threat and/or use of enforcement tools pushed mayors to actually move forward and treat wastewater, in which case the availability of the resources and support was essential. It should also be noted that in 2001, the Water and Wastewater Corporation Law was promulgated, encouraging municipalities to privatize their water and wastewater sector in order to improve its management (e.g., reduce leakages, *etc*.). Indeed, during the following decade, and especially since 2008 and onwards, many such utility companies were established, further assisting municipalities to adequately treat wastewater. This, too, can be seen as a continuation of the shift that started years before. (Moves in this direction that started when the Central Government in the first half of the 1990s encouraged municipalities to privatize their water and wastewater sectors. These moves, however, were hindered by some segments in the Interior Ministry, and the municipal sector and the law was eventually promulgated only in 2001). The main findings for this phase are presented in Table 4.

To conclude, several factors co-aligned to change the interaction process between actors and result in the paradigm shift: the establishment of the Ministry of Environmental Protection, the drastic reduction in the power and influence of the Ministry of Agriculture with, at the same time, its acknowledgement for the need to direct high quality effluent for irrigation, and the Rabin Government's policy of investment in infrastructure. All these factors shifted the balance and altered the interaction between the relevant actors, resulting in the overall shift. With the establishment of the Ministry of Environmental Protection, there is finally an institution that has access not only to power and information but also to motivation. With the sole interest in protecting the water sources, and with highly motivated staff to create a change, this Ministry started a new trend that could not be overturned. In parallel, the drastic reduction in the power of the Ministry of Agriculture, previously controlling almost exclusively the water management sector including wastewater treatment, paved the way for new interaction between the actors. With the new interaction, it can also be seen that the establishment of a Ministry that was determined to make a change and enforce the laws influenced other relevant actors, previously with weaker or impartial positions, especially the Ministry of Health, to embark on this trend and enforce the laws. Be it due to the new rivalry over authority, or due to actual interest in the needed change, the Ministry of Health became a relevant actor in the new trend of enforcement. Finally, enforcing the laws without providing the means to comply with the law would have made it very difficult for the municipalities to establish advanced wastewater treatment plants. The Rabin's Government allocated larger budgets and gave strong financial incentives for municipalities to embark on the new trend and invest in wastewater treatment; it also provided professional assistance and a framework via the new Sewage Administration, now headed by wastewater engineers rather than representatives of the agricultural sector. This process is still on-going and with the stricter regulations recently promulgated by the Ministry of Environmental Protection and Ministry of Health, and with

the further amendment of the Water Law (1959) in 2008 to increase the penalties that can be imposed on water polluters, it seems that the high motivation to improve the state of the water sources continues.

**Table 4.** Characteristics and interaction processes, key actors; 1989–present (implementation).

| Actors | Motivation | Information | Power | Position in the interaction processes |
|---|---|---|---|---|
| Ministry of Environmental Protection | + | + | + | With high motivation, the only institution with an exclusive mandate to and interest in protecting the environment and the water resources; with access to information and by maximizing the power available to it, became a crucial actor in the policy network in terms of law enforcement. |
| Ministry of Health | + | + | + | With higher motivation in comparison to the previous phase, better information due to the base-line quality regulations and increased authority in practice, has a stronger position in the actors' network; more influence over the process; aligned with other actors to promote advance wastewater treatment. |
| Ministry of Agriculture | + | – | – | Much reduced power and access to information with the transfer of the water institutions and pollution control authority to other Ministries, thus having less influence over the process; however, with higher motivation (acknowledging for the first time the need to utilize high quality effluent in support of agricultural production) aligned with other actors to promote advance wastewater treatment. |
| Ministry of Interior | – | – | + | Retaining the power/authority via the Local Authorities (Sewerage) Law (1962), but still lacking motivation and information, thus remaining an impartial actor. |
| Ministry of Infrastructure | + | + | + | Interests aligned with other actors to promote advance wastewater treatment based on its objective to upgrade national infrastructures as well as its access to information and financial resources via Water Authority and the Administration for the Development of Sewage Infrastructures. |
| Target group: Municipalities /mayors | + | + | + | Target group is pressured into compliance with the law on one hand and given access to resources for implementation on the other, thus in a better position in the actors' network |

As a result, in this phase the implementation process can be defined as "forced cooperation" [12] (p. 295) (of the target group), achieving implementation. Since implementation is achieved, it can be described as cooperation as more actors share similar objectives and together control most power, enabling them to overturn any opposition. However, rivalry and power struggles hinder effective cooperation and coordination and it seems that the similar objectives are motivated by different reasons which result in more independent actions taken by different actors rather than active cooperation to achieve

implementation. The Ministry of Environmental Protection's interest is to protect the water sources; the Ministry of Health aligns either due to its wish to establish its authority within the new rivalry with the Ministry of Environmental Protection over control or due to its own interest in protecting the public health; the Ministry of Agriculture's interest co-aligns, as for the first time the agricultural sector acknowledges its need for high quality effluent for non-restricted irrigation as a reliable water source to replace potable water allocations for irrigation; the Prime Minister's Office prioritizes infrastructure to support the absorption of a massive immigration wave. All these factors influence the interaction process and align to result in different actors taking actions, based on their different motivations and self-interest, to enforce the law and promote advanced wastewater treatment. Although the process was not always smooth and faced objections such as by the Housing Ministry and although the challenges in this field are far from being resolved, the new interaction process yielded enforcement trends and positive results. The target group has being pressured into compliance and at the same time has assumed the power needed for the task. With more access to information and resources, municipalities are now in a stronger position in the interaction process to influence outcomes.

## 4. Conclusions

In the State of Israel, wastewater treatment has been neglected for decades. Municipalities—legally responsible for wastewater collection, treatment, and sanitary disposal—established the collection systems to remove hazards from their population centers, but in most cases neglected the elements of treatment and sanitary disposal. Untreated or partially treated wastewater was discharged into the environment, mostly to the nearest stream or dry riverbed, resulting in on-going pollution of the scarce water sources. As the municipalities are legally responsible, they were traditionally blamed for the long term neglect of wastewater treatment.

Advanced legislation was in place since the early stages of the State's formation, providing the sufficient legislative framework to protect and preserve the water sources but the laws were not enforced. The intended policy goals were thus not attained due to lack of implementation. Since the beginning of the 1990s, a shift can be seen and most municipalities, including ones that have neglected wastewater treatment for decades, began establishing advanced treatment plants. Several factors aligned to explain the paradigm shift of which forceful enforcement and the pressure put on municipalities and their mayors is a major one. The paper, thus, focuses mainly on implementation of pollution control legislation. Additional important trends have been observed such as the rise of the environmental movement, the willingness of farmers to pay higher prices for effluent, the privatization of the municipal water and wastewater sector, *etc*. These however can be seen as supporting or continuing the shift that already started. The environmental movement often used civil law suits to influence mayors to take action and as such can be seen also as part of the law enforcement trend; whereas the willingness to pay for effluent and the privatization of the water sector unfolded in the subsequent years and can be seen more as continuing rather than initiating the shift. While water pollution by wastewater is far from being resolved, there is no doubt a substantial improvement in comparison to the past. This paper aims to analyze and explain the lack of implementation of the policy instruments—relevant legislation for pollution control—as well as the shift to its implementation.

The implementation processes in the Israeli case are analyzed from an actor-centered approach based on the Contextual Interaction Theory. This approach assumes that since implementation of policy instruments is the responsibility of relevant actors in the policy network, they can be seen as a social interaction between key-actors. The characteristics of the actors involved, particularly their motivation, information and power, are analyzed as to explain the standpoint and activities of each of the actors in the policy network. These further explain the interactions between the key actors and in turn, the outcome with respect to the implementation process. Accordingly, the analysis offered in this paper addresses the key actors in the implementation processes of pollution control legislation, their key characteristics, and the interaction between them.

The Israeli case shows a shift from a phase of lack of implementation prior to 1989 to a phase of achieving implementation following 1989. In line with the Contextual Interaction Theory, in the first phase relevant actors had access to information and power in various degrees but none of the actors with the power to enforce the law had also the motivation to do so. The analysis shows that none of the actors had a primal interest in protecting the water sources by requiring municipalities to treat wastewater as all of them had other more important priorities to look after. As such, the most influential actor—the Ministry of Agriculture—dominated the policy network based on the lack of motivation and relative lack of power and information of other actors, and avoided implementation of water pollution control to serve its own primary interest—utilizing wastewater for agricultural production. This Ministry advocated a low-cost low-tech wastewater management approach that served the short term agricultural interests but not the long term water considerations. Other actors passively cooperated with this approach either because it served their own interests as well, e.g., in the case of the Ministry of Interior, or because they had a weaker position in the network to influence the outcome, e.g., the Ministry of Health and the target group. This influenced the outcome of the implementation process—insufficient wastewater treatment and on-going pollution. The interaction between the actors had changed starting 1989, most importantly due to the introduction of a new actor—the Ministry of Environmental Protection—with a sole interest in and high motivation to protect the water sources, as well as with a change in the key characteristics of the Ministry of Agriculture, with less power and higher motivation to promote advanced treatment. Wider contexts such as the massive immigration from the former Soviet Union and the rapid development it brought with it; as well as the acknowledgment of farmers for the first time of their need in high quality effluent for non-restricted irrigation as an alternative reliable water source further influenced the implementation processes. In this new interaction, the Ministry of Environmental Protection promoted forceful enforcement and other actors participated in this process, e.g., the Ministry of Health, or supported it, e.g., the Prime Minister's Office, based on their own priorities. Putting pressure on the target group on one hand and providing it with means to comply on the other, gave municipalities motivation as well as information and power to comply. As a result, in this phase, advanced wastewater treatment is achieved in many of the municipalities. Still facing many challenges, the enforcement trend continues.

The findings thus suggest that the Contextual Interaction Theory can explain well these implementation processes in the presented case. Indeed, the characteristics of motivation, information and power of the relevant actors explain well the interaction processes between them and their standpoint and activities with respect to pollution control. The case, however, shows the need to move

beyond the two-actor model of the Contextual Interaction Theory in its 2004 version, and not only pay attention to the implementer—target relationships—but also to the inter-ministerial interaction to arrive at an in-depth analysis. Furthermore, in two cases, individual persons seemed to make a difference beyond the interaction between corporate actors such as ministries: the official mainly responsible for the 'agro-sanitation' method that dominated the approved wastewater solutions for decades, and the first General Director of the Ministry of Environmental Protection that was fully committed to create a change and enforce the laws. This shows the importance and relevance of the personal factor—the personal attributes of key position holders—in understanding implementation processes.

The analysis also shows that the notion that the municipal sector is to be blamed for the long term neglect of wastewater treatment is not supported by the findings. Until the end of the 1980s and beginning of the 1990s, municipalities were indeed formally responsible but in practice had little power and resources. Municipalities were not only completely dependent on the central authorities (e.g., the National Sewage Authority) but furthermore, were instructed by them regarding which solutions are accepted and approved. Most plans that deviated from the line of the central authorities were rejected. This was based on a very centralized system and the total control the agricultural sector had over the issue. The target group—the municipalities—thus had a very weak position in the interaction process between the relevant actors. Respectively, after the paradigm shift, when laws were being enforced municipalities would have found it very difficult to comply had they not been given access to resources and support. Once the municipalities were given the motivation, resources and power, they responded and were able to establish advanced treatment plants.

Several lessons can be learnt from the Israeli case: (i) enforcement processes are indeed actor interaction processes and the result of these interactions in terms of the policy outcome can be well explained, thus predicted, by understating actors' access to motivation, information and power; (ii) key characteristics of the key actors can be changed over time and in turn result in a changed outcome of the process; (iii) motivation seems to be the most important characteristic explaining implementation processes. Access to power and information alone were found to be insufficient as in the case of the Ministry of Agriculture. Furthermore, motivation can be used to create or increase access to better information and power as was the case with the Ministry of Environmental Protection. Understanding this, an intervention measure in cases of on-going pollution could be to create motivation either within the existing actors, e.g., the Ministry of Agriculture's acknowledgement of the need for utilization of high quality effluent for non-restricted irrigation, or by creating a new actor with high motivation, as was the case with the establishment of the Ministry of Environmental Protection; (iv) while enforcement tools are very efficient in creating motivation for the target group, they are by themselves insufficient in the case of little or no resources. Access to financial and technical resources and support is crucial if municipalities are to be expected to adequately treat wastewater; (v) in the absence of an actor with access to both motivation and power, establishing an actor with motivation and information can in the long run prove to be useful as in the case of the Environmental Protection Service. While this actor had no power to enforce the law, it prepared the ground for such enforcement using its motivation and information and once a relevant organization with access to power was established—the Ministry of Environmental Protection—it could immediately embark on the tasks ahead using the information available by the Service; (vi) once there is an actor with motivation and actions are taken, others may follow even if just to maintain and justify their authority over the matter.

It is not the intention of this paper to advocate solely the use of enforcement tools as these by themselves are insufficient if municipalities are not offered financial and other support. However, in the Israeli case, these were found to be instrumental in the paradigm shift of wastewater treatment. Pollution by untreated wastewater is a major environmental problem in many countries worldwide. Understanding these processes and interactions between key actors may assist predicting outcomes of policy processes and allow deliberate interventions to influence the motivations, information and power of the key actors.

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**Conflicts of Interest**

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