

# **Challenges of transboundary wastewater management for Palestinian communities along the Green Line – The Israeli-Palestinian border<sup>72</sup>**

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**ABSTRACT:** The annual discharges of municipal wastewater across the Green Line (the Israeli-Palestinian “borders”) are increasing; thus a bi-national conflict exists with political, environmental, and economical dimensions. This is a challenge calling for an urgent need for effective transboundary cooperation aiming at public health and environmental protection. Based on the review of selective international and national literature, data analysis of accessible local reports and technical site visits, we demonstrate how complex transboundary wastewater management is throughout the world and on the Green Line or Israeli-Palestinian “borders” specifically. The Israeli water policy reflected by the current unilateral interventions have proved ineffective in addressing regional management of transboundary wastewater problems. This paper provides an overview of the current status of sanitation services coverage in Palestinian communities and discusses the immense challenges behind achieving sustainable wastewater treatment facilities. An example of transboundary wastewater management is presented to advance discussions on Jad Hanna wastewater treatment plant serving Palestinian communities, a recent peace building sanitation project along the Israeli-Palestinian “border”. This paper underlines effectiveness, equality, trust, transparency, benefits sharing and responsibilities as key elements of sustainable transboundary wastewater treatment management. A transboundary cooperation along the Green Line (which currently is being seen as the Israeli-Palestinian borders) to promote affordable sanitation and reuse facilities is achievable if a number of legal, political, socio-economical and environmental questions are fairly resolved.

*Keywords:* Environmental protection, effluent reuse, Green Line, transboundary wastewater, wastewater treatment

## **INTRODUCTION**

The increased population growth rate and rapid expansion of industrial and commercial sites (exacerbated by periodic annual drought periods) has caused an increased

<sup>72</sup> For clarification of the word ‘borders’, it must be noted at the outset that the Green Line is the former Israeli–Jordanian border and widely considered the ‘border’ between Israel and the Palestinian territory. Israel is the only country in the world that does not define its borders.

gap between water supply-demand balance, where treated wastewater as an alternative non-conventional water source can help bridge the imbalance. Due to the Israeli occupation in 1967, the Palestinian people have limited access to their land and water resources and are dependent on Israel's prior permissions and foreign donations to establish their water and wastewater treatment facilities. According to the World Bank (WB, 2009) about 35 percent of the Palestinian population has access to adequate sanitation services. The use of cesspits and the discharge of raw sewage over land and into wadis (seasonal dry streams) and the delay in project implementation contribute to serious public health and environmental risks, reduce availability of limited water resources, as aquifers are polluted by wastewater, and reduce effective treated effluent use in agricultural irrigation (Tagar *et al.*, 2004; Isaak *et al.*, 2004; Kramer, 2008). At present, the Occupied Palestinian Territory (OPT) has 8 large urban wastewater treatment plants (WWTPs) including almost 300 onsite treatment plants. These wastewater treatment facilities serve mainly urban communities covering an approximately 1.5 million population equivalent (PE), where the current total population of the OPT is slightly more than 3 million. The technology type applied for treatment processes is relatively conventional and primarily using an activated sludge system with its process modifications (aerated lagoons, hybrid aerobic-trickling filter and oxidation ponds).

Figure 1 illustrates the potential impacts of inadequate wastewater management on public health, and the receiving environment (soil, surface water and groundwater).

For water decision makers and urban development planners, provision of sustainable wastewater treatment facilities and reuse schemes is an emergent challenge and becomes an increasingly complex, controversial, and expensive challenge to improve the current situation and cope with the rapid expansion of Palestinian urban communities. Limited access to available groundwater sources as cheaper and reliable water supplies are overexploited as a result of the Israeli water policy, thus use of reclaimed

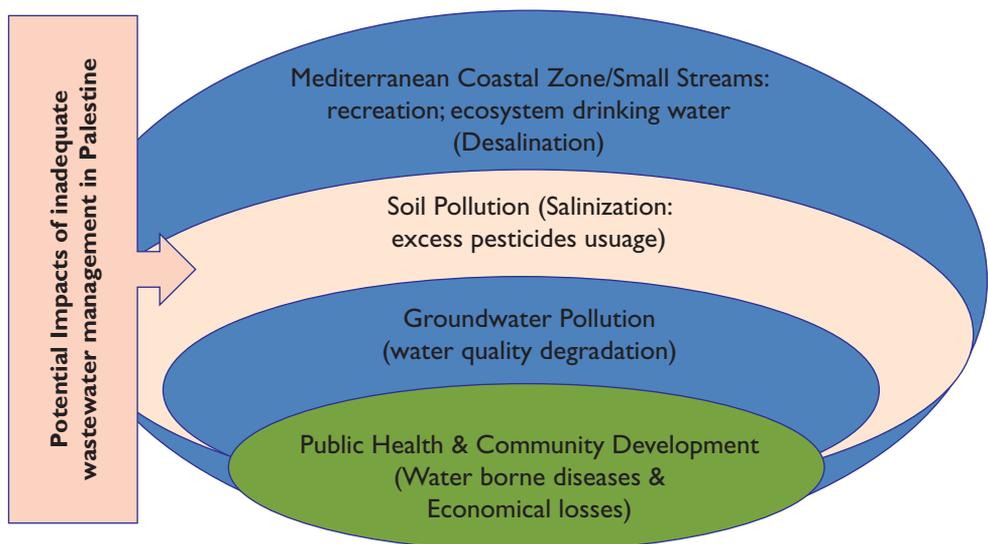


Figure 1 Major impacts of ineffective management of transboundary wastewater in Palestine.

water, brackish and sea water desalination might play a key role. In addition, transboundary management of urban wastewater discharges through viable mechanisms such as recharge and recovery and regional cooperation on major infrastructure needs will become increasingly important.

In order to understand the main challenges behind ineffective and inadequate wastewater management in the Occupied Palestinian Territory (OPT), this study explores the case of Palestinian transboundary urban wastewater discharges from the West Bank across the Green Line (into Israel), where most of the Palestinian urban communities are situated upstream and are characterized by acute settings of asymmetry and political variability (Fischhendler, 2007; Cohen *et al.*, 2008; Hareuveni, 2009; Schalintzek and Fischhendler, 2009). The study begins its review of the subject by considering the current status of wastewater management in Palestinian urban communities and the constraining factors behind enhancing the progress of establishing sustainable wastewater treatment facilities. The past and present Israeli water policies that affect sustainable wastewater management in Palestine are then presented and discussed. Tulkarem-Emek Hefer, as a local case study, is presented and discussed, where the polluter pays principle (PPP) has been opted for as a political tool. Finally, conclusions and recommendations are made pertinent to appropriate and effective joint cooperation for future intervention to promote transboundary wastewater management at the defined Israeli-Palestinian borders of the future.

## CURRENT STATUS OF WASTEWATER MANAGEMENT IN PALESTINIAN URBAN AND RURAL COMMUNITIES

Most of the existing wastewater treatment plants (WWTPs) in Palestine do not function very well, with effluent quality exceeding the prescribed national effluent standards. This may simply be due to overloading, but it can often be the result of the various factors associated with improper physical design, faulty construction and insufficient system maintenance (Al-Sa`ed, 2005; Al-Sa`ed, 2007). [Table 1](#) summarizes

*Table 1* Historical development of sanitation service coverage under various regimes (Israeli occupation period and under the Palestinian Authority rule).

<i>Responsible party</i>	<i>Population served</i>	<i>Years</i>	<i>%/Year</i>
Israel (1948–2008)			
Sewerage networks	95%	60	1.6
Centralized WWTPS	90%	60	1.5
OPT-WB (1967–1995)			
Sewerage networks	20%	28	0.7
Centralized WWTPS	5%	28	0.2
Mekorot (Israeli Water Company): 1937		Israeli Water Law: 1957	
Palestinian Authority (1995–2008)			
Sewerage networks	+20%	13	1.5
Centralized WWTPS	+76%	13	5.8
Pal. Water Authority (PWA): 1995		Palestinian Water Law (2002)	

the historical development of wastewater management (sewerage collection and treatment) under various epochs; during the Israeli occupation (1967–1995) and under the rule of the Palestinian Authority. As a comparison, the sanitation development in Israel for the period between 1948 and 2008 is presented as a reference. It is clear that the wastewater management in the OPT was fully neglected during the Israeli occupation period, where only 20% of the total population were served centrally by sewer networks and only 5% of collected sewage experienced physical and partial biological treatment. The neglect of Israel to provide access to safe sanitation services and the adverse impacts associated with this decision by Israel were recently explored by the World Bank report (WB, 2009). The negative impacts on surface water bodies and annual degradation in groundwater quality were documented recently (Cohen *et al.*, 2008; Hareuveni, 2009).

During periods of peace and stability conditions, the PWA was able to erect only one urban sewage works in Al-Bireh city, with pre-conditions that the nearby Israeli settlements must be connected to the sewage treatment facility. The wastewater management in the Israeli settlements is not within the scope of this paper, however, it must be noted that despite their connection to Palestinian sewage works, they refused to share in the capital investment costs or even to pay the wastewater tariff. In viewing

Table 2 Palestinian efforts made to erect, upgrade and rehabilitate wastewater treatment plants.

District	Capita (#)	Served Capita (%)	Capita (#)	WW (m <sup>3</sup> /d)	Treatment System	Year	Status	Activity Type
Al-Bireh	50,000	85.8	42,900	4,719	Extended aeration	2000	Operational	Upgraded 2008
Ramallah	35,000	74.6	26,110	2,872	Aerated Lagoons	1973	Overloaded	Rehabilitated 2003
Nablus	150,000	82.9	124,350	14,300	Extended aeration	2000	Tendering	09 New WWTP/2020
Hebron	257,000	82.1	210,997	24,265	Conventional ASS	2001	Pending	Hold on
Tulkarm	93,000	68.3	63,519	6,352	Aerated Lagoons	1975	Pending	Upgraded 2000
Saifit	25,000	65.6	16,400	1,394	Planned ASS	2000	Pending	No funding
Qalqilia	20,000	70.5	14,100	1,199	No WWTP		Pending	No funding
Jenin	52,000	66.5	34,580	3,458	Aerated Lagoons	1972	Pending	Upgraded 1994
Beit Lahia	299,000	68.5	204,845	16,341	Aerated Lagoons	1979	Overloaded	
Gaza city	545,000	79.0	430,550	48,243	Parallel TFs/EA	1977	Overloaded	Upgraded /86/98
Rafah	184,000	95.3	175,335	20,000	Aerated Lagoons	1978	Overloaded	Upgraded 2008
Bethlehem	84000	91.2	76,608	8,810	No WWTP		Non	
Jerusalem (E)	115000	80.8	92,920	10,686	No WWTP		Non	
Khan Yunis	120000	75	90,000	10,350	No WWTP		Non	
<b>Total PE</b>	<b>1,710,000</b>		<b>1,513,214</b>	<b>175,580</b>				

this scenario and its associated problems, there are three main strategies, which the Palestinian Water Authority (PWA) applied in order to promote wide sanitation services coverage and enhance the performance of current wastewater treatment facilities to comply with national prescribed effluent quality standards, i.e. (a) new erection, (b) retrofitting and (c) upgrading WWT schemes. Table 2 illustrates the efforts made by the PWA to plan, upgrade and rehabilitate the existing WTPs for municipal wastewater treatment in Palestine. In all the efforts, emphasis was made to integrated pollution control in the upgrading schemes, in which all aspects such as effluent quality standard, sludge disposal, level of technology, ease of upgrading, odor control, land availability, maintenance, cost-effective and other non-financial factors have been considered.

Table 2 shows that 40% (1.5 million) of the total urban population in the OPT have access to central sewer networks, however, only 48% of the total annual collected wastewater is being partially treated (secondary treatment) in owned Palestinian sewage works, whereas more than 30% of the annually collected sewage is being treated within Israel. Under the Status column in the Table, it is obvious that the current sewage works are either overloaded or under the ‘waiting game’ for Israeli final approval. It is worth to mention, if a WWTP proposal is technically approved by the JWC, this does not automatically mean direct implementation. The final approval must obey the “military” orders granted by the “Civil” Administration, which takes years to receive – exceeding 10 years for Nablus and Hebron, as examples.

## MANAGEMENT OF TRANSBOUNDARY WASTEWATER DISCHARGES

### Wastewater management in urban communities along the Israeli-Palestinian “border”

In arid and semi-arid regions, wastewater is now seen as a key component of the water cycle that can be treated and reused for a variety of non-potable uses. Treated effluent (water) can be used to water parks, for agricultural purposes, to revitalize heavily polluted streams and, in general, this will conserve the limited quantities of drinking water available, using the treated/reclaimed effluent for many uses originally served by potable water.

Figure 2 presents an overview of the location of wastewater flowing in three small transboundary wadis (streams) that are used as case studies, including illustrating the the locations of the Green Line and the Mountain Aquifer boundary. About 20% of the total population served by central sewer networks reside in urban communities having transboundary wastewater discharge into Israel. Among the fifteen major streams (rivers) in Israel, only five streams originate in the West Bank: Wadi Mugata (Jenin district), Wadi Zaimer (Nablus-Tulkarm districts), Wadi Zhor (Qalqilia district), Wadi An-Nar (Hebron district) and Wadi Mahbas (Ramallah district).

More than 30% of annual collected urban wastewater (73.7 mcm/year) from Palestinian communities are being treated in Israeli wastewater treatment plants (Table 3). The treated effluent is further reclaimed for various applications within Israel, mainly for unrestricted agricultural irrigation and water for nature purposes (river rehabilitation and landscape recreation). It is essential to point out that the

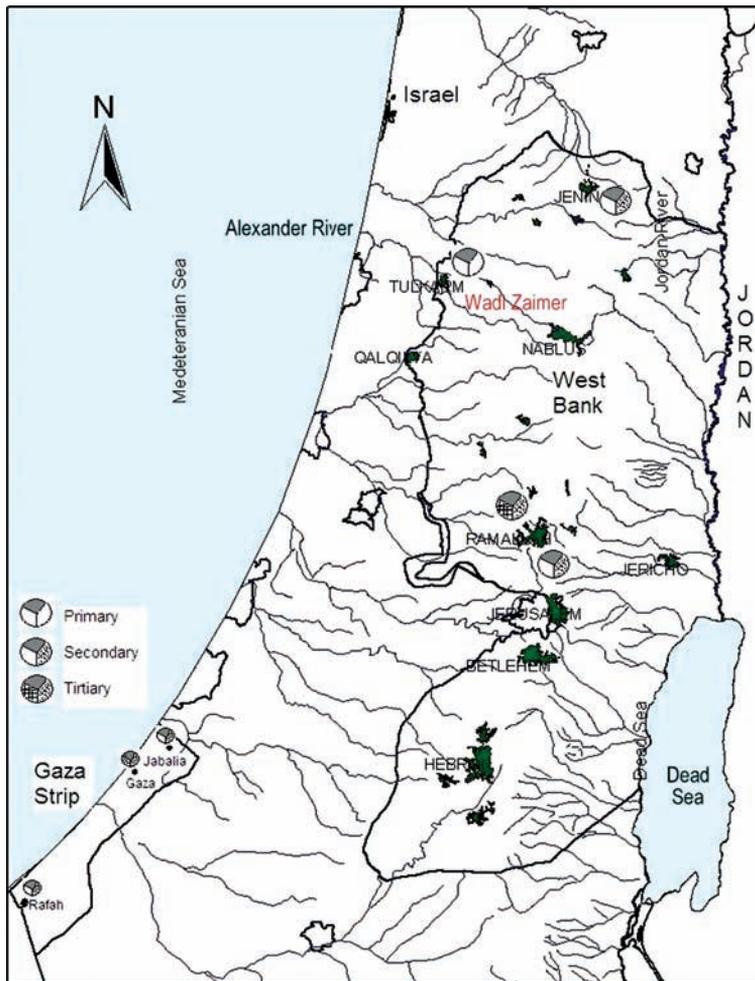


Figure 2 Location of Palestinian WWTPs and receiving surface water bodies.

Palestinian Authority has no share in the economical and environmental benefits from the treated or reclaimed effluent that is of Palestinian origin.

Schalimtzeck and Fischhendler (2009) investigated the feasibility of the Polluter Pays Principle (PPP) as a cost sharing tool for the treatment of Palestinian transboundary wastewater from the West Bank that crosses the Green Line to Israel. They found that, under conflict conditions with strong political and economic asymmetries, Israel opted for the extreme form of the PPP. Lack of a transparent political framework and pressure applied by many Israeli internal actors in the environmental decision making process have led to disagreement between the Palestinian and Israeli sides as to a feasible cost-sharing system. Table 4 illustrates how Israel's application of the

PPP did not achieve environmentally sound solutions pertaining to transboundary wastewater management, where superior environmental alternatives were practiced deviating from the PPP and utilizing dominating regional conflict and asymmetrical conditions.

Perhaps the most objective and complete analysis of the Israeli cost sharing policy was made by Schalimtzek and Fischhendler (2009), who illustrated the ineffectiveness of the oft-noted of PPP's suitability as follows (Table 4):

Table 3 Summary of transboundary wastewater treatment from Palestinian communities.

Total PE WB &GS (PE)	3,761,646		Annual WW collected	73.70 mem
Urban PE served (PE)	1,513,214	40 (%)	Annual treated WW	59.5 mcm
Daily sewage collected (m <sup>3</sup> )	175,580		<b>Potential WW reuse</b>	<b>81 (%)</b>
Daily WW treated (m <sup>3</sup> )	141,743	81 (%)	<b>33% of WW treated/used in Israel (20 mcm/y)</b>	

Table 4 Impacts of asymmetry and political conflict on transboundary wastewater management options on the Israeli-Palestinian borders (modified after Schalimtzek and Fischhendler, 2009).

<i>Background conditions</i>			<i>Effect on suggested/adopted solutions</i>
International Politics	Escalating conflict	Peace process halted and JWC stop meeting	Unilateral solutions endorsed Israeli insistence on PA wastewater treatment and delayed process approval
		Higher emphasis on 'high politics'	Israeli insistence on PPP leading to adoption of extreme PPP Reclaimed water used by Israel alone
		Deteriorating security conditions	Location of wastewater projects inside Israel, no approval for PW projects
Internal Politics	Pressure for solution by Israeli settlements/ local agencies		Project first paid by local authorities and next activation of offset mechanism
Economic	No emphasis on economies of scale		Separate plants proposed or implemented
Environmental	Acute need to prevent pollution		Emergency projects with high treatment standards/partly CAPEX cut form Palestinian taxations collected by Israel Inferior downstream solutions (upstream in Wadi An-Nar-Kidron)

## CURRENT PRACTICES OF EFFLUENT DISPOSAL INTO RECEIVING WATER ENVIRONMENT

### Regional water treaties between Israeli and Palestinian sides

Alon (2007) explored transboundary stream restoration and wastewater treatment standards among five main Israeli/Palestinian transboundary water challenges and analyzed the actual capability of current Israeli laws and regulatory tools to resolve them. Among the main Israeli water pollution control laws and orders are the followings:

- Water Law (1959, 1971, 2002, 2004, 2008),
- Water Commissioner Orders:
  - Clean Up, Allowing, and Stopping Orders related to water pollution,
- Water Council,
- Water Drilling Control Law, Drainage and Flood Control Law,
- Streams and Springs Authorities Law,
- Local Authorities Sewage Law,
- the Public Health Ordinance, and a
- Licensing of Businesses Law.

The 1992 Sewage Effluents Standards (Public Health Ordinance) were set without scientific evidence and are based on European standards assuming a considerable degree of dilution in receiving surface water bodies. The standards unfortunately did not take into consideration the site specific vulnerability of groundwater and the existing water quality of many streams, i.e., that most of these streams have seasonal water flows, if any, or are comprised entirely of wastewater. With almost 95% sewerage coverage, Israel utilizes annually about 300 mcm (75% of treated effluent) in agricultural irrigation and has the status of a “world leader” in reclaimed effluent reuse. The present “20/30” rule for biochemical oxygen demand/total suspended solids (BOD/TSS), set for effluent discharge into receiving waters and reuse for agricultural irrigation, was effective in health risk reduction. However, Gabbay (2002) reported that the recommendations made by the Israeli “Inbar” inter-ministerial committee entailed efforts to update the current effluent disposal standards. For comparison, [Table 5](#) lists selected major parameters highlighting the huge variations between Israeli and Palestinian Standards for Effluent Disposal for agricultural irrigation and discharge into surface water bodies.

The Israeli stringent effluent quality standards are forced upon the Palestinians (MoU 2003) where the 20/30 rule is required from the Palestinian operators during the first phase of implementation of any new wastewater treatment facility. However, the WWTPs effluent shall comply with stringent level of standards (10/10) during the second phase of implementation, given a period of five years as a construction phase to erect an advanced filtration stage. This is evident from the approval protocol for Tulkarm and Nablus-West WWTPs (MoU, 2008). The debate over the adequacy of the standards remains controversial as even the less stringent “Inbar Standards” remain debatable, due to the huge financial burdens associated with their implementation and the objections to their adoption by the Ministries of Finance and Interior.

Table 5 Israeli and Palestinian standards for effluent disposal in various applications.

Parameter	Unit	Israeli Standards 2002		Palestinian Standards 2002	
		Unrestricted Irrigation	Rivers	Unrestricted Irrigation	Rivers
BOD	mg/l	10	10	20	–
TSS	mg/l	10	10	30	–
COD	mg/l	100	70	–	200
Ammonia-N	mg/l	20	1.5	50	5
Total-N	mg/l	20	10	–	–
Total-P/PO <sub>4</sub> -P	mg/l	5	0.2	30	5
SO <sub>4</sub>	mg/l	–	–	500	1000
Chloride	mg/l	250	400	500	–
Sodium	mg/l	150	200	200	–
Fecal coliforms	CFU/100 ml	10	200	<200	<1000
Boron	mg/l	0.4	–	0.7	2
Hydrocarbons	mg/l	–	1	0.002	1
Anionic detergents	mg/l	2	0.5	15	25
Total Oil	mg/l	–	1	5	10
pH	[–]	6.5–8.5	7–8.5	6–9	6–9
Dissolved oxygen	mg/l	<0.5	<3	>0.5	>1

At present, the current valid 20–30 standard is still valid as the level of treatment required for wastewater treatment in Israel. However, before Israel can begin to force new stringent effluent standards on the Palestinian wastewater management facilities, it must first enact those on its own treatment facilities (Feitelson and Levy, 2006; Alon, 2007).

### TULKARM-NABLUS/EMEK HEFER REGIONAL COUNCIL – A CASE ON TRANSBOUNDARY WASTEWATER MANAGEMENT

There is a lack of scientifically based knowledge on the significant environmental impacts posed by the discharge of raw wastewater from upstream Palestinian communities and the possible adverse impacts on the performance of Yad Hanna wastewater treatment plant (YHWWTP). This fact poses a real challenge due to cultural differences within the Palestinian-Israeli “border” region and the varying powers and responsibilities among local council, and governmental agencies from both countries. To overcome this challenge, there will be the development of an Environmental Management System (EMS) for YHWWTP, where an initial environmental assessment of the discharge of raw sewage from Palestinian urban areas including industrial facilities along Wadi Zaimer shall be initiated. The IEA shall aim at identifying environmental issues and the significant environmental aspects (SEAs). SEAs are those aspects that can have significant impacts (positive or negative) on the receiving environment. Given the scope and breadth of activities at the JHWWTP, the SEA identification

process shall reveal a range of environmental aspects from Palestinian communities over which it has little or no control. Since the JHWWTP receives wastewater from Palestinian urban areas, some SEAs identified would be the ones that are not realistically in the WWTP's control, but rather those that it could only influence (Figure 3).

According to Schalimtzek and Fischhendler (2009), the Israeli government opted in January 2003 for the application of the offset mechanism to wastewater treatment, similar to those applied to the health and water sectors. Based on this Israeli unilateral action, the construction and O&M costs of the downstream solution of Wadi Zaimer (Alexander river) and Wadi An-Nar-Hebron emergency projects were deducted from Palestinian money held by Israel.

### Regional wastewater agreements between Israeli and Palestinian sides

A similar case on EMS development is the Nogales International Wastewater Treatment Plant (NIWTP) where management of the real and potential transboundary environmental impacts from Mexico formed a challenge. The NIWTP was able not only to influence but control the treatment of sewage from Mexico that has been found to contain industrial and infectious waste. The EMS teams focused on the inputs of its processes and found proper methods to work with the upstream entities across the USA-Mexico border to manage the SEAs and minimize the pollution loads at the source, through cleaner production application (Jobin and Peña (2006).

One specific challenge for the YHWWTP is working to meet the Israeli effluent discharge permit for restricted irrigation use and for discharge into the Alexander River, a surface water body. Of particular concern is the total suspended solids (TSS), ammonium and high oil/grease content of the influent coming from the Tulkarem

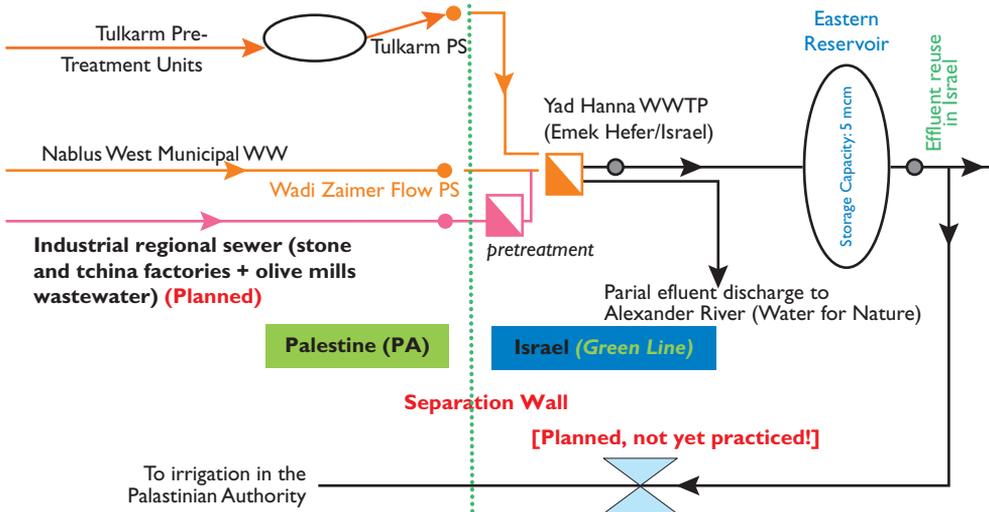


Figure 3 Tulkarm-Nablus/Emek Hefer council a case on transboundary wastewater treatment.

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city and Wadi Zaimer. Because of the strict Israeli regulatory issues (10/10; mg/L TSS and BOD, respectively) and the potential for contaminating the underlying aquifer, treated effluent became a significant aspect. Even though the effluent poses an overall positive environmental impact on the riparian habitat of the Alexander River by providing regular annual flow (water for nature) for what would otherwise be a dry and seasonal small stream bed, the effluent has appeared to limit populations of some wildlife, including invertebrates and fish.

Figure 4 illustrates the annual operational expenditures (OPEX) for the operation, maintenance and repair (around \$4 Million; period 2004–2008) of JHWWTP established by the Palestinian tax money, deducted by Israel. The Palestinian Authority refused all receipts sent by the Israeli Water and Sewerage Authority for many reasons. The Israeli official authorities' financial claims are not supported by signed bilateral agreements and they lack legal requirements (Alon, 2007).

The establishment of JHWWTP, paid with Palestinian taxes of \$5 millions, was a unilateral Israeli action characterized as an emergent solution, while currently claimed as "status quo", forcing the Palestinian side to pay for annual wastewater quantities that lack any scientific or professional status. A bi-national agreement on transboundary wastewater management based on watershed basin and mutual benefits for both sides and based on an international framework might resolve the current political conflict. This is a major challenge to solve fairly, where Israel has deducted more than \$34 million over the past 14 years (1994–2008). This deduction is made from the reimbursements allotted to the Palestinian Authority paid as custom/trade taxes and collected by Israel at all import/export points controlled it controls

Installation of advanced pre-treatment units (flocculation/coagulation) to reduce high organic and inorganic pollution loads of the influent are associated with high annual capital and running costs exceeding 40% of the total CAOPEX. However, a root cause of the effluent not meeting Israeli strict water quality standards is the lack of upstream pretreatment programs and the rapid increase in land use for both industrial

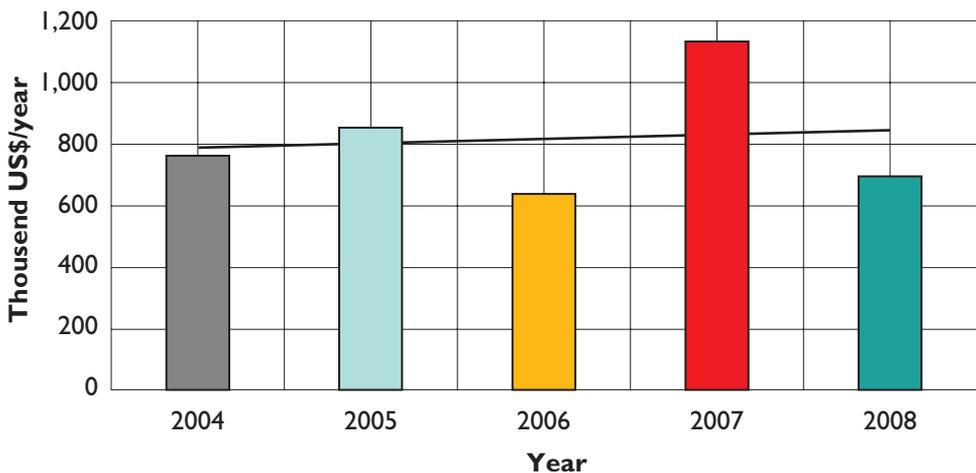


Figure 4 Annual OPEX exempted from Palestinian tax captured by Israel.

and residential purposes. As a measure to solve this problem, the YHWWTP shall use every possible communication channel to provide environmental public awareness campaigns to the local Palestinian communities. Promotion of small family-owned industrial sites in pretreatment programs to reduce the harmful industrial discharges at the source along Wadi Zaimer course is another possible mean.

Jobin and Peña (2006) reported that effective implementation of the NIWTP's EMS hinges upon the plant's ability to manage the SEAs that it has influence over, which presents challenges for the plant. Under the EMS framework, the NIWTP must work towards minimizing its environmental impact through programs that increase bi-national cooperation, stakeholder engagement, and best practices to implement its environmental management programs.

### **ISRAELI WATER POLICY TOWARDS TRANSBOUNDARY WASTEWATER MANAGEMENT**

Environmental policy would then make the environmental standards obligatory for all members of a society. The duty of environmental economists has predominantly been seen as studying the most efficient and cheapest way to achieve targets set by others. To this end, Israel's environmental policy pertaining to sanitation services in general and to transboundary wastewater management, in particular, has chosen the following economic efficiency criterion:

- a given target or output has to be achieved by a minimum input and minimum costs.

However, this principle is only useful in cases where clear environmental rules and guidelines can be defined. It is often not possible to determine exactly which interventions into nature are environmentally sound. The relationships between ecological and economic systems from the local up to the global level are too complex to set proper standards for many pollutants.

Additionally, the aim of Israeli-environmental policy lacks adapting economic behavior to principles of ecological system development. Instead of trying to determine exact levels of pollution where they are not suitable, environmental policy should aim at giving continuous incentives to encourage this kind of adaptation for precautionary reasons. The level of a continuous incentive depends on the political will to change the present "economic behavior" and it is based solely on long-term economic aims. The short-term aim is always an intermediary one; in fact it is subject to the level of the incentive one can agree upon. Thinking in terms of economic efficiency criteria with a given permanent incentive, the Financial Ministry tried to reach the maximum financial output. The focus is not on specific environmental targets that have to be sustainably achieved, but rather on a specific ideological-based development target that will change the economic patterns of local development. In this manner, the performance of economic adaptation is maximized without considering the ecological principles in the upstream riparian areas where downstream environmental problems arise from economic activities at both sides. In addition, the Israeli environmental policies and management regimes along the Green Line were different and never took

the Palestinian social and economic system to facilitate regional acceptance into considerations (Feitelson and Levi 2006).

Figure 5 depicts schematically the current Israeli water policy with acting influential official institutions and the various tools applied of a variable nature to develop wastewater management infrastructures. The associated adverse impacts pertain to economical and community development.

Applying the principle of control, check and isolate (CCI), Israel has succeeded in the past and recently in applying resistance, inflexibility causing burdens on the PA, and NGOs, and donors, thus preventing enhanced provision of access to and erection of adequate sanitation services in the OPT. To this end, Israel succeeded in claiming that the PA is not willing or makes no effort to prevent any harm to water resources.

Policy approaches favoring environmental standards based on current knowledge and technology equally are of little help: either the knowledge of complex interactions in natural systems is missing to exactly determine precise standards, or past and continuing processes, often time-delayed, make them obsolete. Chronic and pervasive environmental problems call for an enhancement of environmental policy that encompasses a process orientation while considering ecological principles of system development (Ring, 1997).

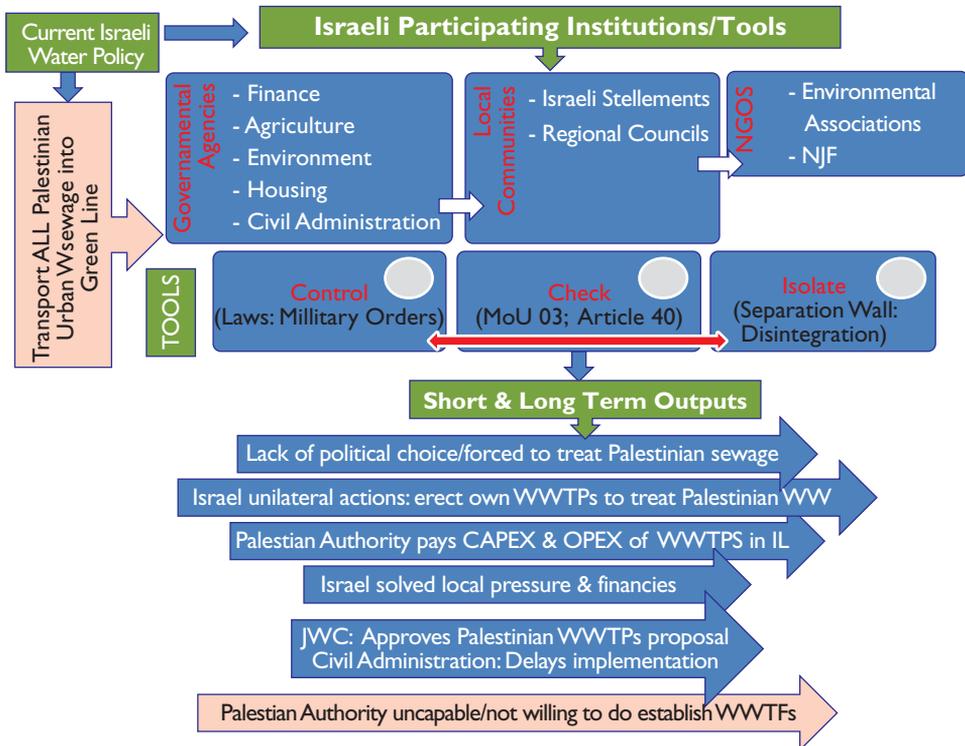


Figure 5 Israeli water policy and transboundary wastewater from Palestinian communities.

## **TRANSBOUNDARY COOPERATION FOR SUSTAINABLE TRANSBOUNDARY WASTEWATER MANAGEMENT**

Israel has solid human and financial resources but it is surrounded by great threats of variable nature, among of which is the dispute on water and wastewater issues with neighboring countries: Egypt, Jordan, Lebanon, Palestine and Syria. This core threat can be solved through viable partnerships and fair cooperative agreements. The outcomes of research and cooperative initiatives will not only provide practical technical solutions to critical wastewater management challenges, but shall also ensure a secure and safe livelihood for all nations, a prerequisite for a any given bi-national treaty governing transboundary wastewater management (Zeitoun, 2008).

The use of natural water resources has been the subject of many fruitful joint initiatives with neighboring countries worldwide (Europe and USA). Transboundary projects enabled efficient management of water courses, improvement of the quality of lakes and rivers, the development of tourism and the preservation of biodiversity. Based on the experience made over six years of transboundary cooperation, Marczin (2007) reported that transboundary facilities were established for dialogue and cooperation, where obstacles have been transformed into opportunities for exchange and joint management of natural resources for the well-being of the local population. However, transboundary cooperation between Israel and Palestine requires national and regional multi-functional management of the land and water bodies through well coordinated institutions. Throughout history, it has been learnt that maintaining harmonious relationships with its neighbors is a prerequisite for the economic, social, environmental and cultural development of focus countries.

Caponera (1992) and Tal (2007) have written much about water law and administration but there are still many unanswered questions. Here is the challenge for international law and water lawyers – to study and develop the legal instruments which will enable nations to carry out such difficult and often harsh water management policies which involve reallocation of water and may involve complex legal issues of ownership and compensation (Shuval, 1999).

Establishing transboundary dialogue and mutual trust after 42 years of Israeli military occupation and associated conflicts and enabling local actors to manage shared natural resources in a sustainable way should be the main tasks of any planned regional project. Preventive policy based dialogue has to be promoted aiming at involvement of border towns whose cooperation is a key prerequisite for tackling resource management issues in a transboundary context. Groundwork is needed to be laid so that such a process involving many smaller-scale pilot projects can become sustainable and contribute to achieving the longer-term goal of the project: the sustainable management of shared natural resources. In addition to dialogue between and among countries and communities on the two sides of the border, the integration of local communities into national processes is crucial.

Efforts shall be made to enhance cooperation between local and national level institutions, and to include cross-border sites into national strategic documents and processes related to the protection of the receiving environment and revitalization of heavily polluted wadis and streams. The nature of the project might be unique in the region, thus there are no neighboring countries from which to learn or build

on gained experience. Hence, the project's methodology shall be kept as open and flexible as possible and tailored to the specific needs and circumstances of each site. [Table 6](#) which summarizes the most important elements of the project methodology is presented as follows:

The expected outputs from transboundary cooperation are the following:

- Establish communication among water and sewerage institutions on both sides;
- Enhance operational cross-border cooperation and promote participatory processes;
- Support transboundary cooperation by official cross-border agreements;
- Conserve shared natural ecosystems through new transboundary cooperation;
- Local communities share benefits from concrete cross-border initiatives and products;
- Ensure joint management of transboundary WWT facilities via multi-stakeholder dialogue;
- Countries of focus make progress towards political stability and economical development.

To improve capacities of local stakeholders, several strategies can be suggested, including:

- Disseminating knowledge and increasing the understanding of natural and cultural values through topic-oriented training for local stakeholder groups;
- Developing site-specific solutions to address nature conservation problems together with affected stakeholders and with the application of their traditional knowledge;
- Providing information on alternative approaches to the use of natural resources: linking nature conservation with agriculture and rural tourism;
- Assisting local players in developing their initiatives into concrete projects and in raising additional funds for their implementation;

*Table 6* Important elements of methodological approach of transboundary cooperation.

Relying on an international cooperation framework	Unify communities around a joint vision
Treating the project as an open-ended process	Empowering local actors to become leaders
Fostering local participation by engaging as many relevant stakeholders	Allowing stakeholders to take action and learn from their own results
Identifying priorities locally – working with proposals made by local stakeholders	Promoting a positive regional image through transboundary promotional activities
Establishing permanent transboundary bodies to engage stakeholders in planning of activities and maintaining cross-border dialogue	Ensuring transparency through a systematic approach to communication

- Establishing links between organizations dealing with conservation and management to facilitate experience exchange and knowledge transfer across borders and among project sites;
- Strengthening the capacities of local and national decision makers to develop and implement action plans for the management of protected areas and natural resources; and
- Upgrade local Master of Science programs on water and sanitation issues, training of trainers, with focus on building capacity and retaining knowledge and expertise on the local level that could be further disseminated to entire communities.

In addition to local stakeholders training, most of the project activities entail capacity building aspects. Stakeholders were not only exposed to new knowledge but also received opportunities to apply this in concrete situations. This allowed them to learn about innovative approaches and their possible application in the community.

## CONCLUSIONS AND RECOMMENDATIONS

A thorough analysis of the current Israeli water and environmental policies revealed that the flow path of wastewater irrespective of its origin – a Palestinian community or an Israeli settlement within the West Bank – is being systematically changed through the watershed or river basin. These policies aimed at altering the utilization of treated effluent to a higher-value use in agricultural sector, and increasing the output per unit of water consumptively used, thereby exploiting the raw wastewater that is not usefully recycled within the basin of its origin, reducing the degradation in water and soil quality and minimizing public health hazards. We believe that development of a solid bi-national cooperation on transboundary wastewater management would achieve effective public health and environmental protection with additional treated water for all. With cooperation, people on both sides of the Green Line or “borders” of the future can benefit and live and prosper separately.

Establishing an international border water commission, like the one created in 1889 between USA and Mexico border, can help in resolving transboundary wastewater issues on the Israeli-Palestinian “borders”. The international border water commission shall diplomatically resolve transboundary wastewater management and associated infrastructure issues. Of equal importance, all related technical issues shall be tackled in a way that benefits the social, environmental and economic welfare of all people on the two sides of the boundary and will improve relationships between the two countries.

Ongoing land and resource confiscation, isolation and restrictions on freedom of movement have created conditions of severe economic hardship for Palestinians. During the last years, many regional projects and partnership initiatives were established to strengthen, legitimize, and institute the presence of the Israeli occupation in Palestine. However, the ‘joint’ Israeli-Palestinian projects do not foster cooperation for sustainable growth, but rather maintain Israeli control over the development of both the Palestinian water and sanitation sectors. The Israeli military and civil administrations are key actors over core Palestinian development activities pertaining to free access of goods and movement, as well as provision of safe drinking water, adequate sanitation and electricity. International financial aid and investment in the water and sanitation

sector is being controlled by the Israeli military administration. The major goal of any future regional cooperation and partnership shall be based on effective, fair, equitable dialogue in order to establish sustainable wastewater management infrastructures.

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