

A SLEEPING TIME BOMB: POLLUTION OF THE MOUNTAIN AQUIFER BY SEWAGE

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Abstract

Untreated sewage of over 2 million people on the recharge area of the Mountain Aquifer threatens to pollute the most significant, shared water source of Israelis and Palestinians. The vast majority of Palestinians in the West Bank, and large parts of the Israeli settlements, have none or inadequate sewage treatment facilities. The international community, led by Germany and the US, has committed funding for several sewage projects, however only one of them was fully implemented to date. This paper examines the factors preventing projects' implementation, and proposes recommendations to all parties involved.

Keywords: development; Middle East; mountain aquifer; transboundary pollution; water

This report describes one of the most severe environmental problems threatening Palestinians and Israelis: large-scale pollution of freshwater resources. The Mountain Aquifer is a shared Israeli – Palestinian fresh water resource. Though there has been much debate over the division of the waters of the Mountain Aquifer between the parties, the issue of protecting the aquifer's groundwater from pollution has yet to receive the attention that it deserves. Large quantities of untreated sewage run on the surface of the Mountain Aquifer, percolate into the ground and threaten the continued utilization of vital water resources. Pollution sources are both Palestinian and Israeli, the threat to future water supplies is undisputed and evidence shows that groundwater in some locations has already been polluted. Despite the urgency of the issue, progress on solutions has been slow, and funds committed to build sewage treatment projects may be withheld or withdrawn.

This report points at major sources of pollution from sewage, describes the different solutions that have been proposed and attempts to identify factors that prevent the implementation of sewage solutions. In the preparation of this report, FoEME staff met with Israeli and Palestinian representatives as well as those of donor countries. These meetings, and the comments gathered on drafts of the report, enabled Friends of the Earth Middle East to draw conclusions and make recommendations to protect the Mountain Aquifer, as detailed below.

BACKGROUND

The Mountain Aquifer is one of the most significant sources of water for both Israelis and Palestinians. It consists of three sub-aquifers, which together supply 600-700 million cubic meters of water per year (Gvirtzman, 103; IWC, 2003a, V), equivalent to more than one third of the yearly water consumption in Israel. Water of the Mountain Aquifer is shared between Palestine and Israel, whereby nearly the entire Palestinian population in the West Bank is dependent on springs, wells or extracted water from the Mountain Aquifer for drinking and other uses. In Israel, the Mountain Aquifer supplies water to major population centers such as Jerusalem, Tel-Aviv, Be'er Sheva and other cities. Israeli settlements in the West Bank also rely on Mountain Aquifer water.

The Mountain Aquifer is the source of major streams and rivers in Israel's coastal area, including the Yarkon, Taninim, Hadera and other streams. The aquifer consists of a recharge area and a confined area. Rainfall in the recharge area permeates through the rocky foundation and accumulates underground, where it flows west, north-east or east, dividing the Mountain Aquifer into three sub-aquifers. The confined area is located further down the slopes, beneath an impermeable layer of rock. Most wells and water extraction sites are located there.

The greatest part of the recharge area (consisting of 4,700 sq. kilometers) is situated in the West Bank and the Jerusalem corridor. The confined area of the western sub-aquifer lies, for the most part, within Israel. This sub-aquifer is the source of most of the water extracted by Israel from the Mountain Aquifer, and for many wells in the Palestinian cities of Tul Karem and Qalqiliya. Water in the

northeastern sub-aquifer flows underground initially to the north, and then continues eastward to the Jordan Valley and the Dead Sea. In the eastern sub-aquifer, water flows underground directly eastwards from Ramallah, Jerusalem and Hebron towards the Jordan Valley and the Dead Sea (Gvirtzman, 102-136; UNEP, 42-57).

Given its karstic geology, most of the Mountain Aquifer's recharge area is vulnerable to groundwater pollution (Gvirtzman, 112; UNEP, 33). The north-western strip of the Mountain Aquifer's recharge area, around the cities of Tul Karem and Qalqiliya, is particularly vulnerable. Groundwater in that area is closer to the surface, requiring a shorter period of time for pollutants to percolate and reach it (Guttman). Some of the most abundant water extractions from the Mountain Aquifer are located in that area (Gvirtzman, 25). Alarmingly, it is also the location of some of the most serious pollution spots (IWC, 2003a, 124).

The recharge area of the Mountain Aquifer includes most of the area of the West Bank as well as some parts of Israel. The human population in that area reaches around three million people. It includes Palestinian cities and villages in the West Bank (approximately 2,263,931, as of mid-2003) (Palestinian CBS)¹; Israeli settlements in the West Bank (212,900 by the end of 2002) (Israeli CBS); and Israeli cities and villages in the Jerusalem Corridor and Modi'in areas (at least 500,000, including Jerusalem, Modi'in and villages in the Jerusalem Corridor).² While sewage of most Israeli localities within Israel is treated adequately, most Palestinians as well as many of the Israeli settlements in the West Bank do not have adequate sewage treatment facilities. The sewage of over two million people flows untreated in the recharge area of the Mountain Aquifer, percolating into the largest and most significant groundwater reservoir in the region.

POLLUTION OF GROUNDWATER

Sewage flow in the recharge area of the Mountain Aquifer leads directly to pollution of groundwater. Recent reports by the hydrological service of the Israeli Water Commission shows high levels of nitrate pollution, originating from untreated sewage as well as agricultural sources, in the area near Tul Karem and Qalqiliya,

reaching at times concentrations of 100-145 mg/l. A smaller area of pollution was found in the Hebron area, where nitrate concentration reached 60-80 mg/l (IWC, 2003a; 2004b) (WHO standard for nitrate concentration in drinking water is 50 mg/l). Other evidence shows water contamination by nitrate and fecal coliforms in many wells and springs in the West Bank, with many sources no longer fit for consumption without prior treatment. Many of the natural springs in the West Bank, mainly the ones located inside the villages, are polluted by fecal coliforms, since most of them are located downstream from some source of pollution, usually unsanitary cesspits of uphill villages (Rabbo et al., UNEP, 34-35).

Nitrate pollution, was also found in wells in the Jordan valley, Nablus, and Jenin districts. Wells in the Tul Karem district were also found to contain chloride pollution, indicative of industrial and municipal wastewater. Micro-biological pollution, also above WHO levels, was evident in 600 of 2,721 samples examined in 2001 (Kliot, 43-47). In addition, some hotspots of industrial pollution were identified in the vicinity of quarries, olive oil refineries, abattoirs and leather processing industries (UNEP, 56-57).

This evidence suggests that pollution from the surface in the Mountain Aquifer's recharge area has already begun to contaminate water resources. However, the bulk of the pollution has yet to reach groundwater. The 'travel-period' of pollutants to underground reservoirs is difficult to predict, but experts agree that many of the pollutants that have begun to percolate into the ground will undoubtedly reach the reservoirs at some point. According to one study, the first trace of pollution from the Barkan industrial area is expected to reach groundwater within 15 years. Within 30 years, traces of that pollution are expected to reach wells in the Yarkon area and others, which currently provide 37 million cubic meters of water a year. Examining sewage from Ramallah, too, the study estimates that nitrate pollution will take approximately 15 years to reach groundwater. Initially it is expected to cause low concentrations of pollution in groundwater, but those will then rise steadily (Shuval and Isaac, 2000).

Sewage from Palestinian Sources

Sewage from Palestinian sources on the Mountain Aquifer's recharge area is estimated at 46 million cubic meters per year.³ In villages, comprising 61% of the Palestinian population in the West Bank, sewage is commonly disposed of in unlined cesspits, allowing gradual absorption into the ground and requiring periodical emptying of the remaining solid waste. In urban centers, 70% of the population is connected to sewage networks (UNEP, 52). In the vast majority of cases, however, these networks discharge the sewage without treatment into streams in the open environment. Where sewage networks are not in place, sewage runs in open canals or is also disposed of in cesspits.

Currently, only five sewage treatment plants exist for the Palestinian population in the West Bank. Of these, only one is functioning adequately: a new, German-funded plant in El-Bireh, which can treat the sewage of up to 50,000 people. Of the other sewage treatment plants two (in Jenin and Hebron/Al Khalil) do not work at all and the other two (in Tul Karem and Ramallah) have only recently been rehabilitated with German funding. Even the rehabilitated plants, however, are of limited capacity and unable to adequately treat the sewage of today's population.

Several new sewage treatment projects have been planned for West Bank Palestinian cities since the beginning of the peace process. These were supposed to be financed by German and US development agencies, who have committed hundreds of millions of dollars for their implementation. Unfortunately, to date the sewage treatment plant in El-Bireh is the only one that has been implemented. The result is that sewage in most West Bank cities continues to flow untreated, while large sums of money committed to sewage treatment projects remain unused.

Sewage from Israeli Sources

It is only in recent years that sewage from Israeli cities and villages on the Mountain Aquifer recharge area *within Israel* undergoes adequate treatment. West Jerusalem sewage, for example, is treated at the Soreq treatment plant, which began operation in 1999. Today, therefore, sewage from Israeli sources within Israel poses little threat to the Mountain Aquifer. The treatment of sewage from Israeli settlements in the West Bank, however, is less satisfactory.

Only partial data was provided to the authors of this report on the treatment of sewage from Israeli settlements in the West Bank, amounting to 15 million cubic meters per year. Despite the existence of precise data on the issue, the Israeli Water Commission refused to provide detailed reports. Instead, it claims that 70% of the settlements' sewage is treated satisfactorily, while the remainder is either treated to unsatisfactory levels or is not treated at all (IWC, 2004a).

Data obtained by the authors of this report shows a somewhat different picture. Monitoring results from 1999 suggest that only 6% of the sewage conformed to Israeli treatment standards (Environmental Protection Association Samaria and Jordan Valley, 2000), while 48% of the sewage was treated inadequately, or not treated at all. Monitoring results for 17% were not available, and the status of 7% was unclear. Several sewage treatment projects for Israeli settlements are currently in various stages of implementation. Once completed, they will treat the remaining 22% of the settlements' sewage. These projects include the Kana Stream carrier line, upgrading of the sewage treatment plant of Barkan Industrial Area, sewage treatment plants in Efrat and Beit-Aryeh, and upgrading as well as building of sewage infrastructure in Modi'in-Illit (IWC, 2004a).

Table 1: Sewage in the Mountain Aquifer's Recharge Area by Source

	Palestinian Villages	Palestinian Cities	Israeli Settlements
Population ¹	1,381,000	883,000	213,000
Quantity of sewage ²	28 MCM/Y	18 MCM/Y	15 MCM/Y
Current treatment	Cesspits (unsatisfactory).	None or unsatisfactory sewage treatment plants. (One exception)	Partial treatment only. Some projects in progress.
Finance for planned infrastructure	None.	Germany and the USA have committed \$230 million for projects in the above cities. Very slow implementation.	NIS 65 million (approx. US \$14.5) financed by settlement municipalities. NIS 400 million (approx. \$90 million) required.

¹ Palestinian and Israeli Central Bureaus of Statistics, respectively.

² Quantity of Palestinian sewage: estimated according to population data and assumptions of average water consumption and percentage of wastewater from it according to reports of the Israeli Water Commission. See Endnotes for details. Quantity of Israeli settlement sewage: Israeli Water Commission (IWC, 2004a).

SOLUTIONS AND IMPEDIMENTS TO THEIR IMPLEMENTATION

Protection of the Mountain Aquifer and the prevention of groundwater contamination by sewage from large urban centers in the West Bank requires the building of extensive sewage treatment infrastructure. Since the beginning of the peace process, the international community, led by Germany and the USA, has committed \$230 million for sewage treatment projects in Palestinian cities. This could be the starting point for the protection of vital groundwater resources; however, very little progress has taken place on the ground. To date, only one project has been implemented, while several others remain on hold.

Table 2: Planned Palestinian Sewage Projects in the West Bank

City	Donor	Cost ⁴	Project Status
Hebron/A I Khalil	USA	\$45 M	The project is in the planning stages. Agreement over the level of treatment and direction of sewage discharge was reached recently. Project was frozen due to the security situation, expected to commence next year.
Tul Karem	Germany	\$50 M	Currently work is taking place on the rehabilitation of the municipal sewage network and the old sewage treatment plant. Plans to build a new sewage treatment plant exist, and Germany has committed to finance it. However, no work has taken place to date. Sewage flows across the Green Line, and is treated in an emergency treatment plant in Israel.
Jenin	Germany	\$50 M	An old, non-functioning sewage treatment plant exists. Plans include its rehabilitation, a new industrial sewage facility and a new regional sewage treatment plant. No work has taken place at this stage.
Nablus East	Germany	\$20-25 M	Plans to build a new sewage treatment plant were cancelled and funds committed shifted to other projects.
Nablus West	Germany	\$25 M	A new sewage treatment plant has received final approval from the Joint Water Committee. No work has taken place to date.
El-Bireh	Germany	\$12 M	Germany has built a new sewage treatment plant. Still to be built is a pipeline to remove treated effluent.
Ramallah	Germany	\$10 M	There are plans to build a new sewage treatment plant. Rehabilitation of the old sewage treatment plant completed, providing a very partial solution.
Salfit	Germany	\$13 M	Following approval of the JWC, German agencies began to build a carrier line to a planned sewage treatment plant. After work had begun, it was decided by Israel that the planned location, earlier approved, was too proximate to a planned new neighborhood in the Ariel settlement. Israel compensated Germany and work was supposed to continue at a new location. Plans and tender documents for this project are currently reevaluated in preparation for implementation.

The Palestinian Authority, the Israeli Government and German and US aid agencies are all involved in the attempt to build sewage infrastructure in the West Bank. This has proven to be a difficult task even prior to the outbreak of the Second Intifada, and certainly throughout the violent conflict. The following is FoEME's attempt to identify the hurdles which have prevented the implementation of sewage projects to date, based on a series of discussions with all parties concerned.

Germany

German agencies operating in the Palestinian Authority have committed more funding than any other donor country to sewage projects, and had plans to construct treatment facilities in all major cities in the northern West Bank. However, they managed to build only one plant before the Second Intifada broke out. Since the Intifada, the Germans have placed all large projects on hold, focusing instead on smaller projects such as rehabilitation of old sewage infrastructure in Tul Karem and Ramallah. These 'pilot projects' are considered test cases, the successful completion of which is required before commencement of larger-scale projects.

The main reason for placing the sewage works on hold, according to German agencies, is the restriction on movement of civilians and vehicles into and out of Palestinian cities, imposed by the Israeli military. Under these conditions, workers, experts and equipment required for the construction of sewage infrastructure often cannot access the sites, work has been delayed while workers and experts have had to be paid. In addition, imported materials and equipment have been held in Customs for long periods, pending security clearance by military authorities. Such delays occurred even in cases that work was coordinated with Israeli authorities. Instructions to facilitate works often failed to reach the checkpoint level, leading to soldiers not allowing workers through to the site. In one incident, workers were reportedly shot at.⁵ These complications have led to a significant increase in the costs of sewage projects, which German agencies are not prepared to absorb. The German taxpayer, it has been said, is prepared to pay for infrastructure projects in Palestinian cities, but not for the 'costs of Israel's occupation'.

When confronted with this argument, officials from the Israeli military have stated that German representatives have rarely approached them with requests to facilitate access for workers and equipment. According to the Israeli side, permits for workers can be issued for speedy passage through checkpoints, and equipment can be quickly released from Customs once the military is assured that it cannot be used for hostile purposes. The Israeli side claims that delays are unavoidable, but their extent depends on the level of coordination between the foreign aid agency and the military.

Clearly, the conflict situation and the policies employed by Israel impose severe constraints on the operation of aid agencies. If projects are to be implemented, a significant investment in daily coordination must be made. German agencies, however, do not consider themselves as responsible for such coordination, and are short of staff for this purpose in any event. FoEME was told that given that Germany's development cooperation is with the Palestinian Authority, official representatives rarely communicate directly with Israeli ones.⁶

USA

The United States Agency for International Development (USAID) committed to build a sewage project in Hebron/Al Khalil. Though plans have been drawn up and negotiations held with all sides, no physical work has yet taken place, and sewage from the city continues to flow down the Hebron River. USAID reports that it also suffers from additional, conflict-related costs, estimated at about 25% of project total costs. USAID reports to have direct and frequent contact with the Israeli military's District Coordination Office (DCO).

The Hebron/Al Khalil Project has been delayed for other reasons, related to the disagreement between Israel, the Palestinian Authority and USAID on aspects of the project's plans. For a long time, the parties were in disagreement about the required location as well as levels of treatment of the treatment plant. Israel insisted that the plant be located on the western slopes of the mountain, so that wastewater flows westward down the Hebron stream, eventually entering Israel across the green line. If the plant was to be located on the eastern side in Banei Naim, as requested by the Palestinian Authority, Israel insisted that far reaching and costly measures be taken to prevent

pollution of the Hever stream which it claimed would lead to polluting the springs at Ein Gedi nature reserve. In addition, locating the project in Banei Naim encountered objections from local residents. Recently, agreement has been reached between the parties, and the plant will probably be located in the western side of Hebron.

It appears that these complications and the resultant delays in work could have been prevented by USAID if both the Palestinian and the Israeli authorities were more involved in the planning process from the outset. The Israeli side noted that had they been asked to comment on the project's terms of reference, for example, before completion of plans, much of the subsequent dispute could have been avoided.

Israel

The Israeli Water Commission holds the Palestinian Water Authority responsible for the stalemate in implementing sewage projects in the West Bank. The Palestinian side is blamed for its indifference, deceitful conduct and malintent, which result in no progress on sewage issues despite the availability of donor funding (IWC, 2002). According to FoEME's findings, however, many of the problems concerning sewage projects are the result of insufficient coordination between Israel and the donor countries, and Israel could do better in promoting them.

By pointing at the Palestinians as the sole party at fault in implementing sewage projects, the Israeli Water Commission is ignoring major impediments which the Palestinian Authority is not able to address, for example restrictions on movement resultant from Israel's military policies. If Israeli authorities were to closely follow up the implementation of sewage projects, support donor country efforts and remove the bureaucratic obstacles that they face, it is likely that many of the projects would have been implemented by now. As it stands, however, Israel's liaison with donor countries on this matter has been left in the hands of relatively low-level officials, rather than the diplomatically trained staff that the situation necessitates. This is despite the fact that investment of such magnitude in Palestinian sewage treatment is in Israel's direct interest.

In addition, sewage from many Israeli settlements in the West Bank continues to flow untreated, contributing to pollution of the Mountain Aquifer. Israeli settlements do not suffer from restrictions of movement on West Bank roads, and there are no impediments to building infrastructure there. Nonetheless, it appears that different requirements apply to settlements and to localities within Israel: most settlements have highly inadequate sewage treatment, yet their municipalities do little to address the issue and the Israeli Government fails to enforce its own environmental laws on them.

Palestinian Authority

The issue of sewage treatment appears to be relatively low on the Palestinian agenda. In a recent summit of international donors, the Palestinian Authority detailed its aid requirements, reaching \$1.2 billion. Of these, only \$60 million was requested for sewage infrastructure (USAID)⁷. It appears that other issues (for example, humanitarian assistance and water supply), are treated with greater urgency by the Palestinian Authority, which expresses its preferences to the donor community.

In a letter dated September 2003, high level officials of the Palestinian Water Authority requested USAID to reallocate funds committed to a sewage treatment plant in Hebron/Al Khalil to water supply projects. Such expressions of Palestinian priorities have led some donor countries to rethink their allocation of aid funds, potentially withdrawing their support for sewage treatment infrastructure.

Israeli officials have claimed that the Palestinian side takes a long time to submit plans for sewage treatment projects in the Joint Water Committee, thereby demonstrating little interest in promoting sewage solutions. While FoEME cannot determine the exact validity of these allegations, correspondence between the parties does suggest that Israel has had to urge the Palestinian side to submit such plans. Another example is the long period of time required for the Palestinian side to agree to a Memorandum of Understanding on an acceptable level of sewage treatment. Initially, the Palestinian side rejected the treatment criteria as too costly, They later agreed to sign the document, however the signing of the MoU was not brought to the attention of the German development agency (KfW), which continued

to regard the non-agreement over standards as a major obstacle to project implementation.

FOEME'S FINDINGS

The building of sewage infrastructure in a conflict zone such as the West Bank is not a simple undertaking. All sides have blamed the conflict conditions, and sometimes one another, for their inability to move forward on sewage treatment facilities. The following is a summary of FoEME's findings:

General

- The vast majority of West Bank Palestinian localities have no sewage treatment at all.
- All relevant stakeholders recognize the importance of protecting groundwater from pollution.
- Project implementation requires intensive investment in coordination between all parties.
- Restrictions of movement through military checkpoints is the main factor causing additional costs and delays to projects.
- Should Israel and the Palestinian Authority fail to support donor countries' sewage treatment projects, an investment in protecting shared water resources to the total value of \$230 million may be lost.

Israel

- Present coordination of the issue on behalf of Israel is not handled at an appropriately senior level.
- There has been inadequate follow-up and support of donor country efforts on sewage projects by Israel.
- Though Israel blames the Palestinians for failing to implement sewage projects, significant difficulties between Israel and donor countries could be addressed irrespective of the Palestinians.
- The Israeli security forces are bureaucratic and unorganized.
- In the past, Israel conditioned its approval of sewage treatment projects by insisting that they be connected to settlements. This issue slowed progress on sewage projects until 1999.
- Since then, Israel demanded particularly high standards of sewage treatment in Palestinian sewage treatment plants. A mutually

acceptable compromise on sewage treatment standards was agreed upon only very recently.

- Israeli settlements produce an estimated 25% of the sewage in the Mountain Aquifer.
- The majority of the settlements do not have adequate sewage treatment.
- The Israeli Environment Ministry fails to sufficiently enforce sewage treatment in settlements.

The Palestinian Authority

- Present coordination of the issue on behalf of the Palestinian Authority is not handled at an appropriately senior level.
- The Palestinian Authority has openly stated that water supply projects should take precedence over sewage projects. While sewage treatment projects are largely on hold, many infrastructure projects (particularly on water supply) have continued to move forward in the West Bank.
- The Palestinian Authority has, until very recently, refused to accept the standards of sewage treatment upon which Israel has insisted.

Donor Countries

- Donor countries prefer to postpone the implementation of sewage treatment projects, so as to avoid additional conflict-related costs (25-40%) resultant from restrictions on movement and imports.
- Insisting on peacetime conditions in a conflict zone is not a realistic expectation. Additional, conflict-related costs should be included in the planning of projects in the West Bank.
- Conflict-related costs can be significantly minimized by improved coordination between donor country agencies and Israeli authorities.
- The working relationship of German development agencies with Israeli authorities is limited and cumbersome.
- Some project had to be seriously altered following objections of the Palestinian and/or Israeli authorities. This could have been prevented through consultations prior to detailed planning.

RECOMMENDATIONS

FoEME believes that solutions to groundwater contamination cannot wait for the end of the Israeli-Palestinian conflict, and all parties must do their utmost to achieve such solutions even under the conflict conditions. In order to protect the Mountain Aquifer from sewage pollution, FoEME believes that urgent, constructive and pro-active steps need to be taken by all parties:

Israel:

1. It is recommended that the Minister of National Infrastructure appoint a senior staff member to advance the issue at the diplomatic and political levels. This person should invest maximum effort to assist donor countries in implementing sewage projects in the West Bank through, inter alia:
 - a. Removing obstacles and administrative barriers to their operations;
 - b. Coordinating between them and the Israeli authorities on work permits and import of materials
2. The Ministry of the Environment should take immediate legal action against settlement municipalities that fail to implement Israeli sewage treatment standards.

The Palestinian Authority:

In order to protect the Mountain Aquifer from sewage pollution, FoEME believes that urgent and key constructive and pro-active steps need to be taken by the Palestinian Authority, as follows:

1. Sewage treatment projects should be promoted with a similar level of urgency as water provision projects, applying medium- and long-term foresight. The treatment of sewage in the recharge area of the Mountain Aquifer is necessary for the protection of shared Palestinian-Israeli water resources. The aquifer's pollution will cause massive humanitarian problems and will be a great burden on the Palestinian economy.
2. The involvement of the Palestinian Authority and local municipalities in the planning stages of donor-funded sewage infrastructure can prevent delays at a later stage. For example through examining and submitting comments on projects' terms of reference (ToR), the Palestinian Authority and local municipalities can voice their concerns on important issues before

completion of detailed plans. This could prevent disputes at a later stage, reduce costs and accelerate project implementation.

Donor Countries

FoEME believes that there are several key steps that donor agencies urgently need to adopt in order to better facilitate the implementation of sewage projects in the West Bank.

1. In the planning, building and budgeting of projects in the West Bank, it is necessary to factor in additional, conflict-related costs rather than await the end of the conflict before project advancement.
2. Investment in intensive, daily coordination with Israeli authorities can significantly reduce conflict-related costs. Such cooperation requires:
 - a. Designating staff whose primary task would include coordination of activities with Israeli authorities.
 - b. Submitting lists of the registration numbers of vehicles and names of workers employed in the construction of sewage treatment projects, as well as detailed lists of imported equipment in advance to the relevant Israeli authorities in order to expedite the necessary permits.
 - c. During the past year, the IDF has created a special division for external relations and international organizations. Its services should be used to the greatest extent possible for the coordination of ongoing activities.
3. Comprehensive consultation with the Palestinian Authority and Israel during the planning stages of projects could prevent later objections. Certain projects have had to be relocated, and the parties insisted on significant alterations to the plans, which could possibly have been prevented had the parties been informed and allowed to comment on the plans at an earlier stage.

Recommendations to all Parties

1. The use of the Mountain Aquifer's pollution for propaganda by either Israel or the Palestinian Authority is damaging. Pollution of the aquifer's recharge area originates from both Palestinian and Israeli sources, and can only be solved through maximum cooperation between all sides, keeping in mind the shared interest to protect scarce water resources.

2. The involvement of Israeli authorities in the planning stages of donor-funded sewage infrastructure can prevent delays at a later stage. For example, through examining projects' terms of reference (ToR) and then submitting comments, Israel can voice its concerns on important issues before the completion of detailed plans. This could prevent disputes at a later stage, reduce costs and accelerate implementation of projects.
3. Palestinian villages continue to discharge the largest volume of untreated sewage in the Mountain Aquifer's recharge area. Most of their sewage percolates into the aquifer through cesspits. Similarly, several Palestinian cities have no plans or financing for the treatment of their sewage. Solutions to these problems should be urgently sought.
4. Joint research on the threat of pollution of shared groundwater is of vital importance. Several joint studies were carried out in the past, but most experts agree that the issue requires further research. A joint fact-finding committee, supported by donor countries and consisting of the Israeli Water Commission and the Palestinian Water Authority, would advance better understanding as to the impact of untreated sewage already released and identify priority areas for funding of additional sewage treatment solutions.
5. Appropriate training of staff for sewage treatment plants in the recharge area of the Mountain Aquifer should be supported by donor agencies, including the possibility of joint Palestinian – Israeli training activities.
6. The work of civil society NGOs in community education on transboundary water and sewage issues and their link to peace-building is of vital importance. All parties should cooperate with, and donor agencies support, such efforts in Palestinian and Israeli communities.

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¹ The Palestinian city of Jericho is not included in this figure.

² Jerusalem and Modi'in municipalities, see respective web sites.

³ In the absence of hard data, the amount of sewage had to be estimated thus: on a calculation of 2,263,931 Palestinians in the West Bank (excluding Jericho), (Palestinian CBS), yearly water consumption of 29 cubic meters per capita and sewage proportion of 70% of water (Tahal, 1999, p. 2-4). (There exist a variety of other estimates.) Given the relatively low water consumption in Palestinian society and its limited access to water resources, concentration of organic matter is much higher in Palestinian than in Israeli sewage.

⁴ Information obtained from interviews with representatives of KfW (German development funding agency) and USAID.

⁵ At the beginning of 2003, the military began to operate a new division in charge of international organizations and external relations. It is hoped that this will improve the military's internal coordination.

⁶ Stated to FoEME staff in meetings held with KfW officials in Jerusalem and in Frankfurt

⁷ Statement by Lawrence J. Gumbiner, (First Secretary, Environment, Science and Technology Affairs, US Embassy in Tel-Aviv) at a symposium: "Protecting the Mountain Aquifer", Tel Aviv University, 17 December 2003.