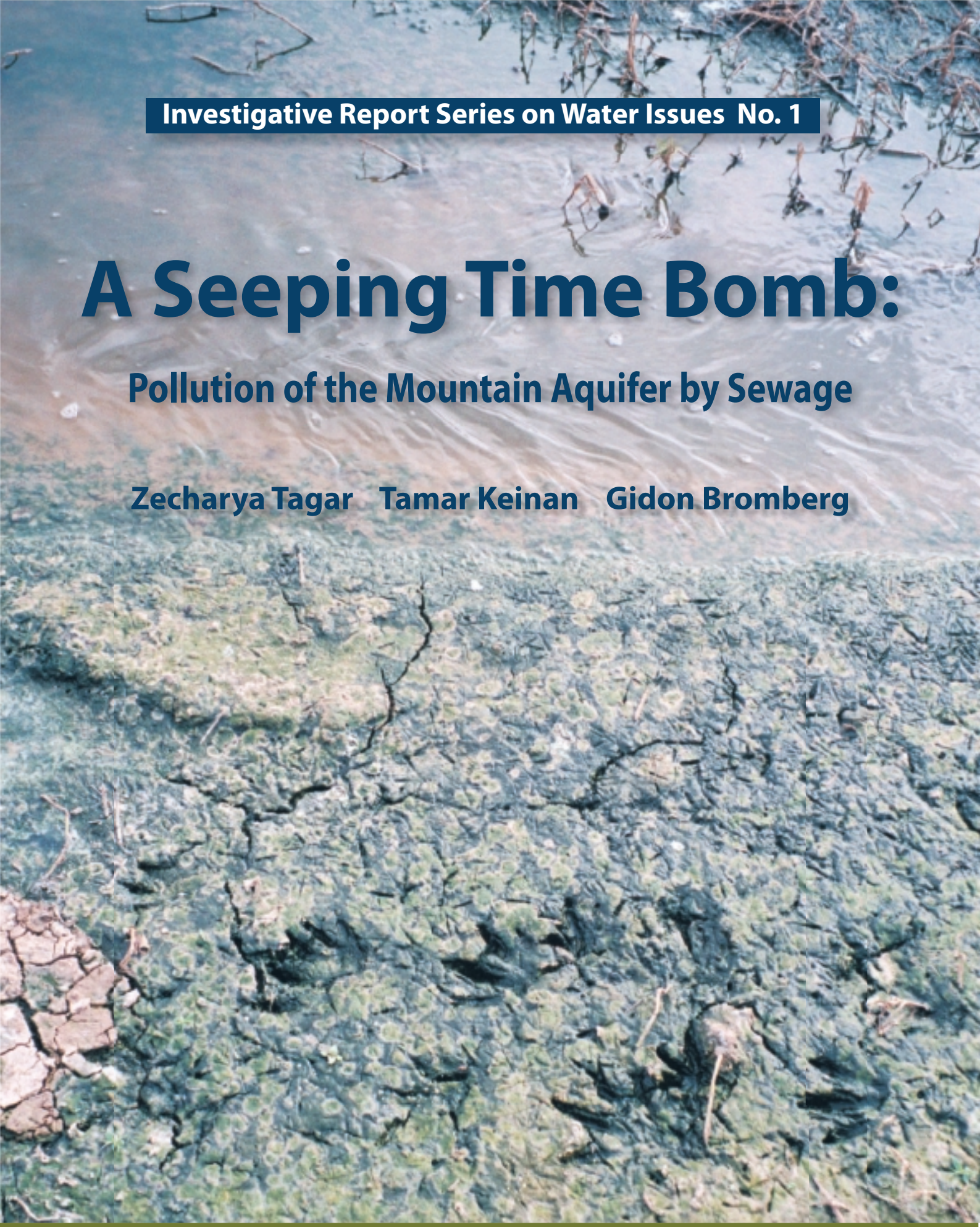


Investigative Report Series on Water Issues No. 1

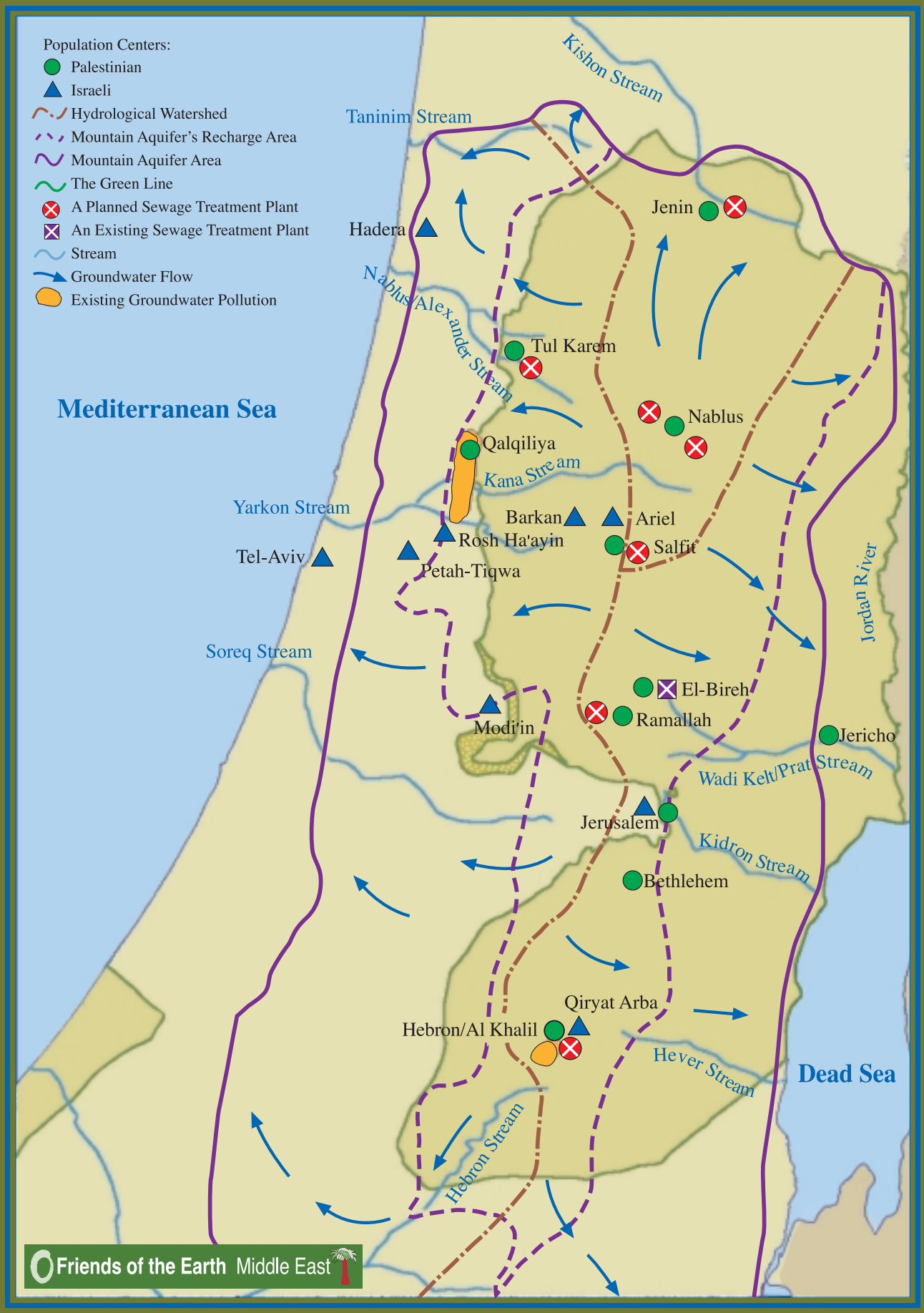
A Seeping Time Bomb:

Pollution of the Mountain Aquifer by Sewage

Zecharya Tagar Tamar Keinan Gidon Bromberg

Friends of The Earth Middle East

Planned sewage treatment plants in West Bank Palestinian cities[1]



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A report of Friends of the Earth Middle East

Tel Aviv, February 2004

Friends of the Earth Middle East (FoEME) was established in 1994 under the name of EcoPeace. It is a non-governmental, non-profit environmental organization with the primary objective of promoting co-operative efforts to protect the shared environmental heritage of the Middle East. In so doing, FoEME seeks to advance sustainable development and sustainable peace. FoEME has offices in Amman, Bethlehem and Tel-Aviv.

Note of gratitude

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The views expressed in this report are those of the authors and do not necessarily represent those of the Richard and Rhoda Goldman Fund or the Global Nature Fund.

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Contents

Introduction

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 details the geographical characteristics of the Mountain Aquifer, 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

Water Supply

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 Palestinians in the West Bank rely heavily on this resource for their water supply.[2] Moreover, the Mountain Aquifer provides the best quality water compared to the region's other water sources. 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).

Hydrological Vulnerability

Most of the Mountain Aquifer's recharge area is vulnerable to groundwater pollution due to its hydrological characteristics. The Mountain Aquifer is a *karst* geological system, which provides little protection to its groundwater. Over the years, the limestone ground was subject to dissolution by water containing acidic elements, developing a wide system of underground channels inside the rock. This system allows for relatively fast and unhindered percolation of surface water, both rain and sewage, into the ground. Pollutants on the surface of the Mountain Aquifer thus pose a very serious threat to the quality of groundwater, far more than in the case of the Coastal Aquifer, where the sandy soil filters or absorbs pollutants, and allows for biological processes that decompose organic matter (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 to pollution. 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).

Human Settlement above the Mountain Aquifer

The recharge area of the Mountain Aquifer includes most of the area of the West Bank as well as some parts of Israel. Most Palestinian cities and villages in the West Bank are located in the aquifer's recharge area, with the exception of Jericho.[3] Inside Israel, the recharge area includes mainly the Jerusalem Corridor and the Modi'in area.

The human population in the recharge area of the Mountain Aquifer 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)[4]; 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).[5]

The sewage of this entire population percolates into the Mountain Aquifer's groundwater. Some of it is treated and does not pose a threat to groundwater quality. This includes the sewage of western Jerusalem as well as some neighborhoods in Beit Sahour, Bethlehem and A-Ram, which is treated at a new Israeli treatment plant that began to operate in 1999. Sewage from the Israeli city of Modi'in also undergoes treatment. In the West Bank, however, the situation is quite different. Sewage from the great majority of the population in the West Bank, which includes Palestinian cities and villages as well as Israeli settlements, undergoes insufficient or no treatment, as detailed below.

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

Evidence of Pollution in Groundwater

Sewage flow in the recharge area of the Mountain Aquifer leads directly to pollution of groundwater. A recent report 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) (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).

This does not mean that groundwater will remain safe for the next 15 years. Pollution in the recharge area of the Mountain Aquifer has taken place over the last decades, and has been on its way to groundwater reservoirs for a long time. Further, the study examined sewage that originated in relatively high altitude, therefore requiring a long period of travel to reach groundwater. Pollution in the lower areas requires less time to reach groundwater, as evident today in the cases of Tul Karem and Qalqiliya as well as nearby Israeli wells within the Green Line (IWC, 2003a).[6]

Sewage from Palestinian Sources:

Sewage from Palestinian sources on the Mountain Aquifer's recharge area is estimated at 46 million cubic meters per year.[7] 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.

Whether disposed of in cesspits or discharged into streambeds, untreated sewage percolates into groundwater, threatening the future availability of good-quality, safe drinking water from the Mountain Aquifer. Solutions such as ecological sanitation for villages and the building of sewage treatment plants for urban centers in the West Bank can greatly reduce the risk of contaminating the aquifer, thereby ensuring future availability of safe drinking water in this water-scarce region.

Currently, only five sewage treatment plants exist

for the Palestinian population in the West Bank. Of these, only one is functioning: a new, German-funded plant in El-Bireh, which can treat the sewage of up to 50,000 people. All other sewage treatment plants are old, incapable of handling large quantities of wastewater or not functioning at all. Two of them (in Jenin and Hebron/Al Khalil) do not work at all, and the other two (in Tul Karem and Ramallah) are currently being rehabilitated with German funding. These are old, limited capacity facilities which cannot cope adequately with today's population. Their rehabilitation would be an improvement to the current situation, but will not solve the problem.

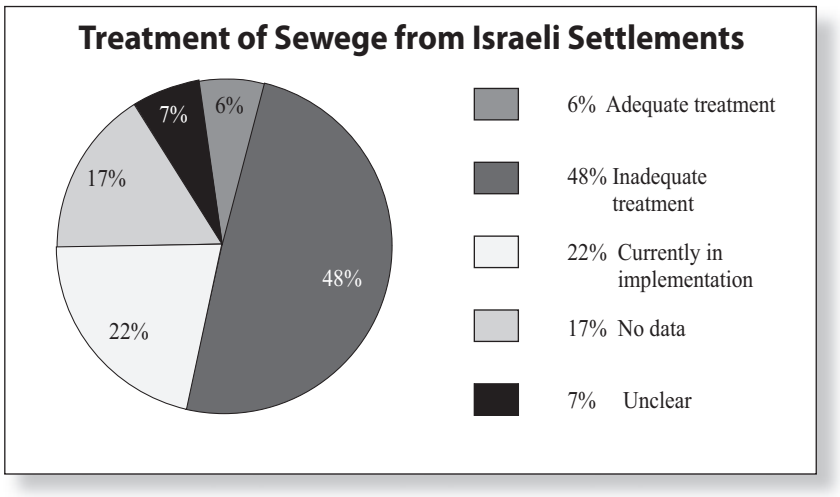
Several new sewage treatment projects have been planned for West Bank Palestinian cities since the beginning of the peace process. These were supposed to be financed by German and US development agencies, who have committed hundreds of millions of dollars for their implementation. Unfortunately, to date 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, percolating into the ground and polluting the Mountain Aquifer. At this stage, there are no planned solutions for the sewage of Palestinian villages in the West Bank.

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 is treated at the Soreq treatment plant, which began operation in 1999, and Modi'in was connected to an adequate sewage treatment plant only after a successful appeal by environmental organizations to the Israeli Supreme Court. 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, 2004).

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, 2004).



Apparently, the building of sewage infrastructure in the remainder of the Israeli settlements in the West Bank has been delayed, due to the unwillingness of local authorities to fully finance their sewage treatment. These settlements requested a government grant of 50% of the sewage infrastructure costs.

Such support is not given these days to other local municipalities in Israel.[1] The Finance Ministry has taken the position that the settlements are to pay fully for the treatment of their sewage by way of special government loans, to which every municipality is entitled. Such sewage projects as are currently being implemented in West Bank settlements are financed through similar government loans, to the total sum of NIS 65 million. It appears that the rest of the settlements are waiting for governmental grants, while continuing to discharge their untreated sewage illegally.

According to the Israeli Minister of the Environment, her office has undertaken enforcement measures against several settlement municipalities on account of sewage discharge (Naot, 2004). Enforcement measures have been taken against a total of 14 settlements, while illegal sewage discharge takes place in over 60 settlements. In most settlements against which such measures have been taken, adequate sewage treatment is still not available. Despite the fact that the issue is within the jurisdiction of the Ministry of Environment, it appears that the ministry has not succeeded in enforcing sewage treatment in the West Bank to the same extent as within Israel. Even today, new neighborhoods are being built and planned in West Bank settlements without solution for their sewage problems. The issue is of particular concern given the hydrological vulnerability in the area, and the threat of groundwater pollution in the Mountain Aquifer.

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

	Palestinian Villages	Palestinian Cities	Israeli Settlements
Population[2]	1,381,000	883,000	213,000
Quantity of sewage[3]	28 MCM/Y	18 MCM/Y	15 MCM/Y
Current treatment	Cesspits – unsatisfactory.	None or mainly unsatisfactory sewage treatment plants.	Unsatisfactory treatment in many of the settlements.
Solution	Connection to urban or regional sewage treatment facilities is possible for some villages. In other cases, small-scale solutions are required.	Building municipal or regional sewage treatment plants for every city.	Small-scale sewage treatment plants or connection carrier-line for regional treatment.
Planned infrastructure	Connection of some villages to the Israeli regional Kana Stream Project is a possibility, which at this stage encounters Palestinian opposition. Currently, there is no solution for other villages.	Infrastructure for Hebron, Nablus, Jenin, Tul Karem, Salfit and Ramallah is in different stages of planning. The plant in El-Bireh is operating but requires some additional work. Currently, there are no plans for other cities.	The Kana regional sewage carrier-line will carry settlement sewage to a facility inside Israel; upgrading of the sewage treatment plants in Barkan Industrial Area and Modi'in-Ilit; treatment plants in Beit Aryeh and Efrat/Gush-Etzion.
Finance	None.	Germany and the USA have committed $230 million for projects in the above cities.	NIS 65 million (approx. US $14.5) financed by settlement municipalities. NIS 400 million (approx. $90 million) required.

[1] The Environmental Protection Associations of Judea and Samaria requested a grant of NIS 200 million for treatment of settlements' sewage. The local municipalities agreed to take a government loan of a similar amount, thus investing the total sum of NIS 400 million in the treatment of settlement sewage (in a proposal for a government decision, submitted by the Ministry of the Environment).

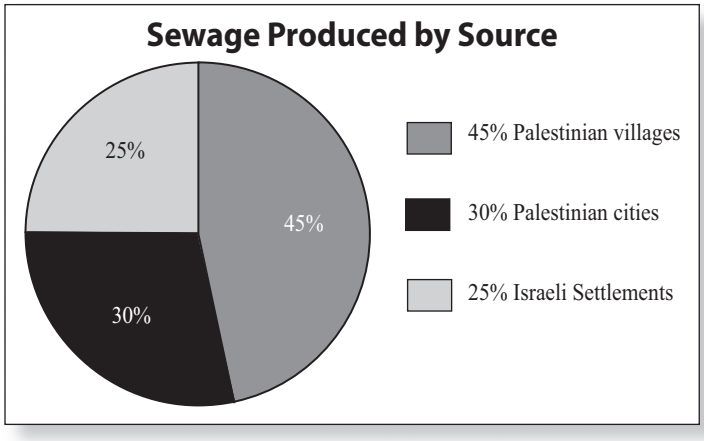
[2] Palestinian and Israeli Central Bureaus of Statistics, respectively.

[3] 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, 2004).

Other Threats to Groundwater Resources:

The subject of this report is groundwater pollution from domestic sewage. However, there exist several other threats to the groundwater of the Mountain Aquifer, which can be summarized as follows:

- Wastewater from Palestinian and Israeli industrial activity in the recharge area of the Mountain Aquifer is of concern to groundwater quality. Some of the planned Palestinian projects, such as Jenin, include facilities for industrial wastewater as well as municipal sewage. At this stage, there exist no facilities for the treatment of Palestinian industrial wastewater. The treatment of wastewater from Israeli settlement industries has been reported as unsatisfactory (Kliot, 2003, 44), but has undergone some improvements in recent years, and further improvements are in the planning stages. The assessment of industrial pollution is presently beyond the scope of this report.
- Unsanitary landfills and dumpsites dot the entire West Bank, in the absence of adequate solid waste solutions. The situation has deteriorated since the beginning of the Intifada, as restrictions on movement have led to an increase in the number and distribution of unsanitary, illegal dumpsites. Contaminants from unsanitary landfills also seep into the groundwater of the Mountain Aquifer, adding to the threat of sewage pollution.
- Agricultural practices such as the use of inorganic fertilizers, pesticides and herbicides as well as irrigation by untreated sewage create additional sources of groundwater pollution (UNEP, 2003, 35).
- Other possible threats to groundwater resources include over-exploitation, which may lead to irreversible salinization, rendering future use of the aquifer's water impossible without prior treatment. Unsustainable water exploitation practices in the Gaza Strip have led to intrusion of seawater into the coastal aquifer, significantly exacerbating water scarcity in Gaza. Saline water exists in the Mountain Aquifer as well, and over-exploitation of its groundwater may lead to contamination of freshwater resources (Guttman, 2000).



Pollution of Streams

Sewage from Palestinian cities and Israeli settlements pollutes several streams. Some of the streams flow from the West Bank into Israel, eventually reaching the Mediterranean Sea. Others flow eastwards to the Jordan River and the Dead Sea. Table 2 below outlines the major polluted streams and the sources of the pollution.

Table 2: Sewage Pollution by Streams (Sources: Kliot, 2003; IWC. 2002)

Stream	Source
Kishon Stream	Polluted upstream by Jenin sewage and downstream by Haifa's sewage treatment plant
Alexander/Nablus Stream	Polluted by Tul Karem as well as Nablus sewage, including industrial sawmills and olive oil production wastes.
Yarkon Stream	Polluted by sewage of Ramallah and Qalqiliya sewage. A tributary stream (Kana Stream) is polluted by sewage from Israeli settlements such as Imanuel, Yakir, Nofim and Karnei Shomron. (Settlements' sewage will be treated in the Kana Stream Project, currently being established).
Modi'in Stream	Polluted by sewage from Ramallah.
Kelt/Prat Stream	Polluted by sewage from Ramallah.
Kidron Stream	Polluted by sewage from eastern Jerusalem, Bethlehem and Beit Sahur.
Hebron/Be'er Sheva stream	Polluted by sewage from Hebron as well as the Israeli settlement of Qiryat Arba. The sewage contains toxic industrial waste and sawmill waste that clogs sewage pumps.

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.

The Palestinian Authority, the Israeli Government and German and US aid agencies are all involved in the attempt to build sewage infrastructure in the

Table 3: Planned Palestinian Sewage Projects in the West Bank

City	Donor	Cost	Project Status
Hebron/Al Khalil	USA	$45 million	The project is in the planning stages. Disagreement exists over the level of effluent treatment, direction of sewage discharge and payment for additions to the project requested by Israel. Ongoing discussions between USAID, the Palestinian Authority and the Israeli Government are taking place. USAID recently froze the project due to the security situation.
Tul Karem	Germany	$50 million	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. The city's sewage flows across the Green Line, and is treated in an emergency treatment plant in Israel.
Jenin	Germany	$50 million	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 million	No plans have been submitted, but there are plans to build a new sewage treatment plant. Discussions have been held at the Joint Technical Committee.
Nablus West	Germany	$25 million	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 million	Germany has built a new sewage treatment plant. Still to be built is a pipeline to remove treated effluent.
Ramallah	Germany	$10 million	There are plans to build a new sewage treatment plant. Currently, work on the rehabilitation of the old sewage treatment plant is in progress. It will provide a partial solution.
Salfit	Germany	$13 million	After 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, but no progress has been reported.

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

In a conversation with a representative of the German technical assistance agency (GTZ), FoEME was told that if it was up to the German agencies, the entire northern West Bank would have had all its sewage treated by now. German agencies are located in the West Bank (as well as the Gaza Strip), and have committed more funding than any other donor country to sewage treatment facilities in the 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 security policy employed by the Israeli military in the West Bank. Throughout the Second Intifada, the military has been restricting the movement of civilians and vehicles into and out of Palestinian cities. Under these conditions, workers, experts and equipment required for the construction of sewage infrastructure often cannot access the sites. As a result, work has been delayed though workers and experts have had to be paid for many days on which they have not worked. In addition, materials and equipment that have had to be imported have been held in Customs for long periods, pending security clearance by military authorities. These complications have led to a significant increase in the costs of sewage projects.

Funds allocated for international development cooperation are limited. Development agencies aim to maximize their benefits and avoid spending any more than necessary. 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'. Consequently, there has been no progress on any of the large-scale sewage projects funded by Germany since the outbreak of the Second Intifada. Instead, the efforts of German agencies have been invested in smaller projects.

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 is greatly dependent on the level of coordination between the foreign aid agency and the military.

The German response given has been that some attempts to coordinate with the Israeli side were made but that even when coordination did take place, delays still occurred. An official from the German representative office to the Palestinian Authority gave the example of an attempt to coordinate work on a carrier line at the El-Bireh treatment plant. Despite the fact that the work was coordinated in advance, soldiers at the checkpoint were not aware of it and refused to allow the workers through to the site. In another incident, workers were reportedly shot at.[9]

Despite the above example, from the conversations held with FoEME it is clear that German agencies invest relatively little in the ongoing coordination vis-à-vis the Israeli military. It was stated to FoEME that only occasionally do senior officials from the German representative office to the Palestinian Authority and other agencies contact military officials directly. There is no staff member in the German agencies who has coordination with the Israeli side as an office task. On the contrary, FoEME was told that given that Germany's development cooperation is with the Palestinian Authority, not with Israel, official contacts of German development agencies in Palestine with Israeli authorities are usually done through the German Embassy in Tel Aviv and not directly.

FoEME believes that development work in a conflict zone such as Israel / Palestine is naturally different to development work in a peaceful area: when planning to carry out development work, additional complications must be factored in.

Working in a conflict situation entails, amongst others, additional, conflict-related costs. Given the conflict reality on the ground and the restrictions on movement, an intense, ongoing coordination effort with both Palestinian and Israeli authorities is required from any agency that aims to work in the West Bank.

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 is on hold for other reasons, related to the disagreement between Israel, the Palestinian Authority and USAID on aspects of the project's plans. According to USAID, treated effluent from the plant was to be discharged into the Hever Stream running east towards the Dead Sea. Israel, however insists that no discharge should take place there, as the stream is currently free of pollution and effluent should be used for agricultural irrigation only. Consequently, any surplus effluent, which can be expected especially in rainy periods, should be pumped across to the western side of the mountains to the Hebron Stream. Israel further requests that a pipeline be built along the path of the Hebron Stream to carry any excess or untreated sewage from Hebron to the Green Line, where Israel would treat the sewage. Israel's position is that the costs of the additional components, on which it insists, should be borne by USAID. To date, no agreement has been reached as to engineering and financial solutions.

The Hebron/Al Khalil Project also encountered Palestinian objections to its initial plans, and had to be relocated to a different area, requiring a new planning process and much delay and increased costs.

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 current dispute could have been avoided.

Following the fatal attack in October 2003 on USAID security personnel in Gaza and the deteriorating security situation, USAID decided to put on hold all its water and infrastructure projects in Palestinian areas. In response to the freeze, the Israeli Water Commission requested USAID to consider relocating the project to the Hebron Stream, a move that it claims will simplify the operation, and reduce both the risk of pollution and the operating costs. However, the idea has encountered Palestinian opposition in the past, and will necessitate incurring extensive planning costs.

Disagreement over planning and financing issues between Israel and the Palestinian Authority, combined with the deteriorating security situation, pose significant question marks regarding the implementation of the sewage treatment plant in Hebron in the foreseeable future.

Israel

The Israeli Water Commission holds the Palestinian Water Authority responsible for the stalemate in implementing the above mentioned projects. 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, much of the stalemate on sewage projects, and certainly on those already approved by the Joint Water Committee (JWC), is not the result of Palestinian inaction, but concern donor country issues.

By pointing at the Palestinians, the Israeli Water Commission is ignoring major impediments to solving the sewage problems threatening the Mountain Aquifer. Israel does not follow up sewage projects in the West Bank on an on going basis, and does not sufficiently support donor country efforts on its own initiative. This is despite the fact that investment of such magnitude in Palestinian sewage treatment is in Israel's direct interest. The liaison vis- à-vis donor countries on this matter has been left in the hands of relatively low-level officials of the Israeli Water Commission.

In addition, the Israeli position is represented to

donor countries by two different entities. The Israeli Water Commission is the official body entrusted with the issue. However, the advisor on water issues to the Minister of Defense is also taken by some agencies to be an official representative. His previous positions as head of the JWC and involvement in the Israeli-Palestinian water negotiations contribute to his high standing, but his positions on important matters are different to, and not coordinated with, the Water Commission.

While different Israeli ministers have charged the Palestinians with waging a 'Sewage Intifada', sewage from Israeli settlements in the West Bank, which also contributes significantly to pollution of the Mountain Aquifer recharge area, continues to flow untreated. Under Israeli law (which is also in force in Israeli settlements in the West Bank and the Gaza Strip), municipalities themselves are directly responsible for treatment of their sewage; the Israeli Government provides 100% loans under favorable conditions for this purpose. Unfortunately, most settlement municipalities have not used this loan option to establish appropriate sewage infrastructure.

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)[10]. 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, but recently agreed to sign a document, conditioning its consent on provisions of gradual implementation.

Despite the danger posed to water resources by sewage pollution, the Palestinian Authority does not appear to regard the protection of water resources with the same urgency as the supply of water to the Palestinian population. Clearly, the supply of water to the population is of prime importance. However, without sustainable management of water resources, their future supply may be jeopardized. This has been the case in Gaza, where over-exploitation has resulted in irreversible salinization of groundwater of the Coastal Aquifer. Urgent action must be taken to prevent contamination in the Mountain Aquifer as well.

Table 4: Government Bodies and Agencies that Operate in the Region, Relevant to the Issue of Sewage Solution in the Mountain Aquifer's Recharge Area.

The Joint Water Committee (JWC)	The JWC was established under the 1994 Israeli-Palestinian Interim Agreement for the West Bank and the Gaza Strip (Annex III, Appendix 1, Article 40). Its functions are to deal with all water and sewage related issues in the West Bank. It is headed by the Israel Water Commissioner and the Head of the Palestinian Water Authority, and has several sub-committees, including a joint sewage committee and a joint technical committee. It is the principal body of coordination between Israel and the Palestinian Authority on all water related matters, and has continued to meet during the Second Intifada. Sewage projects in the West Bank have to be agreed upon by both sides and a permit issued by the JWC.
The Palestinian Water Authority (PWA)	The PWA is the body responsible on behalf of the Palestinian Authority for provision of water and sewage services. It represents the Palestinian Authority in the JWC.
The Israeli Water Commission (IWC)	The IWC is the body responsible on behalf of the Israeli Government for the provision of water and sewage services. It is part of the Ministry of National Infrastructure, and represents Israel in the JWC.
The Israeli Defense Forces (IDF)	The IDF presently has military controls over most of the West Bank, and has direct impact on the implementation of projects there, especially through its restrictions on the movement of people, vehicles and materials on West Bank roads. Several of its organs are of particular relevance: the Civil Administration, which handles the civil affairs of Palestinians in areas under Israel's control; the Office of Government Activities Coordinator in the Territories; and the Division for External Relations and International Organizations.
Environmental Protection Associations: Samaria and Jordan Valley, Judea	These associations are responsible for sewage treatment in Israeli settlements in the West Bank.
Kreditanstalt fuer Wiederaufbau (KFW)	The KFW is a German federal development funding agency. It has financed several Palestinian sewage projects, and has committed to fund several more.
Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ)	The GTZ is a German federal agency that provides technical cooperation and assistance to Palestinian sewage infrastructure.
The Representative Office of the Federal Republic of Germany to the Palestinian Authority	The representative office coordinates much of the work of German agencies in the Palestinian Authority.
US Agency for International Development (USAID)	USAID funds a sewage project in the West Bank city of Hebron/Al Khalil.

Claims of the Parties

The key impediments to implement sewage solutions, as expressed by the different parties, are listed below. It is not claimed that they represent official statements by any one government; however, each of the following points has been stated to FoEME, whether at one or more meetings held, in documents obtained, or as stated in the press.

Israeli Claims:

1. Security measures take priority over easing restrictions for the building of sewage infrastructure.
2. Donor agencies place insufficient emphasis on the coordination of their activities with the Israeli authorities. This may include both daily coordination of activities, as required, or consultation with Israel in the planning of sewage projects in areas under Israel's control.
3. Palestinians are not seriously interested in advancing the issue. They advocate strongly for additional water supply projects, sometimes at the expense of sewage projects.
4. Palestinians refrain from implementing sewage solutions out of spite.
5. Palestinians and donor countries fail to submit adequate plans for sewage treatment infrastructure to the Joint Water Committee.
6. Some of the equipment provided for infrastructure projects, such as metal piping, can be potentially used to produce weapons. Hence all imported materials must receive security clearance before their release from Customs.

Palestinian Claims:

1. Israel continuously creates obstacles to Palestinian efforts to treat sewage. During the period of Netanyahu's government, Israel insisted that settlements be connected to Palestinian sewage treatment facilities. Donor countries refused to meet this demand, and the issue was on hold at the Joint Water Committee. At later stages, Israel demanded particularly high standards of treatment (much higher than those implemented by Israel). Under such conditions, the running costs of sewage treatment are not affordable to Palestinians, thus projects remained on hold.
2. Israeli obstruction to the construction of sewage treatment plants serves the implicit policy of Israel to carry Palestinian sewage by pipeline into Israel for treatment, and the potential use of the resulting effluent for agricultural irrigation in Israel.
3. The Israeli side of the JWC failed to provide work permits on projects that received final approval, such as Nablus West and Salfit, despite their prior undertaking to do so. The PWA applied for permits through the Civil Administration but permits were not granted. German agencies that applied for permits were similarly denied.
4. Permits were also denied for German experts who planned to prepare a master plan for the Jenin sewage.
5. In JWC deliberations, Israel consistently postpones approval of planned projects tabled by the PWA.
6. Unlike other projects, the rehabilitation of Ramallah's treatment plant was approved within minutes, as the current sewage discharge flows near a military base and creates a major nuisance.

Donor Country Claims:

1. Israel cannot guarantee that its army will refrain at all times from carrying out activities that hinder the construction of sewage infrastructure in the West Bank. Such activities include constant restrictions on passage of workers, engineers and materials through checkpoints at the outskirts of Palestinian cities, and closures and curfews.
2. The Israeli military is bureaucratic and lacks internal organization. It takes a long time to handle requests, and even when tasks are coordinated between donor agencies and its officials, instructions fail to reach the checkpoint level, resulting in the inability of workers to reach construction sites.
3. Israel takes a long time to grant security clearance for the release from customs of equipment imported for the construction of sewage projects.

4. The above-mentioned Israeli security measures make infrastructure work in the West Bank a complicated undertaking and result in significant additional costs to the donor agencies, estimated at 25-40% of the original project costs. Tax payers in some donor countries are unwilling to spend money incurred because of Israel's military policy, especially when this is perceived as the "costs of the Occupation", which they refuse to finance.
5. Israeli demands on sewage treatment quality are unduly burdensome and higher than current Israeli standards. It is easy for Israel to demand such high standards when it requires others to pay the bill.
6. Somewhat surprisingly to FoEME, representatives of donor agencies have not mentioned that concerns about possible military assaults on sewage infrastructure have played a significant role in their decision to place sewage projects on hold.

FoEME's Findings

Friends of the Earth Middle East supports the United Nations Environment Program conclusion that untreated sewage in the recharge area of the Mountain Aquifer is an alarming issue, which needs to be given high priority by all parties (UNEP, 2003). FoEME believes that implementation of sewage solutions is in the interest of both Israelis and Palestinians, whose scarce, shared water resources are threatened by pollution. It is also in the interest of the international community, specifically Germany and the United States, which have committed to spend hundreds of millions of dollars between them for the construction of sewage infrastructure in Palestinian cities. By building such infrastructure, they help to advance the peace process and improve the living conditions of Palestinians. These projects would also help to achieve the Johannesburg 'Millennium Goal' by which the international community vowed to reduce by half the percentage of the world population living without access to appropriate sanitation by 2020.

The building of sewage infrastructure in a conflict zone such as the West Bank is not a simple undertaking. FoEME believes, however, that it is a necessary and urgent issue. Significant resources of shared groundwater are at risk of pollution from untreated sewage. Groundwater pollution will increase regional water scarcity, leading to a humanitarian crisis and exacerbating the Israeli - Palestinian conflict.

All sides have blamed the conflict conditions, and sometimes one another, for their inability to move forward on sewage treatment facilities.

FoEME believes that solutions to groundwater contamination cannot wait for the end of the Israeli-Palestinian conflict. If the parties have real intentions to protect groundwater resources then they must do their utmost to accomplish this under the given conditions of conflict.

Sewage from Palestinian Sources:

A. General

- All relevant stakeholders from Israel, the Palestinian Authority and donor countries recognize the importance of protecting the Mountain Aquifer from pollution.
- The successful implementation of projects requires an intensive, daily investment in coordination between the parties. The responsibility for this coordination lies with all parties.
- The problems involved in the movement of workers, engineers and materials through military checkpoints is the main factor causing significant additional costs to original project costs. The difficulties encountered are directly related to the continuing Palestinian-Israeli conflict.

B. Israel

- Present coordination of the issue on behalf of Israel is not handled at an appropriately senior level. The Ministry of National Infrastructure delegated this critical issue to the professional level of the Water Commission, rather than appointing a senior staff member from the ministry to handle this sensitive diplomatic issue.
- There has been inadequate follow-up on progress of sewage projects by Israel. Nor does Israel sufficiently, at its own initiative, support donor-country activities on sewage projects. The investment of hundreds of millions of donor-country dollars in Palestinian sewage projects is of clear Israeli interest, yet Israel does not put sufficient effort into promoting it.
- The Israeli Water Commission states that the main failure in treating sewage in the West Bank is due to the Palestinians. Irrespective of this accusation, significant difficulties exist between Israel and donor countries that impede the advancement of sewage treatment solutions.
- Donor countries report a lack of organization within the Israeli security system and claim that high-level promises to allow passage of workers have failed to reach the checkpoint level.
- In the past, the Israeli government conditioned its approval of sewage treatment projects in the West Bank by insisting that they should also handle the sewage from Israeli settlements, with appropriate payment mechanisms in place.

This issue slowed progress on sewage projects until the change of the Netanyahu government in 1999, leading to a withdrawal of Israel's demands.

- 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, following presentation of the problem by FoEME at a conference on the Mountain Aquifer.
- Two bodies represent Israel to donor countries: the Water Commission, which is the official organ in charge of the issue, and the Advisor to the Minister of Defense, who in the past was in charge of the water issue vis-à-vis the Palestinians, and is still perceived by some parties as the Israeli representative. The approaches of the two bodies are sometimes inconsistent, for example on the issues of the required level of treatment and the desired direction of sewage discharge.
- Should Israel 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.

C. The Palestinian Authority

- Present coordination of the issue on behalf of the Palestinian Authority is not handled at an appropriately senior level. This critical issue is left to the professional level of the Palestinian Water Authority, rather than professing ministerial leadership.
- The Palestinian Authority has openly stated that water supply projects should take precedence over sewage projects. FoEME agrees that water supply issues for domestic consumption are of prime importance and must be guaranteed at all times. While sewage treatment projects are largely on hold, many infrastructure projects (particularly on water supply) have continued to move forward in the West Bank. FoEME believes that the two issues should not be linked and donor funding for both issues should be of priority.
- The Palestinian Authority has, until very recently, refused to accept the ultra-high standards of sewage treatment upon which Israel has insisted. A mutually acceptable compromise has now

been agreed upon.
- Should the Palestinian Authority fail to support donor-country sewage treatment projects, an investment to the total value of $230 million for protecting shared water resources may be lost.

D. Donor Countries

- Donor countries prefer to postpone the implementation of sewage treatment projects, so as to avoid additional conflict-related costs. Building of infrastructure in the West Bank today is associated with high costs resulting from the ongoing conflict. These costs are estimated at 25-40% of the original infrastructure costs. However, the end of the conflict is far from sight, and sewage continues to percolate into groundwater.
- Insisting on peacetime conditions in a conflict zone is not a realistic expectation. Additional, conflict-related costs should be included in the planning and budgeting of projects in the West Bank.
- Conflict-related costs can however be significantly minimized. The prevention of workers from crossing checkpoints has no security rationale. Their speedy passage could be better coordinated with the Israeli security system. Similarly, the speedy release of imported equipment from Customs could be better facilitated by the submission of detailed lists in advance by the donor countries.
- The working relationship of German development agencies with Israeli authorities is limited and cumbersome. The German agencies invest too little effort in coordinating their activities with the Israeli security system, leading to delays in implementing projects.
- In some cases, detailed project plans have had to be seriously altered following objections of the Palestinian and/or Israeli authorities. In addition to the added planning costs incurred, project implementation has been further delayed. This could possibly have been avoided if both parties had been consulted about the projects' terms of reference prior to detailed planning.

Sewage from Israeli Sources:

- Israeli settlements in the West Bank are responsible for an estimated 25% of the sewage pollution in the recharge area of the Mountain Aquifer.
- Unlike most Israeli localities, the majority of the settlements do not have adequate sewage treatment. Despite the lack of sewage treatment facilities, Israel continues to build additional neighborhoods and settlements in the Mountain Aquifer's recharge area. Additional neighborhoods are in the planning stage today, also without solution to their sewage problem.
- The Ministry of the Environment is in charge of enforcing sewage treatment in Israeli municipalities, but it fails to enforce sewage treatment sufficiently in settlements.
- Instead of financing the sewage treatment themselves, settlement municipalities request a grant from the government amounting to 50% of the sewage infrastructure cost, to the sum of NIS 200 million. Such funding is never, these days, given to localities inside Israel.

Recommendations

Israel:

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 Israeli government, as follows:

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 senior staff person should invest maximum effort to assist donor countries in implementing sewage treatment projects in the West Bank through, inter alia:
   a. Removing obstacles and administrative barriers to their operations;
   b. Coordinating between them and the Israeli security services in the issuance of permits to workers, engineers and vehicles involved in sewage treatment projects;
   c. Coordinating between donor countries and the Israeli security services on the release from Customs of goods and materials required for sewage treatment projects.
2. The use of the Mountain Aquifer's pollution for propaganda against the Palestinian Authority is damaging, and creates distrust regarding Israel's genuine good will to find solutions. 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 even through these difficult times. The shared interest of all the region's inhabitants to preserve scarce water resources must be the priority.
3. Israeli settlements in the West Bank discharge significant amounts of untreated sewage in the recharge area of the Mountain Aquifer. The Ministry of the Environment should take immediate legal action against settlement municipalities that fail to implement Israeli sewage treatment standards. [4]
4. 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.

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 use of the Mountain Aquifer's pollution for propaganda against Israel is damaging, and creates distrust regarding the genuine good will of the Palestinian Authority to find solutions. Pollution in the aquifer's recharge area originates from both Israeli and Palestinian sources, and can only be solved through maximum cooperation between all sides even through these difficult times. The shared interest of all the region's inhabitants to preserve scarce water resources must be the priority.
3. 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

[4] Friends of the Earth Middle East stands firmly against Israel's settlement activity in the West Bank and Gaza Strip, and considers the return of Israeli settlers a necessary part of future peace between Israel and Palestine. With this recommendation we call to minimize the damage of existing settlements and not to continue or prolong settlement activity

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. 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.
2. 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.
3. 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.
4. 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.

Annex I

Interviews, meetings and consultations held in the preparation of this report:

Name	Position	Organization
Shimon Tal	Water Commissioner	Israeli Water Commission
Baruch Nagar	Head, division of water and sewage in Judea and Samaria	Israeli Water Commission
Shmuel Kantor	Advisor	Israeli Water Commission
Dr. Yossi Guttman	Chief Hydrologist	Mekorot, Israel National Water Company
Noah Kinarti	Advisor to the Minister on water issues	Ministry of Defense
Major Michael Bendavid	Head, International Law Department	IDF, The Military Advocate General's Corps
Major Oded Herman	Head, Infrastructure Division	Coordinator of Government Activities in the Territories
Valerie Brachia	Deputy Senior Director	The Israeli Ministry of Environment
Ori Livne	Head, International Relations Division	The Israeli Ministry of Environment
Erez Yemini	Advisor to the Minister	The Israeli Ministry of National Infrastructure
Yitzhak Meyer	Director General	Environmental Protection Association, Samaria and Jordan Valley
Noa Yotzer	Officer in charge of wastewater in Judea and Samaria	The Israeli Ministry of Finance
Shimon Tsuk	Hydrologist	Israeli Union for Environmental Defense (Adam, Teva V'Din) (IUED)
Henrik Slotte	Head, Post Conflict Assessment Unit	United Nations Environment Programme (UNEP)
Aniket Ghai	Project Coordinator, Post Conflict Assessment Unit	United Nations Environment Programme
Dr. Hisham Sharabati	Local Expert	Kreditanstalt fuer Wiederaufbau (KfW)
Raymund Meyer/Robben	Project coordinator	Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ)
Ulrike Metzger	Counselor Development Cooperation	Representative Office of the Federal Republic of Germany, Ramallah
Andreas Kindl	First Secretary, Political Affairs	German Embassy in Israel
Alvin Newman	Chief, Office of Water Resources	USAID
Thomas Rhodes	Environmental Officer	USAID
Karen Assaf	(Past) Advisor	Palestinian Water Authority
Iyad Yaqoub	Palestinian head, Joint Sewage Committee	Palestinian Water Authority
Dr. Sharon Hophmayer-Tokich		
Dr. David B. Brook	Director of Research	Friends of the Earth Canada
Stuart Shepherd		OCHA

Annex II

Planned sewage treatment plants (STP's) and sewage network projects in West Bank Palestinian cities (Sources: Civil Administration, 2001; IWC, 2002; UNEP, 2003; Kliot, 2003; Personal interviews)

Location	Project	Condition of Sewage Network	Current Sewage Treatment	Current Pollution Situation
Jenin	Restoring existing STP	Entire system requires repair. German agencies committed funds to upgrade network.	Existing STP consists of three aeration ponds. Built in 1972, modified in 1993. Capacity: 760 CM per day. Not operating effectively since the aerators (fans) are broken and require replacement parts.	Untreated wastewater is discharged into wadis and used for irrigation, resulting in groundwater contamination and pollution of the Kishon Stream.
	New temporary STP for industrial area			
	New regional STP: Jenin, industrial area, villages			
	Sewage network repair			
Nablus	New STP (Nablus West)	70% of households are connected, refugee camps are not. German and British agencies have allocated funds for network.	An emergency dam was built by Israel to stop the sewage from reaching Alexander Stream (the Yad Chana Reservoir).	West: sewage flows into Nablus Stream, reaching Alexander Stream, then receives partial treatment in an emergency STP in Emek Hefer. East: sewage flows into Al-Sagour Stream and to Jordan rift via Wadi El Baden/Tirza Stream. Used for irrigation and pollutes ground water.
	New STP (Nablus East)			
Tul Karem	Restoration of existing STP	50% leakage in the city network.	50% of sewage flows to malfunctioning stabilization ponds. The rest flows into the Alexander Stream. Stabilization ponds are currently rehabilitated by German agencies.	Sewage flows to Alexander Stream inside Green Line, reaching an emergency reservoir (Yad Chana) built by Israel. Also leaks inside the city. Pollution spots were detected near the city.
	New STP for Tul Karem + collection pipe.			
	Sewage network repair			
Qalqiliya	No project.	75% of the population are connected, but leakage from the system reaches 50%.	Sewage network is connected to the Nir Eliyahu STP, inside the Green Line. Payment for treatment of sewage in Israel is yet to be arranged.	Sewage leaks at the point of connection to pipe, and pollutes the Yarkon Stream. Also leaks inside the city. Pollution spots were detected near the city.
Salfit	A new STP for Salfit		Malfunctioning oxygenation ponds	Wastewater is currently discharged from the oxygenation ponds into Shilo Stream (a tributary of the Yarkon Stream).
Bir Zeit	A new STP			Sewage flows down Natuf Stream.
Ramallah	A new STP – either north or west.		Aeration ponds built in 1974. Have little effect due to frequent overload and mechanical failure. These are currently rehabilitated by German agencies.	Sewage flows untreated down Modi'in Stream. Sewage from Ramallah also reaches the Kana Stream (a tributary of the Yarkon Stream) and Wadi Kelt.
	Upgrade to existing STP			
	Repair of sewage network			
El-Bireh	Extension of sewage network and removal of treated wastewater	Requires extension	A new, adequate STP exists and operates.	Treated wastewater flows down Wadi Kelt.
	A new STP (P proposal) **or** Paid connection to W. Jerusalem STP (I proposal)		Some sewage pipes are connected illegally to the W. Jerusalem treatment plant through the Giv'at Ze'ev – Jerusalem pipeline.	Sewage flows into Wadi Kelt.
Bethlehem East & Beit Sahour	A new STP in Kidron stream **or** connection to planned E. Jerusalem STP in Nebi-Mussa	Requires repair	Sewage from western Bethlehem reaches the Soreq treatment plant of western Jerusalem.	Sewage from eastern Bethlehem is pumped to the Kidron Stream and continues to flow with the East Jerusalem and Beit Sahur wastewater, polluting the eastern Mountain Aquifer.
	Repair of sewage collection network			
Beit Jala	Agreement on payment and connection of more neighborhoods		Sewage is treated at the W. Jerusalem STP, but is not paid for.	No pollution – sewage undergoes treatment.
Hebron	A new STP, sewage delivery facility, sewage pipe along Hebron stream and reuse of water		A non-functioning STP exists in Hebron. Israel contains and treats the water inside the Green Line.	Sewage from Hebron and Qiryat Arba flows into wadis at Hebron's outskirts, reaching Hebron Stream. The sewage contains toxic industrial waste and sawmill waste that clog sewage pumps. Wastewater reaches Meitar area and Shoket junction (inside Israel) in the winter, threatening water extraction in the area.
	Repair/building of sewage network			
	An emergency facility for Hebron sewage inside Green Line.			

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Endnotes

[1]Based on Gvirtzman,2002; IWC, 2002 and 2003a; Kliot, 2003; UNEP, 2003

[2] Additional water resources of Palestinians in the West Bank include supplies from Israel's network (whose water comes from the Mountain Aquifer as well as other sources) and harvested rainwater.

[3] Sewage from the city of Jericho, which does not undergo any treatment, creates a separate environmental problem by polluting the Dead Sea.

[4] The Palestinian city of Jericho is not included in this figure.

[5] Jerusalem and Modi'in municipalities, see respective web sites.

[6] Y. Guttman identifies the western strip of the Mountain Aquifer as the most vulnerable to pollution from wastewater. That strip does not include the areas of Ramallah and Barkan.

[7] 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.

[8] Information obtained from interviews with representatives of KFW (German development funding agency) and USAID.

[9] 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.

[10] 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.

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This report is based on research carried out by Friends of the Earth Middle East through its project on protecting the Mountain Aquifer. Friends of the Earth Middle East is a joint Israeli, Jordanian and Palestinian organization that deals with transboundary environmental problems in the Middle East. The organization promotes solutions to shared environmental problems as part of advancing efforts for peace building in the region. FoEME is a member of Friends of the Earth International, the largest network of environmental NGO's, with member organizations in 70 countries. FoEME has offices in Tel-Aviv, Bethlehem and Amman. FoEME's main issue areas include water, the Dead Sea, the Gulf of Aqaba/Eilat and the environmental impact of international trade agreements.

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