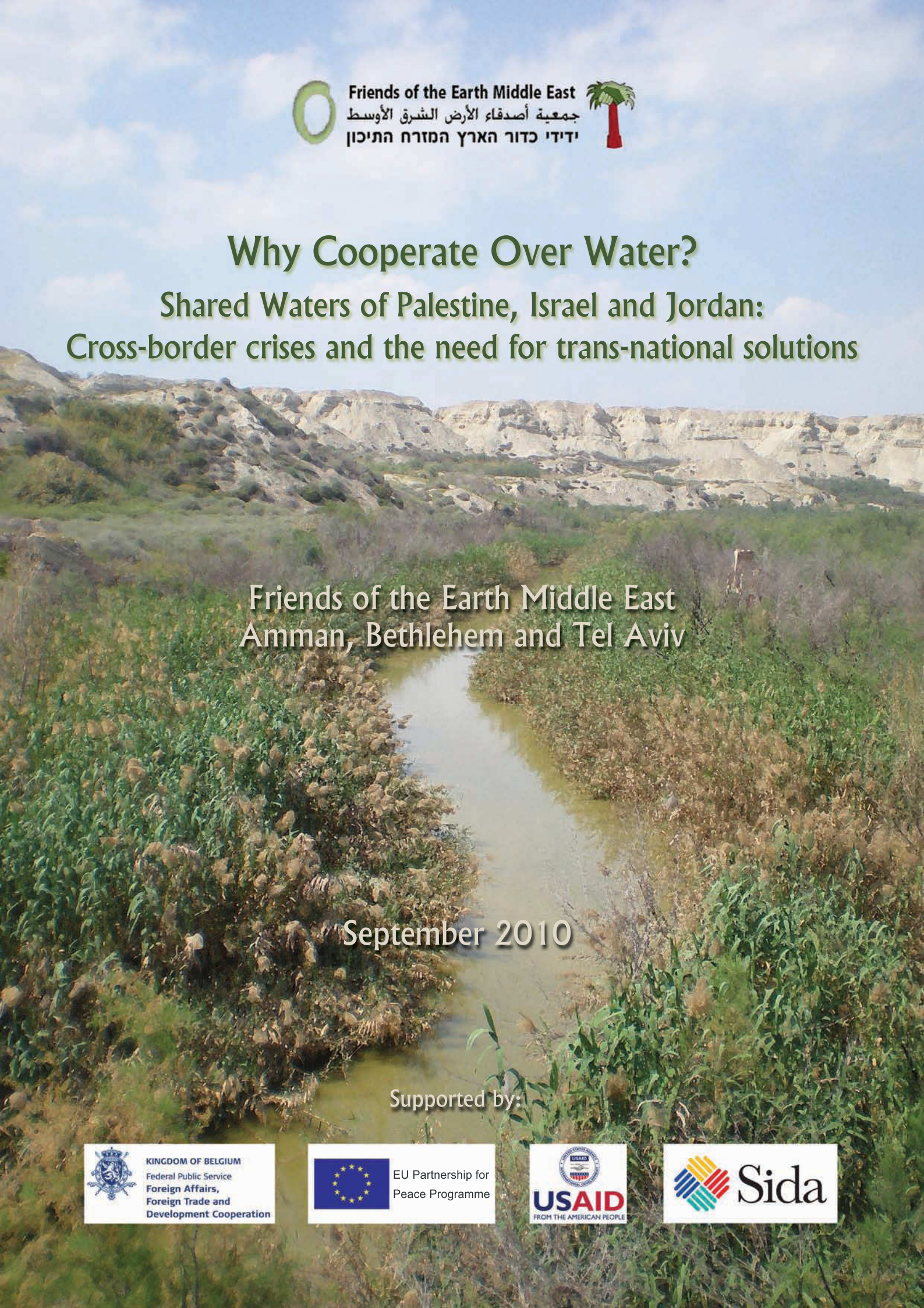

Friends of the Earth Middle East
جمعية أصدقاء الأرض الشرق الأوسط
ידידי כדור הארץ המזרח התיכון

Why Cooperate Over Water?

Shared Waters of Palestine, Israel and Jordan: Cross-border crises and the need for trans-national solutions

Friends of the Earth Middle East
Amman, Bethlehem and Tel Aviv

September 2010

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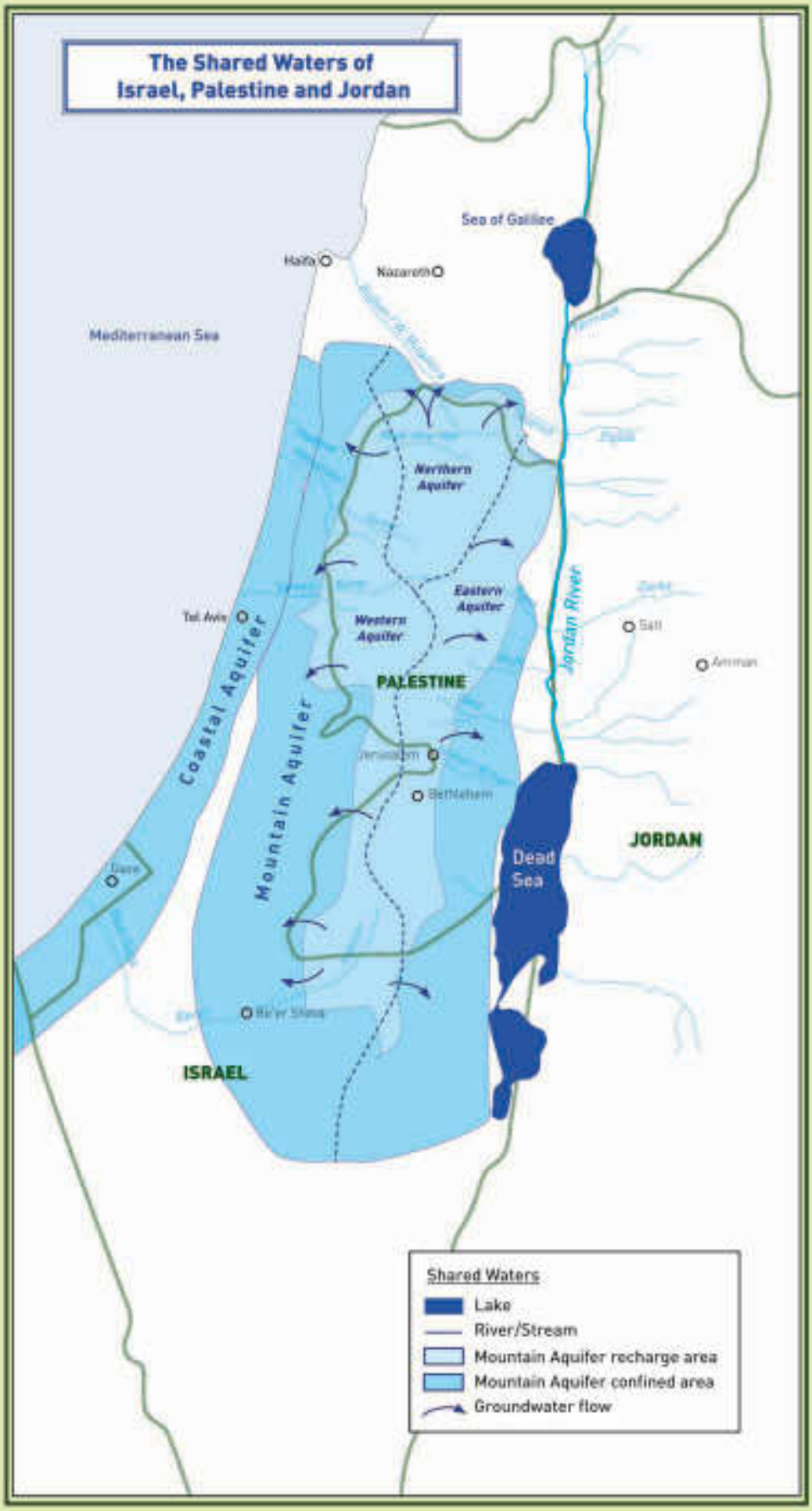
Map 1: Shared water sources of Israel, Palestine and Jordan



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September 2010

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Friends of the Earth Middle East (FoEME) is a unique organization at the forefront of the environmental peacemaking movement. As a tri-lateral organization that brings together Jordanian, Palestinian, and Israeli environmentalists, our primary objective is the promotion of cooperative efforts to protect our shared environmental heritage. In so doing, we seek to advance both sustainable regional development and the creation of necessary conditions for lasting peace in our region. FoEME has offices in Amman, Bethlehem, and Tel Aviv. FoEME is a member of Friends of the Earth International, the largest grassroots environmental organization in the world.

Note of Gratitude

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A. Introduction

Jordan, Israel and Palestine[1] share a geographical area comprised of shared water basins, including the Jordan River, the Dead Sea and the Mountain and Coastal Aquifers. These basins are all subject to natural conditions of water stress given the region's mostly dry climatic conditions. All three governments, though responsible to varying degrees, are exploiting these common water sources in an unsustainable manner. Political conflict has further led to domination and misallocation of resources, encouraged unregulated pollution, and prevented the sustainable management of these shared waters.

Harsh water realities have resulted. The high disparity between average Israeli and Palestinian water consumption rates is directly related to Israeli domination over the Palestinian water economy.[2] Shared water bodies have been heavily compromised, over-pumped or diverted to a degree nearing devastation, with pollution, including untreated sewage, often replacing the water diverted. Beyond the conflict, poor management, inappropriate investment in water, lack of national political leadership, and unsustainable water consumption behavior have greatly contributed to the mismanagement of scarce water resources in the region.

Adequate cooperation over the management, utilization and protection of these resources is necessary to ensure sustainable water use on the one hand and equitable water utilization between people, and between people and nature, on the other hand. Arrangements for shared water management exist in the region, including in the 1994 Israel-Jordan Peace Treaty and the 1995 Oslo Interim agreement between Israel and the Palestinian Authority, which set up a Joint Water Committee (JWC). But these arrangements have proven inadequate, as evidenced by inequitable water allocations, the continuing deterioration of shared waters and mutual blaming by all sides, as skepticism grows over the wider regional peace process. Nevertheless, fair and fruitful cooperation over water resources remains an issue of self- and mutual interest in all three countries dependent on these shared waters. Transnational arrangements for sustainable management of shared waters exist elsewhere in the world, including in conflict regions, and provide models that can be applied in our region.

This report summarizes the interrelated water problems faced by Israel, Palestine and Jordan, focusing on their shared water basins and highlighting the urgency behind the need to cooperate, and the values and principles underlying the type of cooperation espoused by Friends of the Earth Middle East (FoEME). We rely on the many reports and briefing papers FoEME has published in the past. Our assessments are based on the hands-on experience FoEME has gained through the cross-border community program 'Good Water Neighbors', now active in 25 communities sharing common water resources[3] (see Map 2, back cover).

This report shows that transnational cooperation over shared waters is unavoidable. FoEME's experience shows that the *manner* by which that cooperation takes place -- and an understanding of the importance of water to both people and nature -- will determine how this cooperation will result in healthier ecosystems and more equitable allocation of water between the peoples of this region.

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[1] FoEME supports the Geneva Accord parameters of a final peace agreement between Israel and Palestine and sees the 1967 Green Line as the basis for the future state of Palestine.

[2] World Bank, Middle East and North Africa Region; Sustainable Development Report 47657-GZ: "Assessment of Restrictions on Palestinian Water Sector Development", Sector Note, April 2009. http://siteresources.worldbank.org/INTWESTBANKGAZAINARABIC/Resources/WaterRestrictionsReport18Apr2009.pdf

[3] Good Water Neighbors publications by EcoPeace/Friends of the Earth Middle East:

- "Environmental Peacebuilding Theory and Practice, A Case Study of the Good Water Neighbors Project and In Depth Analysis of the Wadi Fukin Tzur Hadassah Communities", January 2008 http://foeme.org/uploads/publications_publ93_1.pdf
- Identifying Common Environmental Problems and Shared Solutions", February 2007. http://foeme.org/uploads/publications_publ69_1.pdf
- "A Model for Community Development Programs in Regions of Conflict, Developing Cross-Border Community Partnerships to Overcome Conflict and Advance Human Security", August 2005 http://foeme.org/uploads/publications_publ19_1.pdf

B. *The Demise of our Shared Waters*

The amount of water in the Lower Jordan River has been reduced to 2% of its original flow

1. The Jordan River

The Lower Jordan River (LJR) used to flow from the Sea of Galilee in a meandering 200 kilometer course down to the Dead Sea. Shared by Jordan, Israel and Palestine, the Lower Jordan River Valley is part of the Great Rift Valley linking the Fertile Crescent with Africa. The LJR Valley is a unique ecosystem stretching along both banks of the world's lowest river, home to endemic and rare species, and the third most important bird migration route on earth. It is also one of the oldest routes of human migration, with natural and cultural sites valued the world over, justifying its candidature as a World Cultural and Natural Heritage site.[4] The world-famous Jordan River remains highly symbolic for Jews, Christians and Muslims.

This unique river valley is presently threatened by excessive water diversion, pollution and inappropriate development. Israel, Syria and Jordan have dammed and diverted nearly all the tributaries that fed the Lower Jordan River, leaving less than two percent of the 1.3 billion cubic meters of water that used to flow naturally. Over 98% of this water has been diverted for other purposes, mostly agriculture and domestic consumption. By 2011, parts of the Jordan River are expected to dry up completely for most of the year. In place of the diverted fresh water, Israel, Jordan and Palestine discharge their untreated or poorly treated sewage either directly into the river, or indirectly through unlined cesspits. In addition, diverted saline water, agricultural runoff and fish farm effluents are discharged into the Lower Jordan, effectively turning this fabled river and vital ecological system into a drainage canal.[5]

[4] These include one of the oldest cities on earth (Jericho), Greco-Roman and Nabatean traces, the baptismal sites of early Christianity, Muslim sites related to Muhammad's companions, and more. FoEME, "Crossing the Jordan", Concept Document, March 2005. http://foeme.org/uploads/publications_publ21_1.pdf

[5] Gafny, S., Talozi, S. & Al Sheikh, B., "Towards a Living Jordan River: An Environmental Flows Report on the Rehabilitation

Due to Israeli and Jordanian military restrictions most of the LJR is off-limits to valley residents and tourists alike, so that most people are unaware of the river's dire condition. Finally, the artificial drying out of the Lower Jordan River is also a primary cause for the drastic shrinking of the Dead Sea.

The Lower Jordan River has potential to attract significant tourism and benefit local residents, but this is unrealized due to the river's condition and military restrictions. In cooperation with eleven communities on both sides of the Jordan River, FoEME is helping to promote sustainable local development based on the Valley's tourism potential. It has developed plans to expand the Peace Island at Bakoura/Naharaim and create the Jordan River Peace Park.[6] In 2005, FoEME established a 2000 dunum Eco-Center, including a visitor's center and cabins, in the Jordanian village of Sheikh Hussein. In the Palestinian village of Al Auja, north of Jericho, FoEME recently opened the Auja Environmental Center to promote environmental education and host eco-tourism groups.[7]

These projects are initial examples of the ecological and tourism-based potential of trans-border cooperation in the Jordan Valley. However, without a long-term, multi-state policy to return enough fresh water to the Lower Jordan, the river is doomed. FoEME's research shows that an annual flow of 400-600 million cubic meters (mcm) of mostly fresh water (between 1/3 and 1/2 of the river's original flow) will be needed to gradually rehabilitate the Lower Jordan.[8] FoEME recommends that Israel, Syria and Jordan allocate respectively 220 mcm, 100 mcm and 90 mcm of water to meet this goal.[9] Palestine, as a riparian to the river, should also have direct access to the river and be allocated its fair share of Jordan River water.

The Israeli Ministry of Environment recently launched an effort to create a master plan along the Israeli side of the river, an effort that FoEME hopes will be duplicated by the Jordanian and Palestinian authorities. To revitalize the Lower Jordan River and Valley, however, a joint Israeli – Jordanian - Palestinian management structure is required, with Syrian representation in the future. FoEME is recommending a trans-national LJR Commission be created to ensure the long-term cross-border coordination that will allow economically viable and environmentally sustainable development of the Valley.

Sewage discharged directly into the Lower Jordan River (Israel)

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of the Lower Jordan River". http://foeme.org/uploads/publications_publ117_1.pdf

[6] See Jordan River Peace Park at http://foeme.org/www/?module=projects&project_id=123

[7] See Sharhabil Bin Hassneh EcoPark, and Auja Environmental Center at http://foeme.org/www/?module=projects&project_id=170

[8] FoEME, "Towards a Living Jordan River: An Environmental Flows Report on Rehabilitation of the Lower Jordan River", May 2010, http://foeme.org/uploads/publications_publ117_1.pdf

[9] FoEME, "Towards a Living Jordan River: An Economic Analysis of Policy Options for Water Conservation in Jordan, Israel and Palestine", Draft Report for Discussion Purposes, May 2010. http://foeme.org/uploads/publications_publ118_1.pdf

2. The Dead Sea

The Dead Sea is the lowest and saltiest body of water on Earth, shared by Jordan on its eastern shores and Palestine and Israel on its western shores. Apart from being a major source of potash and other minerals, its waters are prized for their therapeutic value and the Dead Sea's natural beauty make it a major tourist attraction. The Dead Sea basin, replete with oases, is home to nearly 600 species of plants and animals and boasts world-class cultural heritage sites such as the Qumran caves, Mount Nebo and the fortresses of Karak and Masada. It is currently a finalist in an international competition on the new Seven Natural Wonders of the World.[10]

Dead Sea water levels have been dropping at over 1 meter a year

After decades of over-exploitation, primarily Israel and Jordan[11] have brought this unique body of water toward ecological disaster. The sea level has been dropping by over one meter per year, due to the combined impact of massive water diversions from the Jordan River (the Dead Sea's natural water source), and the Israeli and Jordanian mineral extraction industries, which induce accelerated evaporation to enable low-cost extraction of the lake's minerals. The consequences thus far include a loss of one-third of the lake's natural surface area, and the development of over two thousand sinkholes (resulting from drops in the groundwater table), destroying natural habitats, damaging infrastructure (roads, tourist developments) and threatening the livelihoods of local communities.

[10] See Natural Wonders of the World at http://sevennaturalwonders.org/asia/dead-sea or http://www.new7wonders.com/community/en/new7wonders/new7wonders_of_nature/dead_sea

[11] Israel's responsibility is greater than Jordan's, both in water diversion from the Jordan River and in mineral extraction impact on the Dead Sea. Syria is also responsible, in its diversion of water that historically flowed down the Yarmouk to the Jordan River into the Dead Sea. Palestinians, who also have riparian rights to the Dead Sea, are effectively restricted by Israel from access to its resources.

To preserve this unique area for future generations, long-term sustainable management of the Dead Sea basin is imperative and urgent. FoEME helped place the demise of the Dead Sea on the regional and international agenda by publishing reports on the challenges facing the Dead Sea, the need for joint management and international listing of the area and economic studies.[12] FoEME is active in five Good Water Neighbor communities around the Dead Sea (see Map 2), creating for example, an environmental education center at Ein Gedi, Israel, in parallel to the eco-centers built in Jordan and Palestine along the Jordan River.[13]

Policymakers in Jordan, Israel and Palestine have recognized the imperative to act to 'save the Dead Sea', however, in a manner that fails to deal with the root causes of the lake's demise: unsustainable levels of water diversion and mineral extraction. Instead, our governments are promoting technological solutions such as the mega-infrastructure project (the "Red-Dead Conduit") which proposes linking the Dead Sea with waters from the Red Sea. FoEME has been outspoken as regards its concerns on the unknown and potentially adverse environmental consequences of this scheme.[14]

As with the Jordan River, FoEME believes that saving the Dead Sea requires the creation of a trans-national commission involving Israel, Jordan and Palestine. The Dead Sea Commission would help foster the conditions for sharing the economic benefits of this amazing lake, such as tourism and mineral extraction, while balancing development needs with preservation of its unique natural environment.

Israeli and Jordanian industries use evaporation for low-cost extraction of the Dead Sea's minerals

[12] FoEME, "Let the Dead Sea Live, Concept Document: Moving Towards a Dead Sea Basin Biosphere Reserve and World Heritage Listings", November 1999, http://foeme.org/uploads/publications_publ25_1.pdf ; FoEME, "Advancing Conservation and Sustainable Development" March, 2004, http://foeme.org/uploads/publications_publ25_1.pdf

[13] See the Ein Gedi EcoCenter at http://foeme.org/www/?module=projects&record_id=171 ; the Auja Environmental Center http://foeme.org/www/?module=projects&record_id=174 and the Sharhabil Bin Hassneh EcoPark at http://foeme.org/www/?module=projects&record_id=170

[14] FoEME, "An Analysis of the Latest Research Commissioned by EcoPeace / FoEME on the Red Sea to Dead Sea Conduit and its Relevance to the World Bank Led Study", May 2007. http://foeme.org/uploads/publications_publ75_1.pdf

3. The Mountain Aquifer

The Mountain Aquifer is perhaps the most significant source of water for both Israelis and Palestinians, and provides the best quality water compared to the region's other water sources. The entire Palestinian population in the West Bank depends on this water source, and it provides water to major Israeli population centers including Tel Aviv and Jerusalem. Situated under the West Bank and parts of central Israel, the Mountain Aquifer is also the source of major streams and rivers that originate in the West Bank and flow into Israel (see Map 1).[15]

The Mountain Aquifer mainly lies under the West Bank and provides water to more than four million Palestinians and Israelis

This shared source of water is increasingly endangered, following decades of over-exploitation (primarily by Israel) and discharge of untreated wastes (primarily by Palestinians at present). Israel effectively controls the extraction rates and access to water, extracting some 80% of the Aquifer's annual water supply, with the Palestinians taking the rest (see section C.3, below).[16] Over-pumping threatens the long term viability of the groundwater, resulting in the drying up of springs. Moreover, most of the Mountain Aquifer's recharge area is especially vulnerable to groundwater pollution, due to its hydrological characteristics.[17] Some three million Palestinians and 500,000 Israelis who live above the aquifer are contributing to its steady contamination, with nitrate concentrations in some springs already surpassing World Health Organization standards for drinking water.[18]

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[15] The Mountain Aquifer's *recharge area* (where rain falls, permeates through the rock and accumulates underground) is situated largely under the West Bank and the Jerusalem corridor. The aquifer's *confined area* is located further down the slopes beneath impermeable layers of rock (largely inside Israel), where most wells and water extraction sites are located. This groundwater is divided into three sub-aquifers: the *western* sub-aquifer is the source of most of the water extracted by Israel west of the Green Line, and for the Palestinian cities of Tulkarem and Qalqiliya. The northern sub-aquifer supplies water to Nablus and Jenin areas as well as the Jezreel Valley and Beit Shean Valley (all in Israel). In the eastern sub-aquifer, water flows underground eastwards from Ramallah, Jerusalem and Hebron towards the Jordan Valley and the Dead Sea.

[16] This 5:1 ratio of Israeli/Palestinian water use is considerably greater than the ratio of the two populations.

[17] The Mountain Aquifer is a *karst* geological system, which allows for relatively fast and unhindered percolation of surface water, both rain and sewage, into the ground.

[18] FoEME, "A Seeping Time Bomb: Pollution of the Mountain Aquifer by Solid Waste", January 2006, p. 6. http://foeme.org/uploads/publications_publ59_1.pdf and World Bank, MENA Region; Sustainable Development, Report No. 47657-GZ: "Assessment of Restrictions on Palestinian Water Sector Development", Sector Note, April 2009. http://siteresources.worldbank.org/INTWESTBANKGAZAINARABIC/Resources/WaterRestrictionsReport18Apr2009.pdf

The two main sources of pollution of the Mountain Aquifer are inadequately treated sewage, and unsuitable solid waste dumps. Illegal dumping sites used by Palestinians as well as Israelis are widespread throughout the West Bank.[19] Due to lack of sanitation infrastructure, Palestinian villages commonly dispose their sewage in unlined cesspits that allow pollutants to gradually seep into the ground. In most Palestinian cities, the sewage systems very often discharge sewage without treatment into nearby wadis. This is due to lack of wastewater treatment plants in the West Bank, for several reasons. These include the Palestinian Authority's prioritization of water supply over wastewater collection and treatment; lack of funds; and Israeli refusal to grant permits and insistence to either connect Israeli settlements to the Palestinian sanitary systems or obtain Palestinian Authority approval for the settlements water and sanitary projects. Many Israeli settlements also discharge their sewage without adequate treatment. Altogether, this has led to serious pollution of most of the West Bank streams, which then flow into Israel and the Mediterranean Sea, the Jordan River or the Dead Sea.

FoEME has prepared key reports on sanitation issues above the Mountain Aquifer, placing the issue on the agenda of relevant Israeli and Palestinian authorities as well as the donor community. FoEME is working in eight GWN communities who share the Mountain Aquifer as well as the streams that flow from the West Bank to the Mediterranean Sea. Sewage and solid waste solutions have been a key focus of the work, with FoEME active in advancing sewage solutions between Baqa al Garbiya-Jat and Baqa al Sharqiya, Tulkarem and Emek Hefer, West Bethlehem Villages and the Hebron Stream. FoEME has proposed the creation of a Mountain Aquifer Commission as the mechanism to jointly manage the shared waters of this most important fresh water source.[20]

Inadequate sewage treatment threatens the Mountain Aquifer (Tulkarem, Palestine)

[19] FoEME, "A Seeping Time Bomb: Pollution of the Mountain Aquifer by Solid Waste", January 2006. http://foeme.org/uploads/publications_publ59_1.pdf

[20] FoEME, "Draft Agreement on Water Cooperation between the State of Israel and the Palestinian National Authority", June 2008.

4. The Coastal Aquifer

The Coastal Aquifer lies under the Gaza Strip and parts of Israel's coastal plain. It is the sole source of drinking and irrigation water for 1.5 million Gazans and a secondary but important source for Israelis. A relatively shallow aquifer, it has been used for centuries by local communities and agricultural settlements along the coastal strip. Most of the major cities in Israel are located along this coastal stretch and all Gazan residents live above this aquifer.

The water quality of the Coastal Aquifer within Israel has deteriorated due to urban sprawl that has reduced surface water infiltration into the aquifer on the one hand, and on the other hand, contamination from agricultural, urban and industrial sources. Over-pumping of the coastal aquifer has further led to seawater infiltration. The combined results of mismanagement of this aquifer have been drastic. In Israel, already some 15% of the wells on this aquifer have been shut down due to pollution.[21]

In the Gaza Strip the situation is even worse: rapid population growth, dependence on agricultural revenues and inadequate water governance have led to severe over-pumping of the southern sub-aquifer. As a result, seawater intrusion has increased and the aquifer is now severely polluted with high levels of contaminants, in particular salt and nitrates.[22] Many towns in the Gaza Strip are not connected to a sewage network and the three existing wastewater treatment plants are strained well beyond their capacity. The untreated sewage either percolates into the groundwater or is pumped out to sea, polluting the Mediterranean coastal waters. Severe wastewater and sanitation problems have resulted, and even led to wastewater flooding of a village and the direct loss of life.[23] Damage caused by Israel's continued blockade of the Gaza Strip and its January 2009 invasion of Gaza have worsened this situation, destroying facilities and limiting the ability to replace vital mechanical parts.

FoEME is active in two coastal aquifer communities on either side of the Gaza/Israel border, highlighting the link between the Mountain and Coastal Aquifers and the Mediterranean Sea. For example, FoEME is organizing joint tours for the communities located on the basin of the Hebron-Besor-Wadi Gaza streams, raising awareness of the cross-border pollution of this river basin, which begins in the West Bank, continues through Israel and the Gaza Strip, and empties into the Mediterranean (see Map 2). This pollution may also have an eventual impact on coastal desalination plants. FoEME has proposed the creation of a Coastal Aquifer Commission as a mechanism to jointly manage the shared waters of this essential fresh water source. Without intervention, the Coastal Aquifer, too, is heading toward environmental collapse.

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[21] Gvirtzman, H. "Water Issues between Israel and the Palestinians - The Israeli Position" [Hebrew], Ecology and Environment, Journal for Science and Environmental Policy, Issue no. 2, May 2010, p. 55. http://magazine.isees.org.il/Files/Articles/52.pdf

[22] World Bank, Middle East and North Africa Region; Sustainable Development, Report No. 47657-GZ: "Assessment of Restrictions on Palestinian Water Sector Development", Sector Note, April 2009, p. 27. http://siteresources.worldbank.org/INTWESTBANKGAZAINARABIC/Resources/WaterRestrictionsReport18Apr2009.pdf

[23] Haaretz, 27.3.2007. http://www.haaretz.com/news/flood-of-sewage-in-gaza-strip-village-kills-at-least-five-people-1.216752

C. Dealing with the Root Causes of Demise

The demise of our shared water basins -- the Jordan River, Dead Sea, Mountain and Coastal Aquifers -- reflects our loss of understanding of water as being the sustenance of all life forms. When we deal with water resources so recklessly, it comes as no surprise that we come to treat water rights poorly, failing to respect access to sufficient, clean water as a basic human right.

FoEME advocates that a balance be struck, based on more equitable sharing of water between the peoples of the region, and guardianship of the water resource between people and nature. Only by dealing with the root causes of the mismanagement of our shared waters can we effectively create the regional structures required to sustainably manage these resources. Our politicians often turn to technological fixes to counter the damage done by earlier policies that harmed these water sources. The proposed Red-Dead Conduit is one example (see above), but so is desalination of sea water. While some level of water supply augmentation through desalination may be necessary, this should be the option of last choice due to the environmental impacts of its use, not as the option of first choice as presently stated by our decision makers.[24]

The interdependent nature of the water resources in our region, and the severity of their demise, means that sustainable management of the waters shared by Jordan, Palestine and Israel must begin today. In other words, trans-national water management cannot remain hostage to lack of progress in the overall peace process. Indeed, FoEME's experience has shown that if trust is built around shared water issues, it can then impact positively on other aspects of human relations, toward working cooperatively for common gain.[25]

1. Promoting sustainable water consumption

Considering the natural water scarcity in this region, it comes as a surprise to many that water is wasted at considerable rates in all three countries. For example, approximately a third of domestic water use goes to flush toilets, although this could be done with grey water (from showering, washing and cleaning) using existing technologies. The estimated leakage from water conveyance systems is as high as 34% in Palestine, 25% in Jordan and 15% in Israel, adding up to tens of millions of cubic meters of water lost each year.[26] Municipal wastewater, which is largely reclaimed for agriculture in Israel, is not sufficiently reused in Palestine or Jordan. Israel and Jordan both subsidize the cultivation of water-intensive crops such as bananas and other tropical fruits, much of it for export. Indeed, the agriculture sectors account for over half of the water use in the Israeli and Jordanian economies, but contribute only a tiny fraction to GDP.[27]

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[24] FoEME, "Whose water is it? Privatization of water and sewage services, sea water desalination and public participation", Executive Summary, July 2004. http://foeme.org/uploads/publications_publ32_1.pdf

[25] FoEME, "Environmental Peacebuilding Theory and Practice, A Case Study of the Good Water Neighbors Project and Analysis of the Wadi Fukin /Tzur Hadassah Communities", Jan. 2008. http://foeme.org/uploads/publications_publ93_1.pdf

[26] FOEME, "Towards a Living Jordan River: An Economic Analysis of Policy Options for Water Conservation in Jordan, Israel and Palestine", Draft Report for Discussion Purposes, May 2010, p. 28-30. http://foeme.org/uploads/publications_publ118_1.pdf

[27] Ibid. For Israel, see: Rosenthal and Katz (July 2010), "An Economic Analysis of Policy Options for Water Conservation in Israel", p. 34
http://foeme.org/uploads/JR_Economic_Analysis_of_Policy_Options_for_Water_Conservation_in_Israel_ENGLISH_August_2010.pdf

A recent economic analysis of the water economies in Israel, Jordan and Palestine concluded that over 900 million cubic meters of water can be saved in the region if specific water management policies were implemented – with most of the savings at less than the marginal cost of water.[28] Analyzing the different sectors of the water economy (agriculture and domestic), the report concludes that in Israel an estimated 517 million cubic meters (mcm) of water could be conserved through reduced water losses from reservoirs and pipe leakages, removal of water subsidies and import tariffs in the agricultural sector, public awareness campaigns promoting water conservation, changes in gardening practices, the use of grey water for toilets and gardening, etc. In Jordan, an estimated 305 mcm could be conserved through better water management efforts at prices lower than the local cost of treated sewage water. This would involve the reclamation of municipal wastewater for agriculture, municipal and household rainwater catchment, reduction of water conveyance loss, improved efficiency of irrigation, reform of agricultural tariffs and changes in farmland renting practices in the Jordan Valley, public awareness campaigns, gardening reform and the use of grey water. In Palestine, an estimated 92 mcm could be made available to improve domestic water needs through better water management, mostly through the reuse of treated sewage, rainwater harvesting and other efforts that include several of the policies mentioned above.

Numerous examples of efficient water use exist in all three countries: Jordan is one of the few countries with long experience in water demand management, with a specific department in the Ministry of Water whose knowledge could be of help for Palestine and Israel. Israel's rich experience in agricultural water efficiency has, and could further, benefit its neighbors if it were shared more systematically. The revival of traditional rain-fed crops in Palestine, adapted to the local climate and land, provides a lesson for the agricultural sectors in Israel and Jordan, which have tended to rely on irrigated crops.

Until now, there has been little political will to *systematically* share water efficiency and wise use experience, despite the fact that all three nations draw water from shared sources. Above all, common targets and means for achieving efficient and sustainable water use in the different sectors should be agreed to by the three countries. Due to their interdependent nature, continued over-exploitation of water by one country will discourage water-wise management by its neighbors, who draw from the same source of water.[29] Without agreement, each side continues to act unilaterally, dooming the shared resource. Thus, sections of the Jordan River will likely dry up completely by 2011 if no multilateral action is taken. This means agreeing on a common strategy for long-term sustainable management of this shared river, including the amount of water each riparian country will return to the river, based on the amount of water extracted in the first place.

For the same reason, the shrinking Dead Sea, deprived of water from the Jordan River and over-exploited by Israeli and Jordanian mineral extraction companies, will only be saved by a sustainable basin management arrangement agreed to by the parties. FoEME proposes such a trans-national management structure, as well as arrangements for joint Israeli-Palestinian management of the Mountain and Coastal aquifers and shared cross-border streams.[30] All of these arrangements depend on sustainable water use by all sides, including sharing of information and technology, as a central component of trust-building and long-term success.

[28] See footnote above.

[29] For example, Israelis ask: why should we save water and return it to the Jordan River if it is then pumped up by the Jordanians and Palestinians? The same question is asked on the other side.

[30] FoEME, "Draft Agreement on Water Cooperation between the State of Israel and the Palestinian National Authority", June 2008. http://foeme.org/uploads/publications_publ104_1.pdf

2. Stopping the pollution

i. Contamination from Sewage

Inadequately treated sewage is a major source of pollution of shared waters in the region. Most of the streams and rivers in Palestine, Jordan and Israel, have either been dried up or turned into open sewers containing untreated or inadequately treated sewage.

This is due in large part to inadequate or non-existent sewage treatment systems. In Jordan, only 58% of the total population (and only six percent of the rural population) is connected to a sewage system. In Palestine, most cities and villages have no sewage collection or treatment systems and must resort to local solutions such as unlined cesspits or septic tanks, which leak and contaminate the groundwater. Over the Mountain Aquifer, an estimated 60 million cubic meters of untreated sewage threatens the very viability of this shared resource.[31] For Palestinians in Gaza, untreated sewage contaminates their groundwater and pollutes the Mediterranean Sea. Though Israel is a world leader in collecting and reusing treated sewage for agriculture, pollution from sewage sources remains a problem in parts of the Galilee and the Negev, and many Israeli settlements in the West Bank continue to discharge un- (or only partially) treated sewage into the environment.

Solutions to the serious groundwater contamination in Palestine cannot be put off until the political conflict is resolved. In 2009 the Israeli and Palestinian Water Authorities agreed to move forward in implementing existing plans for new sewage treatment plants, but little progress is actually seen on the ground.

The failure to mobilize sanitation infrastructure in the West Bank and Gaza demonstrates a fundamental failure of the current arrangement. A primary political obstacle is the current inequitable allocation of water, whereby Israel extracts the lion's share of the Mountain Aquifer's water (see Section 3, below). The Palestinians therefore prefer to invest in expanding their fresh water supply, rather than treating their sewage. Each side puts the blame on the other. FoEME proposes a new model for joint Israeli-Palestinian management of the Mountain Aquifer and cross-border streams that creates a common interest to capture and re-use treated sewage by all sides.[32]

Residents build a natural filtration system for sewage treatment, Um Reihan (Palestine)

[31] FoEME, "A Seeping Time Bomb: Pollution of the Mountain Aquifer by Solid Waste", January 2006. http://foeme.org/uploads/publications_publ59_1.pdf

[32] FoEME, "Draft Agreement on Water Cooperation between the State of Israel and the Palestinian National Authority", June 2008. http://foeme.org/uploads/publications_publ104_1.pdf

ii. Contamination from Solid Waste

Solid waste is another major source of contamination of the region's rivers and groundwater. An estimated 1.2 million tons of domestic waste per year is produced by the three million people (Palestinian and Israeli) residing over the Mountain Aquifer alone. Improper disposal of this solid waste results in the percolation of toxic substances into the groundwater.[33] Further, waste in unsanitary dump sites is frequently burned, leading to air pollution containing toxic elements.

Leachate from an illegal waste dump infiltrates to the aquifer below

While Israeli policy has led to the closure of most unsanitary dump sites inside the country, illegal dumping of Israeli waste over the Green Line in deals struck with Palestinian landowners remains a serious problem. The disposal of the vast majority of solid waste produced by the Palestinian population in the West Bank is still highly inadequate, with hundreds of unsanitary dumpsites dotting the West Bank, [34] though a new sanitary landfill built in the Jenin area for the north of the West Bank shows some progress.

In Jordan, too, waste disposal is still poorly managed in large part, and solid waste management systems have not been developed to adequate levels. Pollution from solid waste endangers Jordan's scarce groundwater and streams, some of which eventually reach the shared Jordan River.

The regional commissions proposed by FoEME to jointly manage shared water resources will have to devise common policies on the prevention of pollution from sewage and solid waste sources. For Israel and Palestine, FoEME prepared a specific annex to the Geneva Accords on Israeli-Palestinian environmental issues, including recommendations for the joint management of solid waste.[35]

Open dumping site of solid waste in Tulkarem, Palestine

[33] Leachate (liquids that contain dissolved pollutants) from unsanitary dump sites typically include dozens of biological, organic and inorganic pollutants, including chloride, arsenic and heavy metals such as lead.
[34] Estimates of the number of unregulated dump sites in the West Bank vary from 189 to 413. FoEME, "A Seeping Time Bomb: Pollution of the Mountain Aquifer by Solid Waste", January 2006, p.23. http://foeme.org/uploads/publications_publ59_1.pdf
[35] FoEME, "Draft Agreement on Environmental Cooperation between the Governments of the State of Israel and the Palestinian National Authority", November 2007. http://foeme.org/uploads/publications_publ105_1.pdf

3. Support for more equitable allocations of water

i. Between Palestinians, Israelis and Jordanians

Water sharing arrangements were part of the 1994 Peace Treaty between Jordan and Israel. In 1995 Israel and the PLO signed an Interim Peace Agreement (Oslo II) which established a temporary structure (the Joint Water Committee) to jointly manage water resources for an interim period until a final status agreement would be reached.

Between Israel and Jordan there exists a final agreement but not all water allocations that Israel agreed to transfer to Jordan have been carried through. This is partly due to the purposely vague language in the agreement itself as to who would bear the costs of additional water allocation to Jordan. Some Israelis criticize the fixed rate of water transfer from Israel to Jordan, as it fails to account for drought periods and reduced precipitation rates due to climate change.[36] Similarly, some Jordanians criticize the fixed amount of water that Jordan transfers to Israel from the Yarmouk River, as it fails to account for drought periods and reduced water flow in the river due to Syrian diversions upstream. Though relations between Israeli and Jordanian water authorities are generally good, the above issues continue to trouble many and need to be resolved in a transparent and equitable way, perhaps in a manner that would relate to benefits-sharing and rehabilitation of the Lower Jordan River, as detailed below.

More problematic is the 1995 Oslo II Accord, originally meant as an interim five-year agreement between Israel and the Palestinian Authority. As regards the Mountain Aquifer, Oslo II relates only to the shared waters in the West Bank (the Mountain Aquifer recharge area) and not to shared waters located inside Israel (the Aquifer's hydrological watershed where Israeli wells are drilled, is mostly inside Israel – see Map 1). Together with Israel's continued administrative control of Area C (60% of the West Bank) this effectively gives Israel veto powers over extraction rates and access to the shared aquifer, which is the Palestinians' only source of water in the West Bank. Israel currently extracts up to 80 percent of the Aquifer's water while Palestinians extract some 20 percent. Indeed, Palestinians extract *less* water than they did before the Oslo Accords, according to a 2009 World Bank report, and have become increasingly dependent on buying water from the Israeli water company, Mekorot.[37]

The World Bank report is highly critical of the framework set up by Oslo II, in particular the Joint Water Committee, which left near-total Israeli control of water allocation and management in the West Bank, and "makes integrated planning and management of water resources virtually impossible for the [Palestinian Authority]".[38] With the Palestinians receiving a relatively small amount of water, quite understandably their primary focus and investment of donor funds has been towards increasing water supplies. The fact that Palestinians receive such a disproportionate percentage of the shared Mountain Aquifer waters has also discouraged them from acting enough to prevent pollution of these shared waters. This short-sighted policy risks pollution of the shared water for all.

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[36] Fischendler, I., "Ambiguity in Transboundary Environmental Dispute Resolution: The Israeli-Jordanian Water Agreement", Hebrew University of Jerusalem, Journal of Peace Research, vol. 45, no. 1, 2008, pp. 79–97. http://www.foeme.org/uploads/IF-Ambiguity_Transboundary_Env.pdf

[37] World Bank, MENA Region; Sustainable Development, Report No. 57657-GZ: "Assessment of Restrictions on Palestinian Water Sector Development", Sector Note, April 2009.
http://siteresources.worldbank.org/INTWESTBANKGAZAINARABIC/Resources/WaterRestrictionsReport18Apr2009.pdf

[38] Ibid. p. vii.

The Oslo II accords further ignored Palestinian rights to water allocation from the Lower Jordan River and access to the Lower Jordan River and Dead Sea for purposes of economic development, especially tourism. Equitable water arrangements have to take into account *all* the shared waters between the parties.

FoEME has proposed a joint water management mechanism between Israel and Palestine that is based on the principles of ecological sustainability, economic efficiency and equitable allocation of the shared waters.[39] The latter would mean an immediate increase of fresh water to be made available to Palestinians. Such an agreement would not designate specific quantities (as in the Israel-Jordan Peace Treaty), rather, it would establish an agreed-upon mechanism for continuous monitoring of the shared water resources (as water levels change from year to year) and dynamic allocation criteria including population, existing water use, socio-economic development levels, etc. Above all, such a mechanism has to ensure the long-term sustainability of the shared water sources (staying above "the red lines" and maintaining groundwater quality) -- something the current arrangement has completely failed to do.

ii. Between People and Nature

While achieving a fair allocation of water between people is essential, FoEME believes that there should also be a fair allocation of water between people and nature. The demise of the Lower Jordan River and the Mountain and Coastal Aquifers, as well as the drying up of the Dead Sea, all demonstrate over-extraction of water resources beyond recharge rates and natural carrying capacity. To strike a fairer balance between the water needs of people and nature requires what may appear to some as radical changes in water use behavior and the introduction of a new water ethic, often based on best practices implemented in other parts of the world.[40] Such changes are required in the domestic, industrial and agricultural sectors of all three countries, as detailed above. Removal and treatment of pollutants, both sewage and solid waste, must also be advanced hand-in-hand with the return of higher levels of fresh water to nature. Reviving the natural water systems ultimately benefits the people as well.

Mayors from Jordan, Palestine and Israel symbolically bring water back to the Jordan River

[39] FoEME, "Draft Agreement on Water Cooperation between the State of Israel and the Palestinian National Authority", June 2008. http://foeme.org/uploads/publications_publ104_1.pdf

[40] FoEME, "Best practices in Domestic Water Demand Management", Mar. 2009http://foeme.org/uploads/publications_publ106_1.pdf
FoEME, "Best Practices in Agricultural Water Demand Management and Comparative Analysis for Israel", June 2010. http://foeme.org/uploads/publications_publ123_1.pdf

D. Next Steps

Many of the water problems in this region are man-made and can be resolved through policy changes. FoEME calls upon the public, our governments and the international community to undertake and/or support the following actions:

- ✓ ***Establish trans-national mechanisms for shared-water management***

Institutional arrangements including bi-lateral and tri-lateral mechanisms for sustainable management of shared water resources need to be advanced, replacing existing structures which are failing all of our peoples, as described in detail in the FoEME Water and Environment Accords.[41]

- ✓ ***Immediately increase water allocation for Palestinian needs and invest in sanitation solutions in the West Bank and Gaza***

Water must cease being held hostage to the peace process, and water-sharing arrangements between Israel and Palestine should follow the management structures described in FoEME's Model Water Accord.[42] Israel must increase water supply to Palestinians, and Palestine must advance sanitation solutions for the additional water allocated.

- ✓ ***Support changes in water consumption practices***

National programs need to be developed and launched, promoting change in water consumption practices, based on clear targets and financial or other incentives, to encourage wiser use of scarce water resources in the domestic and agricultural sectors. See the recommendations in FoEME's report, "Policy Options for Water Conservation".[43]

- ✓ ***Invest in formal and informal public education programs to promote an understanding of shared water/environment issues***

Policy changes must be supported by public education. Common educational materials, such as FoEME's WaterCare Book,[44] need to be integrated into all schools. Other examples of raising public awareness include programs for youth and adults that help visualize the shared water reality, such as FoEME's Neighbor Path Trails,[45] advocacy programs such as the TAP project[46] and environmental education centers that focus on the cross-border nature of water resources in their area, as exemplified in the EcoCenters established by FoEME.[47]

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[41] See footnotes 35 and 39, above, for FoEME's draft agreements on Water Cooperation (June 2008) and Environmental Cooperation (November 2007), between the State of Israel and the Palestinian National Authority.
[42] Ibid. (FoEME, June 2008)
[43] See footnotes 26-27, above, for FoEME's economic analyses of policy options for water conservation in Jordan, Israel and Palestine.
[44] WaterCare is a textbook written by Jordanian, Palestinian and Israeli teachers, describing the shared water reality of the region. It is used in schools participating in FoEME's Good Water Neighbor communities.
[45] FoEME's "Neighbors Paths" have been designed to educate and empower local residents as well as visitors about shared water issues. http://foeme.org/www/?module=projects&record_id=142
[46] "Transboundary Advocacy of Parliamentarians (TAP)" is a FoEME project which aims to bring together residents of communities in Palestine, Jordan and Israel (see Map 2), to advocate among elected representatives and decision-makers in the region, on the need to find sustainable solutions to the threats facing their shared waters. FoEME/WEDO, "TAP Project - Transboundary Advocacy of Parliamentarians over shared water issues", 2010.
[47] http://foeme.org/www/?module=projects&project_id=170

Map 2: FoEME's Good Water Neighbor communities share a common water resource (stream, lake or aquifer) with a community across the political boundary

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