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Lost Water in a Thirsty Land: Pollution Springs in the West Bank

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Summary:
Natural springs contribute some 34% of the freshwater available to Palestinians in the West Bank. However, the vast majority of springs is polluted from unsanitary sewage disposal in Palestinian villages, rendering their domestic consumption dangerous.

This affects in particular rural Palestinian communities that traditionally relied on such water. In light of water shortage and often economic hardship due to years of conflict conditions, many communities face the choice between paying for expensive vended water and using potentially dangerous water.

While the remediation of natural springs may not by itself solve the Palestinian water crisis, it is likely to go part of the way and increase the amount of water available for many communities.

The urgent world wide need to reduce the number of people without access to water and sanitation was clearly recognized by the Millennium Development Goals. In the West Bank, it is rural communities that seem to face the greatest shortage. Preventing pollution would significantly improve public health, prevent diseases and even deaths due to water related diseases.

The solution often requires basic sanitation for rural communities. However, the sector is not a priority for the Palestinian Water Authority or the international donor community.

With this report, Friends of the Earth Middle East calls on able institutions world wide to contribute to the easing of water hardship faced by rural Palestinian communities in the West Bank. Far from the public eye, the support of small scale sanitation projects can make a big difference in the lives of communities and positively affect a scarcity that fuels, in part, an ongoing conflict in the Middle East.

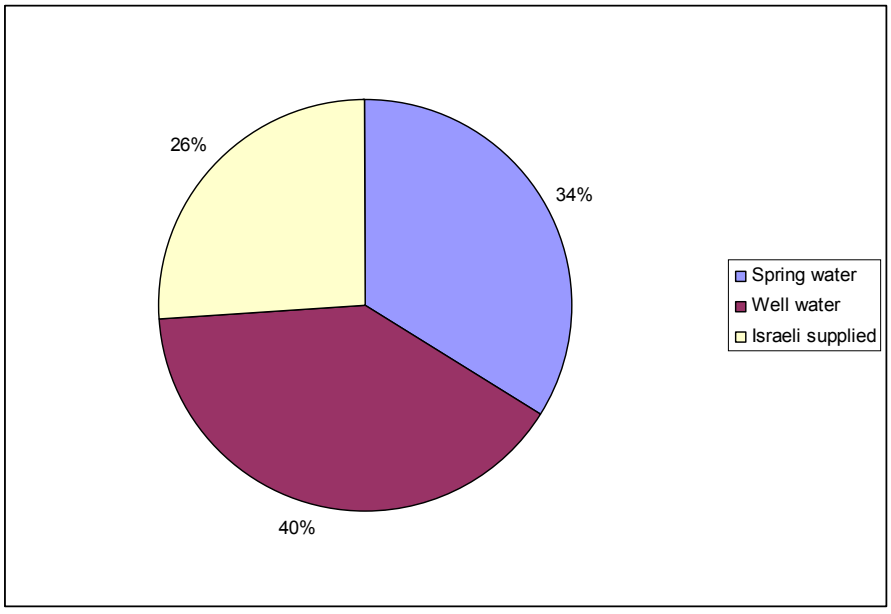
Background:

The Mountain Aquifer is one of the most significant sources of water for both Israelis and Palestinians. It consists of three sub-aquifers, which together supply 600-700 million cubic meters of water per year (Gvirtzman, 2002, 103). Its water is shared between the Palestinian Authority and Israel, whereby Palestinians in the West Bank rely heavily on this resource for their water supply. 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 water from the Mountain Aquifer for drinking and other uses.

The aquifer's water originates from precipitation, predominantly in the West Bank. Underground, the water flows in various directions, and a significant part of it reaches Israel. Mountain Aquifer water thus supplies both the West Bank and Israel and is used by both in accordance with an interim sharing agreement negotiated as part of the Oslo Accords in 1995.

Palestinian use of the Mountain Aquifer takes place through wells and natural springs. In addition to Palestinian extraction, the Israeli water company Mekorot supplies a share of Palestinian water, originating mostly from wells of the same aquifer. Palestinian wells account for 40% of consumption (61.2 million cubic meters a year (MCM/Y)); Palestinian springs account for 34% of consumption (51.7 MCM/Y) and Israeli supplied water accounts for 26% of consumption (39.9 MCM/Y) (Palestinian CBS, 2006).[1] The division of water by source is illustrated in chart 1:

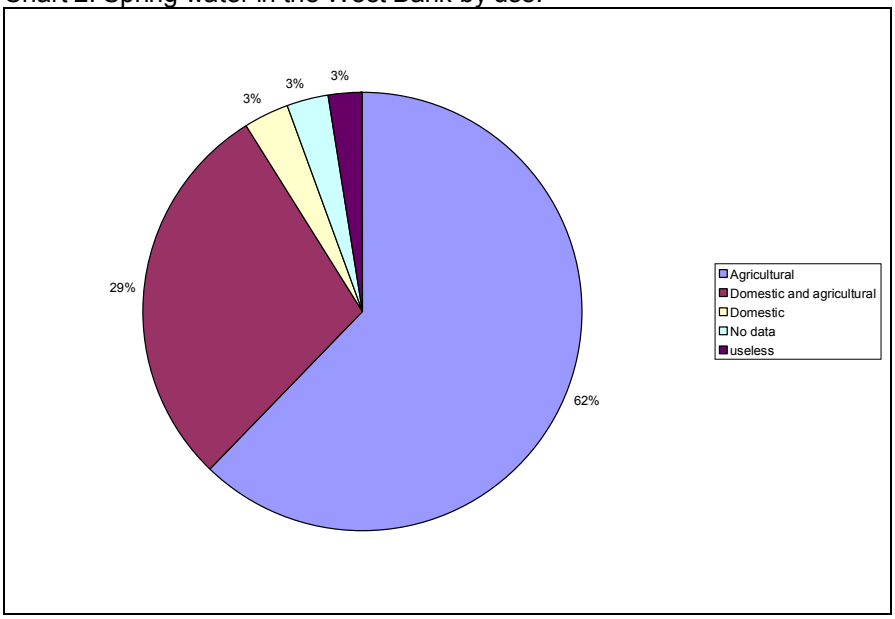
Chart 1: Water in the West Bank by source:



[1] Estimates on the amount of spring water in the West Bank vary. According to the figures presented in the water agreement of the Oslo Accords, springs supply at least 49 MCM/Y. According to other Palestinian sources, spring water amounts to 57.7 MCM/Y (PWA, 2007). According to SUSMAQ (PWA, 2001), some 146 springs in the West Bank have measurable water volumes, totaling 64 MCM/Y.

In the past, many Palestinian communities depended entirely on springs for their water supplies, and some communities still do (Abed Rabbo *et. al*., 1999). There exist up to 500 natural springs and seeps in the West Bank, of which around 150 have measurable flow. Today, spring water is hardly used for domestic consumption any more. The majority of their water (62% or 35.9 MCM/Y) is used for agricultural purposes; some 29% (16.6 MCM/Y) are for mixed use, i.e. both agricultural and domestic; only 3% (2 MCM/Y) are exclusively for domestic use whereas the remaining 6% are useless (1.5 MCM/Y) or have no data (1.7 MCM/Y) (Palestinian Water Authority, 2007). The division of spring water by use is demonstrated in chart 2 below.

Chart 2: Spring water in the West Bank by use:



Water consumption in the West Bank is very low, averaging at 51 liter per person per day (l/c/d) (World Bank, 2004b, 16). **This constitutes about half of the minimum amount recommended by the World Heath Organization** for meeting human consumption and hygiene needs (Howard, 2003). Water availability is restricted by natural scarcity as well as by Israeli control over water resources in the West Bank.

In the context of this unacceptable scarcity, it is alarming to realize that the vast majority of natural springs in the West Bank are polluted and unfit for human consumption. Repeated studies found fecal coliforms in most springs sampled, rendering their use for human consumption dangerous. As a result, a significant share of available water cannot be used, exacerbating water scarcity particularly to vulnerable rural communities.

Chart 3: Springs in the West Bank by governorate:

Governorate	Annual water quantity (MCM/Y)
Bethlehem	2.1
Hebron	0.3
Jenin	0.3
Jericho	21.0
Jerusalem	5.7
Nablus	9.6
Ramallah	10.6
Salfit	0.2
Tubas	7.9
Total	**57.7**

(Palestinian Water Authority, 2007) (note: water volume estimate here is slightly larger than that of the Palestinian CBS).

Pollution of spring water

Over half of West Bank Palestinians live in rural villages. Many of these have traditionally relied on springs for water supply, though their supply source changed to wells and Israeli supply following the water agreement of the Oslo Accords (Scarpa). Today, the vast majority of spring water is not used for domestic consumption but for agriculture, despite prevailing scarcity of domestic supply (see chart 2).

Analysis of most springs in the West Bank shows clearly that they are unfit for human consumption. Abed Rabbo *et. al.* carried out perhaps the largest scale examination of over 170 springs in the West Bank. While they conclude that spring water is generally chemically suitable for drinking purposes, most of those springs are contaminated with fecal coliforms and may not be used for domestic purposes as long as contamination continues (Abed Rabbo et. al, 1999).

Other analysis supports this finding. Scarpa concludes that none of the 75 springs he examined in the southern West Bank were free of fecal coliforms bacterial contamination (Scarpa). Out of 28 springs whose sampling results are available through the Palestinian Central Bureau of Statistics, 22 springs are polluted by fecal coliforms (and all 28 polluted by total coliforms) (PCBS, 2005).

Fecal coliforms originate from human and animal wastewater. When present in water, it indicates the presence of infectious diseases caused by pathogenic bacteria, viruses, protozoa or parasites. Measured by colonies per 100 ml, its concentration in drinking water according to the World Health Organization recommendations *must be zero*. Water in which the presence of fecal coliforms was detected must be disinfected before domestic use (Abed Rabbo *et. al,* 1999).

The contamination of West Bank springs by sewage is not surprising. In Palestinian West Bank localities, only urban centers have a (partially functioning) sewage collection network. Even where it is collected, sewage is commonly discharged to the open environment without treatment (see Tagar *et. al*., 2004). All non-urban localities, including all Palestinian villages, use septic tanks, cesspools, pit or dry latrines and soak pits (World Bank, 2004a). These disposal methods do not treat sewage, but enable its

percolation into the ground: the same ground that contains the shallow aquifer that feeds natural springs. Their subsequent pollution is unavoidable.

The health effects of pollution:

> "Water and Sanitation is one of the primary drivers of public health. I often refer to it as "Health 101", which means that once we can secure access to clean water and to adequate sanitation facilities for all people, irrespective of the difference in their living conditions, a huge battle against all kinds of diseases will be won". (Dr LEE Jong-wook, Director-General, World Health Organization) (WHO, 2004).

Water born diseases are among the worlds biggest killers. Unsafe water, coupled with a lack of basic sanitation, kills world wide at least 1.6 million children under the age of five years. World wide, 84% of the population without access to an improved source of drinking water lives in rural areas (WHO and UNICEF, 2006). The WHO estimates that improved water supply reduces diarrhea morbidity, which causes 1.8 million deaths every year, by 6% to 25%, and improved sanitation reduces diarrhea morbidity by 32% (WHO, 2004).

Available public health data on water born diseases in the West Bank is limited. The best available source is the *Water and Sanitation Hygiene Monitoring Program* (WaSH), conducted by the Palestinian Hydrology Group. The group surveyed the water situations in rural Palestinian communities in recent years. Out of 600 West Bank communities surveyed by the WaSH program, 200 did not have a water network or had a network covering less than 50% of their population (Bashir and Rabi, 2006). The Palestinian Central Bureau of Statistics estimates the number of communities without a water network in the West Bank at 220, with a population of 215,170 as of 2006. This is approximately 10% of West Bank Palestinians (B'tselem, 2007).

Communities without a water network are the most vulnerable to pollution of springs. In the absence of centrally provided, safe water, they rely on three alternatives for their water supply: rainwater collected in household cisterns; water delivered by trucks directly to households; and spring water (B'Tselem, 2001). Often, all these options are highly unsatisfactory.

Where water is stored in household cisterns (both harvested rainwater and water vended by trucks), it is also subject to pollution. A study from 1989 found that 81.2% (out of 288 cisterns sampled) were polluted by fecal coliforms. The study found direct correlation between the proximity of the water cistern to a nearby sewage cesspit and pollution rate, whereby cisterns closer to cesspits showed higher rate of contamination. However, even where the distance exceeded 51 meters, 78.5% of cisterns were polluted by fecal coliforms (Al-Hmaidi, 1989). With the state of sanitation in villages far from satisfactory, frequently relying on unsanitary cesspits, contamination of harvested rainwater is highly likely.

Water delivered by trucks has a significant disadvantage: it is highly expensive. According to World Bank findings, the cost per cubic meter ranges between $2.35 and $7 (World Bank, 2004a). This price is higher than the price paid by many western water consumers, and is often unbearable for rural Palestinians. The burden is particularly high

given the economic crisis resulting from years of conflict, and which led many families to lose their primary source of income.

The third option, use of spring water, is often resorted to when harvested rainwater has diminished during the summer season, and when vended water is unaffordable. However, with most spring water polluted, it may have serious health consequences. The analysis of WaSH survey results shows that over sixty communities in the West Bank, which do not have a water network, experience water related diseases such as dysentery, amoeba, diarrhea and others (WaSH database). Occasional full outbreaks of disease have also been reported, for example in the village of Burin, where 450 cases of Hepatitis A were registered in 2005 in addition to a high number of amoeba cases, both considered a result of spring water pollution by sewage (Bashir and Rabi, 2006).

Implications for water in the West Bank

With nearly all springs in the West Bank polluted by fecal coliforms, it is not surprising that only 3% are used for domestic purposes. However, the current water shortage and anticipated increased demand (PWA, 2007) dictate that all water resources must be protected and utilized to provide best possible benefit. **Currently, at least 34% of available water, i.e. spring water, is lost to pollution.** Such pollution results from lack of basic sanitation, mostly sewage infrastructure in rural communities.

Although this is not the only type of groundwater pollution in the West Bank, it is probably the most immediate. Large scale pollution from Palestinian urban centers is making its way into deeper layers of the shared Mountain Aquifer (See FoEME's Seeping Time Bomb reports: *Pollution of the Mountain Aquifer by Sewage* and *Pollution of the Mountain Aquifer by Solid Waste*). Most of that impact is long term and has not yet resulted in large scale pollution. Pollution of springs is already noticeable, because they are usually fed by shallower aquifers. For that reason, bacterial pollution constitutes a threat to spring water, whereas pollution threats of the deeper aquifer is from chemical pollutants.

Moreover, urban sewage and solid waste are targeted at the policy level, and to some extent on the ground. Indeed, while progress is slower than desirable due to a range of factors, the Palestinian Authority and the international donor community have expressed a commitment to address these problems. The problem of local pollution of springs, however, is not recognized as priority, even at the policy level.

The Palestinian wastewater priorities are directed at centralized treatment facilities, serving first urban and subsequently semi-urban communities. A Water and Sanitation Strategic Planning Study (WSSPS) as well as the Palestinian Environment Strategy state that all communities with a population of 10,000 and up should be connected to a sewerage collection system, with priority to communities of 15,000 people and higher. Treatment plants to serve clusters of small communities are a third priority, not envisioned before 2020 (World Bank, 2004a). All but a few of the communities identified by WaSH as lacking a water network have a population smaller than 10,000. These have no solution before the year 2020, if that.

Adequate sanitation for small communities requires provision of localized, low cost treatment systems. Such systems would prevent pollution of local groundwater resources, which may be turned from agricultural do domestic use. The reclaimed water (treated sewage) may be used in turn for agriculture, minimizing the water loss of that sector.

Properly designed, lower cost processes have been recommended by a World Bank study for West Bank rural communities, claiming that centralized treatment systems are prohibitively expensive for rural areas. The operation and maintenance costs of small scale systems are relatively low, estimated by the World Bank study at $40 per year. (World Bank, 2004a)

The international donor community has largely ignored the sanitation needs of rural West Bank. The major players, Germany and the US, fund sewage infrastructure in large urban centers such as Nablus, Tul Karem and Hebron (FoEME, 2004). Most other donor countries in the West Bank address development and emergency sectors other than sanitation. Palestinian NGOs (for example the Palestinian Agricultural Relief Committee (PARC), the Palestinian Wastewater Engineers Group (PWEG) and the Palestinian Hydrology Group (PHG)), with international funds (from organizations such as Action Against hunger, Save the Children US, and on one occasion the Belgian Technical Cooperation), are the only ones involved in the construction of wastewater treatment plants in the rural areas in the West Bank.

With this report, Friends of the Earth Middle East does not challenge the priorities of the Palestinian policy or of donor countries. FoEME considers the prevention of all water pollution of prime importance. FoEME seeks however to highlight the dire situation of the poorest among Palestinian West Bank population, and the potential water saving that would result from addressing rural sanitation in the West Bank.

If the international community is to reach the targets set by the Millennium Development Goals, a stronger effort on rural sanitation in the West Bank is called for. It is this population that would most urgently benefit from halving the proportion of people without sustainable access to safe drinking water and basic sanitation (targeted by the MDG's for the year 2015). As is the case world wide, also in the West Bank the communities in greatest need for water and sanitation are those in rural areas.

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