21 – 30 October, 2013

Water Markets in Gaza


Rick Bauer – Oxfam GB
28-Nov-13
Contents
Executive Summary ........................................................................................................... 3
Background & Context ..................................................................................................... 3
  Over-reliance on a Single Water Source .................................................................. 3
  Diminishing Water Quality ....................................................................................... 3
  Multiple Water Vendors & Distributors .................................................................. 3
  Confictive Political Context ....................................................................................... 4
  Fragmented Regulatory Environment ......................................................................... 4
  Periodic Humanitarian Crisis ....................................................................................... 5
EMMA & Water Markets in Gaza .................................................................................... 6
  Purpose & Objectives ................................................................................................ 6
  Key Analytical Questions .......................................................................................... 6
  Defining the Crisis Period .......................................................................................... 6
  Targeted Populations .................................................................................................. 6
  Market Actors & Lines of Inquiry .............................................................................. 7
Survey Results .................................................................................................................. 8
  Consumer Preference ................................................................................................ 8
  Supply vs. Demand ...................................................................................................... 8
  Quantity vs Quality ..................................................................................................... 9
  Incentives for Chlorinated Water ............................................................................. 9
  Price Volatility & Credit ........................................................................................... 10
  Diesel Fuel Supply ..................................................................................................... 10
Response Options ............................................................................................................ 11
  Additional Water Storage .......................................................................................... 11
  Neighborhood Water Safety Plans .......................................................................... 11
  Support to Water Vendors ......................................................................................... 11
Recommendations ............................................................................................................. 12
Water Supply in Gaza Market Map .................................................................................. 13
Executive Summary

Background & Context
The Emergency Market Mapping and Analysis (EMMA) tool highlights how people affected by disasters or conflicts access the goods and services they need to maintain dignity, good health and livelihoods. While water is increasingly recognized as an essential human right, people’s access to safe water is primarily shaped by market forces (e.g., the interaction of supply and demand in a market based economy). In Gaza, the market supply and consumer demand for water is heavily influenced by issues that are particular to the hydrology, political and humanitarian contexts of the region. These issues include:

Over-reliance on a Single Water Source
While access to freshwater is a problem for many citizens in many Middle Eastern countries, the 1.7 million residents of Gaza are living under critical water scarcity conditions. With no perennial rivers and limited rainfall, a contaminated underground aquifer (the Coastal Aquifer Basin) serves as the primary water source for all of Gaza. The high demand for water and lack of alternative water sources has led to unsustainable over-extraction of the aquifer. With an estimated natural recharge rate of 50-60 million cubic meters (Mm3/y) per year, currently more than 170 million Mm3 /y is pumped. At current water extraction rates, it is estimated that the coastal aquifer will be unsuitable as a water source in Gaza in less than 10 years.

Diminishing Water Quality
Over-extraction of the Coastal Aquifer Basin is also contributing to high levels of contaminants in the Gaza water supply. Seawater intrusion and pumping-induced changes in aquifer water level have increased the salinity and chloride levels in the water supply. Nitrites from agricultural run-off and waste water percolation have also increased, as well as faecal coliforms and other bacteria. Without expensive filtering or other treatment methods, less than 7% of the groundwater can be used for human consumption.

Multiple Water Vendors & Distributors
Although 96% of Gaza citizens are connected to municipal water supply networks, few neighborhoods receive water on a daily basis due to water losses and rationing. Water losses in the piped distribution system are estimated to be as high as 35-50% in some neighborhoods. While the high level of demand is a major reason for water rationing, electricity shortages throughout Gaza are also impacting on consumer’s access to water. In some neighborhoods, water can’t be pumped through the piped system

---

2 Palestine Water Authority, Water Sector Review of West bank and Gaza 2006
due to the lack of electricity for treatment and pumping systems. In other neighborhoods, householders can’t pump the water from street level connections when it arrives to their roof top tanks due to power cuts.

Despite the use of membrane filters and chemicals to render the water potable and safe prior to distribution, the piped water is often unsuitable for drinking purposes by the time it reaches households. Cross contamination of potable water by wastewater (and in some cases, raw sewage) through cracks and breaks in pipelines is common, and many households complain that the water is too saline for drinking purposes. To meet the demand for drinking water free of objectionable tastes or odors, commercial water vendors have entered the Gaza water market and are competing openly with municipal water utilities. Commercial water vendors purchase water from treatment plants that use advances filter membrane technologies to reduce physical and chemical contaminants in the ground water, and distribute the purified water through tanker trucks to households and businesses. In Gaza, even the poorest neighborhoods receive tanker water delivery – despite the higher cost.

Confictive Political Context

Along with the West Bank, East Jerusalem, and most of the Golan Heights, the Gaza Strip is considered by the UN and many countries as one of the Israeli occupied territories. Although Israel denies occupying power status over Gaza, the Israel Defense Forces control Gaza’s borders, coastal waters, and airspace. During periods of heightened conflict between Israel and Hamas, border crossings are closed. Supplies and materials needed to maintain water production and distribution systems inside Gaza are often held up at the border, especially construction related materials that might be diverted to military uses.

Israel has also used security concerns to block the construction of seawater desalination plants needed by Gaza to reduce the dependence on groundwater from the Coastal Aquifer Basin (CAB). Although the coastal aquifer extends the full width and length of the Gaza Strip and along most of the Israel coastline, there are no trans-boundary water sharing agreements that regulate each countries allocation of the CAB as a shared resource. Some estimates suggest that the Israel Water Company extracts three times the amount of water from this shared resource as Gaza.  

With the military coup in Egypt in 2013 and the loss of power of the Muslim Brotherhood (a key Hamas ally), many of the tunnels between southern Gaza and Egypt have been closed. As these tunnels served as transportation conduits for many goods and materials that helped keep the Gaza economy functioning, their closure is likely to have an impact on availability and price of water production and distribution.

Fragmented Regulatory Environment

The Palestinian Water Authority (PWA) serves as the main regulatory body for water resources management and development in the West Bank and Gaza. In Gaza, the Coastal Municipal Water Utility (CMWU) has the responsibility for delivering, regulating and monitoring water services throughout the country. The ability of CMWU to fulfill its mandates is hampered by the current economic and political crisis in Palestine, and the fragmented nature of the water sector in Gaza. There are low levels of cost

---

recovery by water utilities in Gaza, which is exacerbated by what many consumers view as poor quality service. Anecdotal evidence suggests that water tariffs in Gaza are set at the same rate as they were 20 years ago, despite increased operational and maintenance costs.

Periodic Humanitarian Crisis

Ideological, political, economic and security issues that periodically erupt into military activities have been dominant features of the region since the 1948 Arab – Israel War. Relations between Gaza and Israel took a turn for the worse in 2006 when Hamas rose to political and military power in Gaza. After a series of cross-border military activities between Hamas and the Israel Defense Forces (IDF) in December 2008, the IDF launched a military assault on Gaza known as “Operation Cast Lead”. Over 1400 Palestinians were killed during this 22 day war, and 20,000 people were left homeless. Non military installations in Gaza were targeted or suffered collateral damage, including 20,000 meters of water pipes, 4 drinking water reservoirs, 11 drinking and agricultural wells, and numerous water storage tanks.4

In November 2012, hostilities between the two countries again erupted into an 8 day period of intense conflict between IDF and militant groups affiliated with Hamas.5 While this war was much more limited in its scope and resulted in fewer deaths and damages, essential services and markets were disrupted. The commercial and municipal water market was particularly affected by this conflict, as a water tanker truck was hit by an IDF airstrike, killing the driver and his 10 year old son who was assisting him on his water distribution rounds.

---

4 Institute for Middle East Understanding (IMEU), Fact Sheet: Operation Cast Led (Jan 2012)
5 The IDF code name for this conflict was “Operation Pillar of Defense”.

5 | EMMA Water Market Report _ GAZA _ November 2012
EMMA & Water Markets in Gaza

Purpose & Objectives
The Emergency Market Mapping and Analysis (EMMA) tool is a rapid market analysis technique designed for understanding the effect of disaster or conflict induced crisis on the supply of key goods and services. Due to the cyclical or periodic nature of many crisis, the EMMA tool is also useful as a pre-crisis market assessment and contingency planning exercise. As part of humanitarian grant from the ECHO, Oxfam facilitated a NGO training and market assessment exercise in Gaza from 19-31 October 2013. Three critical markets were selected for further assessment: wheat flour; poultry; and water for drinking and domestic use.

Key Analytical Questions
Key analytical questions are used in EMMA market surveys to help focus interviews with key stakeholders. The two key questions of relevance to water supply in Gaza were identified as:

1. Can the commercial water sector meet the demand for affordable drinking water during times of crisis?
2. Where are the incentives in the market value chain to promote wider use of chlorinated / disinfected water?

Defining the Crisis Period
In the volatile political context of Palestine and Israel, military actions by one side or the other can spark an extended period of confrontation that threatens lives, livelihoods, and infrastructure in Gaza. While the threat of an extended conflict along the lines of the 22 day “Operation Cast Lead” in 2008-2009 remains viable, optimism over the renewed efforts by the US administration in the second half of 2013 to broker a more viable peace between Israeli and Palestinian authorities suggest that future spikes in conflicts will follow the pattern of the November 2012 crisis. For the purposes of this EMMA survey, the crisis period was defined as an 8-10 day period of periodic aerial incursions in Gaza where civilians and critical infrastructure are not specifically targeted.

Targeted Populations
The EMMA survey results can be used to help inform decisions on appropriate interventions by agencies or governments to improve the effectiveness of market systems during the relief and recovery period of a crisis. As each market system has multiple market actors or stakeholders, determining which of these groups are intended to benefit from the proposed interventions is an early decision of an EMMA survey. The EMMA Water Market Team in Gaza selected consumers as the main target populations, specifically poor and very poor households. Using vulnerability criteria identified during a recent socio-economic food security survey in Gaza, the water market survey team interviewed representative households from these groups.

---

Market Actors & Lines of Inquiry

Seven main key informant groups in the Gaza Water Market were identified by the survey team, and questionnaires were developed for conducting structured interviews with representatives of these groups. Groups included:

- *Consumers* (poor, very poor, and middle income households);
- *Water Tanker Operators* (independent truck owner-operators and contract drivers who work for commercial water treatment and distribution companies);
- *Water Treatment Plant Managers* (municipal and commercial treatment plants);
- *Drilling Company Managers*;
- *Water Treatment Equipment & Supply Companies*;
- *Regulatory Agency Representatives*; and
- *NGO and IO staff* involved in water projects in Gaza (including UNICEF and WASH Cluster agencies)

Although most of the questions used during the interviews were tailored to the specific roles and activities of each market actor group, some similar questions were asked of each group. Common lines of inquiry include:

- What are the biggest challenges you currently face in getting (or selling) the water you need (or supply)?
- Are there significant differences in water supply and demand during summer and winter? Does the price change?
- Does your household or business have sufficient water storage capacity?
- How was the supply of water affected by the November 2012 conflict? How was your business or consumption of water affected during the period? What can be done to limit the interruption of water supply during crisis times?
- Would you be willing to pay more or charge more for better quality water? How much more? Would you be willing to buy or sell water that had a residual chlorine level as a disinfectant?

Common questions asked of market actors involved in the production, selling, or distribution of water included:

- How is your business regulated? Does the regulation help or hinder your business?
- What has been the impact of the tunnel closures on your business?
Survey Results

Consumer Preference

For many Gaza residents, the water distributed via the municipal water supply network is considered unfit for drinking. Although treated at the source to remove objectionable tastes, colors, and harmful bacteria, water pumped through Gaza’s aged pipelines is often contaminated by the time it reaches households. Cracks and breaks in water pipes permit sewage and gray water to enter the network, and microbial growth and other forms of bio-fouling of pipes is common. Due to electrical supply problems, pumps are not able to supply enough pressure for water to reach rooftop storage tanks. While many of these problems are common to cities everywhere and can be addressed through routine maintenance operations, municipal water authorities in Gaza are handicapped by a lack of funding for effective water quality monitoring, and an Israeli imposed blockade on materials and equipment needed for repairs and other remedial activities.

As the municipal water supply system struggles to deliver potable water in Gaza, commercial water tanker operations have proliferated to meet the gap. Some estimates suggest that there are approx. 100-12 tanker trucks delivering water throughout Gaza on a regular basis. Trucks fill their tanks directly at water treatment plants, and deliver water to almost all neighborhoods in Gaza. Tanker delivered water is now used by most households in Gaza for drinking and cooking purposes, while municipal water is used for other domestic uses.

Supply vs. Demand

Given the distinction that Gaza families make between drinking water (primarily delivered by tankers) and domestic water (from piped networks), the EMMA water survey team looked separately at these two sources to understand total household water demand. Literature reviews suggested that the average water consumption per household in Gaza was around 80 -90 liters of water per person per day. The poor and very poor households in the target population estimated their total usage at lower than this, around 60 to 80 l/p/d. Drinking water from tanker delivery averaged 4.2 liters per person on a daily basis. The level of water consumption per capita in Gaza is low by WHO standards (100 l/p/d) or when compared with consumption patterns in neighboring Israeli (211-242 l/p/d).

During the 8 day conflict of November 2012, it was estimated that 50-60% of the water tankers reduced their service delivery to a few hours a day (during cease fire periods) or to neighborhoods close to their homes. More independent tanker drivers than company affiliated drivers worked during the crisis, which is likely to reflect the fragility of the livelihoods of independent drivers who may have cash flow problems.

The supply of water available to target groups therefore was reduced, yet the demand remained similar to the pre-crisis period. As fewer trucks were delivering water, there was less production from most

---

7 This figure is based on discussions with EMMA Water Market Survey Team members, and not triangulated with other sources due to time limitations.
8 80 l/p/d: http://www.uruken.info/?p=91989
9 90 l/p/d: www.btselem.org/gaza_strip/20100823_gaza_water_crisis
10 Howard, G. & Bartram, J. Domestic Water Quantity, Service Level and Health (WHO: Geneva) 2003
11 http://www.btselem.org/water/consumption_gap
commercial treatment plants that supply tankers who went from a 12 to 14 hour production cycle to 4 to 6 hrs per day.

**Quantity vs Quality**
The EMMA Water Market Survey identified three main issues related to the quantity and quality of water available during the November 2012 crisis.

- **Reduced Water Supply**: Most households reported that their domestic water supply from piped water networks during the November 2012 crisis was reduced by 20 to 30%. Much of this reduction was due to the increased frequency of electricity outages. Interviewees from many neighborhoods reported that they were unable to pump water to their rooftop storage due to the intermittent electrical supply.

- **Substitution of Water Sources**: As the amount of potable water for drinking is already low, the amount of drinking water that families consumed remained unchanged during the crisis - 4 l/p/d on average. What did change was the source of this drinking water. Many families reported that they boiled domestic water for drinking and cooking purposes, or obtained drinking water from local mosques or *sadaqah* (*sabeeel*) charities which have their own purification equipment. Less than 20% of the families reported that they resorted to using water from untreated sources like wells.

- **Few Significant Health Impacts**: Few households reported increased cases of diarrhea or skin irritations related to reduced water availability during the conflict period. This is not surprising, as 8 days is not a significant length of time for health issues to emerge, especially for families accustomed to periodic disruptions of water supplies. Many households reported that they consistently reserve the cleanest water they have available for children’s hygiene and health, either in times of crisis or not.

**Incentives for Chlorinated Water**
Chlorine is a highly effective, low cost chemical disinfectant widely used by the water sector to kill bacteria that can lead to bio-film buildup in pipes and tank, or diseases such as diarrhea or cholera. Chlorine is also widely disliked by consumers due to its objectionable odor and taste. Few commercial water production facilities provide a sufficient dosage of chlorine to protect the water during transport or storage at home due to three reasons: a) *lack of consumer acceptance*; b) *lack of effective regulation and monitoring*; and c) *high cost of chlorine in Gaza due to Israel blockade*. While the municipal water supply is chlorinated, the high incidence of wastewater and sewage intrusion from broken pipes contaminates the water within a few minutes of it leaving the plant or pumping stations.

While a slight majority of households (54%) indicated they would be willing to pay for better quality water, no one stated they would pay for chlorinated water. The low rate of consumer acceptance and challenges in maintaining and monitoring residual chlorine levels within a decrepit water infrastructure suggests that there are no incentives within the Gaza water market system for chlorinated water.

Currently, it is NGOs and international organizations such as UNICEF and UNWRA that are providing incentives through projects that distribute chlorinated water free of charge to target groups. Anecdotal evidence from these projects indicate that once these subsidized water projects end, there is little interest on the part of consumers to buy or producers to sell water disinfected with chlorine.
Price Volatility & Credit

As the price of drinking water can fluctuate according to seasonal changes in demand and supply, the EMMA Survey team asked consumers, producers/treatment plants, and tanker delivery drivers price related questions. Few tanker drivers or consumers report any significant changes in price between summer months (when there is increased water consumption) and winter months. Nor do water treatment plants change their prices significantly in response to increased demand. None of the stakeholders interviewed report that water prices increased during the 8 day crisis period of November 2012. The average cost of drinking water delivered by tankers has been stable for the last couple of years at 2 NIS per 20 liter container.

Some independent tanker drivers report that they offer credit to some poor households who can’t afford to fill the 2 or 3 ea 20 liter containers need for drinking water. When asked the payment terms of this credit, most drivers shrugged off the question. While the charitable nature of this credit must be acknowledged, it is likely a good business practice in a context where consumers report that they can choose which tanker company to supply their water.

At least one water production and distribution company offers free water storage tanks to new customers as a way of creating customer loyalty. One household reported that they returned the gift tanker to the company as they didn’t like the taste of the water.

Diesel Fuel Supply

Due to the Israel blockade, tunnels under the Gaza border with Egypt have been important to the Gaza economy as a delivery corridor for goods and materials. Since the fall of the pro-Hamas government in Egypt, many of these tunnels have been closed. As a steady supply of membrane filters, chemicals, and spare parts are needed to maintain water production and tanker trucks, the EMMA water survey asked questions to drivers and water treatment plants about supply chains and stocks of spare parts.

Most water treatment plants reported a 2-3 month supply of stockpiled materials. There also seems to be sufficient supplies of spare truck parts in Gaza to handle most mechanical breakdowns. The biggest concern of both treatment plants and drivers alike was shortages of diesel fuel, the largest single consumable in the drinking water market. Drivers need diesel fuel to operate their trucks, and treatment plants require fuel to operate electrical generators and pumping equipment. Although these treatment plants are connected to the Gaza municipal electrical network, the supply is not reliable. One water treatment plant owner stated that they have increased their daily production schedule to meet increased demand as several smaller treatment facilities have closed due to fuel shortages.

Although data about volumes and prices of tunnel supplied diesel fuel was not available, the tunnel closures place additional pressure on an already restricted supply of a critical commodity in Gaza.
Response Options

Additional Water Storage

The majority of households (80%) expressed a desire for additional drinking water storage capacity to help them cope with water delivery shortages and to reduce the time spent collecting water from tanker trucks. Many interviewees were explicit about how much storage capacity they wanted, with 70% expressing a preference for either one or two 250 liter tanks.

As distribution of water storage tanks of this capacity to poor households after the November 2012 crisis was a recommended response option by the WASH Cluster in Gaza, the EMMA Water Survey Team sought the views of cluster member agencies on lessons learned from these distributions. Two issues emerged:

1. Poor and very poor households were unable to afford the 20-30 NIS ($6.00-8.00) cost of filling these tanks.

2. As the average cost of a 250 liter tank is approx 180 NIS ($50), social tensions between those who received free tanks and those who didn’t were exacerbated.

Taking into account these lessons, future water tank distribution programs should consider providing partial subsidies or loans to enable all households to purchase additional water storage tanks. It is also suggested that local merchants and water tanker drivers be included in future water tank distribution programs to avoid disrupting local businesses and to take advantage of established supply chains.

Neighborhood Water Safety Plans

Water Safety Plans can be an effective way of mobilizing all stakeholders involved in the production, delivery and consumption of potable water, especially in rural contexts where there are is often a limited number of water sources and a simplified distribution system. In complex urban contexts like Gaza that is subject to periodic military conflicts; economic and cultural blockades; and severe environmental degradation, an effective water safety plan can take years to achieve its objectives.

By reducing the scope of an urban Water Safety Plan from a national to a neighborhood level, agencies involved in ensuring the availability of potable and disinfected water have a greater chance of success. In Gaza, Neighborhood Water Safety Plans that target consumers and water tanker drivers can indentify locally appropriate interventions and mutually acceptable standards that don’t compromise on the goal of all water safety plans: to ensure safe water “from the source to the mouth”.

Support to Water Vendors

Water tanker drivers are a critical market actor in the Gaza water supply system, providing a continuous service throughout the year at a reasonable price to all neighborhoods, even the most poor. As periodic crisis such as the November 2012 conflict disrupt their livelihoods as well as others, agencies interested in ensuring that Gaza citizens have continued access to safe water should explore options of targeting water tanker drivers for market support interventions. One possible intervention would be to engage drivers in water tank distributions (see above), or incentivize drivers for providing chlorinated water.

11 See http://www.who.int/wsportal/wsp/en/
Recommendations

- **Advocacy towards Israel on Meeting its Water Supply Commitments**
  To ease tensions over water resources between Israel and Palestine, Israel committed ten years ago to pump 5 million cubic meters (mm3) of water per year from Israel to the Coastal Municipal Water Authority in Gaza. Sources in Gaza who requested not to be identified by their organization stated that the actual amount provide by the Israel National Water Company (Mekorot) is closer to 4.1 or 4.2 mm3 per year. During times of crisis such as the November 2012 conflict, Mekorot shuts down their water supply to Gaza, leaving Gaza without this desperately needed water supply.

  In 2009, Israel made public statements to double the amount of water it supplies to Gaza from 5 to 10 mm3. To date this commitment has not been realized, despite funding by the US Government to construct additional pumping stations on the Israeli side of the border. More recently, in November 2013, the US and Israel announced that Mekorot would increase its supply of water to Gaza 20 mm3 each year. The international community should advocate that Israel meet its water supply commitment, and demonstrate more transparency in how much water it sends to Gaza - and at what cost.

- **Market Analysis of Diesel Fuel Supply**
  Although both municipal and commercial treatment plants in Gaza are connected to the national grid, power outages of up to 16 hours a day are becoming increasingly common. The primary reason for this is the lack of diesel fuel, which powers the generators at the Gaza Power Plant and the stand by generators at municipal and commercial water treatment plants. The scarcity and high cost of diesel fuel is also negatively impacting tanker truck operators. Over 90% of all water treatment plant operators and tanker drivers interviewed for this survey stated that the limited availability and high cost of diesel fuel was the single most challenge they face in their business. A market analysis of the diesel fuel supply market in Gaza is urgently needed. Information gained from this analysis can help inform stakeholder in the Gaza water market supply chain on where and what type of support interventions are needed to address this problem. Due to the international sanctions on Hamas and the politically charged atmosphere around fuel and energy in Gaza, a market survey of the diesel fuel supply should be led by a UN agency with a perceived neutral status.

- **Increased Efforts to Address Wastewater and Sewage Problems**
  While attention to the challenges around the water supply market in Gaza are important for the international community to pay attention to, there needs to be an increase in analysis and remedial activities around waste water and sewage problems in Gaza as well. Although sewage and waste water interventions are generally costlier and require extensive infrastructure work, actions must be taken now to prevent further environmental degradation and public health risks. Donors such as the EU should consider prioritizing projects which seek to address these problems as part of their commitment to supporting disaster risk reduction in vulnerable urban communities.
Water Supply in Gaza Market Map

Key to Map:

= disruption to service during Nov. 2012 crisis
Red Text Box = critical issues during Nov. 2012 crisis
Yellow Text Box = exacerbating conditions

Ends.