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**SUSTAINABLE WATER AND SANITATION SERVICES
FOR ALL IN A FAST CHANGING WORLD**

**Unsafe to drink? Perspectives on water quality among
NGOs, commercial firms and consumers**

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Ensuring a reliable supply of potable water for people affected by conflicts or disasters is crucial for daily living and to prevent disease. For humanitarian NGOs and government water service providers, potability is usually defined as water free from chemical, physical and bacterial contaminants. Water consumers, however, typically define water quality from a less technical view. For the end user, the two main questions about potability are: Does the water taste good? And do my neighbours drink the same water as I do?

As part of an ongoing NGO response to facilitating access to safe water by urban refugees and low income communities in Jordan and Palestine, water market assessment surveys were conducted in 2013. A key lesson emerging from both studies was the need for active engagement with local water service providers to help promote a shared understanding of the importance of safe drinking water.

Water markets in urban humanitarian responses

In urban communities throughout the world, drinking and domestic water for households is often provided by a combination of municipal water authorities and commercial service providers. Municipal water typically flows through piped water networks from production facilities to households or neighborhood stand pipes; while commercial companies deliver water via tanker trucks for street side collection or to storage tanks on roofs or in cisterns. Private water kiosks that sell filtered water in bottles for customer collection or delivery have proliferated in many urban settings, especially where the quality of water produced by municipal authorities is considered poor.

For NGOs, UN agencies and donors involved in humanitarian responses to disasters or conflicts, an understanding of how local and national markets react to crisis is becoming increasingly important. While the humanitarian credo “Do No Harm” was originally intended to remind aid workers that emergency assistance may have unintended negative consequences for crisis affected people, it has recently been adapted as a motto for market-based humanitarian interventions. NGO food distribution in areas where food supplies in local or national markets can meet demand is a common example of how humanitarian assistance can have a negative impact on local shopkeepers. Duplication of existing market services is not only cost ineffective, but it can also delay post crisis recovery by local market actors.

In 2010, a simplified market mapping and analysis tool was developed to help the humanitarian community understand how to analyze the impact of disasters or conflicts on markets and the normal flow of goods and services. The Emergency Market Mapping & Analysis toolkit (EMMA) was initiated by a consortium of humanitarian agencies, research organizations, and economists to help guide emergency relief operations towards a better utilization of local economies.

Although readily adopted by the emergency food security and livelihood sectors of humanitarian response, the EMMA methodology has also been used by shelter and the Water, Sanitation, and Hygiene (WASH) sectors. Two recent examples of focused EMMA surveys after natural disasters include an NGO lead survey of water kiosk operators in Haiti following the 2010 earthquake and water tanker operations in drought affected areas of Ethiopia and Kenya in 2012. The findings from these market surveys led WASH focused

NGOs and some donors in Haiti and Ethiopia to engage directly with local water market actors to compliment, not compete, with private sector water supply services.

In 2013, two EMMA surveys looking at water supply in urban settings were conducted by Oxfam with financial support by the European Commission Humanitarian Aid and Civil Protection Department (ECHO). The first took place in Amman, Jordan in September 2013 which focused on the municipal and commercial water supply markets serving Syrian refugees and their host communities in Amman. This was followed by an EMMA training for NGO and municipal water authority staff in Gaza in November 2013, which looked specifically at how low income communities in Gaza are serviced by municipal, private and NGO water suppliers during periods of intensified conflict with Israel where borders are closed and air strikes are common. While the primary objective of each of these surveys was to determine if humanitarian WASH services could be effectively delivered through private market actors, an important issue that emerged from each survey was how people's perceptions of water quality influenced their choices of water for consumption. The key lesson from these studies is that NGOs and donors must consider disaster affected people in urban settings as consumers who make rational choices, rather than passive beneficiaries of aid.

Water access and quality in Syrian refugee communities in Amman

Water supply and demand

Jordan is considered to be the fourth most water stressed country in the world. In recent years excessive agricultural usage has led to depletion of groundwater resources, while surface water from the Jordan and Yarmouk Rivers Basins is shared by Israel and Syria. High population growth has also contributed to the water crisis in Jordan, and since 2011 the population has increased by approx. 500,000 to 1 million with the arrival of refugees from Syria. While some 100,000 refugees live in Zaatari and other camps in the northern part of the country, the majority have moved into rented accommodations or informal settlements in eight of the twelve governorates.

To understand the impact of the increase demand for water exacerbated by the rapid influx of refugees, Oxfam initiated a water market assessment in Balqa & Zarqa Governorates of northern Jordan in September 2013. Using the EMMA methodology, the survey team looked at the supply, demand, and cost of water distributed to refugee and host community households. Three main sources of drinking and domestic water were identified:

- household connections to municipal piped water networks;
- bulk water purchased from water tankers and stored in rooftop tanks or cisterns; and
- drinking water available from local water filtering plants.

An estimated 97% of households are connected to the piped network. Water supply is intermittent, however, averaging 1 – 4 times a week for 24 hour periods. As the water distributed from the municipal piped network is insufficient to meet the demands of most households, additional water must be purchased from private water vendors. These vendors include water trucks selling bulk water and small shops selling filtered drinking water in 20 liter containers. Most residential and office buildings have rooftop or household level storage tanks which are topped up by private water tanker operators on regular schedules. During the summer months of May to September, water demand increases and tanker operators increase their delivery schedules. The price of tanker delivered water also increases during the summer.

Water quality and neighbourhood water filtering shops

A 2010 WHO/UNICEF Monitoring Mission on Drinking Water Quality in Jordan's municipal water networks found 97.8 % compliance with WHO international standards for levels of bacteria, chemical and physical contaminants. Among long term Jordanian citizens and newly arrived residents from Syria, however, there remains widespread distrust of the quality of the water in the piped system. Part of this distrust is historical: in 1998 a malfunction at the main water treatment plant in Amman led to high number of cases of diarrhea and shook consumer confidence on the quality of pipe delivered water. A survey conducted at the same time as the WHO/UNICEF monitoring mission found that over 80% of urban residents in the Amman and surrounding areas purchased drinking water from local water filtering plants.

The EMMA survey found that nearly all people in the survey area, regardless of socio-economic or resident or refugee status, prefer filtered drinking water from private vendors over other sources. Although the drinking water available from these vendors is more than 100 times more expensive (by volume) than similar quality water available from municipal supplies, even Syrian refugees with limited purchasing power routinely purchase of small quantities of filtered drinking water. By prioritizing the purchase of expensive

drinking water over cheaper bulk water, poorer consumers had to ration their water usage. In addition to reducing the number of baths or shower they took each week, it was noted that poorer households tended to flush their toilets less frequently, or use smaller quantities of water when flushing. This has led to blockages in piped sewage systems in many areas of Amman.

NGO response and lessons learned

As water filtering plants in Amman have the capacity to provide a reliable supply of drinking water that is accepted by refugees and the host population alike, one of the recommendations from the EMMA Water Market Survey was for NGOs to provide water vouchers from these kiosks to targeted households. This intervention was adopted by Oxfam for a six month period as an emergency intervention to help support vulnerable Syrian refugees, and was considered successful by consumers and vendors alike. As a longer term solution to supporting access of potable water, it was proposed to distribute water filter devices to targeted households that would enable families to filter the water directly from the piped network. To ensure the availability of replacement filters for these units, locally available two stage water filter units were identified in local hardware stores and purchased. Distribution began in January 2014, and was followed up by post distribution monitoring 30 days later.

The initial monitoring report identified that less than 15% of the targeted households had installed or used the newly distributed water filters. Two main reasons were cited by recipients for the lack of use of these units: inability / reluctance to install the filter units to the wall above or below the kitchen sink (35%); and disbelief that the filters could remove the impurities that were present in the municipal water supply (65%).

Several of the families who identified the second reason stated that the water kiosks in their neighbourhood were demonstrating the ineffectiveness of these devices by showing a cloudy and turbid water sample supposedly produced from the household filters.

Based on these findings, Oxfam increased its efforts at social mobilization and awareness raising with both recipients and local water kiosks around the household water filter distribution. While subsequent usage of the filters by targeted households increased, several of the local water kiosk operators expressed concerns that their business was being undercut by this NGO intervention. Three key lessons emerged from this experience:

- The legitimacy of private water vendors in providing safe water to urban consumers must be acknowledged by NGOs, and supported whenever possible.
- Tackling water quality perceptions through technology is not likely to meet with widespread success, especially if acceptable water is locally available at what consumers view as a reasonable cost.
- Recognition by NGOs of local preferences in many urban contexts for two types of water: drinking and domestic water.

Water access and quality in low income communities in Gaza

Water quality and service providers

While access to freshwater is a serious problem for urban residents 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 rapidly depleting underground aquifer (the Coastal Aquifer Basin) serves as the primary water source for all of Gaza. Over-extraction of aquifer is leading to increased levels of contaminants in the water supply, including high levels of salinity and chloride from seawater intrusion and pumping-induced changes in aquifer water level. Nitrites from agricultural run-off and waste water percolation are also present in exceedingly high levels in the aquifer.

Despite the use of reverse osmosis (RO) filters to render the water potable and safe prior to distribution, water distributed through the municipal supply system is often unsuitable for drinking purposes by the time it reaches households. Cross contamination of potable water by wastewater and raw sewage through cracks and breaks in pipelines is common, and many households complain that the water is too saline for drinking purposes. As the cost of repair or replacement of pipelines is prohibitive, municipal water utilities have a dual water supply. *Domestic* water for cleaning and flushing toilets is supplied through piped distribution systems, and *drinking* water is distributed from specialized treatment plants to independent and commercial water vendors via tanker trucks.

As the demand for potable water free from objectionable tastes and odours exceeds the production capacity of municipal utilities, private water vendors have increased in numbers and are competing openly

with municipal water utilities. Independent and commercial water vendors purchase water from public or private treatment plants that use RO technologies to eliminate physical and chemical contaminants in the ground water, and distribute the purified water through tanker trucks to households and businesses. The reach of these private vendors is so extensive that few neighborhoods in Gaza, even the poorest ones, neighborhoods receive tanker water delivery on a weekly basis.

Impact of conflict on water supply and consumption

Since the drinking water supply in Gaza for the poor and less poor alike is heavily dependent upon the ability of tanker trucks to deliver water, the November 2013 EMMA Water Survey in Gaza looked retrospectively at the last major conflict between Israel and Gaza in November 2012. During this 8 day period of intense aerial bombardment and border closures that prevented any goods or materials from entering Gaza, it is estimated that 40-60% of the approx. 400 water tankers that normally deliver water ceased operations due to insecurity. The remaining 160 trucks reduced their service delivery to a few hours a day during cease fire periods, or to neighborhoods close to their homes. Anecdotal evidence suggests that more independent tanker drivers (vs. company affiliated drivers) worked during the crisis, which is likely to reflect the fragility of the livelihoods of independent drivers.

While the supply of the drinking water delivered to all households was reduced during the November 2012 conflict, the overall consumption of drinking water by poorer households remained roughly similar to pre-crisis period. Drinking water consumption typically averages around 4.2 liters per person per day, and poorer households stated that they relied on neighbours, mosques, or local wells to provide water for drinking and cooking. While some households stated that the poor quality of the substituted water led to increased diarrhea rates, others reported that they treated the water by boiling.

Chlorination in the Gaza water supply

The importance of ensuring that all water intended for human consumption is disinfected throughout the water supply chain is widely recognized by government officials; public health authorities; UN agencies and NGOs involved in humanitarian responses. While technical challenges exist in maintaining sufficient level of residual chlorine water pumped through conflict damaged and poorly maintained piped networks in urban settings like Gaza, the primary challenge is end user acceptability.

During 2010 - 2013, Oxfam initiated a pilot project in Gaza that sought to create consumer demand for chlorinated water. The project targeted two key stakeholders: consumers in highly vulnerable households (very poor families with children under the age of 5 years); and private water tanker operators who serviced these neighbourhoods on a regular basis. Tanker operators were given financial incentives and training on how to maintain residual chlorine levels that were sufficient to disinfect the water without impairing the taste. Households were given water vouchers that could be redeemed for chlorinated water, accompanied by safe water promotion campaigns that targeted project beneficiaries and their neighbours.

NGO response and lessons learned

As the lead agency for the 2013 EMMA Water Survey in Gaza, Oxfam included questions related to willingness to pay for safe water. While a 54% majority of interviewed households (including poor and very poor) indicated a willingness to pay more for better quality water, no one replied positively to the question about willingness to pay for chlorinated water. As the neighbourhoods surveyed included ones where Oxfam has been providing subsidised chlorinated water, the EMMA survey results suggest that chlorination as a water quality parameter is not a widely shared view among consumers.

A related set of questions looked to see where there might be opportunities within the Gaza water market to help incentivise producers and consumers for the promotion of chlorinated water. While almost 100% of the water treatment plants visited during the EMMA survey used chlorine to disinfect their production and treatment facilities, none saw it as their responsibility to ensure sufficient residual chlorine levels in their post treatment storage tanks. Oxfam staff in Gaza also reported that a funding gap in April and May 2013 caused a temporary suspension of the pilot project of chlorinated water distribution by tanker operators. During this suspension, tanker operators involved in the project stopped chlorinating their water because "people won't buy our water if it has chlorine".

Two key lessons emerged from the Gaza EMMA Water Market survey and the Oxfam pilot project:

- Financial subsidies for chlorinated water and safe water campaigns by themselves are unlikely to have a lasting impact. Stronger regulation of water service providers and better monitoring of water quality parameters must also be considered.

- The willingness of poor households to pay for quality goods and services should be recognized more widely and supported more actively by humanitarian and development aid agencies.
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