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TRANSFORMATION TOWARDS SUSTAINABLE
AND RESILIENT WASH SERVICES

**Point of use water treatment technique: lessons from
World Vision's drought response project in
Taita Taveta, Kenya**

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Point of use (POU) water treatment technique is increasingly gaining popularity, particularly in rural areas and in emergency response settings in developing countries. Dire consequences related to water borne diseases heavily manifest when proper preventive measures are ignored. In contexts and situations where local communities use highly turbid and faecal matter contaminated surface waters, specific POU techniques become applicable. In its quest to enhance access to clean and safe water for communities, World Vision-Mwatate program supplied 4670 household beneficiaries with P&G water purifiers for water treatment towards a drought response project. P&G water purifiers incorporate both flocculation and disinfection mechanisms. Moreover, in the course of implementing the project, interesting indigenous methods of clearing water off turbidity were identified. However, clear water does not necessarily mean it is safe for consumption, thus triggering some research studies which are currently underway.

Introduction

World Vision (WV) is an international Christian relief, development and advocacy organization, dedicated to working with vulnerable children, families and communities for transformed well-being. Water, sanitation and hygiene (WASH) is one of the core WV's deliverables. Currently, WV works in Taita Taveta County (TTC), one of the arid and semi-arid land (ASAL) counties in Kenya, with an aim of improving household access to safe drinking water supplies, proper sanitation and good hygiene practices among other WASH interventions. TTC was marked with prolonged drought before onset of short rains in October, November and December 2017 (NDMA Bulletin, 2017). The short rains impacted positively towards harnessing of surface water sources for both domestic and livestock use.

The key water sources for domestic use in the county are piped water, springs, dams, water pans, shallow wells, boreholes, rivers, and streams. Unimproved water sources amount to 56% in Kenya, while TTC is at 37% (SID, 2018). Lack of safe water has created a tremendous burden of diarrheal disease and debilitating, life threatening illness to people (Sobsey et al, 2008). In response, WV in partnership with Proctor and Gamble (P&G) championed an innovative point of use (POU) technique for a drought response project towards alleviating waterborne diseases including diarrhoea in the county. POU water treatment technologies have emanated as one of the low cost options of improving access to clean and safe drinking water especially in the rural resource limited settings. Thus, the discussions in this submission focus on P&G water purifier adopted as a POU in the intervention sites.

POU water treatment technology in Taita Taveta County

WV partnered with P&G towards addressing drought response project, having received moderate short rains, especially in the highlands between the period: October-December, 2017 (NDMA 2017). This led to recharge of surface waters to 80% of their capacities, especially in the lowlands. Considering the heightened competition of livestock, wildlife and human consumption amidst open defecation hence contamination for surface waters, there was need for action to mitigate if not prevent water borne diseases and conditions. In

quest to provide clean and safe water, POU water treatment technique via use of P&G water purifiers was introduced. The water purifier operates on flocculation-disinfection mechanism. Response sites were within 3 sub-counties, being Mwatate, Wundanyi and Voi, having a total of 4670 household beneficiaries. P&G water purifier is as shown in Photograph 1 while Photograph 2 shows the surface waters used to fetch drinking water in the face of competition with livestock.



Photograph 1. P&G water purifier sachet

Source: Google 2017



Photograph 2. Livestock drinking water

Source: Faith/WVK

P&G water purifier is packaged in a 4 gram sachet with 0.546% of calcium hypochlorite where, 2.17 ppm is available chlorine. Each packet treats 10 litres of water. Using the combined process of flocculation with iron sulphate and disinfection with calcium hypochlorite, the product kills bacteria and viruses and removes turbidity (dirt) and parasites. This is the same technology utilized by municipal water treatment facilities, and is also effective in removing cysts, arsenic and pesticides like DDT (PSI). Its treatment mechanism is time specific, while making use of clean stirring rod, 100% cotton cloth (used as filter), treatment and storage facility i.e. 10 litre clear bucket.

The mode of usage is as follows, (depicted in Photograph 3 and 4):

- Introduce the 4g P&G water purifier in 10 litres of surface water.
- Stir thoroughly for 5 minutes, and then let the water stand for 5 minutes. If the water is not clear, stir again until the floc is separated.
- Use clean 100% cotton cloth.
- Allow for 20 minutes rest of water, while it is covered in the secondary clean bucket.
- Only drink after 20 minutes. However, if water is yellow in colour do not drink the water.



Photograph 3.
Water treated with P&G water purifier
(at 5 min. of wait after stirring)
 Source: Faith/WVK



Photograph 4.
Water treated with P&G water purifier
(at 5 min. of wait after stirring)
 Source: Faith/WVK

Coordination for response

A coordination mechanism adopted based on diverse field experience through inter-sectoral engagements and the county, Sub County, and community levels (Figure 1). WVK was responsible for dispatch of P&G water purifier’s consignment to field offices. Standard operation procedures were prepared through strategic partnerships with relevant government line ministries at both the County and Sub-County level i.e. health, water and education. Furthermore, vulnerable beneficiaries consuming untreated surface waters i.e., elderly, single headed households, orphaned children, disabled were identified with the help of local authorities, community health volunteers and village elders.

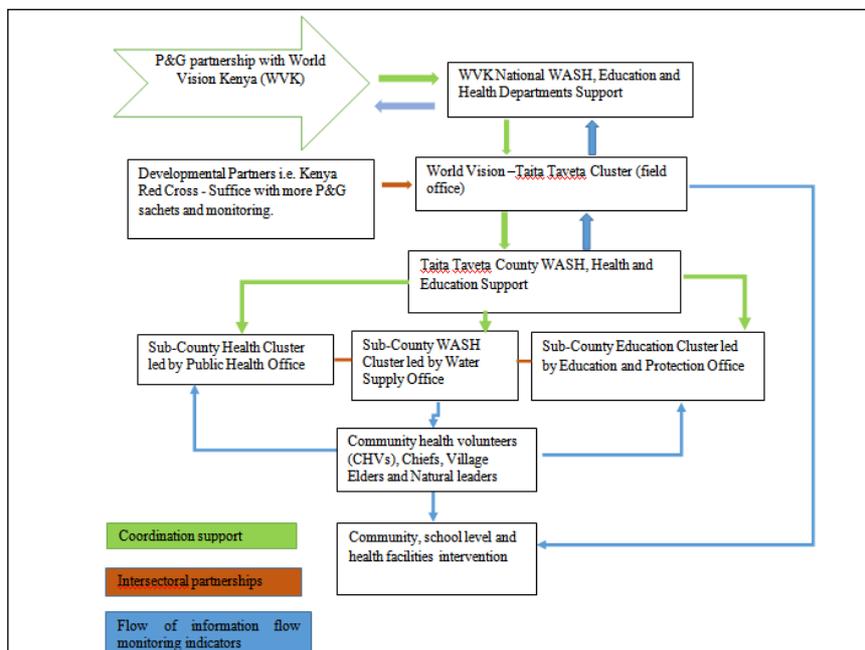


Figure 1. Coordination mechanism for response

Source: Faith/WVK

Other local intervention for clearing water turbidity

While conducting community trainings and monitoring exercises, several locally available clearing agents were identified. However, their significance to public health concerns needed to be further established through an elaborate physical, chemical and microbiological water quality analysis. In addition, the chemical composition of the local agents. Though, they exhibited a coagulant mechanism, '*CLEAR is not necessarily safe and clean for human consumption*'. The indigenous agents are as identified below and concerns attached to their use.

Indigenous twig and tuber derived from 'mkangazighe tree' (Taita language) in photograph 3, attributed a slimy texture in the water in addition to release of odour. Sliminess could be ascribed to the organic particles which start decomposing with time triggering build-up of anaerobic conditions.

Locally available white crystalline rock, photograph 4) readily dissolves in water. Locals complained of scum formation in water when the water was used in laundry /washing activities. Besides, use of the water led to spoilage of boiled beans and mixed milk tea.

Pounded *Moringa oleifera* seeds as natural coagulant: In previous studies, *Moringa oleifera* seeds, have been identified as natural coagulants due to their cationic antimicrobial proteins. The seeds effectiveness as a primary coagulant for water treatment and can be compared to that of alum (conventional chemical coagulant) (Madsen et al.1987; Oslen, 1987; Postnote, 2002) as cited by (Amagloh & Benang, 2009). However, the high residual organic levels limit their applications (Xiong et al., 2017).

All the highlighted substances i.e. mkangazighe, moringa oleifera, mineral rock and white powder presented a great operation challenge regarding dosing quantities; given amount of water, and for what period of time. Currently, water quality analysis are underway to establish if there is a likelihood of introducing foreign substances, which may raise public health related concerns upon consumption of the waters.



Photograph 3. Mkangazighe



Photograph 4. Mineral rock

WASH interventions and lessons learnt

In order to assess the progress and effectiveness of the intervention at ground level, a WASH monitoring tool was developed. However, the overall monitoring and evaluation for the project shall be conducted in March, 2018. The following highlights give the summary of WASH interventions and lessons learnt during the response. Awareness raising on WASH practices and health seeking behaviour continues to be emphasized as part of the health promotion messaging package. Community engagements were achieved through local barazas, key informants interviews, focal group discussions, trainings and meetings in schools and health facilities.

Households' door to door engagement with effective triggering approaches

Community Health Volunteers (CHVs) were mobilized and trained on safe water treatment; handling and storage; sanitation and hygiene behaviours as trainer of trainees (TOTs). The CHVs were involved in door to door campaigns, with a ratio of 1CHV to 100 households. Behaviour change communication was applied in

knowledge sharing, in that, water treatment demonstrations were emphasised with an aim of triggering visual display through floc formation and settling (used as a proxy for faecal contamination). The visual display was found to be an effective tool for building disgust and creation of unpleasant environment, thus triggering the household's to take action. Continued monthly refresher trainings and monitoring were emphasized while using health records to monitor water borne diseases trends. Also, more emphasis were placed on safe handling and storage to prevent post-contamination effects.

Promotion of sanitation and hygiene approaches

Considering the integrated nature of WASH, a component of improving access to sanitation facilities and hygiene messages was integrated in the drought response project. In order to accelerate adoption of low cost sanitation facilities i.e. construction of latrines with hole cover and hand washing facilities; hygiene messages like hand washing with soap/ash at critical times, a motivation factor was incorporated. Through the response project, there was provision of monthly P&G water purifiers, 10 litre clear bucket and 100% cotton white filter cloth for all the household beneficiaries. However, only households that had the basic sanitation facilities were issued with the items. In addition, community led total sanitation (CLTs), triggered communal social norms uptake to end open defecation. Thus, with such a demand driven approach, WASH in totality was addressed. However, more coordinated follow ups with the local public health authorities and chiefs need to be strengthened towards eliminating open defecation and full adoption of sanitation ladder.

Private and public sector partnerships

Strategic and coordinated partnerships were initiated and further strengthened at both County and Sub-county level through stakeholders engagement. Knowledge sharing and feedback forums between government, institutions of higher learning, and development partners for combined synergy. Public health, education and water line ministries supported in training and monitoring exercises. They also served as both opinion and authority figures in during engagements and follow ups exercises. On the other hand, development partners such as Kenya Red Cross supplemented WV with P&G water sachets for beneficiaries that did not have enough to sustain their water treatment culture. Notably, Taita Taveta University (TTU) is currently a partner due in conducting research studies on the identified indigenous coagulants. All these engagements were aimed at leveraging on the limited resources available and diversify experience and expertise of those on board.

Sustainability of usage of POU water techniques

For a sustained uptake and continued quest for behavioural change, there was need to ensure localized viability and up scaling through the following ways:

Knowledge sharing of alternative water POU's techniques

It has been noted that POU chlorination reduces diarrhea risk by 25–85% (Freeman et al. 2009). It was reported that 51% of Taita Taveta households practiced water treatment (WVK, 2016). Taking this in mind, supply of P&G water purifiers was rather a short term intervention as opposed to long term given the potential of its impact in purification of water. Moreover, there was no local market retailer having P&G water purifier supplies. Working from agents that have a social acceptability by communities, alternative low cost and locally viable POU's water treatment techniques were disseminated along P&G water treatment training. However, taking note of turbid waters, locals were trained on using Moringa seeds as a natural coagulant, followed by solar disinfection through use of plastic bottles that allow UV light penetration; use of chemicals i.e. aqua tabs and chlorine powder and water guard. In addition to boiling, commonly adopted by many. Other physical alternatives include settling and straining with a clean, hole free 100% cotton cloth.

Use of social marketing approach to create a market linkage of P&G water purifiers locally

Social marketing is increasingly gaining popularity particularly in the field of WASH (Evans et al., 2014). Local business persons were trained on usage of the P&G water purifier product, and expressed willingness to embrace the venture. Similarly, women groups and CHVs were trained as well on WASH practices in addition to marketing and selling of the water purifiers as an income generating activity (IGA). To facilitate market linkage, WV has been engaging with partners like Populations Service Kenya (PSK), who are the key distributors of the product in Kenya. Assessments of these potential groups are to be undertaken in

February 2018. In pursuit of market linkage with PSK, communities shall be self-reliant in the face of both short and long rains occurrence. Moreover, a culture of consuming clean and safe water shall be sustained capitalizing, on the water treatment knowledge that communities have. However, not until coordinated efforts between developmental partners and county government are actualized towards having an integrated water master plan, towards provision of potable water, contaminated surface waters remain the solution to most in the rural areas.

Use of school children as agents of change to influence adult behaviour

Though the main targets for the project were households, knowledge on WASH practices was also disseminated to schools through their respective health clubs. Identified health club patrons were trained as TOTs and cascaded the knowledge to health club members. It was noted that recognition of children's potential role as agents of change implied that concepts of investment in education should not only be guided by human capital formation for life-time earnings in markets and by cultural dimensions, but should be expanded by inclusion of externalities of children's contributions to a sustainable development of societies (Von Braun, 2017).

Water quality assurance

Following identified indigenous coagulants used by local communities, there was a need to ascertain the physical, chemical and microbiological parameters of the water treated by these agents. The office of public health was involved in samples collection and delivery to government chemist laboratories for full water quality analysis. Likewise, extensive research works are underway on the same in partnership with TTU.

Conclusion and way forward

1. POU's are effective and cost friendly mechanisms of water purification at household level. Therefore, there is need to ensure access to such POU techniques, especially among the rural folks in Taita Taveta who are mostly disadvantaged.
2. Community health volunteers [CHVs] among other community resource persons remain an asset in bridging the interface between the community where most preventable health issues are found and the health system. They may also support the promotion of WASH services and behaviours. Comfortable working conditions, reasonable working hours and ensuring that CHVs are not burdened with responsibilities could increase their productivity. Some level of compensation could be a motivator for CHVs who do not have adequate economic incentives (Aseyo, 2017).
3. The overall response was completely carried out without budget allocation from the government side. Even though their leadership role was one of the key to drive the response, there's need for the dedicated budget allocated from the government for the preparedness and response in case of water borne outbreaks.
4. There's need for water quality testing mechanism in place at service and household level, for periodic monitoring, water source protection, basic personal and food hygiene, environmental sanitation at all level.
5. Comprehensive studies from the obtained water quality analysis results on the available local agents as well as chemical constituent of the local agents as an outward way of addressing sustainability of POU's.
6. Contingency plan in case of outbreak needs to be in place, clearly spelling out the roles and responsibilities of each sector and clear strategies needs to be in place for the common as well as sector wise coordination mechanism.

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Note

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the government/organizations they work for.

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