Mainstreaming Water Security through Rainwater Harvesting (Sand dam)

Type: **Short Paper**

Author: Gloria Berochan
Senior Programme Coordinator, Rural Water, Sanitation and Hygiene
WaterAid Uganda
Contact: GloriaBerochan@wateraid.org
+ 256-773-303992
+ 256-759-389610

Abstract / Summary
In Uganda, the rural population accounts for 82% (28.4million) of the Country's total population (34.8 million). The rural water coverage has stagnated for over five years at 65%. This has been attributed to inadequate technologies to reach those in water stressed areas.The project's targeted district of Napak has water coverage of 59.83%. The district population is predominantly pastoralist in a semi-arid region and affected by a mix of disasters ranging from long spell drought, floods and water insecurity.WaterAid demonstrated a Sand dam technology in Napak district (Karamoja sub-region). This has increased water security for the vulnerable people in eleven villages. To achieve this, a wide range of comprehensive activities were implemented prior to the introduction of the dam; community water needs assessment, feasibility studies, learning visits, stakeholders' dialogues, Community involvement and capacity building. Our recommendation to the sector is to explore major innovations in technologies in order to achieve human right to water.

Introduction

Uganda is challenged with uneven spatial and temporal distribution of its fresh water resources coupled with the ever increasing pressure on the limited resource due to rapid population growth, uncontrolled environmental degradation and pollution. This affects sustainable management and development of the country's fresh water resources. The country has for over years witnessed declined in water levels and also increased water treatment costs. There are considerable variations in the onset of rain seasons as well as significant differences between wet and dry years.

Data from the National Census 2014 provided by Uganda Bureau of Statistics (UBOS) indicates that the population of Uganda by August 2014 was 34.8 million. 28.4 million (82%) are living in rural areas. The national rural water coverage has stagnated for over five years at only 65%[1]. The stagnation is contributed by inappropriate technologies to reach the population especially those settling in water stressed areas and also to meet the competing demand coupled with the increasing population growth. Service fails most often due to high pressure on the limited resources. Majority of the population (35%) with no access to safe water are residing in areas characterized as water stressed.

The year 2003 saw significant advances in the development of the Sector wide approach focussing on water for production and water resources management. But deciding where to invest which technology, how to develop services in an integrated manner has been a challenge requiring data, analysis and successful demonstrations like sand dams.

Sand dams are "*partially subsurface dam build in a dry and sandy riverbed onto bedrock or an impermeable layer. It is constructed across a river to block the subsurface flow of water, hence creating a reservoir upstream of the dam within the riverbed Material*[2]". The reservoir is filled due to percolation of water during flood events. The water within

[1] Sector performance report, 2015, Ministry of Water and Environment

[2] Manual on Sand dam construction by Ethiopian rainwater harvesting association

the riverbed stands out for both domestic use and livestock especially during dry seasons. Hence, providing water security for the different water users and building resilience to climate change.

Context, aims and activities undertaken

The sub-region targeted by this project (Karamoja) is a semi-arid region. Karamoja sub-region has seven districts (Napak, Nakapiripirit, Moroto, Amudat, Abim, Kotido, and Kaabong) with a total population of 988,149 people (478,672 male and 509,477 females)[3]. The population is predominantly pastoralists. The Communities that reside in the sub-region practice small-scale agriculture and livestock farming. Over the past years, the sub-region has experienced a reduction in productivity yields, declined water levels, long drought leading to drying up of some water sources, floods and deteriorating water quality. The sub-region has perennial rivers and with rainfall varying highly, both spatially and temporally, water dries up quickly after the seasonal rains, leaving few sources of water pressurized. The current situation in which there is, perpetually growing water demands and competition from different water users is leading to deepen water insecurity in the region. The situation calls for innovative way of harvesting water during rainy season.

It is in this context that, WaterAid implemented a Sand dam (demonstration) technology in Napak district in Karamoja. The district's total Population was 145,219 people (69,086 males and 76,133 females)[3], the water coverage stands at 59.83% which is lower than the National Coverage of 65%. The sector has been largely investing in point water sources (Boreholes). The depth of boreholes drilled in district ranges from 70m-120m against an average depth of 60m in Uganda. This implies that, the ground water table in the district is low and service fails shortly. The functionality rate is at only 78% again lower than the National figure of 88%. Experience has showed that Boreholes (Hand pumps) are not very technically feasible for sustained water service in such areas. Provision of structures which increase water security for the vulnerable groups residing in water stressed and hard to reach areas has been a challenge. Hence, the need for Water professionals to play an important role in exploring other technological options to build resilience and improve access to water for the different water users. Water being a fundamental right.

Aims
The project was aimed at improving water security for vulnerable people living in post conflict affected areas. These areas previously suffered from insurgencies and are recovering from wars, IDP camps (internally displaced persons)

Activities and how they were done
The project applied a demand responsive approach and supported a comprehensive package of activities as seen below.

Feasibility study: The feasibility study was not only limited to technical (technology) aspect but focused on the wider elements beyond pure technical feasibility i.e. PESTLE Analysis (Political, Economic, Social, Technical, Legal and Environmental). The study found out that, there was bedrock near the river bed; the River sediment largely had fine sand and low silt content in some areas. However, there was evidence that this would not affect the ability to abstract water from scoop holes. Interview with the communities suggested that there were high flows during rainy seasons. The community water needs were for domestic, livestock and food production. There was a strong cultural need to appease the ancestral spirits before introduction of the sand dams. It was also clear that the Council of Elders was the most appropriate entry point into the communities. One area we identified as being critical was ensuring the project processes differentiate between 'community consultation and participation' and true community ownership. Overall, the study established that, the sand dam technology was very effective in the sub-region.

Stakeholders' learning visit: To enhance stakeholders' capacity to design, construct and manage the technology, WaterAid did a learning journey in 2013 to ASDF (African Sand Dam Foundation) in Kenya involving the key stakeholders from the government and partners to implement a sand dam

[3] Uganda Bureau of Statistics (UBOS) census report, August 2014

demonstration project. Following the visit, series of engagement and dialogue were held with political wing, Social and Water Professionals, and local leaders (Elders). As a cultural requirement, the community sacrificed a white he-goat to appease the ancestral spirits as a way to cleanse the construction site. These then led to a buy-in at all levels. However, where knowledge and capacity already exists one may not need to consider learning visits but rather utilize and manage the knowledge.

Community involvement: The local communities actively participated in site selection, provision of local materials and labour. This was very critical to insight sense of ownership in the communities but also to enhance local capacity which is vital for sustainability.

Technical Supervision: Intensive technical supervision was provided during designs, site selection and in constructing other key dam components such as the basement, spillway, foundation ensuring adequate strength and diversion of flow, retention /wing walls to withstand the longitudinal load exerted by both the water and sand was another area for key attention.

Main results and lessons learnt

Before interventions, communities testified of over flooding from Omaniman River and there was no Rainwater harvesting of any kind, limited access to water especially during dry season, communities and animals could share water from the same point, migration and loss of lives in the rivers as a result of high flows during rainy seasons. Today, the stories are totally different;

- ***Evidence of plan to up-scale the innovation by the Government of Uganda:*** A learning journey was held by Directorate of Water Resources Management, Technical support Unit of Ministry of Water and Environment and the Napak District Water supply Coordination committee (the sector) on the sand dam. Reports from the different visits concluded that the sand dam project was successful. This led to incorporation of the technology in Awoja catchment management (Government) plan for wider uptake.
- ***Increased water access for domestic, livestock and food production:*** The dam has a storage capacity of about 10,000m³ and has increased access to water to eleven villages with a population of 3,245 people. During dry seasons, the communities now have access to water for domestic use, livestock and food production. Since the dam construction, local farmers have been irrigating crops using water from the shallow well. This saves especially women and girls' times to other productive activities including school attendance. .
- ***Increased Water reliability***; All the Community members(women and men) interviewed said they now have water throughout the year as opposed to the one month retention period before the dam was constructed.
- ***Increased Water levels:*** The water table has risen and as a result water availability has increased. This is supported by the presence of water within the river sediment at a depth of half a meter compared to the 3m water level during the dam's construction.
- ***Permanent settlement:*** Majority of the men and women interviewed, testified of significant reduction in migration in search of water especially during dry seasons. This is because there is assured water in the dry season; people no longer migrate to other places in search of water.
- ***Significant reduction in water speed***; the construction of the sand dam has slowed the flow of water in the river and saved both human and animals' lives. "*Previously, livestock and people used to die crossing the river each rainy season which is not the case now*" voices from the community members.

Lessons learnt;
We learnt a couple of lessons from this project. some of these include;

- When introducing a new technology in a community it's important to respect their cultures and beliefs to get social acceptance. In this case, the community buy-in was sought after sacrificing a white he-goat to appease the ancestral spirits.

- The involvement of key stakeholders[4] in both project design and implementation is very vital for the success of the project. Additionally, ensuring the project processes differentiate between 'community consultation and participation' and true community ownership is very critical.
- Enabling environment attributed to positive response and embracement of the Project by the Community and District Local Government was very key for the achievement
- Appropriate site selection is the most vital for the sand dam technical sustainability.

Illustration of voices of the beneficiary community members

Conclusions and Recommendations

In conclusion, Sand dams need not to be viewed only as a means of extending improved drinking water coverage as they may add more value by taking the strain off existing water supply interventions thereby bringing about sustained coverage rather than extended coverage. Water harvesting is crucial for communities with long dry spells, seasonal rains, and low ground water potential but also for building resilience to climate change. In this way, sand dams are a more appropriate source for achieving equity and inclusion in such context.

We therefore recommend that; Water professionals should examine collectively the entire range of elements, needs and to design innovations which respects the human right to water and other competing and complimentary water needs as these are critical for sustained service. Specifically to this;

- Sand dam is an appropriate solution for areas with seasonal channel rivers, low ground water potential as the dams are aquifer re-chargers.
- To introduce sand dams, significant buy-in has to be sought from political leaders, professionals and community members.
- Appropriate sites for the sand dam should consider both technical and social aspects. These include;
    - ✓ Real demand from the community for water for production and domestic use as well
    - ✓ Best constructed where there is a tradition of mass community participation in construction but also provision of local materials and labour. This creates a sense of ownership.
    - ✓ Proximity to communities where water will be used
    - ✓ Sites where the bedrock is at or close to the river bed are preferred since this keeps construction costs to a minimum.
    - ✓ There should be Coarse sand grand sediment
    - ✓ Large dimensions and high flows during rainy season, facilitating big storage.
    - ✓ Low silt content.

- The technology requires intensive supervision during construction of the basement, foundation, spillway, retention /wing walls to withstand the longitudinal load exerted by Water and the Sand. The spillways should be designed to accommodate the peak floods and the annual floods.
- It is also important to take into account the impact of sand deposition onto the flood plain as this reduces its water holding capacity. This can be done by introducing contour bunds which helps to deposit the sediment more evenly.

Acknowledgements

We do acknowledge the contribution from the following stakeholders;

- European Union (EU-Water Facility) for the financial support
- Napak District Local Government for provision of enabling environment
- The beneficiary community members for contributing materials and taking charge of Operation and Maintenance.
- The Programme support unit of WaterAid-UK for technical support and African Sand Dam

[4] Government, CSOs, communities and private sector

Foundation, Kenya for allowing us learn from them.

References

Manual on Sand dam construction by Ethiopian rainwater harvesting association
Napak District annual report, 2015.
Feasibility studies report, WaterAid
Ministry of water and environment sector performance reports,2015
Awoja Catchment Management plan, 2015 - Ministry of Water and Environment

Contact Details
Name of Lead Author: **Gloria Berochan**
Email: GloriaBerochan@wateraid.org

Name of Second Author: **James Kiyimba**
Email: JamesKiyimba@wateraid.org
Name of Third Author: **Grace Alupo**
Email: GraceAlupo@wateraid.org;

Annex 1: What communities say

Lomoe Peter 48 years old a resident of Lomuria village, Lopeei parish tells how the sand dam is transforming human and livestock lives in the community. "I was there from the beginning and I took part in the construction of the dam. Most people in my village had never seen this technology and many were not supportive at the beginning because they believed River Omaniman was sold, others were worried that the river would dry up because it would annoy the ancestral spirits". It really took serious discussion with the elders to make them understand how sand dams work and how beneficial it will be to the community.

After sacrificing a white he-goat to appease the ancestors, the elders accepted the construction to commence and many people (men and women) from the village participated in the construction," says Lomoe Peter.

"Today, the story is totally different, the sand dam has become the darling of the village, and we no longer have any fears that the dam will dry our river. We have also come up with a local name for the sand dam technology -"Ethimit" which can be loosely translated as the "Cement of the bridge." All people in the community and nearby villages appreciate this technology because they know it keeps water beneath the sand throughout the dry season.

Before the dam was constructed, the river was made up of big rocks, there was no sand to cover these big stones. Today, one side of the river is full of sand which store water in the rainy season for use in the dry season. We used to dig deep to reach water, today its just half a metre. The sand dam is very good; we did

not have any water problems for both our homes and animals in the previous dry season. Because there is assured water in the dry season, people no longer migrate to other places in search for water.

The dam has also reduced the speed of water, people and animals used to die in the river during raining seasons. Today, we have not heard any one dying after the construction. In the dry season people have started growing vegetables on the banks of the river to sell in the market for an income."

Nicholas Lomilo 61, Parish Chief of Lopeei had this to say:
"During construction of the dam I held the role of supervision and monitoring the construction. Before, it would take only one month of dry season for the river to run out of water. People and animals used to migrate in search for water, however this time the river has provided us with water kept below the sand throughout the dry season. We are now able to access water from the dam during dry season. We do not allow animals to drink from the same point where we get water for domestic use but rather from troughs by the side. People no longer have to live with fears of no access to water because they have seen the goodness of the sand dam."

Nawogo Jacob 70 years, "Water from the sand dam is safe for drinking because it has already been distilled. My wish is to raise the wall so that more sand is protected from going to the other side of the river."

Adeun Madelena, 35, a mother of six

"This dry season we did not have to migrate anywhere in search of water. We could just make shallow scoops in the sand and water came. This dry season, I planted some vegetables by the banks of the river

to eat at home as well as sell in the market for an income. We use the water from the sand dam for cooking, feeding our livestock and even drinking because it is safe, already distilled by sand."

Iriama Robert, 68, a father of 20 children, married with four wives

"The construction of the sand dam on our river has slowed the flow of water in the river. Before, livestock and people used to die crossing the river each rainy season, since the dam construction, we have not heard of anyone who died in the river. The speedy running water used to carry all the sand along with it and we could see the river bedrock all the time. Now the river has accumulated sand which stores water for use during dry seasons."