



Lessons, Successes, and Challenges from the Rehabilitation of East Bank GFS

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1.0. BACKGROUND

In its quest to reach Everyone Forever in Chikwawa District in Malawi, Water For People embarked on a rehabilitation drive of the Eastbank gravity-fed water supply system (GFS). The Eastbank GFS has four interconnected schemes - Mapelera, Limphangwi, Livunzu, and Mbadzi - serving a combined population of around 60,000 people.

This paper reflects the key lessons, challenges, and successes that have been observed during the rehabilitation of the schemes in Eastbank.

1.1. Why Rehabilitation

Eastbank GFS is one of the major water supply systems in Chikwawa which is crucial for the supply of water in three Traditional Authority (TAs) areas: TA Makhuwira, TA Katunga, and TA Maseya, with the lion's share of the system in TA Makhuwira.

The Eastbank GFS was constructed in the early 90s, catering to a small population at that time. With the passage of time, demand for water increased with population growth in the area. Apart from the increased demand, the following issues compounded the need for rehabilitation:

- High sedimentation levels at the intakes
- Low water levels due to poor positioning of the intake pipes
- Old infrastructure
- River-crossing support structures were in a bad state or washed away

The flooding in 2015 was a triggering event for Water For People to undertake the rehabilitation drive. As a result of the floods, a greater part of the Eastbank GFS infrastructure was washed away, rendering the schemes non-functional. Though attempts were made (by other sector players) to maintain the systems after the floods, the work did not bring the systems to the required functionality.

1.2. Achievements

The first scheme to be rehabilitated was Mbadzi, followed by Mapelera and Livunzu, and finally Limphangwi. The rehabilitation did not only look at maintenance issues, but also considered uprating of transmission lines and upgrading of storage facilities. Key components of the rehabilitation included:

- Construction of new durable intake weirs on all four schemes
- Uprating of raw water pipelines
- Improving water treatment works by replacing filter media in all schemes
- Increasing storage capacity at Livunzu and Limphangwi
- Addition of one slow sand filtration tank at Limphagwi
- Construction and uprating of distribution lines in all systems
- Construction of new water points and complete aprons (Mbadzi – 86 taps, Livunzu – 87 taps, Limphangwi – 110 taps, and Mapelera – 70 taps)

For the rehabilitated systems, Water For People will engage the Chikwawa District Council for their active participation and monitoring. From observations on the ground, the following issues require the Council's attention:

- **Lack of routine and preventive maintenance plans of the systems:** All four systems have been handed over to the Council and the communities. Despite full knowledge that the systems lie in flood prone areas, the district does not have routine and preventive maintenance plans, reducing operational efficiency of the system. Water For People will provide start-up funds and support the Council to develop these plans.
- **Lack of ownership:** After handing over the systems to the Council and communities, the Council has not yet taken over full responsibility of managing the systems. In many cases when there are issues, the communities still call Water For People for technical support. In the rehabilitation of Limphangwi GFS, there was no participation of the Council at technical site meetings.
- **Vandalism and theft:** There is observable vandalism and theft of taps and other system accessories. This can be attributed to the lack of ownership as there is no strong reinforcement of discipline by the relevant authorities.

The systems are not necessarily unsustainable, but rather they require high level political will from the Council to complement the work completed by Water For People. There is a lot of work to be done (by the Council or Water For People) to promote a culture of ownership of the systems among the users.

2.0. KEY SUCCESSES

The process of rehabilitating the Eastbank GFS took four years. The project began in 2017 with selected components of Mbadzi GFS. In 2019/2020, Water For People completed a major rehabilitation of the Livunzu and Mapelera GFS. Finally, in 2020/2021, Water For People finalized implementation with Limphangwi GFS. Despite some social challenges, all systems are technically functioning and supplying water to the communities.

Throughout the project, the Water For People team maintained an open mind that improved the processes with each passing year. Through the process of learning, Water For People identified key successes and best practices, described below.

2.1. Good Contract Management Processes

Limphangwi rehabilitation was undertaken in a difficult environment when the world was hit by the COVID-19 pandemic and several restrictions were put in place. Despite the pandemic, because of good contract management processes, Limphagwi GFS was implemented without facing problems. The Water For People engineer and supervising consultant collaborated very well to provide the technical oversight in this challenging situation. No labor issues were reported, which is a signal of good contract implementation.

2.2. Durable Infrastructure

Before the rehabilitation undertaken by Water For People, there were frequent reports of infrastructure (mostly intakes) being washed away. Prior to construction, Water For People engaged a consultant to undertake design reviews and improve on the initial designs that were made by another consulting firm. With this rehabilitation, intakes were designed to withstand floods. When Cyclone Idai hit in 2019, it did not have a significant effect on the intakes and pipe river crossings.

2.3. Chlorination Dispensers

One of the notable successes of the Eastbank GFS is the installation of chlorine dispensers in the two clear water tanks of the system. Water For People noted that there might be some bacteria contamination in the pipelines and decided to boost residual chlorine by installing dispensers.



A chlorine dosing unit at Limphangwi during construction

2.4. Sustainability

While accepting that ownership and leadership of the schemes have not been fully embraced by the district, communities are taking responsibility of the operations of the systems. In Limphangwi and Livunzu, there is a comparatively active management scheme that is overseeing the daily running of the schemes. In all four schemes, there is allocated personnel that clean the intakes in case of blockages, especially during the rainy season. This is done by the schemes themselves without any support from Water For People.

3.0. KEY CHALLENGES

3.1. Heavy Siltation at the Intake

Siltation is significant at the intakes of the Eastbank GFS. In the recently constructed Limphangwi GFS, there are two intake pipes. In February 2021, one intake pipe was completely blocked due to heavy sediments upstream. As a result of this blockage and reduced intake capacity, there was reduced flow of water.

Water quality was also a challenge. Siltation increased the sediment load which is transported alongside the water to the water treatment facilities. Because the facilities are designed to treat specified levels of sediments, the filtration process is compromised by this sediment increase, negatively affecting the treatment.

3.2. Lack of Maintenance Plans

The Eastbank GFS intakes lie in flood prone areas and, almost every year, there are reports of intake pipes washing away. All four schemes have already been handed over to the Council and the communities. Despite full knowledge that the systems lie in flood prone areas, the district does not have routine and preventive maintenance plans, affecting the operational efficiency of

the system. For example, every rain season, a few areas experience erratic flow of water due to damaged intake pipes. It is imperative that the Council develop annual routine and preventive maintenance plans to avert such challenges.

3.3. Reaching Taps

One of the main challenges that we experienced in Mbadzi was the struggle to reach all taps with water. The problem was exacerbated by the fact that the contractor had started constructing the taps without first flushing the pipes to determine the hydraulic flow of water. By the end of implementation, most taps were not getting water as expected.

3.4. Implementation Delays

Rehabilitation of Livunzu and Mapelera was done at the same time as the Eastbank road maintenance project. These two major activities running concurrently affected the rehabilitation process of the water system as more attention was given to the road project.

There were also delays, especially for Mapelera, due to lack of urgency from the Council to undertake the pipe re-routing process. Due to the road maintenance project, the government released funds to the Council to relocate pipes that were within the road reserve and on Mapelera Bridge. However, the relocation was not done in time, and Water For People needed to provide extra resources for the relocation of such pipes after noting the delay, complicating the completion process.

3.5. Aged and Broken Pipes

Another challenge encountered was the huge number of old and broken pipes. As a rehabilitation project, the design was based on the assumption that some pipes were still in good state. However, after work on the intake and transmission line was completed, it was observed that the distribution lines could not stand the pressure due to the capacity increase. For example, in Mapelera, a new main pipeline (of more than 12 Km) was laid because the old line that was assumed to be in good state during the design phase was bursting on daily basis. This forced Water For People to source an extra MK 80 million to fund this new pipeline and other associated works.

3.6. Lack of O&M Manuals

Because they are technical in nature, ideally each GFS has an operation and maintenance (O&M) manual, together with “as built” drawings. While the Mapelera and Livunzu systems were completed, the contractors did not produce the O&M manuals.

For Limphangwi, the O&M manual was produced and shared with the community during the official handover of the system. However, there may be different interpretations of the manual due to low literacy levels of the management committees.



Mbadzi water treatment works outgrown by grass

3.7. Lack of Ownership and Leadership

Lack of leadership and ownership of the schemes has been identified as one of the key challenges affecting smooth operations of the systems. Ideally, the operations of the schemes are entrusted with the Water User Association (WUA) through the various scheme committees. The WUA and scheme committees are supposed to be supervised by the District Water Development Office. On the ground, not much effort is given to the ownership of the scheme, leading to unattended faults, vandalism, and an unkept look of the schemes.



An unattended fault at Mbadzi

3.8. Lack of Capacity

Some scheme committees lack the capacity to attend to and rectify faults observed in the systems. This capacity can be attributed to lack of technical personnel within the WUA to attend to such faults. The reorganization of the Eastbank WUA aims to improve the situation.

4.0. KEY LEARNING POINTS

The rehabilitation of the Eastbank GFS has offered Water For People in Malawi some major learning points that will propel the organization in the right direction in its quest to improve the water supply situation and reach Everyone with safe and reliable water services.

Information gathered from interviews and observations indicate that there are frequent wash-aways of pipelines, especially at the intake area and river crossings; high prevalence of stolen, leaking, and vandalized pipes; non-functioning valves; ineffective water point committees; non-usage of O&M manuals due to low literacy levels of scheme committees in charge of the system; and, as expected, political interference.

In 1989, research carried out by the University of Malawi – Centre for Social Research¹ indicated that many GFS in the country were not operational due to several problems, including low level of commitment and ownership of communities to maintain the GFS. In 2019, Water For People published a brief on [Fostering District Ownership of the Eastbank GFS in Chikwawa](#) on lack of commitment by the Council to take leadership in the O&M of the schemes. It is concerning that points raised in 1989 are still emerging even 32 years down the line.

Observations from the four schemes in Eastbank indicate that the schemes are only partially working, as shown in the table below.

Scheme	Year Rehabilitated	No. of Taps Rehabilitated	No. of Taps Currently Working
Mapelera	2019	70	18
Livunzu	2019	86	50
Limpangwi	2020	110	110
Mbadzi	2017	87	40

Source: Scheme Revenue Collectors

These data show several taps are not working. Scheme managers indicate various reasons, including:

- Some taps have been closed due to non-payment.
- Some taps have been stolen.
- Some public infrastructure works (road works) have affected the performance of taps.
- Some taps are not working due to low pressure. This low pressure in most cases comes from reduced head due to faults (leakages) that are left unattended.

4.1. Leadership

Leadership must be quickly addressed if the Eastbank GFS is to succeed. Both technical and administrative leadership is needed.

During the construction of the Limpangwi GFS, a contract that lasted for seven months, there were technical site meetings that were arranged on monthly basis. These meetings were planned to act as a platform where all stakeholders would discuss and agree on technical solutions pertaining to the contract. However, during the construction of Limpangwi GFS, there was no single day when the Council participated in these technical meetings. This was a concern considering a number of prickly issues that were encountered during implementation.

¹ Petros Nandolo Zuzani, Raphael Ackim, Khumbo Kalulu (2013), Sustainability of Piped Water Supply Schemes in Malawi through Community Management, Journal of Basic and Applied Scientific Research.

For example, there were issues with the pipeline route from the intake to the treatment plant where the contractor was being denied access on some sections of the stretch by villagers. This is an area where Council intervention was required.

An example of the impact of positive leadership was the support rendered directly by TA Mphuka of Thyolo, where the intake of Limphangwi is located, in resolving with villagers who were blocking the contractor from laying pipes on some sections. Despite not benefitting from the supply himself, the TA's understanding of developmental issues propelled the implementation and completion of Limphangwi GFS.

Another aspect of leadership is political will within the community which helps manage disruptive elements that may work against the project or contractor for their own interests. Such a so-called "concerned members" group was encountered during the handover ceremony of the Limphangwi GFS.

4.2. Siltation

For all four systems, when it rains, a caretaker must go to the intake to manually clear debris that comes with surface runoff. The heavy siltation of the intakes affects the flow of water when the intake pipes are blocked by sand.

As an implementing entity having rehabilitated four schemes, Water For People needs to come up with solutions to curb the vice. We believe that during the design phase of these systems, consultants should make provisions for silt control structures upstream.

As a remedy for intakes that have already been constructed, the Council should make O&M plans that include construction of sand traps in the form of check dams to reduce the flow of sediments.

4.3. Procurement

Another major learning in the Eastbank rehabilitation is related to procurement of service providers (contractors and consultants), including decisions made during procurement. Experience or track record of work of this nature should be given the utmost priority to avoid disruptions during implementation. In the case of Mapelera, Water For People awarded the contract to a contractor that had indicated similar work before, but we did not take time to seek evidence from the acclaimed clients. This proved to be a difficult contract as the contractor did not finish the work, and the contract ended in disputes. In the end, the work was completed directly by Water For People which incurred significant additional costs and time extension from the donor.

Another lesson in project implementation is to take bold decisions when it matters. With Mapelera, the contractor had breached a number of contractual obligations. As a client, we did not act fast and ended up in a tight corner in regards to the completion of the works.

Advance procurement of contractors facilitates smooth implementation of huge volume construction projects. During rehabilitation of Mapelera, Livunzu, and Limphangwi GFS, Water For People made deliberate efforts to identify contractors well in advance. Having an understanding that charity water grants have an implementation period of 12 months, advance procurement was essential, considering the topography where implementation is difficult in the rainy season. Despite a contractual hiccup in Mapelera, the work was successfully completed.

4.4. Maintaining Scope of Work

Of the four schemes rehabilitated in Eastbank, the recently completed Limphangwi GFS was completed with good speed and quality. The scope of the work did not go through any reduction process. Prior to the bidding process, Water For People in Malawi engaged a consultant for a design review assignment. The initial design of the system was done in 2017, and learning from Mapelera and Livunzu, the original design estimates were significantly below market values.

For Limphangwi, a review enabled us to have updated costs. Despite the design review, the tendered costs (for the lowest evaluated bidder) were still above the budgeted estimate. However, Water For People considered various budget lines within the grant and identified areas with potential savings. This avoided reducing the scope which would eventually affect the quality of work.

The following table indicates the budgeted estimates, tendered prices, and prices of reduced scope for Mapelera, Livunzu, and Limphangwi.

Scheme	Budget			
	Engineer Estimate	Tendered Amount	Reduced Amount	Contract Amount
Mapelera	139,934,240.00	209,729,325.45	144,097,399.56	145,000,000.00
Livunzu	186,794,567.85	255,895,288.15	189,733,988.89	193,000,000.00
Limphangwi	185,232,137.89 ²	352,517,290.39	N/A	352,517,290.39

This clearly shows that the initial design of the rehabilitation works grossly underestimated the costs. For Livunzu and Mapelera, the scope was reduced to accommodate the available budget. Limphangwi maintained the tendered price after Water For People successfully made re-allocations to cover the gap. This scenario underscores the need to undertake detailed review processes for works of this nature, especially considering the volatility of the local currency.

4.5. Internal Capabilities

After going through contractual hurdles with the contractor of Mapelera GFS, we realized that it is possible to successfully undertake some construction work using direct implementation given the resources and adequate time. As the contractor failed to honor the contractual obligations and Water For People still had commitments with charity: water, a bold decision was made to complete Mapelera work using direct implementation. The work was supervised by the Program Engineer with support from the Mapelera community. The work was completed, all taps received water, and work was formally handed over to the community.

5.0. CONCLUSION

The Eastbank GFS is one of the most important water supply sources in Chikwawa. The rehabilitation drive led by Water For People is a major step in the quest to reach Everyone Forever in Chikwawa.

While the system has been rehabilitated and working properly, it is imperative that Water For People engages the Chikwawa District Council on governance modalities of the system. If the governance issues are not addressed quickly, running the systems will become expensive as more maintenance works will be required on a more frequent basis.

² After the design review by EMD, the Engineer's estimate was revised to MK 244 Million.