Polycentric LocAl Led Climate AdapTation ChampION (ACTION) to Build Resilience to Droughts in Hanzila Village, Southern Zambia

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Cover photo: Agricomm Media & Marketing Ltd, Women using piped water from the newly developed solar powered borehole in Hanzila village, Southern Zambia

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CGIAR Initiative on Climate Resilience

The CGIAR Initiative on Climate Resilience, also known as ClimBeR, aims to transform the climate adaptation capacity of food, land, and water systems and ultimately increase the resilience of smallholder production systems to better adapt to climate extremes. Its goal is to tackle vulnerability to climate change at its roots and support countries and local and indigenous communities in six low-and middle-income countries to better adapt and build equitable and sustainable futures. Learn more about ClimBeR here: https://www.cgiar.org/initiative/climate-resilience/

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Summary

As part of the "ClimBeR: Building Systemic Resilience Against Climate Variability and Extremes" initiative, the Zambia spotlight developed a case study on "Water Access and Management in Community-based Water Tenure" in two rural communities of Zambia. The study highlighted insights into bottom-up, top-down polycentric decision-making processes that people come up with to advance local solutions to preclude challenges from the risks and impacts of climate change around the interconnectedness of water, food, and land for sustainable livelihood development and reduce people's vulnerabilities (Mweemba et al. 2023).

Aside from local solutions, the study highlighted the role of external support in enhancing adaptive community capacities to respond to the impacts of climate change. This highlighted the importance of mobilizing workable solutions into next-layer interventions, such as external financing for water infrastructure through vertical and horizontal integration processes.

Of significant relevance for this project stage, the Case Study on Water Access and Management in Community-based Water Tenure recommendations pointed to investment in public water infrastructure, such as boreholes, to ensure extensive coverage of people accessing water resources. Prioritizing the development of water infrastructure equally contributes to equitable access to water for drinking, domestic and productive uses and guarantees communal tenure in the ownership, access and use of communally owned sources. With recurrent droughts and uncertainty resulting from extreme weather events, investment in water provides opportunities for communities to have reliable water sources that open up opportunities for food security through small-scale crop farming activities and livestock watering, especially when and where other reliable water sources dry up due to droughts or cannot be accessed due to excessive flooding.

Following up on these recommendations, ClimBeR's Loc**A**lly Led **C**limate Adap**T**ation ChampI**ON** (ACTION) Grant Program focused on interventions driven and implemented at the local level in Hanzila community, with the involvement and leadership of community members, organizations, and local governments. For example, initial stages involved initiating collaborations with the community in Hanzila community project goals which was by followed by diagnosing of challenges resulting from impacts of climate change within the community and determining appropriate solutions for community adaptation. These interventions were tailored to the community's specific needs, priorities, and context and aimed to build resilience against the impacts of climate change. As such, the ACTION project was initiated to develop a water infrastructure for a community to build community resilience to climate change adaptation through a champion community-led project. The community of Hanzila collaborated with the ACTION Grant Program and the local authorities to pursue funding opportunities to respond to the community-identified water infrastructure requirement to fulfil their water needs. As a result of the CGIAR ClimBeR initiative, the ACTION Grant program financed the budgetary requirement of installing a solar borehole infrastructure within the community.

The project highlighted the significant horizontal and vertical polycentric decisions by community members in advancing local solutions to improve access to water and the role played by government and donors in polycentric decision-making processes in providing solutions for improved access to water for drinking, domestic and productive uses.

1. Introduction

1.1. Water in Climate Resilience

Water is central to all aspects of life (Chaplin 2001) and climate resilience. Improving water security in ever-changing temperatures and reducing water access due to droughts mitigates the impacts on household income streams derived from crop production and livestock production, especially for rural communities that rely on water and land for survival. In the same way, volatile food prices due to reduced crop production in extreme weather events are well managed when investments in water resources provide opportunities for people to produce the right amount of food that reduces the impacts on people's consumption patterns (International Management Water Institute 2022).

Other fundamental principles in enhancing access to water are improved access for drinking and domestic uses, such as cooking, bathing, washing clothes and cleaning surroundings (Bwire et al. 2020; Crouch et al.2021; Howard et al. 2020; Shan et al. 2015; United Nations 2014). Equally, livelihood activities and economic growth, such as livestock watering and crop production, are key water users that require access, mainly in rural communities (International Labour Office 2019). Water contributes to eradicating poverty at the household and community level (Brocklehurst and Janssens 2004). Readily available water in the right quantities and quality is also crucial for enhanced health through clean water's role in preventing diseases and promoting people's dignity at the community and household levels.

While water contributes to rural development, the challenge remains that access to water for required needs is not always universally accessible (Delia 2022). Many people still lack access to clean water resources. WHO-UNICEF (2015) highlighted that 2.1 billion people lacked access to clean water, with a large population, estimated at 159 million, still drinking unclean water from surface sources such as open streams and rivers. Rural populations continue to lag in water access compared to urban populations globally (Kamba et al. 2016).

The Zambian picture is not any different. Rural water access is 48 percent compared to 87 percent in urban areas (USAID 2022). With climate variability, the challenge is more compounding for people. For example, reduced precipitation to promote water recharge and increased water reservoirs persistently decrease physical access to water for drinking, domestic, and productive activities in rural areas. Women and girls must cover long distances to access water for drinking and domestic uses. Sometimes, distances are more than a kilometre from home, against the generally accepted 500 m distance to fetch water for drinking and domestic use for rural populations (African Development Bank 2006). For men, providing water for livestock becomes a daunting task, and they have to cover long distances to find open sources such as rivers and streams for livestock watering.

For many years, communities have shown their unwavering ability to cope and adapt to the impacts of economic and social shocks, such as droughts and floods, when they have no choice but to adapt (Smit et al. 2001; Schipper 2009; Madzwamuse 2010). Over the years, communities have adopted new and sometimes unfamiliar strategies to tackle the effects of climate variability and change (Schipper et al. 2010) and increase the resilience and capacity to cope with climate change impacts (Adger et al. 2007; Prowse and Scott 2008). For example, they manage groundwater resources and use primitive technology, such as buckets and small containers to access groundwater from hand-dug wells or scoop holes.

Others in rural communities develop scoop holes in dry riverbeds to get water. At the same time, others forego livelihood activities that heavily depend on water and use the available water resources for drinking and domestic uses (Mweemba et al. 2023). They also collaborate with other community members to develop timetables that allow access to water at different times of the day for different uses. They also collaborate to build relief water sources that have helped communities cope with climate variability since time immemorial. This shows examples of solutions in community-based water tenure being highlighted when households in communities drive their local solutions to gain and enhance access to water in horizontal bottom-up polycentricism in water resource access and management.

Although people's ability, in low-income rural areas such as in rural Zambia, to adapt is evident through horizontal local solutions, it is no longer enough to rely on what has been the practice for water access since time immemorial. More integrated responses in vertical governance, from international, national, provincial, and district levels to local levels, are needed to better mobilize communities' age-old horizontal knowledge and practices on how to deal with climate variability. In the recent past, local solutions in rural areas, such as scoop holes and walking long distances to access water, could not sustain people's water needs. The impacts of climate change, such as dry spells and droughts, make it hard to continue the lifestyle people have used to survive since long. For example, solutions such as using small streams and scoop holes have no sustainable means of living beyond certain dry months in a year because drought years with limited rainwater causes them to dry up. The impact on farming activities is felt almost immediately because the drying up of water sources causes people to halt agricultural activities.

The demand for water supply has also increased, and impacts of climate change are felt more now with increased variability in temperature increases and reduced rainfall (Jain 2007; Neubert et al. 2011; Thurlow et al. 2009). Increased intensity of climate change impacts decreases the adaptive capacities of communities. In rural communities, as seen elsewhere, climate change is reducing potable water and shrinking resources to cater to the growing demand (Ishaku and Majid 2010). The recurrent and severe impacts of climate change threaten the existence of humanity with increased heat waves, potentially increasing disease occurrence (USGCRP 2016; CCSP 2008), and the elimination of food sources due to shocks to agricultural food production. Moreover, the adaptive capacities are constrained by limited social safety nets for rural communities because rural social safety nets equally rely on good climatic conditions to thrive. For example, rural communities have used livestock as a resource to fall back on when there is crop failure. They tend to sell the livestock and use the raised funds to educate children and provide food for their households (Mweemba 2019). However, unfavourable climatic conditions affect the existence of livestock in rural communities. There is limited pasture for grazing and limited sources of water for drinking. This causes livestock to die of hunger and thirst. Animal diseases also increase with increased changes to the climate (Chang 2023). Therefore, the need to support and confront the impacts of climate change becomes urgent.

ClimBeR's Loc**A**lly led **C**limate adap**T**ation ChampI**ON** (ACTION) Grant Program aims to provide opportunities for enhanced livelihoods, to continue crop and vegetable growing throughout the year to improve nutrition at the household level and the surplus sold to earn income. Moreover, with recurrent crop failure resulting from droughts, dry spells and floods, the vertical integrated support by the ACTION project is locally led, recognizing and strengthening bottom-up polycentricism in water infrastructural development to provide sufficient amounts of water required for crop production and livestock watering. Food security – provision of adequate food needs and nutrition and elimination of hunger and vulnerability are prioritized under the ACTION project to reduce community vulnerability to climate change. The project also intends to reduce the water burden on women and children who spend hours accessing water at congested boreholes, which could be spent on more productive activities.

This ACTION program is being implemented in Hanzila community in Zambia. This report presents the evolving processes of this project up till end 2023, within the overall program goals and broader conceptual context of community-led water and climate security in horizontal and vertical polycentric decision-making.

1.2. Goals and Objectives

ClimBeR's Loc**A**lly led **C**limate adap**T**ation Champ**ION** (ACTION) Grant Program aims to advance practical solutions through infrastructural water innovations and development for community locally-led adaptation to risks of climate change, climate variability, and extreme events around the water-food-land nexus. The ACTION initiative in Zambia supports community-led adaptation to climate change by providing a reliable water source for drinking, other domestic uses, irrigation, and livestock and mitigating climate impacts. This also responds to community priorities in integrated water tenure and access.

More specifically, the project has the following two main objectives:

- Develop enhanced water infrastructure to improve adaptation to climate change and
- Foster a community-led demonstration initiative in building resilience to climate change for enhanced water access for drinking, food security and sustainable agricultural development.

The project also demonstrates collaboration with local government for joint choice of a reasonably representative site to draw lessons learned that can be replicated elsewhere or up scaled through polycentric vertical integration in water resource development. This demonstration project by ClimBeR highlighting ClimBeR's focus on polycentric governance and locally led planning is already active in Monze District and Hanzila village, as elaborated below.

1.3. Conceptualizing Polycentric Governance

Recognizing the growing water challenges, compounded by the impacts of climate change, that are seemingly increasing over the years, is the starting point for vertical and horizontal polycentric decision-making processes where different layers of actors, i.e. communities, district-level government and funders, devise solutions to respond to the water needs of the people at the local level. For example, through vertical integration, donors devise projects to allocate or implement water infrastructure for communities to reduce the impacts of water shortages. To a certain extent, donor projects and initiatives are driven by the earmarks and availability of funds to be allocated under a project and by responding to the community's calls for support (Mweemba et al. 2023).

District-level government responding to community needs highlights vertical integration. At the minimum, communities would request and apply for water infrastructure, such as a borehole, from the local government when there is limited supply. Accessing such water resources implies that communities must meet the stipulated rules and regulations recommended by the local government, such as mandatory community contributions of an initial fee and in-kind contributions. While these rules and regulations instill a sense of ownership among the users, they also highlight vertical integration at district level government enhanced through obligatory regulations passed on to communities (Mweemba et al. 2023).

Climate change, specifically droughts, impacted people's water access to water for drinking, domestic use, livestock watering, gardening and general well-being (Mweemba et al. 2023). The study highlighted the bottom-up, top-down polycentric governance decision-making processes supporting climate change adaptation. It showed that people devised several initiatives at the community level through horizontal integration to adapt to the impacts of climate change, such as digging shallow wells or scoop holes to find water in dried-up river beds. Other adaptations were around migrating from usual places of dwellings to find alternative sources of income in urban locations.

However, while local adaptation options were most prevalent, some of the community solutions in dealing with the impacts of climate change were mobilized into next-layer governance, with the district-level government playing an active role in providing water resources through top-down vertical integration to enhance water access for people with inadequate access to drinking, domestic use and livelihood activities such as gardening and livestock watering.

The only sure way is investments in infrastructure through polycentric vertical and horizontal integration, where financiers and communities interface with various processes to bring out water in required quantities and quality to provide water to people affected by water insecurity. Importance is placed on ensuring that livelihoods are sustainable by providing adequate water resources. In Hanzila village, investing in water infrastructure for rural populations contributes to eliminating the water challenges and addresses the physical water scarcity facing many people today. More so, investment in water reduces the skewed rural-urban representation of water access, which shows better access for urban populations than rural populations (World Bank 2020).

Other past research has shown the role that external funding plays in enhancing water access for rural communities through vertical integration (Mweemba et al. 2023). For example, through their rural water development programs, district local governments develop boreholes for communities to access water for drinking, domestic use, and productive use. In the same way, external funds channelled through projects provide funding for investments in water access to respond to identified water needs at the community level. All this happens through tiered bottom-up and top-down polycentric decision-making processes where vertical and horizontal agreements are entered into between developers and communities for each to meet their responsibilities. On the one hand, donors promise to meet the final obligation of investing funds for infrastructure development, and on the other hand, communities pledge their commitments to sustaining water infrastructure. Through horizontal integration, communities devise local rules that safeguard the infrastructure and ensure sustainable use and management. It is usually through a water committee selected through democratic processes.

Aside from rules, communities determine what is critical for their development. Community participatory processes in deciding the type of water infrastructure help to align proposed water infrastructure to the purpose of water infrastructure with community needs. By definition, community participation is people's involvement in projects intended to solve problems they face[1]. It is also looked at as a process where groups discuss an array of issues pertaining to their development initiative to determine the best possible

[1] https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/es/ES12CD.pdf

course of action and solutions that benefit all parties involved (Ndekha et al. 2003; Claridge 2004). At the heart of discussions, communities focus on short-term and long-term water needs, mostly bordering on drinking, domestic use, crop and livestock watering. Rules of access to water infrastructure and management have vertical and horizontal implications as they are entered into with clear highlights of each user's contribution and way of conduct.

On top of devising water infrastructure for communal use, land tenure comes into play. Choosing neutral locations for implementing water infrastructure is one sure way of ensuring access to water for all. However, not many places are without ownership in today's context because most land has been taken up by households or is used as farmlands by families. This is not only true for state land but also customary land. Under customary tenure, local traditional leaders are paramount in ensuring land allocation to households and communities for various uses. In the Zambian context, local chiefs primarily own land within their village or jurisdiction. They use the birthright of owning land in their village to pass different pieces of land to other families or individuals as people request land to use. The unwritten rule is that the land remains in the ownership of the traditional leader, yet families can use that apportioned land for generations and may still refer to the piece of land as their own (Fischer et al. 2002; Cotula 2011). Such apportioned lands stay within the family for generations and are passed on to sons or daughters of the family through generations.

Where communal use for land is required, in the case of public water infrastructure development, community members agree to let go of pieces of land for the common good. This does not disadvantage anyone because land chosen for infrastructure development is surrendered to the community and considered public land. Again, the community may enter into a verbal or written agreement highlighting horizontal integration to ensure that the piece of land given to the community is safeguarded and becomes community property rather than having someone claim ownership of the land.

With all the issues surrounding access to water and the importance of structuring processes that promote sustainable water access and use in communities facing the impacts of climate change, devising new infrastructure for the common goal requires concerted effort throughout the processes to ensure stability even beyond project implementation.

1.4. Conceptualizing Participatory Processes

Contemporary developers understand the significance of bottom-up approaches in resource development (Isidiho and Mohammad 2016). The bottom-up approach is 'an approach that allows the local community and players to express their views and help define the development course for their area in line with their views, expectations and plans'[2].

Community participatory processes that allow people to collaborate horizontally to determine steps to achieve water infrastructure development have shown creative ideas that respond to needs that affect people on the ground and propose solutions to address community problems. A sense of responsibility and ownership is also instilled when communities participate in determining projects that address their needs (Ishaku and Majid 2010).

2 https://ec.europa.eu/enrd/sites/default/files/leaderii_teaching-kit_booklet-chap4.pdf

However, this literature about community members 'participation' or 'involvement' in projects that impact their livelihoods is quite general. A lot of factors should be considered when understanding what constitutes participation. A key issue remains on how involved they are from the onset, with a better understanding of what the projects are about in reality and buying into the idea more meaningfully. In some cases, fewer voices constitute 'community participation', which should be well managed to enhance a sense of ownership in users for sustainability.

This report, however, highlights participatory methods used in the Hanzila case to understand the community context and select the most suitable water infrastructure that responds to the community's needs.

A step-wise participatory process adapted from IWMI Working Paper 194 (van Koppen et al. 2020), is adopted to analyze the implementation of a community-led water borehole to enhance resilience to agriculture and food security in rural communities of Zambia, as shown in Figure 1.

While the proposed methods highlight best practices of community participation in polycentric decision-making processes in water resource development, the generic operationalization of the adapted participatory process is not rigid. In the Hanzila case, some steps coincided with others, particularly the initial stages, while others played out as proposed in the IWMI Working Paper 194 (van Koppen et al. 2020). Nonetheless, all necessary considerations occur at whatever stage, and any next steps require some action on earlier steps. In practice, further refining earlier decisions, for example, in the construction phase, can bring up many new possibilities, but also unforeseen ones. This, too, is an opportunity for much more learning for future project implementation of a similar nature.

i) **Step 1, Initiating collaboration:** This stage is intended to initiate a conversation about the project and identify and communicate goals that the project would achieve.

ii) **Step 2, Diagnosing:** Community engagement and community-led identification of specific challenges resulting from extreme weather events and water scarcity.

iii) **Step 3, Envisioning Solutions:** Solutions to identified challenges are discussed, and specific and essential issues are prioritized to be addressed.

iv) **Step 4, Fitting the financial framework:** Infrastructure costs are determined and presented for financing and contracting.

v) **Step 5, Implementation:** Sites are agreed on, land tenure issues are concluded to guarantee equal access rights for all, procuring materials are done, and actual implementation of water infrastructure is done.

vi) **Step 6 Using infrastructure:** Monitor and evaluate the project's impact regularly to ensure that plans align with proposed implementation plans. Where variances are noted, adjust strategies as needed to ensure the project goals are met.

Figure 1: Stepwise participatory process to implement a community-led water infrastructure to enhance resilience to agriculture and food security.

(Source: van Koppen et al. 2020)

1.5. Methods and Structure of the Report

This remainder report on the Hanzila project is subdivided into several chapters. It highlights the context of Hanzila village, followed by process documentation, which shows partnerships and initial contacts with the district-level government to introduce project goals. This is then followed by events for each of the six steps highlighted in the preceding sections and specific cases, comparing with evidence elsewhere in Zambia or globally.

This report, therefore, documents the process with the information provided by local government partners through key informant interviews and by the community through focused group discussions and interviews throughout the steps. Responses provided by district-level partners and community members were recorded through audio, and notes were taken.

The national facilitator was responsible for facilitating activities within Monze district and Hanzila village of the ACTION project. As the first author, the facilitator was also responsible for documenting the processes from start to finish. The second author represented IWMI in mobilizing funding and contracting for the development of the borehole. The third author assisted with the reporting of the process.

2. Context of Hanzila Village

The case of the ACTION project discussed in this document takes place in the Southern Province of Zambia, in Hanzila village of Monze District. Monze district is predominantly rural and covers an estimated total area of about 4,771 square kilometres[3]. The population of the Monze district is currently 268,432 (CSO 2022). This is a 2.9 percent annual population increase from the population in 2010, with a total of 191,872 people (CSO 2012; CSO 2022).

The district is about 180 km southwest of Lusaka, the capital city of Zambia. From the tourist capital in Livingstone, which is situated further south of the country, Monze is 300 km away. In relation to Monze town, the ACTION project was implemented on the western side of the district, approximately 18 km from Monze's main business centre. Hanzila is accessible by gravel road, with some parts hard to pass, particularly during the rainy season. Hanzila village has limited developed infrastructure except for a few, such as water hand pumps, schools, and health care facilities that serve the people in the catchment area.

Hanzila village, like the rest of Monze district, is characterized by agrarian economic activities that are the mainstay for people in the district. Most people depend on rain fed crop production as the main economic activity that sustains their livelihoods. Major rain fed crops include maize, cotton, sunflower, groundnuts, sweet potatoes, and soya beans. The dry season has also seen few farmers engaging in farming vegetables on small pieces of land for household consumption, and the excess is sold within communities and in marketplaces to earn income. However, the limited access to water sources limits farming activities in Hanzila village and Monze district at large. There is no developed technology in the community, such as dams, to support agricultural activities and provide much-needed income sources for people. This contributes to high poverty levels among people and limited access to proper nutrition at the household level. However, few individuals have diversified their income sources through small-scale economic activities such as trading and transportation. Their target market is people in the main business centre of Monze district, which is the central hub for economic activities.

Recurrent droughts and floods threaten food security and agricultural opportunities for rural communities in Monze district. The last two decades have seen steep increases in poverty levels, resulting in lost income due to crop failure in some farming seasons resulting from droughts (Katema and Siwila 2019). Population increases and increased water needs for crop and livestock farming causes an added strain on existing water infrastructure accessed by communities for domestic and productive uses. The area also has limited man-made water reservoirs that are much needed to support livestock and crop production during the dry seasons. The available naturally occurring water reservoirs dry up at the end of the rainy season. With limited investment in technology that holds sufficient water resources for community use, crop and livestock watering remain challenging, especially among communities that rely heavily on farming for their economic activities.

Investment in water for communities that depend on agriculture of crops and livestock for survival remains the only means to sustain such communities to enhance reliable access to water for improved food security through small-scale farming activities, particularly in the times when impacts of climate change cause more recurrent droughts and cause water sources to dry up in later times of the year.

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3 https://citypopulation.de/en/zambia/admin/southern/0908__monze/

3. Partnership with Monze District Government and Site Selection

The chapter begins by highlighting engagement with district-level staff directly linked to enhancing adaptation capacities to local communities and actors responsible for agriculture and rural water supply development. The engagement also led to the identification of Hanzila village.

In January 2023, the national facilitator for the ACTION Project made initial contacts with district-level government from the Ministry of Agriculture in Monze district to understand their work supporting communities to adapt to the impacts of climate change and various community initiatives of interest in the district. The District local government responsible for rural water supply was also engaged to understand how district-level interventions on water supply were implemented at the community level. Moreover, the interest was also to know how polycentric vertical and horizontal decision-making processes play out in external support for water infrastructure development and what constitutes a qualifying community to be supported through external financing.

Through initial contacts and discussions by the ACTION project with the district office at the local government and Ministry of Agriculture, it appeared that Hanzila village was one of the communities in Monze district where community members had devised several community initiatives to better their livelihoods. For example, the community has been involved in livestock rearing and milk production designed to improve their livelihoods. Also, three (3) hectares of land had been allocated for this. This was a collective effort from the entire community and therefore spurred interest among district-level staff in the Ministry of Agriculture, seeing that community members were working together to advance their wellbeing through local initiatives that highlight the highest form of horizontal integration processes.

Despite community efforts to advance their wellbeing, limitations were noted among community members because they lacked adequate water resources to boost their activities. Most of what needed to be achieved required a sufficient water supply. For example, livestock support for livestock watering requires enough water because cattle, for instance, require more than 20 litres daily to have enough to drink. Similarly, milk production requires adequate water to keep the milk collection centres clean and sanitary.

The single borehole equipped with a hand pump in the village was inadequate to support all livelihood activities for the community whilst using the borehole to access drinking and domestic water. This improvement had not been achieved yet despite writing to the local government to get an additional borehole equipped with a hand pump.

Moreover, it was clear that the community was driven to improve their livelihood. Yet, the local government had limited funding to enhance the community's efforts through any support that could come through vertical integration.

While these challenges highlight the problems in Hanzila Village, conversations with district-level staff confirmed that the problems faced by Hanzila Village were representative for the entire district. Rural communities in Zambia experience inadequate water supply for drinking, domestic and productive uses. The challenge of limited funding from government to finance water infrastructural development is widespread. Nonetheless, contacts with the Ministry of Agriculture at the district level highlighted all these issues facing Hanzila village. It was made clear that Hanzila village presented a thought-provoking case compared to initiatives and efforts from other villages that could be interesting to explore further and get a clear understanding of various bottom-up and top-down polycentric vertical and horizontal integration decision-making processes at multiple levels that drive the community to work collectively and advance community initiatives and also efforts around enhancing community access to water through local means and external support.

These features of Hanzila village drove an initiative to develop a better understanding of what the community was doing. Therefore, contacts were made with the community leaders to engage in conversations regarding the community initiatives in their village.

At the district level, data was collected from the Ministry of Agriculture and the Monze District Council officials. The critical participants narrated the context of Monze district holistically concerning climate change impacts and adaptation practices and the role of water in improving adaptive capacities in communities.

In-depth interviews were conducted using unstructured interview guides with each key target participant to allow for open discussions on opinions and experiences about how they perceive district-wise contexts concerning impacts of climate change on agriculture, water and livestock rearing and the existing adaptation practices devised at the local level and how district level government supports the initiatives.

The interviews were done face-to-face to get all insights and allow follow-up questions on responses that were not clearly understood. It also allowed the interviewer and the participants to see that all ambiguous queries and issues were clarified since the interviews were conversational.

4. Step 1: Initiating Collaboration

In February 2023, the ClimBeR team, in collaboration with government officials from the Ministry of Agriculture, visited the Hanzila village to initiate conversations with the community about the ACTION project and communicate the project's goals.

Community participation was open to all members of Hanzila village. Through contacts with the local leadership, all community members were invited to initiate discussions to highlight issues about their community, highlighting issues important to the community and challenges people in the village face in accessing water for drinking, domestic and productive uses. This means that men, women and young people were all invited to be part of the discussions.

To enhance representation of all community members, a complete mix of people was present during the meetings, including all water users – pastoralists and crop farmers, people in various local leadership positions such as Ward Development Committees, members of the cooperative, elderly men and women, young girls and boys.

Furthermore, participation was not restrictive in numbers and represented the entire community. The meeting intended to get all available views and hear from several voices regarding the situation in Hanzila village. Figure 2 shows part of the group present during discussions with members of Hanzila village, where they highlighted various challenges they faced and explained how they collaborated to work together to enhance their well-being.

Figure 2: A group discussion with community members in Hanzila village

(Photo: Agricomm Media & Marketing Ltd 2023)

With a profound understanding that enhances solutions for access to water for various uses through polycentric governance systems, the initial visit was also intended to explore how the ACTION project could contribute to meeting people's multiple water needs. Contextual knowledge of polycentric vertical and horizontal integration in water access and management and existing community development initiatives highlighted by district officials at this meeting drove conversations to begin initial engagements centred around communicating project goals of the ACTION project as providing practical solutions through infrastructural innovation for community locally-led adaptation infrastructure project to enhance adaptation to the risks of climate change around the water-food-land nexus. Further, the meeting ensured that linkages within communities were created with people, including men, women, and youth, that would contribute to realizing the project goals.

Apart from communicating the ClimBeR project initiatives and goals, communities committed to sustaining the water resource infrastructure by having an operational water point committee that would care for the infrastructure and maintain a fund for repairs in the event of the breakdown of the borehole or its key components.

5. Step 2: Diagnosing

Once the project goals were clarified, several meetings were held where the ClimBeR team moved to understand existing water access opportunities for people and climate change-related stressors, extreme weather events, and water scarcity issues affecting people's livelihoods in the area. Diagnosing water-related and climate change challenges is a starting point for building insights into issues of importance to members of the community that provide opportunities for enhanced access to water.

Community members, including men, women, youth, community leaders, and cooperative groups, discussed community context in relation to settlements, domestic and productive water uses, and impacts of climate change over time in the area, as highlighted in the subsequent sections.

5.1. Focused Group Discussions

The initial form of data collection at the local level entailed gathering information from all community members through a public meeting. An unstructured interview guide was used to clarify each issue about the discussed subjects. This gave a basis for the Hanzila village and existing local projects, the community's water needs, and climate change impacts.

The second part involved splitting groups according to gender and understanding different priorities for climate change adaptation and water needs among men and women. At this point, community members, through their grounds, recounted issues on the subjects provided as a means of discussion. The discussions were recorded with audio recordings and notes.

At the end of the separate group discussions, groups were brought together to hear from each group what issues were necessary for their gender and what constituted priorities for adaptation to the impacts of climate change on food, water, crop farming and livestock rearing. This process indicated the community consensus with specific issues pertaining to men and those that affected women.

5.2. Participatory Mapping of Water Resources

Understanding water access gaps and opportunities requires a fair understanding of existing water resources in a community. Where communal water sources are used, the ideal situation is that each household has equal access to the public water resource. In reality, this is not the case. Several factors lead to such situations, including the geographic location of the water resource or infrastructure in relation to households and different water use priorities.

The participatory mapping exercise of the water resources was intended to map out different water resources and infrastructure in Hanzila village in relation to households. This showed how some households were closer to different water access points than others, presenting much more need for water than those closer to water resources.

Community members were given large pieces of paper, and men and women in different groups drew their villages and households about existing water resources in the village. Various water sources depicted their essential uses. For example, the community members showed which water resource was primarily used for livestock watering and gardening and which included water access for drinking, as shown in Figure 3. This means single-use sources and those of multiple uses were also mapped out with consensus among participants.

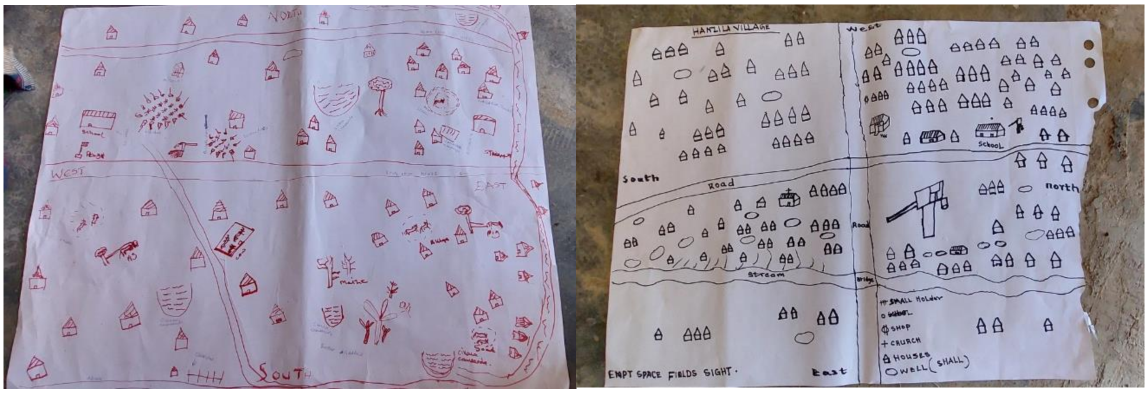


Figure 3: Community resource mapping done by men and women in Hanzila village

(Photos: Mweemba 2023)

Further, other essential resources in the community that contribute to enhancing livelihoods for the community, such as the community Cooperative used for milk production, forests used for wood and timber and gravesites used as burial sites for the community, were also mapped and marked on the resource map.

Transect walks were also undertaken to verify some of the information provided through the resource map and see where vital water sources were situated in relation to households' location in the community. Transect walks also provided an opportunity to understand the village in detail to plan for the proposed ACTION infrastructure project adequately. Understanding the existence of various water sources in the village was essential to determine the best possible location for siting the proposed infrastructure to make the location as fair in access as possible for all target beneficiaries.

5.3. Climate Change and it's Impacts on Water and Resources in Hanzila Village

Communities recounted changes in the climate that they had observed for a couple of decades. Similar to descriptions cited by scholars (Agrawal 2008), people in Hanzila village explained that they observed gradual changes in temperature and rainfall over a period of time. These observations are aligned with observations consistent with climate changes in Agro-ecological Zone 1, where Hanzila village falls. Agro-ecological Zone 1 is most prone to droughts, as highlighted by many scholars (Thompson 1993; JICA/MEWD 1995; MTENR 2007). Community members indicated that droughts and dry spells were major features that characterized the area. They also noted significant variations in seasons and increased frequency and intensity of events of dry spells and droughts. Droughts were cited as a recurrent feature in the last two decades due to changes in precipitation.

As a result, recurrent droughts have increased people's inability to manage the stresses they are exposed to due to climate change impacts. As most crop production in Hanzila village depends on rainfall for survival, in drought years, most crops do not mature to full term, causing significant crop failure.

Further, reduced precipitation over time causes increased water access challenges, mainly when rivers and wells dry up with a limited amount of rain. The needed quantities and sound quality are reduced due to limited and unpredictable rainfall patterns and the recurrence of droughts and dry spells. Rivers, scoop holes, and weirs that collect water during the rainy season dry up soon after the rainy season and sometimes a few months after. Vegetable gardening that happens in the dry season significantly reduces and creates a situation where people's sources of income are lost. Coupled with the unavailability of water technologies such as dams to complement crop production in the dry season, people face increased vulnerabilities to reduced income-generating activities that depend on water because agricultural activities in the dry season are no longer possible. The resultant effect of all this is increased poverty among those affected.

Whilst some years experienced drought conditions, floods were also a feature of the area. Just like droughts, floods were a contributor to food insecurity. For example, floods in most farming communities characterized the 2022/2023 rainy season. The Disaster Management and Mitigation Unit reported that in February 2023, it experienced the most severe floods that had not been experienced in more than 50 years4. Monze district was among the areas impacted, leaving people with crop losses, collapsed houses, and loss of clean drinking water sources.

Although floods come with high and sufficient water runoffs, there are no technologies that could be used to harvest water that can be used for livelihood activities in the dry season.

5.4. Sources of Water for Domestic and Productive Uses in Hanzila Village

Through a focused group discussion, community members of Hanzila villages mapped out existing water sources used for various activities in the village through a participatory exercise as shown above. Figure 4 shows women's and men’s focused groups mapping out water sources in the community in relation to their dwelling.

Figure 4: Groups of men and women mapping out existing water sources in Hanzila village

[4] https://reliefweb.int/report/zambia/zambia-flood-southern-province-dref-application-mdrzm019

(Photos: Mweemba 2023)

Rural water access is primarily through boreholes equipped with hand pumps, hand-dug wells, wells equipped with drills, open sources such as rivers and streams, rainwater harvesting, and scoop holes. These water sources are primarily for drinking, domestic uses such as bathing, cooking, and washing clothes, and productive activities such as livestock and crop watering, including brick making. In some instances, the availability of some water sources is seasonal, while some sources exist annually.

In Hanzila village, there are two boreholes equipped with handpumps. The first borehole, centrally located in the village, is the primary water source for the community and is open to the public.

> "…In this community, we only have two boreholes. It is also safe to say we only have one borehole because the other belongs to the school,"—Female respondent in a focused group discussion in Hanzila village.

The primary borehole equipped with a hand pump is used and accessed by approximately 500 households. The usage is much more pronounced when other sources are unavailable in the dry season. The dry season presents itself with the drying up of water sources such as open streams and rivers, including some groundwater sources in wells, significantly decreasing access to water elsewhere (Kelly et al. 2018). As the boreholes in Hanzila remain with adequate supplies, they are considered primary water sources.

The primary borehole equipped with a hand pump is used for drinking, cooking, bathing, and other productive uses such as gardening, livestock watering, and brick making. However, drinking, cooking, and livestock watering are the most essential and primary water use at the borehole during the dry season.

In the rainy season, many people use alternative water sources such as scoop holes, rainwater harvesting, and open dambos to get water for bathing and other domestic purposes.

> "…When the rains come, at least we have other sources to get water for drinking and our livestock. The nearby stream behind the houses fills up, and cattle drink from there. The scoop holes also fill up, and we have sufficient water for bathing, drinking, cooking and cleaning plates,"—Female respondent in a focused group discussion in Hanzila village.

The availability of other water sources in Hanzila villages significantly reduces the usage of the public borehole by more than half. Some households use the borehole to access water for drinking and cooking during the rainy season, while for other uses, such as bathing and washing clothes, they get water from scoop holes.

The second borehole within Hanzila village belongs to a community school. Although the borehole is open for public use, access to the school borehole has limitations in the kinds of uses allowed. Access to the school borehole is primarily for drinking, cooking, and domestic uses. Moreover, the borehole also has a limited number of households permitted to use it because the prerogative is mainly for school staff and school-going children. Some households residing closer to the school have access to the borehole to get water for drinking and domestic uses. However, access to the school borehole for people requiring water for livestock watering is not permitted.

Some households within Hanzila village situated closer to Mainde and Kalulu villages get water from public boreholes in those villages. However, access to water from the nearby villages is limited. Access to water from nearby villages is given priority to people from the villages. This is because the villages serve large numbers of people equally, and having additional people accessing water from their hand pumps increases the strain on the infrastructure.

> "… We can't freely get water from the hand pumps in Mainde and Kalulu villages because we do not have access rights to that borehole. The owners have to get water before we can also get it. Sometimes, even when we first arrive at the borehole, the owners of the village still get water before us, and there is nothing we can say."—Male respondent in a focused group discussion in Hanzila village.

Hanzila village has 19 scoop holes that form one of the significant water sources for people in the area. These are open for use among people residing in their proximity. The scoop holes are primarily used during the rainy season and a few months into the dry season before completely drying up.

Though the community has 19 scoop holes, about seven hold water until mid-year while the rest dry up. By late August, all scoop holes would have dried up, and there would be no more water from scoop holes to supplement water sources in Hanzila village. When available and with sufficient water, the scoop holes are used for drinking, cooking, bathing, vegetable gardening, and livestock watering.

In the rainy season, the people of Hanzila village also have other water sources they rely on. For example, they harvest rainwater from the roofing sheets into jerry cans. Rainwater is used for drinking, bathing, and cooking.

People also use water from the nearby Hamwanda Stream for gardening and livestock watering. Unfortunately, the stream is seasonal and dries up by midyear. Seven villages use the stream for livestock watering, gardening, and brickmaking.

Figure 5 shows examples of water sources used in Hanzila village for drinking, domestic and productive use. The borehole equipped with a hand pump is for multipurpose use (drinking, domestic and productive uses) and holds water all year round. The scoop hole is equally multipurpose and most for domestic and productive uses. It dries up a few months into the dry season. The dambo and stream are essential for livestock and vegetable watering. They are seasonal and run out of water a few months into the dry season.

Figure 5: Main sources of water found in Hanzila village used for various activities

(Photos: Mweemba 2023)

5.5. Challenges with Existing Water Sources

Looking at the available water sources in Hanzila village, several challenges impact people's general livelihoods with water access in the community. Firstly, the challenge experienced with the existing water supply in Hanzila village has been having one public borehole equipped with a hand pump serving large numbers of people (about 500 households with a population of over 1500). The existing public water source is inadequate to cater to the community's fast-growing population and all needs. Due to the many people accessing water from the public pump, round trips to access water take a long time.

> "…when we reach the handpump, we stand in line for about 30-45 minutes waiting for people we find to get water before we can get it. Sometimes, the queues are long, especially when many people fill up drums and get water for cattle. It means we almost forget the other work we must do to get water",—Female respondent in a focused group discussion in Hanzila village.

Due to limited water sources and the many people who access the water from a single public borehole, competition for water is rife for the many needs the borehole supports. Sometimes, conflict ensues at the public borehole. In Hanzila village, physical fights have been reported among people who compete to get water from the public borehole for various uses.

Further, the diversity of uses of the borehole and many people accessing water at once causes the borehole to break down frequently. This leaves people without clean water sources for some time because it takes approximately 2 to 3 days before the borehole can be fixed. Time is taken to source parts and repair, and people will not have access to water for some time.

The other challenge pertains to the distance of the borehole. For some households, the borehole is situated further from their homesteads. This means round trips take longer to complete to access water for drinking and domestic use. For women, the challenge is much more compounded because they carry heavy containers of water on their heads over a long distance, which can cause exhaustion.

Furthermore, those without access to water and requiring water from nearby villages closer to their homesteads are not allowed complete access. They have to wait in line for more extended periods than the village owners to get water. This limits their access to water for crop production, drinking, and livestock water, especially during the dry season.

Streams that supply water to the communities are seasonal and last only during or after the rainy season. After that, they dry up. All crop and gardening activities are halted, and livestock have significantly reduced access to water for drinking. Pasture growing around the streams is also lost – leaving livestock without sufficient grazing grass for proper nourishment.

During the rainy season, scoop holes have sufficient water for all uses. However, the scoop holes do not hold water throughout the year. In some scoop holes, one can only get up to 40 litres at each point in time and then wait 3 to 4 hours to have more water recharge from underground aquifers to continue getting water. This takes an unprecedented amount of time to complete activities that require water, such as watering vegetables and crops in gardens, getting water for livestock, or getting water for use at home. Further, few people can access water at such a source, and it takes a long time for a single person to have water. Consequently, most people stop gardening activities and wait until the following year after the rainy season to continue gardening when there is an inadequate water supply.

It was also reported that in some years, a significant number of cattle died of thirst when water from the scoop holes and the other sources was inadequate to provide sufficient water supplies.

Apart from the problem of quantity supplied by water sources, accessing water from scoop holes is done using primitive lifting devices such as small containers that pose health risks to drinking water. Not only does the technology disadvantage people by providing a limited water supply, but it also exposes them to unhygienic conditions that could potentially contaminate the water and contribute to waterborne diseases.

The impacts of climate change on water sources are also a challenge in Hanzila village since 1980 when the drying up of water sources began. Before then, water was sufficient, and existing water sources such as streams and wells would have enough water all year round. The current situation has shown increased water drying up in water sources, making it hard for people to access water for required uses. Open streams dry up, and livestock have limited drinking water sources. The lack of man-made dams in nearby locations further compounds the problem of providing water for cattle and other livestock in the community. As a result, the population for of cattle has gone down due to limited water, pasture and livestock diseases. The same goes for crop production. It becomes a challenge to do crop production when open sources are unavailable due to the drying up of sources. The resultant situation is reduced crop productivity during dry periods.

5.6. Challenges with Water Access by Gender

While water access challenges impact both men and women in Hanzila village, unsurprisingly, women are most affected and face the brunt of inadequate water supply because they are the primary water collectors in the village. They collect water for drinking, bathing, cooking, and other domestic uses for the family, which are the primary uses of water at the household level. Having to spend time looking for water risks women losing productive hours that could be invested in productive activities.

During menstruation, women and girls require sufficient water to keep themselves clean and care for themselves, such as bathing frequently. When there is no water due to dried-up sources or too many people at the borehole, women and girls do not have adequate baths, which results in discomfort and can be a source of embarrassment. Sometimes, girls fail to attend school and other normal livelihood activities because of an inadequate supply of water to manage menstruation. For example, school-going girls would miss school because of the discomfort of not taking adequate baths to keep themselves clean when attending their menstrual cycles.

In terms of vegetable gardening, both men and women are equally impacted. However, as most gardening work is done by women, even though gardens belong to the household/family, women are still disproportionately affected when it comes to water access because they still make extra efforts to get water from the sources.

> "… Once we finish household chores, we water vegetables in the late afternoon because the gardens belong to the family. […] We still face many challenges getting water for gardens because there are many users at the borehole. The same borehole caters for drinking and livestock watering"—Female respondent in a focus group discussion in Hanzila village.

Men mostly need water for livestock watering, particularly cattle watering. However, when accessing water for small livestock, such as goats, pigs, and chickens, both men and women are equally involved in getting water for small livestock and, therefore, are similarly impacted.

Overall, women require access to water more than men due to the nature of their own and their families' water needs, both for drinking and domestic and productive uses.

5.7. Polycentric Governance in Water Access and Management of Existing Water Sources through Horizontal Processes

The starting point of harmonizing access to water at multipurpose sources is engaging in agreements on rules of access to reduce misunderstandings and ensure access to water for all priority needs is attended to properly and sequentially. Community members of Hanzila village build consensus through horizontal decision-making to determine the time allocation for water access for each priority water need. Water for drinking and domestic use is allocated in the early hours of the day, from the morning until late morning towards noon. As agreed, households requiring water for such uses should ensure they utilize the allocated time to get water at the household level. Beyond that, time is allocated time for livestock watering. Young men would line up from late morning to late afternoon, getting water in large drums and sometimes large buckets, and give cattle to drink. This takes a considerable amount of time if someone has many cattle and therefore requires sufficient time to get water. When people access water for livestock, people with gardens use the early evening to night time to water their crops. For most people, time allocated for vegetable watering is limited, and people have been known to stop vegetable gardening in the dry season because access to water is limited. In practice, the time for vegetable irrigating is unfavourable because evenings are needed to prepare meals for the families. Therefore, women were already excluded from accessing water from the borehole for crop production.

Nonetheless, even with the scarcity of water and people competing for water to meet various water needs and satisfy different water priorities, rules of engagement and use contribute to promoting horizontal integration intra-community.

In the same way, intra-community horizontal integration is exemplified in processes that contribute to sustaining public water infrastructure. At the public borehole in Hanzila village, people maintain the water supply infrastructure by maintaining a fund from contributions made by users to buy materials and pay for parts that break down, as well as paying pump minders responsible for fixing broken-down boreholes. As the rules stand, all users of the public borehole should adhere to this requirement to continue accessing water for their uses. Non- compliance with set communal rules means one risks being denied access to public water infrastructure.

At the school-owned borehole, each household accessing water from that is expected to pay an annual subscription of K500 (USD 19.7) to access water. These top-down vertical rules and decisions are passed on to all water users in the community.

Just like the public water source, funds for the pump at the school are mobilized for maintenance in case the borehole breaks down. Households that fail to pay for maintenance are prohibited from using the water.

Alongside maintaining a maintenance fund is establishing a borehole committee or a water point committee elected into office through democratic processes. Community members decide who they want to manage the water infrastructure on their behalf and will hold elections to vote for such persons in office. The committee's current composition is 10 people, comprised of 5 women and 5 men. It was decided that gender should be equally represented in the management of public water infrastructure. Further, people are selected to be part of the committee because of their ability to lead. They are also seen to be hard workers and should have high integrity.

Polycentric governance processes at the local level of water resource management are seen through the committee’s local decisions that stipulate how the borehole ought to operate to ensure that it is well maintained and works effectively.

Some rules for managing water access at the public borehole are allocating time for different uses (as highlighted in the preceding sections), maintaining a fund for borehole maintenance, cleaning the surrounding area of the borehole, and monitoring proper usage of the borehole.

6. Step 3: Envisioning Solutions

With the water challenges identified, the solutions to draw on the adaptive capacities are envisioned using community vertical and horizontal participatory processes.

In Hanzila village, with the onset of the dry season, people stop cultivating vegetables in their gardens because water sources used for this purpose dry up. Unfortunately, crops and vegetables not ready for harvest when water is no longer available are equally lost – a situation that contributes to loss of income at the household level. Returns from livestock production are equally limited when pasture is limited for grazing and the much-needed water for livestock drinking. People in Hanzila village indicated that milk production, a source of income for people, reduced significantly because of poor nutrition for livestock with limited access to pasture and low access to water.

6.1. *Horizontal Polycentric Governance: Envisioning Solutions for Enhanced Water Access at Community Level*

With documented community conversations highlighting the challenges of water access and climate change in Hanzila village, community participatory processes were used to identify potential solutions envisioned as measures to resolve the difficulties at present.

Just as water needs differ for women and men, solutions that respond to water access needs also differ among men and women. The ACTION project facilitated separate groups of men and women to organize themselves to discuss and develop action plans to build resilience to climate change for the identified risks. They discussed solutions about the most probable water infrastructure that would work efficiently for their community to respond to all identified challenges, such as lack of adequate supply of water for drinking, water needs for promoting agricultural activities, and crop diversification for improved nutrition in the community and enhance adaptive capacities for livestock rearing.

Through focused group discussions, women and men recounted their adaptation choices separately to show what priorities were most important for men and what priorities were important for women.

Figure 6 shows men and women-focused group discussions identifying adaptation options that were important to each group that they felt would alleviate their water challenges.

Figure 6: Men and women's focused groups discussing water priority infrastructure and other priorities to enhance adaptation to impacts of climate change in the Hanzila village

(Photos: Mweemba 2023)

A gendered approach in prioritizing solutions for water needs among men and women emanates from understanding the different rankings women placed on types of infrastructure that respond to their water needs. Women prioritized infrastructure that addresses immediate water needs for drinking and household domestic uses, including opportunities for gardening activities. Conversely, men identified infrastructure that directly addresses the challenge of livestock keeping to be of paramount importance.

Identified solutions were then presented to local authorities and ClimBeR to agree on an accountable, transparent priority list of needs representative of the community's views for external support.

6.1.1. Water Infrastructure Needs for Women

According to women, two types of boreholes were prioritized as sources of water that would reduce water challenges facing the Hanzila village. The first was a borehole equipped with a hand pump.

> "…Having another borehole equipped with the hand pump in this community will help to meet all our water needs, such as drinking, bathing and gardening. We currently face shortages, and there is a lot of congestion at the existing borehole, which causes us to take a long time when accessing water."—Female respondent in a focused group discussion in Hanzila village.

For a long time, the boreholes equipped with hand pumps have served as important sources of water for identified water needs by women and have been user-friendly. The choice of infrastructure is also seen as what is known to be most effective. In most communities, whilst water sources such as hand-dug wells and scoop holes dry up, the hand pumps remain with water throughout the year. Having additional boreholes with hand pumps implies reducing congestion at the existing borehole equipped with a hand pump and having access to sufficient water per household for various needs.

Secondly, a solar-powered borehole with reticulation was suggested instead of a hand pump, which was essential for women in reducing water challenges for drinking, domestic use, gardening, and livestock watering. A multi-use solar-powered borehole can have several taps within the village that reduce congestion at access points. It also reduces the distances for households accessing water for drinking and domestic uses because access points are spread in locations closer to homesteads.

For children, the risk of missing out on essential school hours used to access water is eliminated because the cause, which is to queue up for water before school, is taken care of.

Further, women highlighted other important projects outside infrastructural development for water to enhance opportunities to access finance in times of crop failure. Women proposed having goat production in communities because these are drought-resistant, proliferate and can be sold quickly to raise income for household use in times of need.

> "…Another project that would work for us here in this village is the production of goats. If we are supplied with goats, we can grow them and multiply them easily so that whatever challenge we face in the future, we can use them to earn income. For example, the last couple of years have been characterized by too much crop failure. We can sell goats and buy food for household consumption if we have goats. Compared to cattle, goats multiply and are unaffected by many diseases. They also do well in drought conditions and hence a better solution for income generation in this community."—Female respondent in a focused group discussion in Hanzila village.

6.1.2. Water Infrastructure Needs for Men

Men's priority water needs focus on access for livestock, particularly cattle, which consumes between 20 litres to 40 litres of water per animal per day.

> "…Our biggest challenge is trying to water cattle at the already congested borehole and use it for various uses such as drinking and bathing. Some people also use it to water their gardens. Now, when we come with our cattle, it takes a long time for each animal to be given water. At any one time, each animal requires 20 to 40 litres of water every day. Now imagine having 20 animals, and they are all waiting near the borehole to be given water. How long would that take? That means other people that need water for drinking will not get water",—Male respondent in a focused group discussion in Hanzila village.

As sufficient water was considered necessary, men highlighted that constructing a dam nearby would solve the significant water challenges they faced when providing water for their cattle. Therefore, they mentioned that building a dam would ease all problems. Dams are a lifeline that farmers need in rural areas for drought mitigation5 (Liebe et al 2007).

They are multipurpose sources of water that support livestock and water for small-scale irrigation of crops such as cabbage, tomatoes, and onion grown during the dry season. Dams provide a good reservoir for water security throughout the year for multiple needs (Acheampong et al. 2014). The seasonal streams do not hold water during the dry seasons, so crop farming and livestock water are challenged. With continued drought conditions, rainfall patterns reduce over the years and hardly infiltrate the ground to provide sufficient stream reserves (Liebe et al. 2005; Jain 2007). Dams, on the other hand, have adequate capacity to collect and store rainwater during rainy seasons that is used when the dry season comes.

Through their existence, crop farmers and cattle ranchers establish reliable means to ensure that crops and livestock receive sufficient water throughout the year. In Hanzila village, livestock is one of the critical income-generating resources that people rely on, mainly through milk production. This alone requires that sufficient amounts of water are available for livestock to drink in order to produce sufficient amounts of milk, keep the overall health of cattle, and provide the resource, an essential source of income for the community. When dams are available and close to villages, it helps eliminate the need for cattle to move long distances to find water. The current state is that when boreholes are congested, there are limitations on how much water one can get to give turns to others. Those who avoid congestion at the borehole walk long distances to access water from dams in faraway villages with such infrastructure.

6.1.3. Consensus Building on Water Infrastructure for Men and Women

Through a group representative, women and men presented their feedback on the most desired type of water infrastructure and community projects identified as necessary for each group (Figure 7). Women informed the group that they prioritized two types of boreholes – a borehole equipped with a hand pump and a solar-powered borehole, as the most preferred water resources that would respond to community needs.

5 https://www.bigditch.com.au/the-importance-of-farm-dams-for-small-scale-agriculture/

Figure 7: Women representative presenting preferred water source that responds to the water needs of women in Hanzila village

(Photo: Mweemba 2023)

Women highlighted the ideas that informed the decision to arrive at the borehole equipped with a hand pump and solar-powered borehole. The borehole fitted with a hand pump was arrived at, considering the current benefits seen from the existing boreholes with hand pumps that provide water throughout the year compared to other sources that dry up. Having additional boreholes would support a good number of people and reduce congestion at existing boreholes.

The solar-powered borehole, though without experienced benefits locally, had evidence of its benefits borrowed from a nearby community with a solar-powered borehole. The borehole benefits were reported as multi-use, reduced water access distance and water supply throughout the year. This meant that the stress of having periods of no water was eliminated, including in drought years.

Women also talked about the goat rearing project as a project that would enhance adaptation practices to droughts and crop failure impacts. The decision for such a project was arrived at by looking at the benefits of goats in providing quick income access and being resistant to diseases. They were also mentioned to thrive in hot weather with limited water.

Similarly, men recounted the ideas that informed the group of the conversations held among the men who reported the decision to have a dam as a water source that would change livelihoods for communities through improved support to livestock and crop farming.

The discussions showed opposing views of preferred water sources from men and women based on priorities that needed to be met by the required water source.

Then, the project team informed the community members of the possibility of only having one source of water provided that met the budget requirements under the ClimBeR's ACTION project. The water source would be used to meet all needs prioritized by women and men during the discussion. Therefore, community members had to agree on a single priority that responds to the needs of the entire community – men, women, and children.

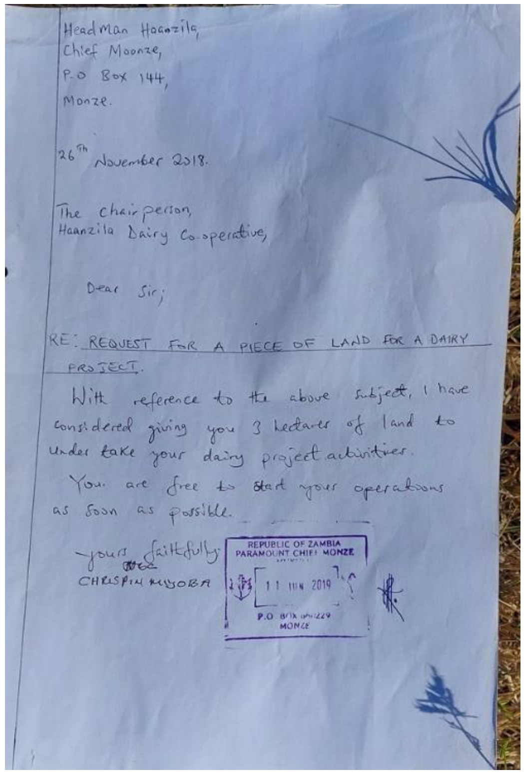
Further engagements between men and women were done to identify the water source that would meet the needs of both men and women. Following group consultation determining merits and demerits for each proposed infrastructure, the consensus to have a solar-powered borehole infrastructure with reticulation was arrived at as the most feasible source of water for the community and seen to be beneficial for the community to cater to all identified water needs – drinking, domestic, livestock support and small-scale irrigation. The following were the perceived benefits of the solar-powered borehole:

- The solar-powered borehole would have several taps or access points that would reduce congestion during access. Women would use different points to get access to water for drinking, domestic and productive uses such as gardening and livestock watering;
- Men would build water troughs in the allocated spaces where water could be conveyed from the taps to the troughs and allow cattle to drink from those points. This means the effort of accessing water would be drastically reduced whilst at the same providing sufficient water for livestock to drink;
- The several taps provided as access points for water would allow men and women engaging in gardening activities to have their taps for gardening. This means any member of the community with interest in using borehole water for gardening would have adequate access to water;
- Taps placed at different locations across the village would reduce distances covered by women and children to access water. This means productive time lost walking long distances when the borehole with the hand pump breaks down or when the borehole is congested would be a thing of the past.

6.2. Polycentrism in Land Tenure Management

The development of communal water resources requires access to land resources that are accessible to all at all times. The bottom-up, top-down polycentric decision-making processes in land and resource use for water infrastructure explore ways communities can source land that secures water access for all intended beneficiaries. These discourses on formal and informal land-water nexus in community-based water tenure have taken impetus in the recent past (FAO 2020). In Hanzila village, traditional leadership is leading in securing land resources for water infrastructure development and related projects.

Before the ACTION water infrastructure project, the headman for Hanzila had sought permission from the local Chief Monze for Hanzila village to use part of the open space in the village for milk production under the Hanzila Cooperative. Permission was granted to the community to use the land for their milk project (see Figure 8).



Headman Haanzila,
Chief Moonze,
P.O Box 144,
Monze.

26th November 2018.

The chairperson,
Haanzila Dairy Co-operative,

Dear Sir;

RE: REQUEST FOR A PIECE OF LAND FOR A DAIRY PROJECT.

With reference to the above subject, I have considered giving you 3 hectares of land to under take your dairy project activities.

You are free to start your operations as soon as possible.

Yours faithfully
CHRISPIN MUYOBA

REPUBLIC OF ZAMBIA
PARAMOUNT CHIEF MONZE
11 JUN 2019
MONZE

Figure 8: Letter of authority granting Hanzila village to use three hectors of land for the community project

(Photo: Mweemba 2023)

The role of traditional leadership in land allocation is well recognized in rural areas because traditional leaders in those jurisdictions own land under customary or traditional tenure. The informal allocation of land not backed up by legal documentation under customary tenure still legitimizes land ownership for the users. In most cases, access to land under customary tenure reduces poverty for rural populations and underpins its importance in any project implementation, including livestock rearing (USAID 2016), as is the case for Hanzila village. About three (3) hectares of land were allocated to Hanzila village to proceed with the dairy project.

In essence, community consensus through horizontal decision-making processes was used to determine the communal usage of land. Much of the project activities were centred on a small constructed shelter where milk was collected before being taken to the main town centre for sale. However, much of the allocated land was underutilized.

With the new water project secured and conversations about the location of infrastructure development underway, the community organized itself to take advantage of existing premises for the dairy and milk production project to use the underutilized land for water infrastructure development. As land rights were in the hands of all the community members of Hanzila village, investing in water infrastructure on such land guarantees access for all. In other cases where no land is available for public use, identified pieces of land would have to be surrendered by the owners to the community for public use and community projects (Mweemba et al. 2023).

In the case of Hanzila village, aside from public land tenure, more substantial claims of water would remain with the public mainly since external investments rather than individuals are responsible for infrastructure development. However, rules of access and management still apply through horizontal integration processes. The starting point of water infrastructure development requires the development of a water committee to sustain the water resources and ensure that downtime time for infrastructure breakdowns is significantly reduced. Through horizontal integration decision-making processes, communities decide who makes up the membership of the Water Point committee through democratic voting processes, as community members are tasked with ensuring the sustainability of the water infrastructure project.

7. Step 4: Fitting the Financial Framework

Communities' envisioned solutions provided insights into the kind of infrastructure, site and approximate layout to implement to reduce community challenges and vulnerabilities due to lack of water access and the impacts of climate change. For example, the Zambian procedure for rural water supply developments implemented by the local authority requires that communities apply for water supply projects, highlighting what access types will be enhanced through the water infrastructure and proposing two potential sites. For the ACTION project, the International Water Management Institute (IWMI), through the CGIAR initiative on Climate Resilience “ClimBeR”, sourced funds to construct a borehole with a solar-powered pump and storage tank in Hanzila village.

The Project invited qualified vendors to bid for drilling and constructing a borehole with a sufficient depth (approximately 100m) equipped with a solar-powered pump, a storage water tank of 10,000 litres and an elevated tank stand to ensure a steady, gravity-fed water supply for the community. Additionally, the borehole had to have a piping network with 10 taps dotted in yet-to-be-defined strategic places in the community to improve access for drinking, domestic use, gardening and livestock watering.

Bill of quantities and all other requisites required to construct the water infrastructure were determined and costed by the bidders responding to the call for borehole construction. In addition, water network requirements and volumes to meet all competing needs were determined to ensure adequate support for all users.

The hiring process considered the most cost-effective bidder to construct the borehole with stipulated works. Other critical considerations for selection included significant experience working on similar assignments with communities and multi-lateral donors. Finally, all determined and costed requirements were presented to the ACTION team to finance the borehole.

The winning contractors signed contracts to develop a borehole that meets the required standards. All borehole components were financed, and work commenced to develop a solar-powered water borehole for Hanzila village.

8. Step 5: Implementation

Simplex Drilling and Construction Limited Company was engaged to construct the borehole for Hanzila village in May 2023. Apart from meeting all measures stipulated in the service contract, the contractor had to strictly follow the government procedures and standard norms, such as applying for drilling of the borehole with Water Resources Management Authority (WARMA) and obtaining necessary permissions, paying necessary fees and carrying out the work safely and efficiently.

Part of the agreement also explicitly included listening to the relevance of the water infrastructure to the community to ensure the investment met community needs and was sustainable. The latter was also crucial because the borehole implementation was community-led. Therefore, upon issuing the contract, the contractor had to meet with ACTION facilitators and community members to agree on the detailed implementation sites before initiating the assignment.

8.1. Social and Geophysical Siting for Borehole Construction

Once the contractor presented the detailed design for the solar-powered borehole to be implemented to ACTION facilitators and all requisites were approved, it was time to begin siting for the borehole.

Proper siting for borehole construction is critical – both technically, by the contractor, but also socially by members of the community or users to enhance access for all, including the marginalised, and avoid boreholes ending up near the elite to prevent their claims of ownership in the long run.

Part of the implementation strategy required community members collectively and with the support of ACTION facilitators and contractors to agree on preferred sites to implement the water infrastructure.

Community voices collectively deciding preferred sites for borehole development is an example of polycentric horizontal decision-making processes in water infrastructure development. Collective community voices that come together to decide on locations for community projects and other issues that affect everyone build confidence in the community projects and promote a sense of ownership. In their article ‘Making Decision in Open Communities: Collective Actions in the Public Realm’ De Liddo and Concilio 2017 acknowledge the importance of dialogue and having common ground in being factors that contribute to the success of choices made collectively through decision-making processes and therefore a critical component for horizontal integration.

In Hanzila village, community members, with the support of the ACTION facilitator and contractor, held a meeting in June 2023 to agree on selecting the site for the borehole that would be favourable for the entire community. With all the water needs known, the location required for the borehole was supposed to be located centrally to be accessed for all water needs as prioritized by community members. However, for Hanzila village, there was the existing, still underutilized site in mind that the community had secured for prior projects for livestock and milk production. This location was in the centre of the village and had sufficient space to accommodate all people who needed to use the space for small-scale gardening. The space also had adequate space for livestock watering if a water trough was to be constructed to support livestock watering. Tenure of the land was also in the hands of the entire community, as elaborated in Step 3 of the preceding sections. Public-owned land was considered the best option for no individual having personal claims to the land where the water infrastructure and all network systems would be implemented. This means there was sufficient clarity among users that no single individual within the community could claim ownership of the land and water infrastructure when water infrastructure was developed. All people would have equal access to accessible land to all people in the community, including the marginalised and vulnerable households.

Despite all proposals pointing to the community-owned land as the best option for borehole construction, other factors had to be considered.

- The safety of the infrastructure;
- The precise location within the selected site had to have a fair distance from all households to ensure that no household was disadvantaged in terms of access to water for drinking and domestic use and
- Geophysical surveys had to confirm that the area has sufficient groundwater resources to produce enough yield to meet the present and future community water needs.

The first thing done during site selection was transect walks in the village with community members, the ACTION facilitators and the contractors hired to develop the borehole. The transect walk was conducted to understand the proposed area's landscape, conduct geophysical surveys, and determine appropriate locations for the borehole. This also ensured that the site picked by communities would fit other technical requirements of the borehole infrastructure and choices of planned infrastructure and its reticulation.

The transect walks highlighted four locations as possible sites for borehole construction. One is on the northern side of the community-owned land; the other is in the east towards the road that cuts through the village end and the other east-central part of the land, and the last is in the centre close to the football pitch. One of the four sites, situated on the northern side of the community, did not qualify on the geophysical investigations as the site that would be ideal for the borehole construction to provide sufficient water yields. Moreover, the location was closer to a land for the community school and had fewer households. This means that if the borehole was situated in that location, fewer households would have access to the borehole, and this was not approved. In addition, the area was located further from people’s homesteads, implying the borehole would not be secure.

Following the transect walks, community members, ACTION facilitators, and contractors sat to deliberate the pros and cons of each of the remaining three locations that had qualified after the geophysical investigations and to agree on one final location that would address all the issues raised and still provide community members with a favourable location.

The first consideration was the centrally located site closer to the football pitch. The community land allocated for projects is mostly circular and situated in the middle of the village. This implies that households in the periphery would appreciate the borehole being centrally located because it gives equal access to everyone who wants water for drinking and domestic use. While this was ideal, this location did not qualify because the security of the borehole in the centre of the proposed site would be compromised. No houses were nearby to monitor and safeguard the borehole, especially at night. In the past, some nearby locations had experienced theft of borehole parts, such as the submersible pump and other electrical components, including the control boxes and cables. The practice for people installing solar-powered boreholes now is to have the borehole situated closer to the homestead so that the community members can task some homeowners nearby to safeguard the infrastructure.

The second site deliberated on was in the southern part of the communal land. The land was situated closer to the community graveyard. In Hanzila village, like most African villages, graveyards are treated with respect, and all forms of disturbance on land allocated as burial places for the community are not allowed. This, too, was disqualified. In some places where water infrastructure has been installed in locations allocated for graveyards, people shun using the boreholes and their water resources, which becomes a wasted investment. For example, an external project implemented some boreholes in one village in Northern Zambia without engaging communities to understand the most appropriate site that would work for the community. One borehole was sited and drilled in an area allocated as a burial place for the community; no community member was interested in using water from the borehole. People located near the site continued accessing water from unclean sources. Only through monitoring visits to understand why the borehole was not utilised did they discover that the site was unfavourable because it was held respectfully and could not be frequented often to access water.

This highlights the importance of community involvement in water supply processes and any other community projects that target communities because they have the history of the areas. Project results or utilisation and ownership can only be guaranteed if they participate. Proponents of this school of thought continue to highlight that local and indigenous communities should always participate in resource development and management, particularly for projects that they stand to benefit from because they have the knowledge of solutions tailored to respond to their needs and address issues as they pertain contextually DeCaro and Stokes 2013; Ostrom 1990). This, too, promises that development will be accepted and sustained. Vertical integration processes are more relevant when coupled with indigenous community practices, highlighting the solutions the projects would resolve.

The last two locations, i.e., land located east towards the road that cuts through the village end and the site east-central part of the land, were both excellent locations because they were situated closer to people's homesteads and could ensure the availability of good security for the infrastructure. However, some homesteads on the western end and those in the south and north would not be closer to the public borehole, which was not ideal. However, this was not the main reason for disqualifying the locations. As reported by the geophysical survey, what disqualified the location was insufficient amounts of water yield. The area that was finally agreed upon was the site that showed sufficient water yields, as shown in the geophysical survey.

The location, about 500 m from the existing borehole, was favourable because several households were closer to it. This was seen as an excellent site to address the security concerns of the borehole infrastructure. Moreover, using network pipes and extension of water supply lines, including placing garden taps at strategic points, would allow households situated further from the borehole to have good access to water.

8.1.1. Borehole Implementation

The contractor began procuring materials for constructing the water infrastructure. Subsequently, the contractor mobilized to start their work on site. This entails the movement of required site infrastructure, equipment/tools, machinery and personnel on-site.

The borehole drilling commenced in July 2023 after the necessary permit was obtained. Community members were on hand during the drilling of the borehole to observe and monitor the process and ensure that the discussed depth of the borehole and placements of equipment were according to what was agreed on in the service contract.

The borehole was drilled at the agreed location, and after that, supply lines were trenched to cover a radius of 1km as per the contract agreement. Taps were placed strategically to ensure that people in all directions of the village could access the water at favourable points. The 3 ha of land initially allocated for the project, i.e., for livestock watering and crop production, got the most taps to ensure that there were a lot of access points for public use. Other taps were placed towards people's homesteads in different directions to enhance access to water.

Nonetheless, because the length of the supply lines was limited, community members furthest from the last points of access were willing to pay for the extension of supply lines closer to their homes to ensure that they, too, had better access to the water resource. People have been known to commit to investments where the benefits outweigh the costs, as is the case for the few households, particularly in the north and south of the village, who agreed to procure polythene pipes and garden taps using their finances to extend the supply lines closer to their doorsteps. Aside from paying for extension lines by the ACTION project, additional payments were made through community initiatives to bring water closer to their doorsteps.

Throughout the process, community members voluntarily carried out some work during the implementation of the borehole, and some other work attracted modest remuneration. For example, the contractor paid community members a modest amount for trenching the supply lines from the borehole to the agreed locations for the taps. The payment was only made because all work surrounding the borehole construction was the contractor's responsibility. The service contract procured did not request a community contribution of any sort. Other water infrastructure projects, particularly those supported by the government of Zambia through the local government, require some in-kind and financial contribution from the community towards implementing the water infrastructure, such as the borehole. For example, the local authority would stipulate through the application forms that any community that requires support with a borehole equipped with a hand pump have to make an initial payment of ZMW 1,500 (USD 59.10)[6] as they apply for the borehole and also mobilized sand and stones to use for constructing the borehole. While this directive to communities highlights polycentric vertical integration, it also assures that communities will have a sense of ownership for the borehole once drilled and constructed because the tool contributed to its development.

Local government officials from the Department of Rural Water Supply participated in overseeing and supervising the development of the infrastructure to ensure that, technically, the infrastructure aligned with recommended government water infrastructure development for rural water supply and that the

[6] The exchange rate of ZMW 25.4 to 1 USD was used in the conversion

infrastructure met the multi-use needs of the community including drinking, domestic and productive uses. For example, when drilling a borehole, there should be a considerable distance between the proposed site and the location of onsite toilet facilities to ensure no water contamination from the toilets to the boreholes.

The borehole drilling and construction were completed and were yet to be handed over to the community.

8.1.2. Challenges with Borehole Implementation

The role of community members in developing rural water supply remains critical to offer checks and balances throughout the process. In the Hanzila case, five pump minders trained in borehole installation and maintenance were present to monitor the contractor's work. They acted as the eyes for the ACTION facilitators to ensure everything was done according to what was agreed in the service contract.

Despite all measures to ensure borehole implementation was constructed according to standard, challenges arose when the contractor did not implement the borehole as per the agreed contract. Instead of having a 100m borehole, the borehole was drilled at 85m, which was not followed by metal casings. Polythene casings were used instead, but only at a depth of 72m. The contractor justified this action by stating that the land in Monze is compacted and, therefore, could not collapse regardless of weather patterns or any form of flooding. This did not satisfy community members who monitored the drilling and casing of the borehole using materials that were not approved because they had experienced communities within the district where boreholes collapsed a few months after implementation due to not installing proper casings and following specifications.

The other challenge pertained to placing the submersible pump. After the drilling, it took considerable time for the submersible pump to be lowered into the borehole, and a couple of weeks had elapsed before the contractor went back on-site to attempt to install the submersible pump.

However, when the contractor returned to put the submersible pump in the borehole, they found that it had caved in from the drilled 85m to only remain with 35m. The entire bottom part of the borehole had collapsed. When placing the pump, the contractor placed the submersible pump at 30m to allow the 5m to keep the pump afloat and not bring up mud. This means that from the 80m drilled, 50m was lost despite being quoted as part of the depth for borehole installation. This also did not satisfy community members, knowing well that during drought periods, the borehole would not sustain the community's multiple water needs – part of the reasons for installing a borehole with sufficient depth was to respond to droughts and avoid having a dry borehole during dry years.

The other challenge was regarding too many leakages in the pipes, indicating that people tasked to install and connect pipes did not do a satisfactory job. Similarly, the workmanship on the wire fence installed to protect the borehole and pump was poorly done.

All these challenges were reported to ACTION facilitators to engage the contractor and request they return to the site to correct the identified errors. As such, the borehole was not approved for handover to the community at the first attempt.

Findings were also reported to ClimBeR financiers to engage the contractor and agree to rectify the challenges and rework the borehole as per the contract agreement.

8.1.3. Theft of Borehole Parts – Emerging Challenges with Borehole Implementation

Once a borehole is constructed, and the submersible pump is lowered into the borehole, the general practice is that the concrete mortar is placed over the borehole to secure the lowered pump from theft. However, this could not be achieved immediately for the borehole in Hanzila village because of several conversations that were still ongoing regarding reworking the depth of the borehole and installing correct casings. This exposed the loose and unsecured installed parts to theft over a while.

A few weeks after installation, the submersible pump and the control box for the newly installed borehole were stolen. The unfortunate situation presents a fundamental lesson on the importance of time management in project execution, mainly that no further work could proceed without completing initial tasks. Moreover, had the work progressed as suggested, contractors would have stayed on site until the completion of project implementation, including securing all parts that are prone to theft.

To rectify the problem, community members gathered in a meeting to agree on how they would replace the lost items and allow the project to proceed as expected. From the meeting, people suggested replacing the stolen parts to avoid bringing the burden back to the ClimBeR project, which had already financed the submersible pump and the control box. Moreover, the community had initially committed to having people among the users safeguard the borehole as they awaited the completion of borehole development. However, because of poor security, which saw some parts of the borehole stolen, community members felt obligated to remedy the problem by paying for stolen parts.

Though that was the case, most of the people indicated that they did not have funds to replace the stolen items at that time. Moreover, the cost of the stolen items was significantly higher than what most community members would have; therefore, it was difficult to raise funds quickly.

A community member offered to sell livestock and pay for the pump and control box in the hope that other community members would refund his money once they raised funds from farming or any other sources of income at their disposal. The challenge is that it puts individuals who paid money at the upper hand, which can lead to ownership claims if not monitored well. This would be particularly dangerous in the event that community members fail to refund the individual his money after he pays for replacements.

However, as ClimBeR had committed to providing the complete water resource for the community, personal claims could not be allowed. Funds were sourced through the ACTION project budget to replace the stolen parts. In addition, the contractor reduced the cost of fixing a new one which reduced the cost replacements on the part of ClimBeR.

8.1.4. Rectifying Challenges of Borehole Implementation

The borehole challenges were not taken lightly and required the contractor to revise the work to the standard agreed upon in the contract. The following amendments were achieved to make the work satisfactory.

Firstly, the contractor had to drill a second borehole in August 2023, of 100m depth to replace the collapsed borehole. This was closely monitored to ensure that subsequent requisites, as per agreement, were done to satisfy the project's requirements.

Secondly, metal casings were used for the second borehole to prevent the borehole from collapsing after construction. The leakages and poor workmanship on the fence to safeguard the borehole were also reworked to satisfy the community's needs.

In addition, through discussions with the local authority, it was agreed that there was a need to amend the contract to include 'defect liability'. This warranty holds the contractor liable for an agreed timeframe. During that period, parts and other installations related to the borehole's durability would still be liable to the contractor even when the community uses the borehole. In the past, contractors have handed over boreholes that are not of standard to communities. From the government side, they hold off 5% of the fees for a year to ensure the infrastructure is suitable for use.

For the ACTION project, the procurement under ClimBeR agreed to engage the contractor to decide on having a "defect liability" clause to prevent similar events from happening again. As the following steps, the procurement team discussed with the contractor to see how the current agreement could be amended. However, since this was not incorporated from the onset, holding any funds from the contractor after project completion didn't prove easy. Nonetheless, the contractor committed to work on the borehole in the future should problems arise.

With all the reworking done, the borehole was completed and ready for community use in September 2023. Figure 9 shows the Hanzila borehole drilled for the community.

Figure 9: Solar-powered borehole infrastructure implemented for Hanzila village as a multi-purpose water infrastructure

(Photo*:* Agricomm Media & Marketing Ltd 2023)

9. Conclusions

Like any typical rural community, Hanzila village faced challenges with water access for drinking, domestic and productive uses. The public water source (communal hand pump) was inadequate to cater for the community's water needs due to the many people accessing water from the public pump, which caused round trips to access water to take a long time. The hand pump is a multi-purpose water source. Other essential water needs, such as gardening, suffered without adequate water supply, contributing to people's limited opportunities for adequate income streams at the household level that could be realized by growing and marketing crops such as tomatoes, onions and cabbages. Moreover, the diversity of uses of the hand pump and many people accessing water at once caused the borehole to break down frequently and left people without clean water access.

Other sources, such as scoop holes and open sources, were unreliable due to drying up and being unclean sources that could not be safely used for drinking and domestic activities such as cleaning dishes.

Yet, in Zambia, rural water supply is a mandate the local authority should fulfil as per the government's obligation to provide water supply services for rural areas under the Rural Water Supply Programme. Service providers responsible for rural water supply should address problems of inadequate access and covering long distances or taking long round trips to access water. However, developing water infrastructure is only possible with funds that ensure that all communities without an adequate water supply have the much-needed water to meet people's needs, including drinking, domestic and productive uses. In most cases, budgets to fund water infrastructure development are inadequate for most rural districts, and therefore, some requests for water infrastructure take a long time to be funded. For most communities, this means waiting in line for extended periods until a time when funds are allocated to provide for water infrastructure development. Moreover, priority for support to such facilities is allocated to communities with the most needs. For example, priority is given to communities with several households situated further from the clean water source, areas without existing borehole infrastructure and areas that experience persistent waterborne diseases due to a lack of clean water sources.

Therefore, to improve access to water for vulnerable communities, support from external donors with funding such as the ClimBeR project is welcome to bring additional initiatives that support communities with water needs to supplement the efforts of the government and contribute to reducing the financial burden for district local government for water infrastructural development.

With the identified climate change impacts affecting access to water for drinking, domestic and productive activities, the ACTION project provided a solar-powered borehole to Hanzila village to enhance access to water to sustain human existence despite climate change impacts threatening water security in rural communities. The new water infrastructure improves access to water for drinking and domestic uses and significantly enhances opportunities for livestock and small-scale crop production to enhance incomes at the household level.

Implementing the ACTION project has highlighted the critical role partnerships play in identifying community challenges that can be supported to alleviate the challenges communities face. Through the engagement with district-level government that has a firm footing in community work and a better understanding of contextual situations in Monze district, adequate information was provided about the impacts of climate change in Monze district and water scarcity challenges that informed the need to source for funds for enhanced water supply in Hanzila village. Collaboration and discussions with district-level government also highlighted insights that led to the selection of Hanzila village as a site for borehole implementation through their thought-provoking stories that showed existing community efforts and initiatives of various bottom-up and top-down polycentric horizontal integration decision-making processes advanced by communities to improve their wellbeing.

While engagements with district-level government remain essential in pointing out sites and communities needing support, reasonable accountability on issues facing communities with similar contexts could be achieved if additional information is available regarding all locations district-wide. These could be informed by existing district plans that might show priority areas for development at the district level each fiscal year. Absent these, selection criteria for location are informed by what is known by individual officers within the government. Arguably, the lack of proper criteria opens up the bias risk by individuals providing information about locations that need support.

Community participation is the cornerstone of a successful project meant for communal benefit. Other than ensuring everybody's voices are heard and contributing to advancing ideas that allow for different needs to be met, community participation also instils a sense of ownership in projects implemented for communal use. Implementing the solar-powered borehole in Hanzila village ensured that all community members were present and consulted from inception to determine the challenges communities faced and identify priorities of water sources that are important for men and women in choosing a site to implement the water infrastructure. With heightened community participation at all levels, different needs are met for various target audiences, and transparency is enhanced.

The case of Hanzila village highlighted that while people resided in the same location, their challenges differed mainly according to age, gender and social class regarding water access. Promoting open conversations that ensure community conversations allowed everyone to develop all-inclusive ideas.

Even in perfectly planned development projects, challenges exist. Some agreed standards in borehole implementation were not followed by the contractor to ensure that set standards were met. However, the vigilant community members contributed to offering checks and balances when things didn't work out. In Hanzila, the community could call out the contractor when the casings were not the right size, and the borehole's depth was shallower than agreed. Knowing from the onset that the borehole infrastructure belonged to them, community members acted to rectify the problem by reporting it, highlighting the importance of community participation that instils a sense of ownership for the infrastructure among community members.

In addition, the inclusion of everyone from the very first contacts, diagnosis and identification of solutions onwards, at the interface between the community and government official is important. The Hanzila case has highlighted that such continued collaboration ensure equitable access to public water resources and gives all members of the community guaranteed tenure to the water resource. It also improves understanding of the processes followed to achieve the water infrastructure, a situation that contributes to sense of ownership of the infrastructure and enhances sustainable use of the resource.

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