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REPORT

Locally-Led Drought Resilience in Zambia's Southern Province: Report on Peer-to-Peer Learning on Implementation and Management of the Hanzila Solar-Powered Borehole and National Scaling-Out

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Locally-led Drought Resilience in Zambia's Southern Province: Report on Peer-to-Peer Learning on Implementation and Management of the Hanzila Solar-powered Borehole and National Scaling-out

Summary

From 2023 to 2025 the ClimBeR program piloted integrated and locally-led drought resilience in Hanzila community, Monze District, Southern Zambia. Through participatory planning, design and implementation, a solar-powered borehole was installed for drinking, domestic uses, livestock watering and irrigation. An elected Water Committee ensured operation, distribution of water among the various uses, fee collection, maintenance and repair. The assessment of the benefits for community members included improved health and hygiene, better nutrition, more income and alleviation of labour to fetch water for drinking and domestic uses and to move cattle to distant water sources in the dry seasons. In 2025, the community expanded the system with significant own financial contributions ('scaling in').

This report presents the project's subsequent phases of 'scaling out' of the model piloted in Hanzila. First, through peer-to-peer learning with selected other communities in Monze District, experiences were shared. This also generated insights in the applicability of the Hanzila model elsewhere. The more generic validity of the Hanzila model was confirmed, including the importance to prioritise water allocations according to local livelihood strategies.

Second, building on the collaboration with the government departments and Local Authority of Monze District from the very beginning in 2023, an assessment was made of the potential for scaling-out of the Hanzila model elsewhere in rural Zambia, through government, especially the Constituency Development Fund, and donors. Locally-led integrated water development and management appeared to align with the emerging integration for climate resilience by the Department of Agriculture. Key conditions identified were, at local level, participation by communities from the earliest planning phase onwards and, at district and higher levels the willingness by support agencies to overcome siloes, to bundle technical expertise and, amidst of many other local needs, to provide more financial support to improve access to water.

1. Introduction

The successful implementation of a solar-powered borehole in Hanzila community marked a notable milestone in efforts to strengthen resilience against recurrent droughts in Monze district, Southern region of Zambia. While the implementation of the solar-powered borehole in 2023 and its scaling-in in 2025, improved access to water for drinking and domestic use, as well as for gardening and livestock, it also demonstrated how locally-led solutions could potentially address climate-related challenges in rural Zambia and other countries with similar contexts as well. Hence, building on this successful pilot, the next phase of the project is the scaling-out. Can the lessons learned from Hanzila and practical experiences with other communities create a foundation for scaling the Hanzila approach not only within but also beyond the Monze district in rural Zambia?

Accordingly, the main goal of the scaling-out project was to assess whether the Hanzila model can be replicated in other parts of the Monze district and, eventually, across rural Zambia. This implied showcasing the approaches and benefits of community-led water infrastructure development, including its management, to inspire similar projects that integrate universal water access for drinking and domestic uses with broader livelihood strategies such as gardening and livestock rearing. This approach also positions water systems primarily used for drinking and domestic purposes as catalysts for economic and social resilience rather than as standalone interventions.

Central to the scaling strategy, adopted in this project phase and reported here, is peer-to-peer learning and community-to-community exchanges**,** which serve as platforms for knowledge transfer. Through these exchanges, participating communities will gain hands-on insights into how the Hanzila borehole was implemented, the management of the solar-powered boreholes, organising water committees, and embedding water access into everyday livelihood activities. These practical interactions ensure that knowledge is not only shared but contextualised to local realities. This also corroborates the validity of the Hanzila model for further outscaling.

To guarantee sustainability, the scaling-out initiative actively aims to engage local governments to provide technical support and align policies with rural water supply frameworks and climate resilience programmes. The initiative also seeks to engage other government departments, such as the Ministry of Agriculture, in enhancing agricultural practices in communities. Other wings of the government are key in institutionalising the model, ensuring that community-led efforts are reinforced by policy and resource backing. Further, the initiative also seeks to involve local leadership to influence the development and management of community infrastructure. This collective approach to the scale-out process creates a pathway for long-term adoption and integration into Zambia's rural development agenda.

2. Methodology

In order to achieve these goals, the project was implemented using three phases: The first part involved developing criteria for communities to participate in the exchange visit with the Hanzila community. The second involved engaging key informants to assess scalability through government and other support agencies, and the third part involved community engagement, implementing peer-to-peer learning activities.

2.1 Development of Criteria for Selecting Communities and Participants

The Project Facilitator developed clear criteria for inviting neighbouring communities to a peer-to-peer learning session with the Hanzila community. The purpose of this phase was to share knowledge about the processes used during the implementation of the Hanzila borehole and the current methods applied to manage it for sustainability. Three criteria were put forward:

The first criterion was to prioritise communities that did not have solar-powered borehole infrastructure and were underserved by adequate water for multiple uses, including drinking, domestic uses, gardening, and livestock. These communities often relied on crowded hand-pumps and shallow wells, and sometimes faced drying water sources needed for livestock and gardening, making them highly vulnerable to climate variability. This criterion aimed to ensure that future projects enabling these communities to access such infrastructure would position them to manage it effectively, drawing lessons from Hanzila's experience. It was also intended to motivate community members to lobby the Local Authority through the Constituency Development Fund (CDF) to implement similar infrastructure and build resilience against climate change impacts.

The second criterion focused on selecting communities that already had solar-powered borehole infrastructure. Including communities with solar-powered boreholes was crucial because they brought practical insights into what it took to secure water systems similar to theirs. It was also important to understand their experiences in acquiring these technologies and how they navigated financing options to secure investments for funding. Their insights were also important to learn maintenance strategies that offer valuable lessons for others aspiring to adopt similar solutions.

The third criterion required representation from diverse community groups across various villages to ensure discussions addressed the different needs and perspectives of participants. Among those invited were:

- *Community leaders (Headmen):* As custodians of local governance, Headmen hold significant influence in decision-making and play a critical role in mobilising communities and households for development initiatives. Their involvement in such initiatives also ensures legitimacy and community buy-in, making it easier to coordinate activities. Headmen also provide historical context on water access challenges and cultural norms that shape resource access and management, and are key in providing all contexts surrounding community projects.

- *Water committee representatives:* These individuals are the backbone of water governance at the community level. They are responsible for overseeing the daily operation of water points, managing water points, and enforcing water maintenance protocols. Their insights are essential to understanding management practices and challenges such as spare part availability, technical capacity gaps, and other challenges related to monetary contributions. Their perspectives are also important in understanding solutions and strategies for sustaining infrastructure over time.

- *Women's and men's groups involved in livelihood activities:* These groups rely heavily on water for gardening, livestock rearing, and other income-generating activities. Their experiences are important to show the link between water access and food security, nutrition, and household income. Their insights are also important in understanding how they were impacted by droughts and climate vulnerability over the years, which constantly affected the availability of water for multiple uses. Including them in the peer-to-peer learning ensured that their voices were heard and solutions proposed addressed issues that affected them directly in their need for water for productive purposes and gender-specific roles in resource use.

- *Youth representatives:* Young people are often excluded from resource planning at the community level, yet they face unique vulnerabilities due to climate variability and unemployment. Hence, they were included to promote inclusive participation and foster dialogue on climate variability, which disproportionately affects young people.

- *Government representatives:* The presence of Local Authorities and technical officers bridges community efforts with national programmes. They have a primary role of developing water supply infrastructure in rural areas. Taking the ClimBeR project's engagement with them since 2023 forward, environmental Health Technicians (EHTs) and Extension Officers from the Ministry of Agriculture were also invited for their technical expertise in water safety, hygiene, and climate-smart farming. Their engagement also ensured alignment with policy frameworks and opportunities for opening pathways for scaling successful models.

2.2 Engagement with Key Informants

2.2.1 Planning for engagements with key informants

To prepare for engagements and meetings, the Project Facilitator developed an interview guide shown in Annex A, with open-ended questions aligned with the objectives of the project. This guide ensured that standardised questions were administered to key informants during the interviews and also allowed flexibility during the discussion to capture nuanced insights.

Further, interviews were scheduled in advance to ensure the availability of the informants and to avoid delays. This preparatory step was critical to creating an environment conducive to meaningful dialogue and ensuring the objectives of the engagement were met.

2.2.2 Purpose of key informant engagement

The purpose of engaging key informants was twofold. First, to gather insights on which elements of the Hanzila drought resilience model, such as community participation during early planning, diagnosis, and visioning of solutions, as well as water and technology management practices, could be integrated into existing government programmes and policies. The engagement was also to assess whether scaling out the Hanzila model would be practical for other communities, considering factors such as resource availability, institutional capacity, and community readiness.

The second goal was to seek strategic guidance on which communities within Monze district could serve as priority sites for scaling the Hanzila model. This was particularly important given the district's vulnerability to climate change and rainfall variability, which have disrupted main water sources and agricultural productivity. Soliciting the support of key informants to share information on geographic conditions, existing infrastructure, and socio-economic dynamics to ensure that interventions would be both impactful and sustainable was key in leveraging local knowledge that can be used to scale out similar interventions as the Hanzila solar-powered borehole.

2.2.3 Selection of key informants

The selection of informants followed clear criteria to ensure relevance to the project's purpose. First, individuals with prior knowledge of the Hanzila borehole's implementation were identified, including government officials from the Local Authority (Council) and the Ministry of Agriculture, as well as community leaders familiar with its current management. Others included were personnel from the Ministry of Health and Ward Councillors within the catchment area of Hanzila community.

Aside from their knowledge of Hanzila borehole, their extensive understanding of communities in the catchment area was critical for providing guidance on which communities to invite for the learning session, drawing on Hanzila's experience with the implementation and use of the solar-powered borehole.

Secondly, selection was based on availability and willingness to participate, and this was confirmed to ensure that interviews could be conducted effectively and without undue delay.

2.2.4 Key informant interviews

The Project Facilitator conducted in-person interviews using an open-ended questionnaire (see Annex A) to elicit perspectives on aspects of project implementation relevant to existing and future government programmes of a similar nature.

Responses were recorded with prior consent, and detailed notes were taken to capture nuances and contextual details. Interviews lasted between 40 and 50 minutes, depending on how quickly respondents provided feedback.

2.3 Community Selection

After the interviews, the Project Facilitator communicated the set of criteria for selecting communities (indicated under 2.1) to the Agricultural Extension Officer, the District Water Supply and Extension Officer and the Community leader. This included the types of communities eligible to participate and the specific participants required for the learning event.

After hearing the proposed criteria for community selection from the Project Facilitator, the key informant also provided additional criteria to be considered for the selection of communities. The first recommendation was to identify communities on the Eastern side of Monze District, as those were among the most affected by climate variability and drought. They noted that rainfall patterns had become highly unreliable, with eastern parts of the district recording as little as 313 mm during the 2024–2025 season compared to the normal average of 500–600 mm recorded for other parts of the district. This variability had serious implications for water availability and agricultural productivity in such areas.

The second recommended criterion was to identify communities with large livestock populations and those with more pronounced horticultural practices to maximise learning of impact.

Based on the additional proposal criteria, the Project Facilitator provided further insights into the Ministry of Health's concern about moving people from a far distance to Hanzila, especially during the period when the district had a cholera outbreak. The Project Facilitator provided further guidance on the need for nearby communities for logistical purposes.

This combined selection criterion, proposed by the Project Facilitator and key informants, helped them identify communities that would be most relevant to the learning session and the community exchange programme.

Subsequently, the communities selected for the learning exchange were Mainde, Mwaalila, Hamapande, Hanguwa, and Mwangazi, all from Hamapande Ward. Aside from adhering to the proposed criteria, the selected communities were also close enough to the Hanzila community to reduce the large cross-movement of people amid the increasing cases of cholera in Monze district.

2.4 Engagement of Selected Communities

The following outlines the process for mobilising and engaging selected communities for peer-to-peer learning sessions: community mobilisation and engagement.

2.4.1 Community mobilisation

Based on recommendations from government key informants, the Project Facilitator approached the Headman for Hanzila community to seek advice on the best and most strategic method to get people to the meeting from the communities proposed by the key informants. The Headman co-opted the Area Councillor for Hamapande into the process because they had greater influence at the ward level, wielded more authority over the communities within their jurisdiction, and were able to bring groups of people together at short notice.

The Headman from Hanzila community and the Area Councillor for Hamapande ward sent word to the Headmen of the selected communities, making it very clear about the criteria for

participants to be called for the meeting. The date and time of the meeting were communicated. Further communication was provided on how communities would travel, i.e., logistics for travelling to the Hanzila community.

The Project Facilitator arranged all transport logistics, as communicated to the Headman, and people who were invited were transported to Hanzila on the morning of the learning and exchange session.

2.4.2 Methods of community engagements

The engagement was structured in three ways:

First, the two representatives from Hanzila, the host community, took the lead in sharing preliminary insights into the history of their water situation before the implementation of the solar-powered borehole and how the first borehole infrastructure was developed in the community in 2023. They also showed the process they went through to develop the second borehole in 2025.

Further, they described existing methods for managing water sources and the rules in place for the initially developed borehole, which had been operational for more than two years. They also shared the challenges they faced and the strategies they adopted to cope with water shortages for various community needs at the first developed borehole. This initial sharing laid the foundation for open dialogue and enabled other participants to ask questions about issues that needed clarification.

Second, visiting communities were invited to share insights into the types of water sources available in their areas and to explain how they manage their water resources. The visiting communities also highlighted diverse practices such as rationing water for livestock, maintaining communal gardens, and organising rotational access to boreholes (both hand pumps and solar-powered boreholes). Figure 1 shows a participant from one visiting community sharing how they manage their water sources.

Figure 1. A participant from one of the visiting communities sharing insights on the management of their water sources (*photo*: Carol Emma Mweemba 2025)

Third, discussions were open to all participants to share experiences on any topic that was discussed, ask questions and make contributions to problems previously highlighted on some

of the solutions they had used from their communities. This participatory approach ensured that experiences from different villages were captured, promoting peer-to-peer learning and strengthening collective ownership of solutions.

The peer-to-peer learning exchange was facilitated in the local language of Tonga, to ensure that all participants in the meeting could fully understand, engage and benefit from the shared learning.

2.4.3 Transect walk

After the peer-to-peer learning community exchange, participants conducted a transect walk in the community of Hanzila to observe some of the locations discussed during the session. The walk provided an opportunity for participating individuals to see first-hand the solar-powered boreholes, both the initial investment of 2023 and the newly constructed one of 2025, to understand how the network of pipes served different parts of the households.

Participants also had the opportunity to see some existing gardens and newly constructed water troughs for livestock to validate some of the issues raised during the meeting and to appreciate the challenges and opportunities for improving water access and managing water sources in Hanzila community. Figures 2 and 3 show participants observing the solar-powered borehole infrastructure and water troughs in Hanzila community.

Figure 2**. Visiting communities conducting a transect walk to observe borehole infrastructure in Hanzila community (*photo:* Carol Emma Mweemba 2025)**

Figure 3**. Visiting communities conducting a transect walk to observe water troughs for livestock watering in Hanzila community (*photo*: Carol Emma Mweemba 2025)**

3. Peer-to-Peer Learning Exchange

3.1 Introductory Remarks

The meeting commenced with a welcome address by the Senior Headman of Hanzila Community, who expressed appreciation for the presence of fellow senior Headmen, the Chief's representatives, the Area Councillor and other government officials, including the Agriculture Extension Officer, the Environmental Health Technician, the representatives from water committees across various villages, and all other participants.

Following introductory remarks, the Headman requested that the Project Facilitator share the objectives of the meetings and give context for why the learning session was called. The Project Facilitator shared the agenda and objectives of the gathering. Attendants were briefed on the purpose of the meeting: to facilitate cross-community learning, enabling communities, both with and without solar-powered boreholes, to learn from Hanzila's experiences in borehole implementation, and to provide an opportunity to exchange best practices and knowledge on climate-resilient water management across communities facing similar contexts.

The meeting then transitioned to hearing from the water committee from Hanzila community. The Chairperson of the Hanzila Water Management Committee for the first borehole, who took up the chairing of the meeting, introduced all the members of the committee who were present, including the roles each member of the committee plays in overseeing management and maintenance of the solar-powered borehole and other water sources within the community.

Participants from visiting communities also introduced themselves, ensuring that everyone was familiar with the diverse representation in attendance and fostering an inclusive environment for dialogue and knowledge sharing. Figure 4 shows some of the participants present during the peer-to-peer learning exchange.

Figure 4. Some of the participants present during the peer-to-peer learning exchange (*photo:* Carol Emma Mweemba 2025)

3.2 Water Scarcity and Livelihood Challenges in Hanzila Community Pre-Implementation of the Solar-powered Borehole

The Chairperson for the first borehole of Hanzila community provided an overview of the water and livelihood challenges community members faced in Hanzila community before the solar-powered borehole was implemented.

They indicated that some years ago, the Hanzila community, like most communities in Monze district, faced severe water challenges due to recurring droughts. The community mostly relied

on a single borehole that was reliable year-round, but had other sources, such as seasonal scoop holes for drinking and domestic uses. Animals and people both relied on these scoops to drink. Larger herds of cattle were taken to dams some 20 km away from the community to drink water when nearby weirs and open streams dried up. They also noted that during those years, water scarcity was acute, and the impact on livelihoods was devastating. The community lost large numbers of cattle because of water shortages. The long distances covered to access water at the dams when nearby sources dried up also caused the cattle to become exhausted. The long distances, combined with the lack of grazing pasture, led to stress, fatigue, and hunger, causing livestock deaths on a scale that left families helpless. Goats were also affected, and the little water available was reserved for human consumption. No gardening activities were done during water scarcity. The first few months after the rainy season were the only times when gardening activities were carried out using water from open sources. Once such sources dried up, no individual could continue gardening activities, and they had to stop. This meant no income from horticultural crops and no adequate source of nutrition for families.

3.3 Origin of the Solar-powered Borehole in Hanzila Community

The Chairperson set the scene by providing an overview of how the borehole in Hanzila community was first introduced. In his presentation, the Chairperson shared that the community leader received a message from the Local Authority that researchers were interested in understanding the context in Hanzila, having heard that it was one of the communities that had faced challenges with water for various uses and faced impacts of climate variability, such as drying up of water sources and experiencing inadequate infrastructure, yet it was a community that was interested in developing their community. The Headman was receptive to the visit to learn more about the project and met with the Project Facilitator to schedule a follow-up visit with the whole ClimBeR project team in a follow-up meeting.

The introduction of the ClimBeR Project into the community marked a turning point for the people of Hanzila in terms of access to water for various uses.

3.4 Implementation of the First Solar-powered Borehole and its Management

3.4.1 Community participatory processes in diagnosing water challenges and envisioning solutions during the implementation of the First solar-powered borehole

Following the first contact and the announcement that more people intended to visit the community in February 2023, the Headman invited community members to the first meeting with the ClimBeR team to understand the project proposal. In February, the first meeting was held, during which community members heard about the project's objectives and were asked to highlight some of the water challenges the community was facing. Men and women first mapped out water resources and highlighted the main challenges they faced with their then-existing water challenges. Some of the challenges they highlighted were indicated by the Chairperson as follows:

> "…We had so many water problems in the community before. We used to have a single borehole serving the entire community, which was often crowded. This means that people had to spend long hours waiting for their turn to access water from the borehole. Those

who did not have the patience to wait for long hours to get water or walk long distances to other water sources in nearby villages, relied on scoop holes to get water for drinking. Unfortunately, such sources were not the cleanest, as cattle and other small livestock also used the same scoop holes to drink". — **Meeting Chairperson during the peer-to-peer learning session.**

After sharing the challenges the community faced, the community proposed possible solutions to some of those problems. Community members were separated into men and women to develop solutions suitable for each group. Proposed solutions that responded to their needs. Men and women proposed different things. Men focused on water sources to improve cattle's access to water and wanted to build dams. Women proposed adding an additional hand pump to ensure people can split to get water from a hand pump.

However, the proposed solutions did not meet all the needs people had for their water sources, including drinking, domestic uses, gardening, and livestock watering. After careful deliberation among the men and women, a solar-powered borehole was proposed as the most likely option because it could reduce congestion at access points, with many taps installed across multiple locations, thereby ensuring people are spread out when getting water. The solar-powered borehole could also be used for gardening, as some taps installed would be allocated for that purpose. Further, the solar-powered borehole could serve as a water source for livestock drinking.

After the solar-powered borehole was selected for implementation in the Hanzila community, the community participated in selecting the site where the borehole would be implemented, together with the project's contractor who assessed groundwater availability. They also participated in selecting actual locations for access taps to ensure that all water needs and households benefited fairly.

3.4.2 Community participation in the development of the first solar-powered borehole

The Chairperson for the Hanzila meeting shared that, during the implementation of the water source, selected community members were present to ensure the contractor drilled the borehole in accordance with the project's guidelines. Because of their presence during the implementation process, they noticed that the borehole was not drilled to the agreed depth.

"… during the interactions with the donor and the Project Facilitator, we were notified that the borehole was supposed to be drilled 100m and all casings included, plus all accessories made available. When the contractor began drilling, they wanted to stop at around 70m, which was not the agreed 100m communicated to us. We knew that 100m was also what had been paid for. So the community was vigilant in quickly intervening to ensure the borehole reached the correct depth. Without anyone monitoring, the borehole would have been drilled at a shallower depth than initially agreed depth". — **Meeting Chairperson during the peer-to-peer learning session.**

Community members also participated in digging trenches to lay pipes that supply water to various locations within the community.

> "… as a community, we agreed that as the contractor was drilling a borehole and installing other hardware, we would do our part and dig trenches where we would lay the pipes. We also helped to install the pipes in different locations that had been pre-selected to be areas for water access". — **Chairperson for the first solar-powered borehole in Hanzila during the peer-to-peer learning session.**

When the infrastructure was completed, it was handed over to the community in September 2023 during an official handover.

3.4.3 Management of the first solar-powered borehole

The Chairperson presented to the visiting communities how water resources from the solar-powered borehole were managed. Upon the borehole's implementation, a water committee was established through community participatory processes, with voting to select the right people to oversee its use and ensure efficient management.

> "… we sat down as a community and elected a Water Management Committee, and I was voted in as the chairperson. Other positions, including secretary, treasurer, and additional members, were also filled. The committee was constituted of 10 members, and we shared different responsibilities on how we would work to manage the water source"., — **Chairperson for the first solar-powered borehole in Hanzila during the peer-to-peer learning session.**

The committee is responsible for maintenance, management, and prioritisation of water use, ensuring equitable allocation between domestic needs, livestock watering, and gardening activities. The committee is also responsible for enforcing the rules, and people have been abiding by them without significant challenges because they understand the need to ensure optimal utilisation of the borehole for its sustainability.

In terms of rules devised for managing water resources, in the initial stages, soon after the implementation of the solar-powered borehole, the community agreed that each household would pay USD 1.20 (ZMW 30) towards borehole maintenance in the event of a breakdown. This fee was adjusted after some indicated that households that accessed water only for drinking and domestic use were required to pay USD 2 (ZMW 50) per month, while those that also used it to water livestock and gardens were required to pay USD 4 (ZMW 100) per month. Most recent conversations, yet to be implemented, propose adjusting the fee structure: households using water for drinking and domestic use would pay USD 4 (ZMW100) per month, and those with cattle would contribute an additional USD 0.40 (ZMW 10) per cow. While this is still under consideration, those with livestock have opposed the fee because those with large herds feel the cost will be too high and recommend paying a round figure of USD 8 (ZMW 200), irrespective of the number of cattle a household has.

The Chairperson further indicated that community contributions from households had created a financial buffer, enabling quick repairs without relying on external sources when the borehole had a breakdown. With the help of a local Engineer, all breakdowns that occur in the borehole

get resolved within a short period of time, with a maximum of 3 days of downtime, because the funds are readily available to buy needed parts and pay the local Engineer for their services.

Further, water access priorities were set to ensure a fair allocation of water for drinking and domestic use, with livestock watering and gardening last. The community prioritises water for drinking and domestic use. Drinking water could be accessed at any time of day. However, the water committee recommends that people utilise the mornings to access water for drinking and domestic uses, ensuring they leave ample time for other uses such as gardening and livestock watering. Further, between gardening and livestock water, livestock takes priority because of the limited open sources of water for cattle, resulting from the drying up of streams and weirs. Access to water for livestock is allowed from 10 am to 3 pm. The time allocated for livestock watering is longer because many animals access water from the borehole. Moreover, neighbouring communities also access water from the borehole and contribute to its maintenance.

Water for watering the gardens is available from 7 am to 10 am and again from 3 pm to 5 pm, with households alternating to access it. Those who water in the morning cannot water their crops in the afternoon and are also required to sit out a day to give others a chance to water their gardens.

3.4.4 Impacts of the solar-powered borehole in community livelihoods in Hanzila

The Chairperson presented to the visiting communities how the first solar-powered borehole had impacted the community in Hanzila. Access to clean and reliable water had significantly improved health and hygiene, making people healthier, cleaner, and more confident. Contributions were also made by women in the group, indicating that:

> "…As women in Hanzila Village, we feel very lucky and privileged to have a solar-powered borehole. […]. We have adequate water to bathe and keep our surroundings clean. Today, if anyone is found dirty in this village, it's by their choice, and not because water is unavailable, because water is right at our doorsteps". — **Female participant during the peer-to-peer learning session in Hanzila.**

Having access to reliable water also enabled households to engage in gardening, which has enhanced the nutritional value of the diets of people in Hanzila community.

> "…We also no longer buy vegetables because we grow them ourselves. We have tomatoes and other crops in our gardens, and the practice here is that we don't sell vegetables to each other; we share freely. If I don't have a certain vegetable, my friend will share what she has, and when mine are ready, I will give my neighbour what I have planted. We only sell to outsiders and at the market, and this has greatly improved nutrition in our village". — **Female participant during the peer-to-peer learning session in Hanzila.**

Through these gardens, families not only grow diverse crops but also generate income from the sales of vegetables and also to purchase foods that cannot be cultivated locally, improving overall food security.

> "…These small gardens have also empowered us financially. […]. All I need to do is sell my vegetables in town, and I can buy what I want and need. In the past, I had to ask my husband for money, which often led to conflicts at home. […] But now, we proudly buy what we need because we earn from our gardens. We are able now to provide for ourselves and our families."— **Female participant during the peer-to-peer learning session in Hanzila.**

Beyond nutrition, the project has contributed to better housing standards. Many households have been able to construct stronger, more durable homes by moulding bricks with borehole water and using them to build houses.

Significantly, the availability of water has reduced reliance on environmentally harmful practices such as cutting down trees for charcoal production. Young people who previously engaged in charcoal burning are shifting focus to productive gardening activities, which are strongly encouraged to enhance sustainable livelihoods and environmental conservation.

> "…The lives of our youth have also improved. They no longer burn charcoal, which used to degrade our forests. Instead, they grow vegetables in their gardens and earn money in a good way". — **Male participant during the peer-to-peer learning session in Hanzila.**

Livestock management has also greatly improved. Despite the drought and scarcity of grazing pastures, cattle in Hanzila remain healthy due to access to adequate water. Exhaustion, usually experienced by cattle when it is hot and water is limited, has been reduced, which also helps prevent cattle deaths.

> "…Even our livestock benefits. Although we lack grass, our cows look healthier because they can drink water anytime. Unlike neighbouring villages without adequate water, our cattle continue to thrive. […]. This borehole has been a miracle for us. Our cows drink freely without waiting for someone to pump water, unlike before, when we used hand pumps to fill basins for cattle, which was exhausting and often left us short of water for cattle because it was labour-intensive. The price is better here because our cattle are healthier compared to those from neighbouring villages". — **Male participant during the peer-to-peer learning session in Hanzila.**

3.4.5 Challenges with the first solar-powered borehole

The Chairperson indicated that while there were many benefits to using the solar-powered borehole, some challenges existed. The current water pump was much smaller (1.5 horsepower) than the original one that was stolen, which was 2 horsepower. The community experienced reduced water output, so its needs are not fully met. The community had to reduce

the number of gardening activities to ensure that other water needs, such as drinking and watering livestock, are met.

Further, managing a community resource is challenging due to diverse personalities and compliance issues. Not all households have been forthcoming with making their monthly fee, yet continue to access water from the borehole. Continued enforcement of the rules, as well as home visits and sensitisation on the value of the borehole for households, livestock, and gardens, have improved compliance. After the recent expenditure, the committee has in its reserves over USD 80 (ZMW 2,000) to address any maintenance needs that might arise.

3.5 Implementation of the Second Solar-Powered Borehole and its Management

The second Chairperson for the newly constructed solar-powered borehole discussed the implementation process.

3.5.1 Community participatory processes in mapping locations and contributions towards the implementation of the second solar-powered borehole

After being notified of the project's proposed new extensions to water supply systems, the Chairperson called a community meeting, where community members engaged in a participatory mapping exercise to determine locations for access taps. Men and women conducted separate mappings, each suggesting locations that were later compared, and agreements were reached on final points.

The initial idea was to extend the first borehole to other, still underserved households. However, due to limited water output, the community agreed to fund the drilling of a new borehole with their personal funds, since other materials had already been provided through the project, and the project had no budget to cover it. This was achieved, and all water networks were put in place, and households that previously did not have water now have access to it from the borehole.

In addition, two water troughs were constructed to provide water for livestock in the community and ease the burden of carrying water to basins.

3.5.2 Observed immediate benefits of the newly constructed water troughs

The newly constructed borehole has been connected to automated water troughs that refill whenever water levels drop, eliminating the need for men and young people to pump water for livestock manually. This has eased the physical burden on households and improved animal welfare.

Further, the benefits extend beyond Hanzila community. Cattle from neighbouring villages often travel to Hanzila to drink from the Hanzila troughs because their areas lack water. In the spirit of solidarity, Hanzila has been able to share the water resource with neighbouring communities, particularly because they understand what it means to struggle with inadequate access to water for livestock.

3.6 Insights from Visiting Communities on Management of Water Resources

Participating communities shared insights into the use and management of their water sources. Most of the management issues were similar to those of Hanzila. In some cases, they also provided solutions on how they managed to resolve some of the challenges they faced.

3.6.1 Communities relying on hand pumps

In communities that relied on hand pumps for drinking water, domestic use, small-scale irrigation, and livestock watering, access to water was often limited by physical effort and time constraints. Households concentrated mostly on fetching water for drinking and domestic use, without focusing on gardening, because fetching water manually was labour-intensive.

> "…Getting water by pumping from the hand pump limits the amount we collect, so we mostly prioritise essential uses such as drinking, cooking, and basic hygiene. Livestock watering and water for gardens are often secondary". — **Male participant during the peer-to-peer learning session in Hanzila.**

During dry seasons, water scarcity becomes severe because open sources in nearby streams and scoop holes dry up. This means that there is heavy reliance on hand pumps to access water. Due to the many people competing for water, conflicts persist. Long queues are also more pronounced in the dry season because many people have to get water at the same time.

In terms of management, water point committees organise pump usage schedules to avoid conflicts. The water points committees also handle maintenance of the hand pump, using contributions from small funds collected monthly, annually, or when the hand pump breaks down. However, because breakdowns are frequent, repairs can take weeks due to insufficient funds to purchase spare parts and, sometimes, a lack of technical expertise.

Further, using hand pumps limits agricultural activities, as irrigation is impractical. As a result, food security and nutrition remain vulnerable, and economic opportunities tied to water use are minimal. While hand pumps provide a lifeline, they do not fully support resilience against drought or enable sustainable livelihoods.

3.6.2 Communities relying on solar-powered boreholes

It was noted that communities relying on solar-powered boreholes had similar experiences to those of the Hanzila community. They noted the benefits of having water readily available on demand, reducing physical strain and time spent fetching water. They also noted that such accessibility promoted better hygiene and sanitation, as households could maintain cleanliness without rationing water. Livestock health was also supported because animals could drink freely, even during dry spells, reducing mortality and improving market value.

Water resource management in these communities was more structured. Like in Hanzila, the water committees established clear rules for usage, including designated points for livestock and gardens to prevent wastage. They also noted that funds for maintenance were collected regularly to ensure sustainability, and in some communities, local people received training from external support when the borehole was implemented to learn how to carry out quick repairs. This means they had in-house staff who could repair the borehole when it broke down. The Hanzila community requested training for local people in the village to repair the borehole without relying on a paid Engineer from a nearby community.

Participants relying on a solar-powered borehole for water access also noted that the availability of water enabled small-scale irrigation, allowing families to grow vegetables year-round. This not only improved nutrition but also created income opportunities, as surplus produce was sold in nearby markets. The solar-powered boreholes contributed to climate resilience, economic empowerment, and improved quality of life.

3.7 Key Learning from the Hanzila Visit

The visit to Hanzila provided visiting communities with valuable insights into how locally-led approaches can successfully address water scarcity and climate resilience challenges. Several lessons emerged from the conversations and experience:

1. **Openness to engagements and new opportunities leads to community development:** The success of the borehole project in Hanzila began with the community leader's openness to external engagement and willingness to explore solutions. This positive attitude created an enabling environment for initiating collaboration among project donors, implementers, and the community, and ensured that the community played an active role from the outset. Visiting communities learned that remaining receptive to partnerships and participating in initial discussions is important in developing interventions that respond to local needs.
2. **Participatory diagnosis and envisioning solutions help to create solutions that respond to local contexts:** Hanzila's experience demonstrated the importance of inclusive processes in identifying challenges and designing solutions. Men and women were involved in mapping water resources and proposing interventions, which ensured that multiple uses, such as drinking and domestic water, livestock watering, and gardening, were considered. The participatory approach led to agreement on the most plausible options that cater to all needs and ultimately to the selection of a solar-powered borehole as the most suitable. Visiting communities recognised that involving all groups in problem diagnosis and developing community solutions is key to developing water projects that are relevant and respond to community needs.
3. **Community vigilance during the implementation of solar-powered borehole enhances the quality of the community project:** One of the most outstanding lessons was the role of community vigilance in safeguarding project quality. Community members monitored the drilling process and intervened when the contractor attempted to stop at a shallower depth than agreed. This oversight ensured that all technical standards were met and prevented shortcuts. Visiting communities learned that active monitoring during implementation is essential for guaranteeing infrastructure quality.
4. **Governance structures for sustainability:** The establishment of a democratically elected Water Management Committee was pivotal for managing the borehole. The committee oversees operations, fee collection, and enforcement of rules, ensuring equitable water allocation among domestic, livestock, and gardening needs. Visiting communities learned that strong governance structures are critical for long-term functionality and conflict resolution.
5. **A financial buffer is key to ensuring that water infrastructure is maintained and downtime is reduced in the event of a breakdown:** Household contributions created a maintenance fund that enabled quick repairs. This financial buffer minimised downtime, with breakdowns resolved within three days. Visiting communities recognised that setting up a maintenance fund is vital for resilience and independence.
6. **Setting up clear rules and prioritisation of the most pressing water needs can help optimise water resource use:** Hanzila implemented clear rules and schedules for water use, prioritising drinking and domestic needs, followed by livestock watering and

gardening. Time slots were allocated to ensure fairness and optimise resource use. Visiting communities learned that structured rules reduce conflicts and promote efficient utilisation of the water for competing water needs.

7. **Livelihood and social transformation**: Reliable water access transformed livelihoods in Hanzila. Households engaged in gardening, improving nutrition and generating income. Women reported greater financial independence and a reduction in household conflicts. Visiting communities saw that water infrastructure can enhance broader social and economic benefits beyond basic access.
8. **Shared responsibility in construction:** Community members from Hanzila contributed labour, dug trenches, and installed pipes, which complemented the contractor's work. This showed visiting communities that working together can help a community to achieve common goals, accelerate progress, and strengthen community ownership. Visiting communities saw that such contributions also enhance sustainability and build a sense of pride in the infrastructure.
9. **Community-led expansion of water sources is a powerful example of how communities that experience real impact also become drivers of expansion:** One of the most powerful lessons was the community's decision to fund a second borehole using its own resources. This demonstrated strong ownership and willingness to invest in scaling solutions when tangible benefits are realised. Visiting communities understood that when communities experience real impact, they become active drivers of expansion.

4. Findings of the Study with Key Informants

4.1 Institutional Support for Scaling Out Water Supply Systems

Officials in Monze district expressed strong support for scaling up water supply systems, such as solar-powered boreholes, which have proven effective in addressing water challenges for multiple uses (drinking and domestic use, gardening, and livestock watering) in communities where they have been implemented, such as Hanzila.

> "…the intervention in Hanzila came at a critical time when climate change is severely impacting smallholder farmers. These farmers are highly vulnerable to droughts and floods and lack the capacity to harvest and store water. The solar-powered borehole is addressing these challenges, including support to small gardens to improve household food security". — **Key Informant 1, Ministry of Agriculture in Monze district.**

> "…most gardening activities occur between May and October, but they are often disrupted when natural water sources dry up. Extending water points to more communities would enable small household gardens, primarily for food consumption, and this can improve household nutrition and food security". **— Key Informant 1, Ministry of Agriculture in Monze district.**

This means that such interventions should be advocated for scaling out to other water-stressed communities in Monze District, because they would not only improve domestic water access

but also support livestock and small-scale gardening, thereby enhancing nutrition, reducing health risks, and promoting climate-resilient livelihoods, as is the case for Hanzila community.

It should be noted, however, that while scaling out interventions such as the Hanzila solar-powered borehole to other communities offers great opportunities, there are two significant challenges to consider: high initial investment costs and the sustainability aspect. Most communities lack the financial capacity to replicate these systems without donor support. At the household level, a few individuals have the financial ability to develop a single-use solar-powered borehole. Such facilities mostly serve single households, and where possible, a few other neighbours can be allowed to access such facilities for limited uses such as drinking and domestic and to a lesser extent, livestock watering. However, large uses of water, for gardening, for instance, may not be permitted from privately owned boreholes.

At the community level, such infrastructures are rare. However, most externally funded water sources are boreholes equipped with hand pumps because they are a cheaper option that is able to cater for larger numbers of communities and households. Moreover, the allocated CDF per ward is not sufficient to address water needs in the communities along with other competing needs such as construction of schools, roads or health facilities. As a result, priority is given to infrastructure such as hand pumps, which require low investment.

> "… We are limited to developing infrastructure that is cost-intensive. From the allocated CDF per ward, we would prioritise increasing access to schools for children, and just one school takes up the entire allocated funds, leaving a very limited amount to split among other priorities. When those funds are used up, no additional funding will be available for the year. Therefore, cheaper water solutions are implemented to ensure broader coverage for people accessing water services at a lower price". — **Key Informant 2, Monze Municipal Council in Monze district.**

In terms of sustainability, community-level governance and management structures must be strengthened to sustain operations once external support ends, ensuring long-term sustainability. Community ownership and clear maintenance plans should be put in place for success.

4.2 Aspects of Hanzila's Experience of Participatory Planning Most Relevant for Government Policies and Programs

During the implementation of the Hanzila borehole, the first three steps of initiating collaboration, diagnosis, and envisioning solutions were adapted from IWMI Working Paper 194 (van Koppen et al. 2020) and contextualised for Hanzila community (Mweemba et al. 2023, Mweemba et al. 2025), providing the basis for the project.

In the initial stages of the project, the ClimBeR team collaborated with government officials from Monze district and visited Hanzila to establish a working relationship and share project objectives. The visit was also intended to create an opportunity for the community to participate in developing a water infrastructure suitable for their context.

Subsequently, community members identified challenges with their existing water sources and proposed solutions they believed would ultimately improve access to water for the community's most important water needs. After several hours of deliberation, the community settled on a solar-powered borehole as the most likely solution to improve water access.

During consultations with the Ministry of Agriculture, the Local Authority, Councillors, Environmental Health Technicians, and community leaders, the steps adapted from van Koppen et al. 2020 and contextualised in Mweemba et al. 2023 and Mweemba et al. 2025 for Hanzila were recognised as key to ensuring that communities participate in resources that enhance their well-being for several reasons. Firstly, community participation allows community members to have a clear understanding of the purpose and benefits of the projects, as well as their limitations. When early engagements are incorporated into the development of the community project, they also serve to build trust and ensure that water infrastructure responds to the real needs of the people. People living in their communities have first-hand knowledge of their water challenges, cultural practices, and environmental conditions, and therefore have an opportunity to identify priorities and technologies that fit their contexts, making the proposed projects more relevant and practical. As indicated by key informants:

> "Like most projects, I believe that the most important step after mapping out your site is to engage with the community. Community engagement helps you identify the most pressing challenges these communities face, which should guide your priorities. Your approach will depend on the available resources". — **Key Informant 2, Monze Municipal Council in Monze district.**

> "… For a well-meaning project intended to improve the livelihood of the people, the best way of going about it is involving people who are going to be impacted by the project. For one, they understand the context better and are in a position to suggest solutions that suit the context". **— Key Informant 3, Ward Councillor in Monze district**.

Further, another respondent indicated that mapping processes together takes away mistrust among people and enhances accountability.

> "… In communities where participatory processes have been implemented, we have seen how much mistrust is reduced because people who participate in deciding what kind of water source will be implemented and where it will be implemented will not come back and ask questions when the project is actually done because they have a full understanding of the process. They also show a strong willingness to participate in community projects because they have little or no suspicion that others will try to hijack the project". — **Key Informant 4, Community leader in Monze district.**

The Zambian government, through its Local Authority, implements similar initiatives to ensure community participation and engage community members before a water project or any other community project is implemented. This is also what they recommend to donors who come with funding to develop community projects, because they want communities to have a sense of ownership for projects that are proposed to communities, and that community members should take leadership on managing such projects when donors are no longer available to support the management of the project.

> "…It is crucial to understand that when investments in water infrastructure are made in these communities, there needs to be a sense of ownership, governance, and leadership. Therefore, we also consider what type of governance structure should be established when a project is implemented and emphasise to communities to put in place structures to sustain the water infrastructure during implementation". — **Key Informant 2, Monze Municipal Council in Monze district.**

Key informants also noted that while all ideas for community participation are recognised as key to community development, they were not always practised well. For externally funded projects, they arrive in a community with pre-developed implementation ideas, the interventions to be used, and the number of people the project would benefit. And because the proposals are submitted to the donors beforehand without community voices, there is a limited opportunity for communities to suggest their own projects that respond to their priority needs. This means that the donors will provide a framework for what should be funded, such as water infrastructure, not, for example, the purchase of livestock, and the communities are expected to work within the proposed framework. There is no room for communities to develop their own wish list through participatory processes that culminate in a proposed project, grounded in the community's identified real needs.

However, for government programs funded through CDF, most projects are community-led, meaning proposals come from the community and are presented to the Local Authority for funding. The projects start with the Constituency Development Fund Committee (CDFC) working in collaboration with Local Authorities, inviting community project proposals annually through advertisements, public meetings, or posters. After this process, the second and third steps of diagnosing and envisioning solutions are seen as more practical to implement because communities come together to identify their priorities that need to be funded and also devise solutions that they see fit to address their problems. As outlined in the CDF Guidelines (Ministry of Local Government and Rural Development 2022), these are participatory processes that require qualification to submit a community project proposal. There is also a need for signed minutes submitted using official CDF forms. Subsequently, technical appraisals are conducted within a couple of weeks of receiving the proposals to assess whether the proposed projects are viable, relevant to community development, and in line with the Ward Development Plans and Integrated Development Plans. The final selection prioritises community-driven, environmentally sound, development-aligned, and beneficial to the broader community projects.

4.3 Aspects of Hanzila's Operation and Maintenance Most Relevant for Government Policies and Programs, including Adaptability in Other Communities

After the implementation of the solar-powered borehole in Hanzila, the community established a water committee to ensure its maintenance and to provide funds to cover any breakdowns. The committee has also developed rules governing water access for various uses, including drinking, watering livestock, and gardening, to ensure water use is shared fairly.

Discussions with key informants in Monze district revealed that aspects of Hanzila's operations, including instituting water committees, maintaining new water technologies, and water distribution experiences, are most valuable to government programs and policies because they help address day-to-day issues that communities face. For example, it was noted that Water Management Committees were very important in communities sharing water

resources, ensuring a fair allocation of water among competing users. Moreover, most communities in Monze district relied on water sources for gardening, drinking, domestic use, and water for livestock. With all these competing needs, the role of the Water Committee was to ensure that all people had some level of satisfaction in accessing shared water and to minimise conflicts over water access among the various competing water users in the community:

> "… We cannot succeed without a Water Committee for a shared borehole or well, because different water users and uses demand different volumes of water per day to meet their needs. A household with cattle will need more water than one that only has chickens. Also, those with gardens will need more water than those without, and therefore, having a Water Committee to enforce rules of access is something that can reduce conflict in water access and ensure that all people adhere to their allocated amounts of water at each given time". — **Key Informant 4, Community leader in Monze district.**

Key informants also noted that the operation and maintenance of new water technologies and water distribution systems, as well as the fee-paying system, are valuable for managing and maintaining water infrastructure. The fees are paid by the people benefiting from the water point, depending on their usage. It was also noted that the amounts varied by location and in some cases, per use. And for hand pumps, which were the majority of the sources of water in Monze district, money contributed by communities for maintenance went toward paying pump minders and purchasing replacement equipment when the borehole infrastructure broke down. This ensures the continuous operation of water points for sustainability, as donors will not continue supporting maintenance once the system is handed over to the community.

> "… We encourage communities to ensure that they collect funds from water users for any water infrastructure that is developed to ensure that they have the ability to maintain and fix anything that is broken from the infrastructure in good time, because they cannot continue to rely on any funder that provides the water sources. Once the donor is done with the implementation of water sources, they hand over, and the expectation is that communities continue to manage their own water resources". — **Key Informant 2, Monze Municipal Council in Monze district.**

Respondents also noted that community ownership is established among users when combined with mechanisms for raising funds for maintenance, which usually come from households accessing the water point. People tend to feel more inclined to care for the infrastructure when they contribute to its sustainability, and therefore, such a system is important to maintain.

Further, respondents also noted that, for other communities, they could adapt some of Hanzila's practices, such as prioritising which types of water use should be allocated more water at a given time and for what reasons. This, however, is very much contextual because each community is different, and one community's priorities might not be the same as another's. One community might prioritise water for gardening over water for livestock, while another might prioritise water for livestock over water for gardening or brick making. This is mainly guided by the most dominant economic activity for a community.

However, one of the main issues consistently mentioned was the importance placed on livestock keeping. Livestock, particularly cattle, is essential to rural communities in Monze district because it is the mainstay of the communities. New designs for new water points (such as hand pumps) should also take into account areas where cattle and small livestock can drink. Dams are heavily silted and dry up for a few months when the rains stop, and hence animals find themselves accessing water at existing water points primarily meant for drinking and domestic use. This means that people cannot prevent cattle from accessing water points used for drinking and domestic use, and have to adapt to include cattle as part of the water user group.

> "…Even as we factor in the designs for hand pumps, we consider cattle one of the primary water users because their water sources, which are dams, become dry from the end of July until November. Moreover, the dams are very silted and cannot hold large quantities of water. As a result, cattle tend to return to hand pumps for water, and we now ensure that, when we design the pumps, we create a small trench with a water-collection hole at the end of the trench so that water spillages can collect there for cattle to drink". — **Key Informant 2, Monze Municipal Council in Monze district.**

However, investments in constructing proper water troughs for cattle remain limited, particularly at hand pump sites. If troughs were available, households would need to spend long hours pumping water to fill them, making the task labour-intensive and time-consuming. Currently, the common practice is for people to draw water into basins and allow cattle to drink directly from these. Each household typically pumps water only for its own herd of cattle.

New infrastructure that does not require human labour to pump water should prioritise water for livestock by creating water troughs, especially with climate variability that has seen reduced rains over the years.

4.4 Prioritisation of Water Allocation for Communities by the Different Sectors

When allocating water for community use, different government agencies have different priorities that they wish to serve. The Local Authority prioritises mixed uses, including domestic and drinking water, livestock, and gardening. However, access to drinking water and domestic use takes precedence because communities in Monze district continue to face severe challenges accessing safe drinking water. In some cases, households travel 5 to 10 kilometres to fetch water for drinking and domestic use, which is not ideal.

According to the Ministry of Health, prioritisation of water allocation mainly focuses on providing access to drinking water and water for domestic use. Other uses, such as watering livestock or gardening, are often overlooked. The health sector emphasises ensuring access to safe drinking water to help reduce the incidence of diarrheal diseases and other waterborne diseases. Additionally, bringing water points closer to communities not only improves access to safe drinking water but also alleviates the burden on women and children who are tasked with fetching water at the household level.

> "… All water points sponsored under the Ministry of Health have to address the challenges of waterborne diseases because we want to ensure that people, especially children under the age of five, do not suffer from diarrheal diseases. For water points near

health facilities, we don't even allow people to collect water for livestock because we want people to have adequate, clean water for drinking and domestic use". — **Key Informant 5, Ministry of Health in Monze district.**

The Ministry of Agriculture, on the other hand, does not allocate water sources such as boreholes and hand pumps. From such sources or from schemes designed for irrigation only, they focus on utilisation to address productive needs for people. In multi-purpose infrastructure, irrigation committees partner with water point committees to allocate water for irrigation purposes. However, gardening activities in Monze district are seasonal, and therefore, the allocation of water for gardening is only needed from April to October or early November. During the rainy season, starting in November, most farmers prioritise the production of staple food crops, such as maize, and cash crops, including groundnuts, soyabeans, sunflowers, and sweet potatoes, over horticulture. This is not to say that vegetables are not available during the rainy season. However, the variety is limited. Moreover, pest and disease management is most challenging during the rainy season, often affecting crops like tomatoes and cabbage, and therefore, people prefer not to grow many horticultural crops in the rainy season.

Across sectors, priorities differ. Each sector focuses on providing water to meet its core mandate. This also limits opportunities for coordination to address all pressing needs at the community level. Siloed approaches have continued, contributing to limited communication about overall community development that relates to water access and usage. The need to overcome such siloed approaches is pressing, given the continued challenges in all sectors in Monze district.

4.5 Emerging Priorities Relevant to Current Contexts in Addressing Community Resilience Against the Impacts of Climate Change

As the impacts of climate change continue to be felt amid ongoing climate variations, the need to focus on what is essential for community resilience and to address pressing needs remains a topic of conversation. Below are some suggested ideas beyond the provision of water supply to support community resilience against the impacts of climate change.

4.5.1 Integrated farming techniques

Integrated farming techniques, which combine crop production, livestock farming, and environmental protection, giving each equal importance, were highlighted as essential.

"…We have noticed that we cannot rely on one aspect of agriculture to promote resilience against the impacts of climate change, but have to bring in a lot of aspects in totality that address challenges facing the communities. Instead of relying on a single crop or enterprise, we encourage farmers to integrate crop, livestock, fish, and tree production. We also encourage farmers to reuse animal waste as manure for crops to improve soil fertility and reduce dependence on chemical fertilisers". — **Key Informant 1, Ministry of Agriculture in Monze district.**

Irrigation is another factor that has helped build farmers' resilience to the impacts of droughts. Organisations such as the Food and Agriculture Organisation (FAO) have helped farmers maintain crop production during dry spells and prolonged droughts through irrigation systems in some parts of Monze district. Such interventions have also enabled crops to reach physiological maturity even when rainfall is erratic, thereby reducing losses and improving food security. One respondent noted that:

> "…Irrigation is particularly critical for smallholder farmers who lack the capacity and resources to withstand climate shocks and should be prioritised now more than ever as we continue to witness changing climate seasons and recurrent droughts in our region". — **Key Informant 1, Ministry of Agriculture in Monze district.**

On the other hand, there is a need now to ensure that the production of livestock, particularly cattle, which is a significant source of income during crop failures and has high market value, is sustained to sustain livelihoods.

Cattle can thrive when projects focus on improving access to water for livestock, such as open weirs and dams that serve large herds. Water system designs at any new infrastructure implemented should incorporate livestock water troughs and ensure adequate capacity to meet animal needs during critical dry periods, particularly in August to early November. This would help keep livestock healthy even when grazing pasture is limited, because access to water helps nourish them more.

Further, cattle can also thrive when projects focus on providing grazing pastures during droughts, thereby boosting resilience to the impacts of droughts. The promotion of fodder crops such as Lablab, Mucuna, and Gliricidia, while addressing pasture shortages and providing nutritious feed for livestock, also improves soil health through nitrogen fixation and helps control pests. As indicated by one key informant:

> "… We highly recommend incorporating fodder crops such as Lablab, Mucuna, and Gliricidia because these have shown great potential to improve soil health and crop yield by fixing nitrogen in the soil, without needing to use chemical fertilisers. This is good in supporting climate-smart agriculture because it increases resilience to droughts and restores degraded soil. Most importantly, the crops benefit livestock feeding, which makes them ideal for integrated farming methods". — **Key Informant 1, Ministry of Agriculture in Monze district.**

4.5.2 Gardening as an alternative to charcoal production

Gardening activities are seen as viable alternative livelihood opportunities for low-income households and young adults. Figure 5 shows some gardens in Hanzila that act as a source of income for households.

Figure 5. A garden in Hanzila that acts as a source of income for one household (*photo*: Carol Emma Mweemba 2025)

While providing a livelihood for communities, gardening activities also divert people's attention away from relying on trees for charcoal production. The production of charcoal has become rampant in recent years, especially in rural parts of Zambia, due to limited livelihood opportunities. As a measure to improve the environment, the promotion of gardening activities should be coupled with other measures, such as social behaviour change programs to change mindsets and provide people with knowledge about the dangers posed to the environment by charcoal production. Figure 6 shows bags of charcoal piled in readiness for the market to earn income.

Figure 6. Piped bags of charcoal prepared for sale to earn an income at the household level (*photo:* Carol Emma Mweemba 2025)

However, the success of enhancing such initiatives requires close collaboration among multiple stakeholders from government ministries, environmental agencies and local leaders. For example, local leaders play a critical role in enforcing by-laws of stopping people from

cutting down trees and penalising illegal tree cutting within their catchments. They also support initiatives of reforestation within the communities. However, it should be noted that reducing the cutting down of trees for charcoal production is not something easy to achieve without alternative forms of livelihood and therefore both tangible economic incentives for communities and ecological education should be implemented for long-term benefits of forest conservation.

There should also be programs that target strong market linkages to ensure that crops from gardens can be sold and provide income for low-income households. Importance should also be placed on ensuring that farmers have adequate market information to avoid oversupplying certain crops, such as tomatoes, thereby flooding the market and reducing market value. The Ministry of Agriculture emphasises transferring this knowledge to ensure that farming is sustainable. As noted by one key informant:

> "…As you know, farmers need systems that help them sell their products. Therefore, there should be proper and organised value chains so that prices don't suddenly drop before farmers could market their crops. As the Ministry, we are already teaching farmers about climate-friendly farming and how to calculate profits, but we also need to include community development and social standards. This way, we're not only making money but also protecting nature, like restoring biodiversity, so the whole system is fair and sustainable". — **Key Informant 1, Ministry of Agriculture in Monze district.**

5. Conclusions

This report showed how the impacts of the Hanzila solar-powered borehole extend beyond Hanzila.

Peer-to-peer learning and community-to-community exchanges were also the essential basis to validate the model for further scaling out. Structured engagement, developed through sharing community presentations and open discussions, contributed to mutual learning and strengthened support for the management of water infrastructure. The use of the local language enhanced participation. Further, transect walks provided a practical understanding of infrastructure and management practices discussed during the exchange. This showed how the Hanzila model resonated with experiences elsewhere, suggesting the more generic validity of the model for wider applicability and outscaling. This held for the following features in particular.

The successful implementation of the solar-powered borehole in Hanzila has demonstrated the importance of developing locally led solutions to address water and climate-related challenges in rural areas of Zambia. The integration of water access for consumptive uses, such as drinking and domestic use, with livelihood activities, such as gardening and livestock rearing, as the Hanzila model, positions water infrastructure as a catalyst for resilience against the impacts of climate change. Implementation of solar-powered boreholes is not a standalone intervention. Rather, the approach shows how improved access to water can integrate benefits of improved health and nutrition, food security, and the empowerment of women and young people economically through gardening activities.

Community participation was key to the success of implementing the solar-powered borehole in Hanzila. From diagnosing water challenges and envisioning solutions to monitoring construction quality, the process created shared accountability for the solar-powered borehole. Further, shared responsibilities of trench digging and pipe installation also reinforced ownership of the solar-powered borehole.

Further, the governance structures created to support maintenance of water systems have been critical for equitable water allocation among different uses, including domestic, livestock, and gardening. Fee-based maintenance systems have also served as a financial buffer for quick repairs when the borehole breaks down. However, challenges persist. These include a limited capacity to fix the borehole infrastructure, reduced pump capacity and compliance issues with fee payments. Building local technical capacity for borehole repairs remains a gap that must be addressed for sustainability.

The implementation of the second borehole highlighted community solidarity and a strong sense of willingness to support community development projects.

Integrated water resource management appeared to align with other emerging priorities for integrated climate resilience, including integrated farming systems that combine crop production, livestock, and environmental protection. Irrigation and fodder crops were identified as critical for sustaining food security and soil health under drought conditions. Promoting gardening as an alternative livelihood can reduce reliance on charcoal production, but success depends on strong market linkages and social behaviour change programs. Addressing these priorities requires multi-sectoral collaboration among government ministries, local leaders, and environmental agencies to overcome siloed approaches and deliver holistic solutions for community resilience, as pioneered in Hanzila.

6. Recommendations

Based on the experiences in Hanzila, and exchange on this model with other communities and Local Authorities, the following recommendations are proposed for scaling out to other rural communities vulnerable to droughts in Monze District, Zambia and elsewhere.

- Government, particularly the Local Authority and other development partners, should prioritise scaling solar-powered boreholes as a climate-resilient solution for rural communities. The Hanzila model demonstrates that integrating water access with livelihood activities can significantly improve food security, health, and income.
- All water infrastructure projects, whether donor-funded or government-led, should adopt participatory planning processes from inception to ensure that the infrastructure is tailored to local contexts and also to enhance community ownership for long-term sustainability.
- Community-to-community exchange programs to promote knowledge transfer on water infrastructure implementation, management, and governance should be formalised. These platforms should use local languages and participatory methods to ensure inclusivity and contextual relevance. This empowers communities and strengthens models for rural climate resilience.
- The establishment and capacity-building of Water Management Committees in all shared water infrastructure projects should be supported. Fee-based maintenance systems to create financial buffers for repairs and reduce reliance on external support is to be encouraged. Training of local technicians for borehole maintenance should be prioritised to enhance sustainability.
- Siloed approaches among health, agriculture, and local government sectors should be overcome by creating integrated water resource management and agriculture frameworks. Joint planning should ensure that water allocation addresses domestic, livestock, and productive needs in a holistic manner for rural areas through cost-effective multi-purpose infrastructure, as locally appropriate.

- Future water infrastructure should take into consideration the development of water troughs and designs that minimise labour-intensive practices for livestock watering, as livestock is one of the critical livelihoods for sustaining livelihoods in rural Monze district and many other drought-prone areas.

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Annex A. Guide for Key Informant Interviews and Out-scaling Activities.

Learning from Hanzila's Water Management Experience

Out Scaling for Hanzila Project

Section A: Guide for Local Authority, Ministry of Agriculture and Extension Officers

Context

Hanzila Village in Monze District, Southern Province of Zambia, has long faced chronic water shortages, with existing water sources unable to meet household, livestock and gardening needs. In February 2023, the ACTION Grant Program—funded by the CGIAR ClimBeR Initiative—partnered with the Ministry of Agriculture and the Monze District Council to improve water access by installing a solar-powered borehole.

The solar-powered borehole, completed and handed over in September 2023, significantly improved water availability. However, due to high demand, the community has had to ration water, prioritising domestic use, then livestock, and finally gardening. While the project strengthened livelihoods overall, the limited water supply means households often scale back gardening during shortages, affecting food security and reducing expected project benefits. Communities also share water points and contribute to maintenance to ensure fair access.

To further address these challenges, an additional solar-powered borehole is currently being installed. Hanzila's experience underscores the crucial role of water for livestock among pastoral communities and the need to balance water use across domestic, crop, and livestock needs. Ongoing consultations aim to capture lessons for scaling to other villages, identify communities for exchange visits, and align priorities with Local Authorities and the Ministry of Agriculture

Engagement and Questions for Ministry of Agriculture, Council, and Extension Officers

- Which aspects of Hanzila's experience with community participation in the early planning of diagnosis and visioning of solutions phases do you think would be most valuable for your programs or policies?
- Which aspects of Hanzila's operation, maintenance (of new water technologies), and water distribution experiences do you think would be most valuable for your programs or policies?
- Are there specific practices (e.g., household water payment systems, prioritization strategies) that could be adapted in other villages?
- Which villages or communities under your jurisdiction would benefit most from exchange visits with Hanzila?
- What criteria should we use to select these communities (e.g., livestock dependency, water scarcity, gardening practices)?
- Among domestic water, livestock water, and gardening water, which is the highest priority for your Local Authority and why?

- How does your ministry currently address water allocation for mixed-use (domestic, livestock, gardening)?
- Which season (rainy or dry season) is gardening mostly practised in and why?
- How can we better combine cultivation and livestock management for pastoralist communities in your area?
- Are there existing programs that integrate transhumance practices with stationary agriculture? What lessons can we draw from them?
- What is your perspective on extending water supply systems like Hanzila's to improve access for domestic, livestock, and gardening needs?
- What challenges do you foresee in scaling such models?

Section B: Out-scaling through Peer-to-Peer Learning

The project will facilitate cross-community visits and workshops, enabling other rural communities, both with and without solar-powered boreholes, to learn from Hanzila's experiences. The opportunity will also allow the exchange of best practices and knowledge on climate-resilient water management across communities facing similar contexts. Emphasising communication in local languages will ensure that all members participating in workshops and exchanges can fully engage and benefit from the shared learning.

Communities to participate in the initiative will be approached in collaboration with Monze Local Authority and possibly with other districts or provinces.

The views of district officials on the scope for further out-scaling within current multi-tiered government structures will also be assessed.

Engagement on Exchange Visits

- Select two communities for knowledge exchange to include communities that currently have solar-powered boreholes and those without.
- Facilitate structured community visits to Hanzila to discuss and observe the system's use of solar-powered borehole, maintenance and management of the borehole infrastructure.
- Use participatory tools and local languages to ensure inclusive communication.

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