

A LIFELINE AGAINST THE FLOODS

Lessons from Mozambique



PARTNERS



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{ Workshop with communities }

FLOODS IN MOZAMBIQUE

Floods are a powerful and often destructive force of nature that cause loss of life, damage infrastructure, and negatively impact on both national economies and local livelihoods. Driven by rainfall, the frequency and magnitude of floods are impossible to control, but their impacts can be managed through specific interventions, whether physical or social. Often a combination of interventions is required to adequately plan for, manage and respond to flood events.

Early Warning Systems have been set up in several flood-prone regions of Africa to protect the livelihoods and economic activities of vulnerable populations, and to reduce the devastation that floods often wreak.

The Mozambican side of the lower Limpopo River Basin is particularly vulnerable to floods, which have local, national and even regional impacts. It is a low-lying coastal floodplain, fertile and densely populated. Subsistence and commercial activities (in particular agriculture) and a number of towns are located in low-lying land close to the river where the land is the most fertile and proximity to the river reduces the need for water infrastructure. Due to its flatness, highly variable rainfall and the presence of cyclones along the coastal area, floods are common, and can be severe¹. Climate change is exacerbating this vulnerability with increased intensity and changing frequency of rainfall.

The Limpopo River Basin: Driving Regional, National and Local Economies

The Limpopo River is at the centre of both rural and urban livelihoods and plays a critical role in the socio-economic development of the region (Maposa et al., 2015). Agriculture is a key component of the basin economies and supports the livelihoods of communities either through subsistence agriculture, or through employment in commercial agriculture. The Limpopo River supplies water to the largest irrigation system in Mozambique via the Massingir Dam and provides water to communities for domestic use and livestock watering. It also supplies water for municipalities, industry and power stations.



Figure 1: Limpopo River Basin Map

WHEN RISK BECOMES REALITY

In such a heavily populated area, floods and cyclones have caused a number of deaths, destroyed infrastructure and crops, and decimated livestock herds, causing significant social and economic suffering to local populations in particular. These impacts resonate up to the national level: it is estimated that the floods in 2000, which affected the Limpopo, Incomati and Umbeluzi rivers, led to a 20% reduction in Mozambique's GDP (Limpopo Awareness Kit).

The high exposure and low adaptive capacity of communities in the Lower Limpopo floodplains makes them extremely vulnerable to increasingly prevalent floods. This vulnerability, coupled with the area's important contribution to the Mozambican economy, made it perfect site for piloting the Community Based Flood Forecasting and Early Warning System project.

TACKLING THE CHALLENGE

The Community Based Flood Forecasting and Early Warning System pilot project aimed to improve local flood management capacities in the Chókwè area of the Limpopo Basin through implementing, testing and ensuring the long-term sustainability of a community-based early warning system.

Considerable time and effort was spent on initial planning to ensure maximum impact. The preparation phase included the selection of the pilot site according to criteria of flood frequency and vulnerability; the identification of relevant partner institutions and affected communities; and the assessment of the institutional and individual capacity of the partner institutions.

The Most Vulnerable Country

Mozambique is the country most affected by natural disasters in Southern Africa (Jaarsma et al., 2001). The floods of 2000 were among the most catastrophic natural disasters experienced by the country. In the beginning of that year, the Limpopo River swelled to between 100 to 200 times its width (reaching 10-20 km wide) for a stretch of over 100 km. More than 1,400 km² of farmland were inundated, and the town of Chókwè was completely under water.

The Limpopo River rose 6 meters above normal on January 24, twice its normal level (Pan African News Agency, 2000). Over 700 people were killed in Gaza province, and damages in the region were estimated at \$500 million (Maposa et al., 2015). More recently, floods were experienced in the lower Limpopo River Basin in 2010, 2012 and 2013, with the 2013 floods being particularly destructive.

The Project in Brief

Initiators	• The German Federal Ministry for Economic Cooperation and Development (BMZ) • The Department for International Development (DFID) • The Australian Department of Foreign Affairs and Trade (DFAT)
Context	• Technical cooperation with the Southern African Development Community (SADC) in the Programme “Transboundary Water Management”
Main implementing body	• The German development agency GIZ
Key local partners	• The Mozambican Regional Water Administration South (ARA-Sul), responsible for water resources management in the area • The National Meteorological Institute (INAM), responsible for providing daily weather forecasts to the public and relevant institutions • The National Institute for Disaster Risk Management (INGC) • 17 Local Disaster Risk Management Committees (LDRMC) • The Limpopo Watercourse Commission (LIMCOM), responsible for transboundary water management issues in the basin
Project duration	3 years and 10 months (October 2013 to August 2017)
Pilot site	Mozambican side of the Limpopo River Basin
Beneficiaries	• An estimated 42 000 people benefitted directly from the Early Warning System, including vulnerable groups and individuals such as those with poor reading skills and female-headed households • Indirect beneficiaries of the project include over 900,000 people residing on the Mozambican side of the Limpopo River Basin, who can be warned of impending floods • The ARA-Sul and INAM staff and the members of the 17 Local Committees have received training through the project

The pilot was highly successful in the gathering and analysis of data, the provision of in-time information about flood and cyclone risks, and the offering of immediate protection options to communities. After two and a half years, the hydro and meteorological stations are still functioning; glitches and repairs have been minor and are effectively managed by well-trained local technicians; inter-institutional communication is efficient, with meteorological and hydrological services sharing information and coordinating on the need to trigger alerts; and the community-based system of alerts has reduced casualties and damages to rural livelihoods.

This case study serves to inform potential replication and up-scaling of such an Early Warning System in other basins in the region and beyond, by unpacking the project components, sharing the lessons and successes from its conceptualisation and implementation, and understanding the challenges that arose.



{ Moisés Benessene, Senior Advisor for GIZ Maputo, inspecting a hydrological station }

A THREE-LEGGED POT

The integrated community-based early warning system consisted of three workstreams, which were implemented in parallel:

- a hydro-meteorological monitoring network,
- an institutional cooperation component for data analysis, and
- an efficient communication mechanism which activates a series responses or actions.

Figure 2 indicates the linkages between the project components and the roles of relevant project partners. Each component is described in more detail in the sections that follow.

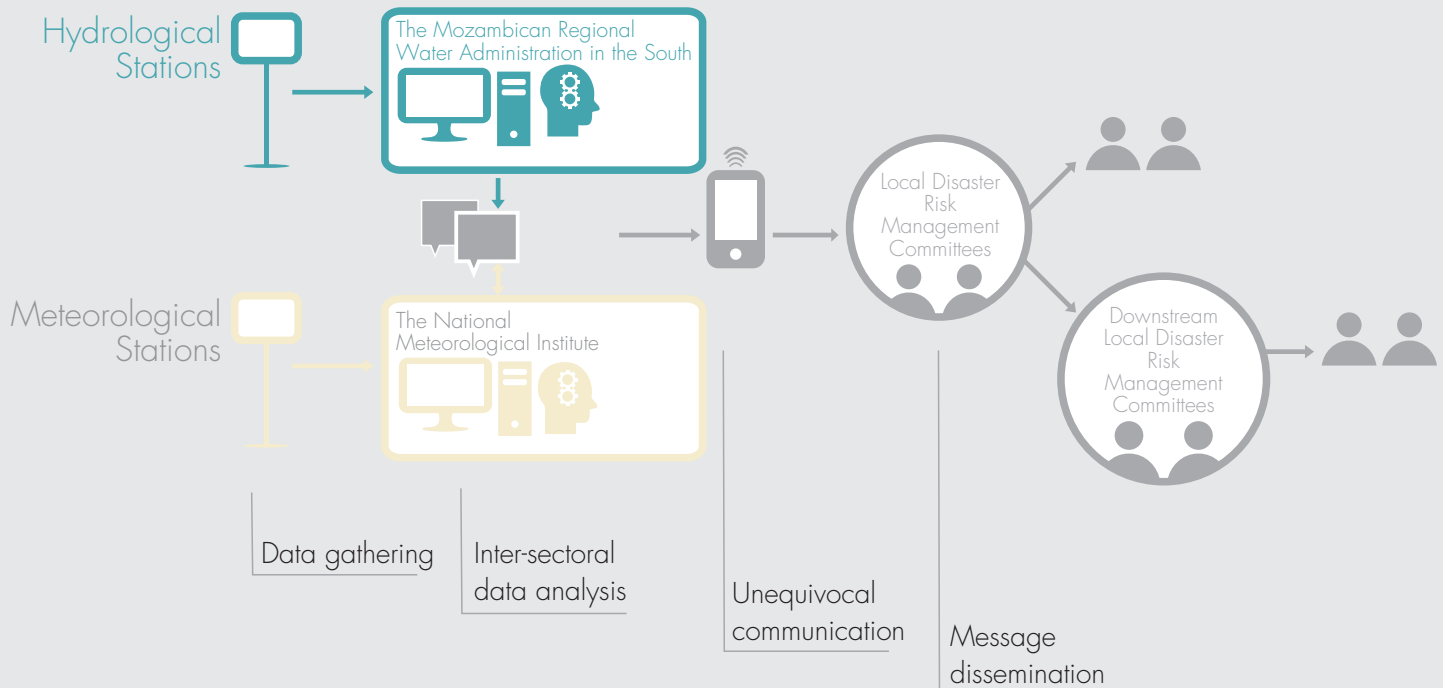


Figure 2: Schematic representation of the Early Warning System

Hydro-meteorological Monitoring Network

The hydro-meteorological monitoring network is composed of eleven automatic hydrometric and eight meteorological stations², situated at strategic locations. These stations form part of the broader Limpopo hydro-meteorological network. Each station continuously monitors key parameters and transmits data hourly via the cellular phone network. Because of their simplicity and their locally-made characteristics, the stations are both robust and easily repaired. They are maintained by local ARA-Sul and INAM staff.



©

{ A station and the Limpopo river in background }

Ensuring Sustainable Design, Construction and Maintenance



- The material needed to construct the stations' system was largely procured in Mozambique – to ensure locally-sourced spare parts would be easily available and compatible with the system.
- An experienced engineering team with a long track record in Mozambique was used because of their knowledge of local conditions.
- A review of lessons from other successful systems was conducted to inform the design.



- ARA-Sul and INAM were involved from early project development stage to ensure buy-in and their contribution to the design of the stations.



- The first station was assembled by GIZ's engineers, who provided on-the-job training to local technicians. The local technicians then built the other stations, initially under the supervision of GIZ, and then independently.
- The stations were activated, tested, and calibrated by ARA-Sul and INAM technical staff, assisted by the GIZ team.

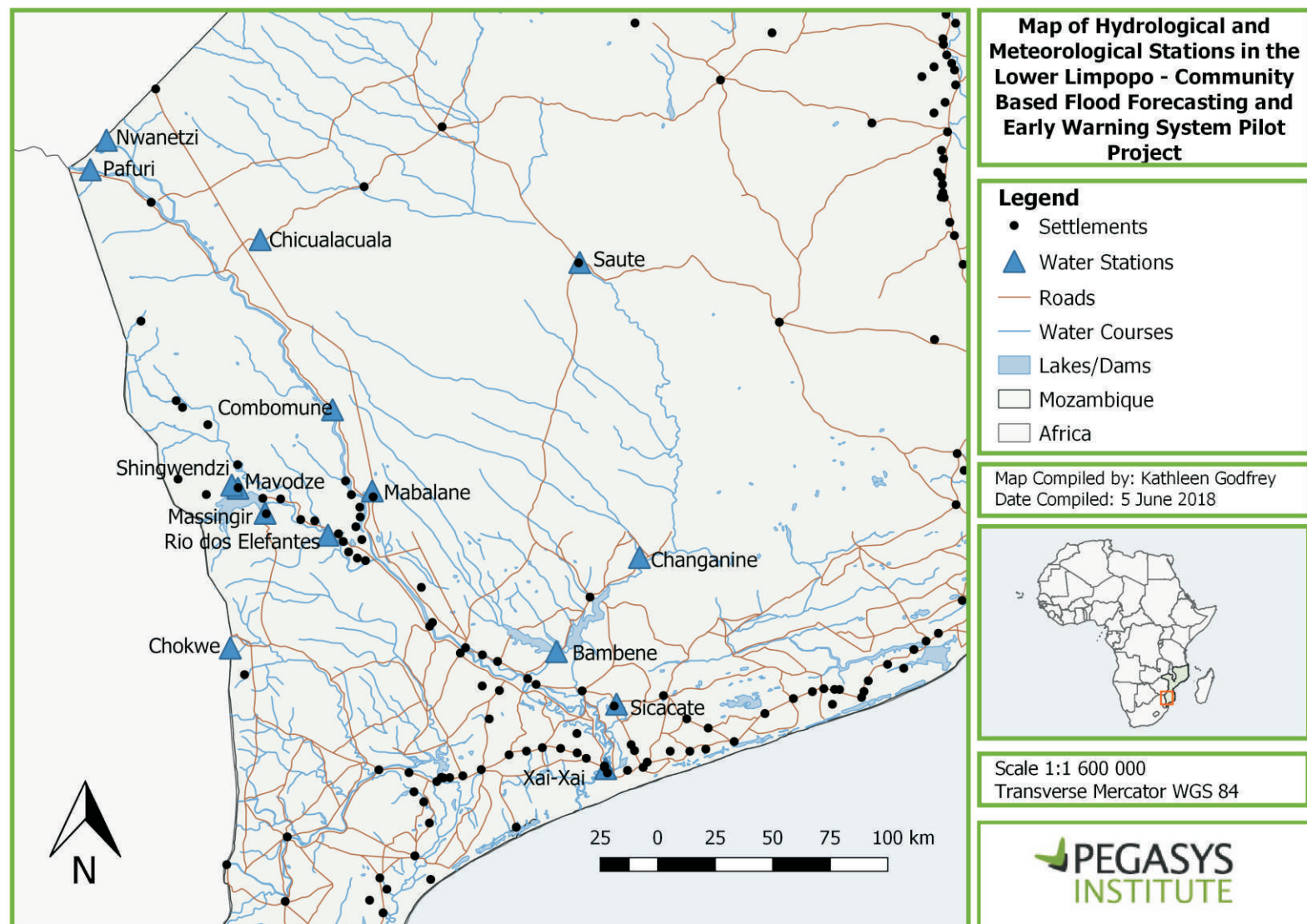


Figure 3: Map of the hydrometric and meteorological stations

Institutional Cooperation For Data Analysis

The institutional cooperation between the three critical government agencies has been codified in a formal agreement which defines the responsibilities of each institution, clear protocols for exchanging information and communicating, and the process for the coordination of flood responses. Thus, for example, ARA-Sul cooperates with INAM and INGC in processing and interpreting the data collected by the stations. The data can be visualised through a graphical user interface created specifically for the project. This unique institutional cooperation has proved to be highly effective.

Interpreting the Data



- The project invested in knowledge transfer and capacity-building for technical staff in the relevant government agencies.



- A steering process was established to guide, assist and oversee the project³, including support processes to ensure financial sustainability, manage quality, coordinate the activities of the different partners, and provide coaching and mentoring services.

Communication and Response

Communication from government entities

When the analysis of data reveals a potential flood situation, ARA-Sul and INAM send a joint message to representatives of the Local Committees for Disaster Risk Management and other local stakeholders using a web-based application. Each message follows a standard structure, providing six categories of information:

- which entity sent the message;
- which areas are at risk;
- what is the advance warning time;
- how severe is the expected event;
- what are the expected impacts; and
- what precautionary measures should be taken by the population.

This standardised message structure ensures that the information being shared is clear and easy to understand. A notification of receipt of the message is received through the app.



{ A Local Disaster Risk Management Committee }

Key Element of the Top-Down Communication Process



- The establishment of a clear early warning procedure with bodies and stakeholders responsible for specific actions and the adoption of standard operating procedures enabled the provision of clear and timely information to communities.

Warning Messages

During the rainy season 2016/17, 42 messages were sent through the Flood Early Warning System, such as this one sent on 14 February 2017:

"INAM / ARA-Sul warns that the districts of Manjacaze, Chongoene, Xai-Xai, Limpopo, Bilene, Chókwè, Guija, Chibuto, Massingir and Mabalane from tomorrow may be affected by strong winds and heavy rains. The population is urged to move away from risk areas, to withdraw goods and equipment and to avoid crossing rivers."

Community-Based Information Dissemination

The Local Committees are responsible for the dissemination of the flood warning information to their communities, the coordination of disaster response efforts with relevant authorities, and for all other activities related to disaster risk management in the communities. They act as intermediaries between the technical institutions assessing the risk and the communities.

Each Local Committee consists of 15-18 members who are trained, equipped and certified by INGC. Their composition is diverse in terms of age and gender. Committee members work on a voluntary basis, and most assert that they are motivated by the recognition of their role by peers. In this project, over 300 people were involved through 17 Local Committees.

Responding to the Information

When they receive an alert message, the Local Committee decides on what actions are to be taken and then communicate their recommendations to the local community. Because Local Committees are made up of community members, they have a clear understanding of the adaptive and response capacity of their communities.

"The Early Warning System is a fantastic tool as it allows ordinary people to understand the danger that they face."

Sergio Siteo (LIMCOM)

Response actions may be preventive or reactive. As part of the preventive actions, the Local Committees inform communities of the need to move their families, belongings and livestock to higher land. The Committees also help to coordinate reactive actions, together with the responsible authorities, such as evacuations of residents trapped by a flood.

During capacity building workshops, the Local Committees designed risk map routes to facilitate evacuation. Evacuation plans were developed which demarcate safe areas of higher land.

Capacity Building Process for Local Committees

- A capacity building strategy was jointly developed by GIZ and Local Committee members, with a view to enhancing their ability to read and respond to messages.
- The system was tested through simulations and operation under real life conditions to ensure that Local Committees understood how to respond effectively under pressure.

The Early Warning System and the 2016/17 Floods

In 2014 and 2015, the Lower Limpopo region went through a severe drought. Agricultural activities were therefore undertaken near the river. In 2016, several flood warning messages were sent, advising communities to move to higher land. The dissemination of the warning and recommendations was widely successful and allowed people to temporarily relocate, together with their livestock and agricultural equipment.

OBSERVABLE RESULTS AND SUCCESS FACTORS

Flood warning systems are complex and rely on various components working together in a timely manner and under difficult circumstances. Despite the challenges, creating successful and sustainable systems is possible, as shown by this project, where the system has been purposefully designed to avoid some of the challenges that have led to the failure of other similar systems.

The Early Warning System implemented through this project is robust, reliable and effective. Training and maintenance work has been successful, and all nineteen stations are transmitting reliable data. The collaboration between the meteorological and hydrological institutional arms of government has been excellent. On the multiple occasions on which alert messages were sent to the Local Committees, they successfully helped to protect vulnerable communities.

The success of this system can be attributed to the following factors:

1. The “tailor-made” characteristic of the system, which serves to optimise the efficiency of the system
2. The focus on local staff and volunteer training and capacity building, which ensured ownership and in turn increased the effectiveness and sustainability of the system
3. The unpretentious design and cost effectiveness of the stations, resulting in a reliable and sustainable system
4. The analytical tools and institutional cooperation, guaranteeing sound interpretation of the data, and
5. The clarity and standardisation of the messages, and the diversity of message-carriers, which guarantees the dissemination of an undistorted message to the whole community

Each of these success factors is discussed further below.

A “Tailor-Made” System

The success of an Early Warning System depends on a solid understanding of various technical, economic and social factors. In this pilot project, each component of the system was tailored to, or designed in consideration with, the local context and communities. For example, all physical risks to the stations were reviewed, including some that are specific to the upstream Limpopo region – such as poachers who feel threatened by new infrastructure which might contain cameras or other anti-poaching tools. To minimise the risk of vandalism, the stations were not only designed to resist vandalism, but a sign was installed next to each station explaining its purpose, and a campaign to inform neighbouring villages was undertaken.

The existence of a good cellular network in the region enabled the use of this technology to convey the warning messages. A number of Early Warning Systems in Sub-Saharan Africa rely on radio or television to convey flood warnings. These communication channels often fail to reach the intended targets effectively. The systems are not always reliable, there is no confirmation of receipt, and the most vulnerable communities have the least access to radio and TV. Language barriers may also prevent their effectiveness if minority dialects or languages are not used.

In this project, by meticulously considering the characteristics of the local context throughout the design process, the system was strengthened and enhanced. The on-going involvement of local stakeholders ensured that the system was tailor-made, and that no important element was overlooked.

Involvement and Capacity Building of Local Staff and Volunteers

Local technical staff, artisans, and community members were key actors in the establishment of the system and remain key to its continued success. The participatory process has led to local stakeholders feeling empowered and increased their sense of ownership.

As member of the Machua Committee, I feel essential to my community. I feel secure, capacitated and confident. My work in the Committee is recognised and appreciated

Celine Manhique, Deputy Coordinator,
LDRMC of Machua

To ensure the sustainability of community engagement, there were numerous capacity building engagements. Training was provided to ARA-Sul and INAM technical personnel, readers of the manual hydrometric stations and meteorological station, as well as to masons, locksmiths and painters from the local town of Chókwè. The training aimed at building institutional and/or technical knowledge. Training sessions covered the installation, construction, operation and maintenance of the monitoring network, transmission, processing and interpretation of data, as well as communication and dissemination.⁴

Local Committees received training and capacity development on the job throughout the implementation phase, particularly in relation to flood management training, practical exercises and emergency simulations, and gender-focused theatre workshops.

Using Community-Cased Theatre for Gender Mainstreaming

Traditionally, women are highly dependent on men in their household, and lack economic power to improve their own and their families' livelihoods. Despite the fact that a number of men work away from home (neighbouring provinces or countries), women are not given the agency to make decisions to protect their families and belongings from floods. Women are a highly vulnerable group to floods.

Sandra Chilengue, INGC Gender Focal Point

A gender specialist was hired to work with the Local Committees in order to ensure that women were effectively empowered through the project. Gender sensitization was conducted through community-based theatre. Role reversal in improvised plays was used as a tool to discuss the deep roots of inequalities and discrimination. The theatre workshops provided a safe and open space for discussion to take place on difficult issues. They focused on different themes, including: the social and cultural myths around water; decision-making at community and household level; and the credibility of information on flood warnings. A critical issue that was addressed was the role of women in making immediate decisions in the face of flood warnings. Traditionally, male heads of households are the decision-makers, but through the theatre work it was recognized that women need to be able to make flood-related decisions when men are away from home, which is often the case in this area due to high levels of migrant labour.

The theatre platform was used not only to discuss the role of women in the prevention of and response to disasters, but also to introduce broader social issues around gender, such as gender-based violence. This process helped to raise awareness around the potential role of women in decision-making, crisis prevention and message dissemination.

Women report feeling empowered by their role as members of the Local Committees. Their ability to take quick decisions to protect their households and communities is key to the effectiveness of the Early Warning System.

In my household, my leadership role in the Committee has created space of more open discussion with my husband. He recently joined the Committee, and I am now his superior! My husband also supports my participation in Committees-related seminars across the region. And I am not the only woman in that situation.

Celine Manhique, Deputy Coordinator,
LDRMC of Machua

In the end, through the involvement of local stakeholders in the project and in training sessions, a high sense of ownership and duty was developed among local institutions and communities, increasing the efficacy and sustainability of the system.

Robust and Cost-Effective Stations

Construction Costs⁵: To set up stations of high quality at a low cost, the bulk of the investment went into guaranteeing the quality of the most crucial and most sensitive part of the station, the sensor. For the other components, low cost materials were used. The technical engineering work was undertaken by local INAM and ARA-Sul staff, with on-the-job training and supervision provided by GIZ. Finally, the stations were designed as modular structures, allowing them to be preassembled at ARA-Sul's operational centre, to reduce the costs of construction on site. Local technicians were given a technical manual that details how to procure spare parts and assemble the stations.

“The manual is similar to an IKEA⁶ manual that would provide the address of suppliers”

Prof. Roehrig,
Technical University Cologne (Consultant)

Operating Costs: The energy costs of the stations are very low since the stations are equipped with a small solar panel which charges a battery, as are the communication costs between the station and ARA-Sul and INAM, and between these institutions and Local Committees. Using the cellular network allows for low-cost messaging. The data transmission costs are estimated to be less than one Euro per station per month. system allows for quick fixes, which is important in the face of emergency situations.

Maintenance Costs: The cost of maintenance of the stations is also low. Most parts can be sourced locally, with the remainder available in either Mozambique or South Africa. All can be replaced by a local official who has been trained to that effect. The simplicity of the system allows for quick fixes, which is important in the face of emergency situations.

In summary, the pilot project prioritised quality key parts but low overall costs; and low cost but highly reliable instantaneous data transmission. This approach changed the views of the technical staff and leadership in Mozambique that adopting the newest high-tech is always the best option.

“Through the pilot project, we have come to understand that, to build an effective and sustainable Early Warning System, the focus should not be on acquiring the newest high-tech stations, but rather on using effective systems that can be maintained locally, at low costs. Using the latest technologies comes with unforeseen challenges.”

Hélios Banze,
Director General, ARA-Sul

Effective Institutional Cooperation

Cooperation and co-ordination between government institutions was formalised through the adoption of a Standard Operating Procedure for the Operationalisation of the MOU. Ensuring the cooperation of existing bodies, rather than creating a new structure (such as a liaison body for example) was a strategic decision taken to limit unnecessary administrative and bureaucratic processes and to minimise system running costs for the partner institutions, ARA-Sul and INAM.

Clear, Standardised Messages, Relayed Via Diverse Message-Carriers

The clear structure of the warning message enables the unequivocal understanding of the messages. The language is also deliberately targeted to be accessible to the recipients, the Local Committees.

The Local Committees are relatively gender-balanced, with 43% women and 57% men among the 306 members. Six of the seventeen LDRMC coordinators are women. Committee members are also distributed in terms of age and include one person with a disability. This diversity ensures that the messages are effectively disseminated across different sub-groups within the communities. For example, social and cultural codes make it difficult for a man to enter the house of a single woman to discuss any matter, including flood risks and evacuation measures. The participation of both men and women thus ensures that the messages reach everyone and are understood by all.

Protection of Personal Information

One of the negative impacts of floods is the loss of important personal documents such as birth certificates, identity documents, marriage certificates and educational certificates.

Replacing these requires community members to travel to administrative centres, costing both time and money. To prevent this, emergency document preservation kits were distributed to communities in the project area. This resulted in community members being able to protect these precious documents in time of floods.

BUILDING ON SUCCESS

The pilot project proved that an integrated community-based system can be an efficient and robust method of sending warning alerts and triggering preventive actions in a developing country. It assisted, at the pilot scale, to evaluate feasibility, time and cost, as well as the challenges and opportunities facing the introduction and maintenance of such a system. The best practices developed through this pilot could greatly enhance the upscaling or replication⁷ of similar, robust and effective early warning systems in other river basins.

Guaranteeing Sustainable Financing

Despite costs being minimised by the local and low-cost characteristics of the stations, there are, nonetheless, costs associated with the long-term maintenance of the system. To ensure that this maintenance takes place, partner institutions need to be able to provide the necessary funding and human resources over time.

Such funding would ideally come from the annual budget of the relevant public sector institution(s), but if this is not sufficient, external sources of funding will be needed, including private funds through public-private partnerships.⁸

Ensuring the Long-Term Engagement of Local Committee Members

The Local Committees work on a voluntary basis, and do not receive direct financial incentives. However, given the success and long-term sustainability of such a system largely relies on proactive and capacitated Local Committees, it is critical that they remain engaged and committed beyond the pilot period. This includes ensuring that processes are in place to 'onboard' new Committee members in instances where existing members step-down or relinquish responsibilities.

Institutionalisation of the Local Committees would give them a legal status which might allow them to apply for government or other funding which might incentivise the continued participation of members.

Ensuring Effective Gender Mainstreaming

One of the pilot's most notable successes was around gender. The lessons, value and impact of using community-based theatre to address gender issues are applicable to a wide range of development interventions and should serve as best practice for future projects that require gender mainstreaming and gender awareness training both at a community level and within public sector institutions.

Upscaling or replicating the pilot project could provide a useful opportunity to harmonise and streamline the gender approaches of participating institutions, including through gender training and workshops conducted across the different institutions. Further, a strong monitoring and evaluation strategy should assess the long-term impact of gender mainstreaming activities.

Monitoring and Evaluation

Good monitoring and evaluation is important to assess the ongoing functionality of the system, identify areas for improvement, motivate for additional financial/human resources, and importantly attract interest from potential financiers.

Recognising this, the GIZ team monitored the efficacy of the pilot system in response to real life events, and interviewed the members of the 17 Local Committees, as well as Community leaders.

A survey was conducted to investigate the delivery of the messages, communication within the Local Committees, the reception of the messages by the communities, and the preventive action adopted in reaction to a message. The results of this survey were highly positive and highlighted the satisfaction of Committee and other community members. Information from the survey was also used as input to improve the functionality of the system.

However, it is key that monitoring and reporting processes be embedded within the relevant public sector institutions beyond the involvement of development agencies to ensure M&E efforts are carried out methodically and routinely post-pilot duration.



{ Chókwe - flood water marks }

Siting of Hydrological Stations

While upscaling or replicating the pilot project, and subject to the availability of financial resources, it would be beneficial to increase the number of stations in critical nodes of the river, to ensure an effective backup in data collection and flood monitoring in case of damage or failure of one station. This would increase redundancy at critical locations, thereby increasing the reliability of the data received.

Changing climatic patterns and human interventions on the Limpopo River may impact the morphology of the river, resulting in the location of the hydrological stations no longer being relevant. Future climate impacts should, to the extent possible, be factored into the design of any similar system as well as other relevant changes such as urban and population growth, and infrastructure construction in the basin. Understanding how these development and climate imperatives impact system design will allow for a more robust, sustainable and climate proofed Early Warning System.



{ Chókwè - road drainage, livelihoods and economic activities in location vulnerable to flood. }

ENDNOTES

- [1] The high incidence of flooding in the Lower Limpopo River Basin can be attributed to the combination of a series of factors including extreme rainfall, saturated soils, poor land management practices, topography and its downstream geographical location.
- [2] Manuals containing more detail on the stations' technical specifications, how to procure spare parts, and the assembly process, were developed during the pilot and are readily available.
- [3] The Steering process included a high level Steering Committee and working groups for different project components.
- [4] The communication training was the largest of all. The 141 participants were from ARA-Sul and INAM technical personnel, and LDRMCs and were close to gender parity.
- [5] Approximate cost of stations (including building and installation): hydro station ~USD 3 700; met station ~USD 2 500
- [6] IKEA is a European retail company specialised in designing ready-to-assemble furniture
- [7] For more information on replication, see the Guide for Replication developed in March 2018 by GIZ.
- [8] For example, agrobusinesses producing crops on flood-prone land would benefit from improved flood management, and therefore could have a financial interest in investing in an Early Warning System.

REFERENCES

Daniel Maposa, James J. Cochran and Maseka Lesaoana, Disaster risk management: Flood frequency curves, April 2015, available at:
<https://www.informs.org/ORMS-Today/Public-Articles/April-Volume-42-Number-2/Fighting-flooding-in-Mozambique>

Limpopo River Awareness Kit, Hydrology of the Limpopo River Basin: Flooding, no date, available at:
http://www.limpopo.riverawarenesskit.org/LIMPOPORAK_COM/EN/RIVER/HYDROLOGY/HYDROLOGY_OF_THE_LIMPOPO/FLOODING.HTM

Jaarsma, M., Bos, H., Vijfhuizen, C. and Ganhane, A. (2001), The credibility of an ant flood forecasting, hydrological models, credibility and communication in Mozambique, 2nd WARFSA/WatweNet Symposium: Integrated Water Management: Theory, practice, cases, Cape Town

Mozambique: Limpopo Flood Reaches Chokwe, Pan African News Agency, January 2000, available at:
<https://reliefweb.int/report/mozambique/mozambique-limpopo-flood-reaches-chokwe>

