GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

FOR #YOUTH-LED PROJECTS

Final Narrative report

Name of project leader(s):	Martha Djan, Mulisa Mudau, Jack Kgwale
Name of the organisation:	Water From A Rock Initiative
Address:	University of Pretoria South Africa
Email:	info@wafari.co.za
Phone number:	**084 232 5359**

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

Table of Contents

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

1. Title of your project

Water From a Rock, Initiative

2. General Information

Project location	City or province: Pretoria, Gauteng Country: South Africa		
Project start date (YYYY/MM/DD)	March 2024	**Project end date (YYYY/MM/DD)**	September 2024
Date of report submission	September 2024		

3. Project Objectives

Reference the objectives in the project proposal and describe what has been achieved, and what has and has not been achieved with reasons. If there were any changes to the project objectives since the project started.

The three project objectives remained the same, however the approaches to the objectives varied slightly since the project started.

3.1 Raising awareness through digital & hard copy Response and Disaster Packages: easily distributable between highschool learners and varsity students.

The team was able to create digital and hardcopy response and awareness packages in order to know what to do before, during and after a flood event. This was created in the form of stickers that students can easily put on their car or devices i.e laptops or cellphones. The team is also brainstorming ideas on what can be easily distributed alongside the stickers. In addition, they engaged with university students by hosting a Mapathon that took place in July with students that participated in the online survey that was posted on social media. We were unable to visit the high school in the local community during this semester however we still have plans to share the stickers and information with them in the form of a fun and interactive workshop.

3.2 Map Vulnerable Communities based on criteria: KZN infrastructure (informal settlements, urban areas), frequency of floods - low, moderate high-risk areas, proximity to the water source (river, ocean)

The team successfully hosted a Mapathon event with a group of YouthMappers students at the University of Pretoria. The primary objective of the event was to map areas around Umgeni and Tongaat that were affected by a tornado on June 3rd, 2023. This severe weather event resulted in

injuries, deaths, and significant damage to infrastructure, leaving communities devastated and in need of humanitarian assistance. We focused on mapping emergency response routes, waterways, and displaced buildings/infrastructure.Additionally, we conducted a flood risk assessment using Digital Elevation Models to evaluate the extent of damage caused by floods in various scenarios such as floods caused by tropical cyclones, tornados, and a Cut-Off Low weather system. Due to time constraints, we were unable to map all flood-vulnerable areas across South Africa or conduct flood risk assessments for other weather events, such as floods caused by severe thunderstorms and squall lines. Since this is an ongoing project, we plan to continue mapping all areas at risk of flood damage from any future weather events in South Africa.

3.3 Creating an application that implements Geofence in local regions vulnerable to disasters.

A prototype of the application was developed using an open source software development kit to demarcate areas on the university as a proxy of areas that are high, moderate and low risk. This was successful and notifications were sent once a device moves into the demarcated space/ geofenced area. The next step is to identify the areas locally that are vulnerable and demarcate them in order for preparedness notifications to be sent to those going into and living in the area.

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

4. Activities

Reference the activities as mentioned in the project proposal and describe how they were carried out, identify any challenges, changes that occurred.

Phases of the project: The project was divided into four phases with six main activities.

1. **Data collection:**
   1.1 Dataset
   1.2 Survey
2. **Awareness:**
   2.2 Awareness and Preparedness infographics
   2.3 Mapathon, Campus Engagement
3. **Mapping:**
   3.1 Mapping awareness
   3.2 Mapping vulnerable communities
4. **Application creation:**
   4.1 Geofence
   4.2 Site & community visit

Planned Activities	**Activities carried out**	**Status, explanation of variance, comments (What went well and what did not)**
Activity 1.1: Acquiring Information, Collecting data	• Identified what data is needed to carry out the project. • Contact the Cooperative Governance and Traditional Affairs in order to assist with data collection.	• Unfortunately no response yet. • Decided to look at data from available/open source databases. There is still a need to acquire infrastructure damage data. In progress
Activity 1.2: Layout	• Layout designed on google document and shared on google forms for survey.	Completed
Activity 1.3: Approved/Revised	• Consulted a mentor to review the survey and make edits.	• There is a need for more collaboration with disaster awareness experts and initiatives to create effective surveys. Completed
Activity 1.4: Create & send awareness Survey to University	• Launched the online survey platform to reach a broad audience. • Developed flood awareness and preparedness survey questions.	• Successfully conducted a survey with a diverse range of participants.

students (UP campus)	• Launched online survey platform and disseminated to targeted demographics. • Monitored responses and ensured a representative sample across various demographics and regions. • Analysed survey data to assess flood awareness levels and preparedness across different groups and areas.	• High engagement from the 18-35 age group. • Survey maintained confidentiality and voluntary participation. • Lower response rates may affect data representativeness. • Variations in flood awareness across regions suggested localised issues. Completed
Activity 2.1: Collect data for mapping Vulnerable Areas	• **Flood Prone Areas**: Polygon covering Umgeni, Umdloti, and Tongaat areas. • **South Africa DEM 30M**: 30m Digital Elevation Model of South Africa. • **Rainfall Historical Data**: Historical rainfall records. • **South Africa Map & Province Shapefile**: Map with provincial boundaries. • **National State of Disaster (April 2022)**: Data and statistics related to the disaster.	• Successful compilation of key datasets and resources for flood-prone areas. • No significant variance was encountered; data was gathered as planned. • Need for more detailed data for certain regions for enhanced analysis accuracy. • Successful compilation of 30m DEM, rainfall history, and provincial shapefiles. • More extensive polygon coverage and more recent or higher-resolution data are needed for future assessments. In progress
Activity 2.2: Map of KZN High-risk areas.	• The eastern parts of KZN were mapped out based on the DEM and the amount of rainfall they received during the Cut-off Low weather system. • High, Medium, and low flood-prone areas were mapped out.	• We found that most flood events occur as a result of Cut-off lows, cyclones, thunderstorms, and tornados. • We were not able to cover all the areas that are prone to floods associated with all the severe weather events.

	• Additionally, some parts in the Eastern Cape Province that are at risk of floods were mapped out.	• We successfully mapped out the emergency routes and infrastructures in KZN during the Mapathon. • A Python script code was well-updated so that we could map out flood risk areas in the country and continent. • Due to poor computing resources, We couldn't do a flood risk assessment for the large study area. We had to downscale into smaller areas of approximately 20 000 km^2 for faster processing of flood risk assessment. • Inprogress
Activity 2.3: Map awareness levels of students	• The map of awareness level is still to be completed	• Inprogress
Activity 3.1: Campus Geofences (small scale sample)	• Three areas on campus were demarcated as high, moderate, and low risk.	• Completed
Activity 3.2: KZN geofence regions	• Demarcate areas based of analysis	• Inprogress
Activity 3.3: Geofence testing	• Campus prototype successful	• Confirm compliance to SA geofencing rules.
Activity 4.1: Host awareness workshop on campus. Gather volunteers- students from youth mappers chapter.	• First Workshop: Organized, scheduled, and developed content. • Volunteers recruited from Youth Mappers chapter. • Conducted workshop, providing flood awareness education and interactive activities.	• First workshop focused on initial awareness and mapping areas in KZN. • Effective recruitment of volunteers from Youth Mappers chapter.

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

Activity 4.2: Share posters	• Poster Design: Created informative, visually appealing flood awareness posters. • Distribution: Placed posters on campus advertising boards for high visibility. • Stickers Distribution: Stickers that can be placed on personal items such as laptops and phones were distributed.	• Successful display of posters and stickers on campus advertising boards. • Impact varies due to location and student engagement. • Winning components include effective poster placement and personal reminder stickers. • Posters were removed after 4 months of being placed due to the student representation elections affecting campaign visibility.
Activity 5.1: On site assessment	- TBC	- TBC
Activity 6.1: UI/UX	• Wireframes are completed and the prototype area demarcated.	• Inprogress
Activity 6.2: Flutter App Design	• Designed with external assistance	•Completed, update pending
Activity 6.3: Wireframe	• Wireframes	• Completed, see below
Activity 6.4: Contact SAWS	• Contacted SAWS on potential collaboration for weather forecasts to be embedded in the application.	• Pending further communication
Activity 6.5: Integrate LIVE weather reports into application	• Integrate best weather reports into application as weather notifications.	• Inprogress
Activity 6.6 Application Prototype 2	- TBC	- TBC

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

5. Review of Project Management

Area of Review	Questions	Feedback
Governance	*How well was the project organised? Were roles and responsibilities clear? Did the project team have the right mix of skill sets and authority to meet their project responsibilities?*	The project initiated with only three members, there was a need to recruit more teammates who had the skills and commitment to assist implement the project. Therefore interviews were conducted to gain more team members to fulfil specific roles. See Key Performance Indicators attached. Roles and responsibilities were clearly assigned and this was based on each person's skills and the skill sets that were needed. The team initially did not have the right mix of authority or skill set to meet the project requirement and so reaching out was pivotal in making sure that the right mix of skills were present during the implementation of the project. The team continues to develop the skill sets covering management, media & marketing, data analysis and research.
Planning and Budget	*How good were the plans and estimates for resources? Did you stay within the budget? How good were estimates of effort, time and cost? Were the* monitoring and control *mechanisms timely and effective?*	•The plans were well laid out with every activity described in detail. Estimates for resources were over budgeted for the 6 month implementation. Adjustments were made and the updated budget and expenditure attached below. • We will continue to use the funds for application and travelling to the affected area in KZN for onsite trial and improved disaster awareness stickers. •Unfortunately, the time estimates for some tasks were delayed due to the team members' full time professional job and academic commitments.

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

Stakeholder Management	*Were the right stakeholder identified? Were the stakeholders engaged and managed effectively? Was the communication management effective?*	• The right stakeholders were identified: which were the community members, high school learners and university students. Additional stakeholders such as developers and municipalities, were identified. The engagement and the support was successful. However, gaining cooperation and collaboration for data is an ongoing issue. • Stakeholders were engaged throughout the duration of the project and will continue to be engaged. Sustainable feedback loops need to be established for project continuity.
Quality management and evaluation	*Did the deliverables meet the quality criteria? Did the team have the right skill mix to deliver quality deliverables? How was the project evaluated for success? Were these success indicators appropriate?*	• Deliverables met the quality because the had good mix of skills • Every team member added value through their creative and technical abilities. • Project evaluated based on the team member's ability to finish the task assigned to them on time, student feedback and the impact of the awareness packages.
Risk Management	*Did any issues occur that could have been predicted?*	• Delays in the submission of video footage and the phases updates, because of focusing on delivering high quality work. •Other commitments like academic responsibilities contributed to the hold-up.

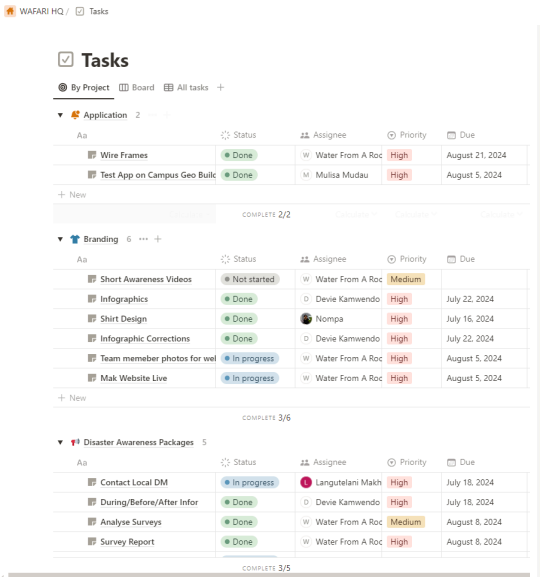
GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

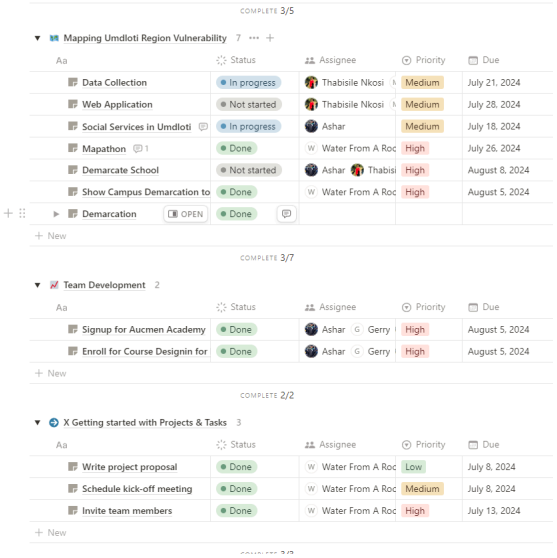
6. Recommendations of Good Practices

Give examples of good practices from this project that can be shared with other future projects.

Good practices included using a project management plan. We used Notion:

This allowed every team member to know what projects we were working on and what tasks were needed for each project as well as the deadline for each task and project.





Meeting regularly was also effective in achieving specific outcomes. We created a schedule for meetings which took place on Mondays at 20h00 for task setting, Thursdays for checkin and Sundays at 15h00 for Deadlines to be met.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
19:00 Online (Setting Tasks, Check In)	13:00 Campus (In person work) Jack - update 18h00		19:00 Online (Checkin, adding tasks)			15:00 Online (Submission Deadline)

In addition created guidelines for each team member's role with key performance indicators for each role that was needed in the project.

WAFRI
WATER FROM A ROCK INITIATIVE

Mission Statement: To improve flood awareness and preparedness in Southern Africa through community engagement, innovative technology, and comprehensive awareness programs.

Vision Statement: A leading youth initiative in Southern Africa by enhancing community resilience to Natural disasters like floods.

Portfolios:
Admin
Community Relations
Media and Marketing
GIS Analyst
Disaster Awareness

The following responsibilities highlighted below are to ensure accountability within the team with some responsibilities being shared to achieve its goals and objectives. Additional portfolios may be added if needed. The following Key Performance Indicators will be assessed through quarterly performance reviews.

Admin:
- Ensure all important documents are filed and copied.
- Maintain team information sheets.
- Ensure surveys (digital or hardcopy) are collected and circulated to respective groups.
- Perform secretarial duties such as attending at all meetings, recording minutes, circulating attendance register, etc to be submitted to the team manager within 2 days after the meeting.
- Attend online weekly meetings.

Community relations:
- Identify vulnerable communities and sustainable areas within the boundaries of the project at hand.
- Effectively communicate with community-based partners, local municipalities and maintain strong working relationships with respective parties and all stakeholders.

7. Lessons Learnt

Document any examples of things that could have been done better, and document what will be done differently next time.

The flood preparedness campaign missed opportunities by relying heavily on traditional methods like posters. To improve, an interactive digital campaign, gamification of workshops, and pop-up awareness stations could have been introduced. A VR experience could have been developed to visualise flood scenarios on campus, making the message more personal and urgent. A collaborative art project could have been organised to visually represent the importance of flood preparedness. Next, a multi-platform campaign with engaging content tailored for platforms like Instagram, TikTok, and Twitter could be launched. A unique #hashtag would unify the campaign, encouraging students to share experiences and participate in online challenges. Gamification elements could include a Flood Preparedness Challenge, a campus-wide leaderboard, and rewards for top scorers. Pop-up learning stations could be deployed weekly, featuring bite-sized lessons, quizzes, and interactive displays.

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

8. Actual Expenditure

8.1 Initial Budget

BUDGET PER CATEGORY			
Categories	**Planned budget**	**Expense**	**Available**
Awareness Packages	R 10,500.00		
Fundraising	R 4,500.00		
Application service fee	R 2,500.00		
Application service fee (ESRI 1 yr package)	R2,500.00		
Workshops venue fee	R 5,000.00		
Site visit to Umdloti(KZN)	R 3,000.00		
Transport to vulnerable communities	R 3,500.00		
Printing	R 5,500.00		
Accommodation (3) KZN	R 5000		
Transport to High Schools	R 1,000.00		
Incentives	R 3,000.00		
Total Budget	R 46,000.00		

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

8.2 Actual Expenditure

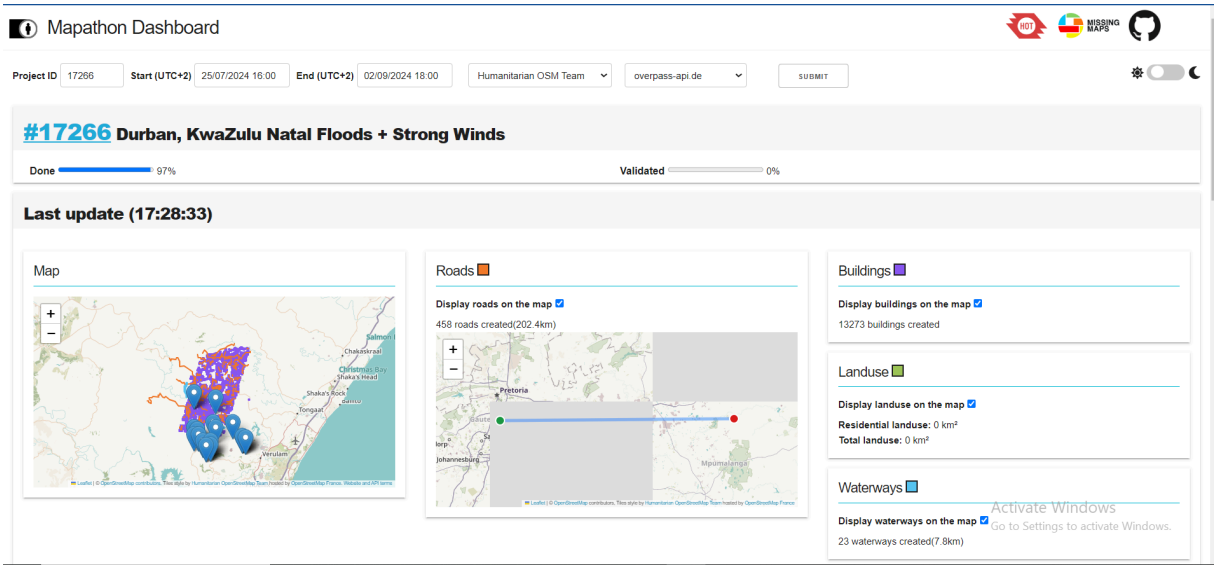
BUDGET PER CATEGORY			
Categories	**Planned budget**	**Expense**	**Available**
Geofence Application/Website/E mail	R 18,000.00	R 10,567.00	R 7,433.00
Fundraising	R 4,500.00	-	R 4,500.00
Application service fee (ESRI 1 yr package)	R 2,500.00	-	R 2,500.00
Workshops/Mapathon	R 5,000.00	R 2,031.00	R 2,969.00
Site visit to Umdloti (KZN)	R 3,000.00	-	R 3,000.00
Transportation Team Errands	R 3,500.00	R 275.00	R 3,225.00
Printing	R 5,500.00	R 245.78	R 5,254.22
Accommodation for 3 people in KZN	R 5,000.00	-	R 5,000.00
Transportation to High schools	R 1,000.00	-	R 1,000.00
Incentives/ Shirts	R 3,000.00	R 1,928.00	R 1,072.00
Bank Fee	-	R 378.01	-
Under budget			R 8,622.92
Total Budget	R 51,000.00	R 15,424.79	**R 44,576.14**

Received	Spent	Remaining
R60 000.93	**R15424.79**	**R44576.14**

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

9. Results

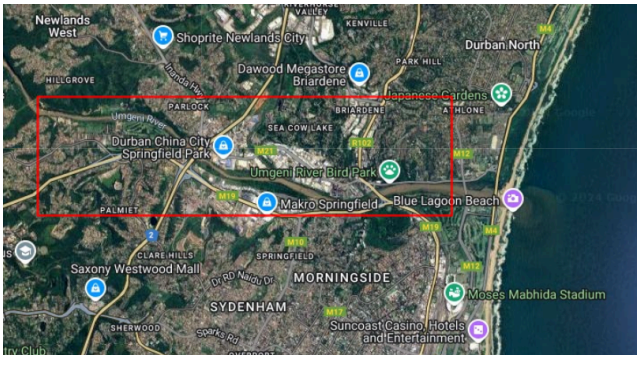
9.1 Mapathon



During the Mapathon, students used the HOT Tasking Manager to map buildings, roads, and water pathways.

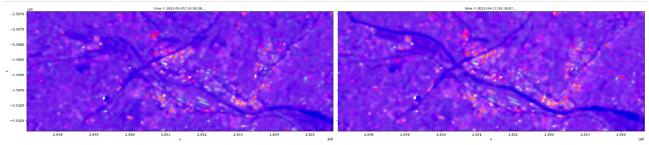
9.2 Flood risk assessment

The following table compares the flood risk assessment between the Umgeni River in KwaZulu-Natal(KZN) and Kariega in the Eastern Cape.

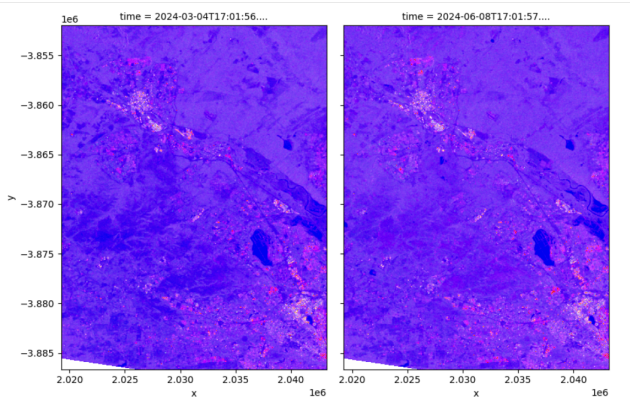
Umgeni River, KwaZul-Natal (KZN), SA **Case 1: Cut-Off Low Weather System** **April 2022**	**Kariega, Eastern Cape, SA** **Case 2: Tornado Severe Weather System** **June 2024**
 Study Area: Areas around Umgeni River.	 Study area: Area around Gqeberha, close to the coast.

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

Excessive rainfall overwhelms the river's capacity to carry water, leading to overflow and severe flooding around the areas near the Umgeni River.

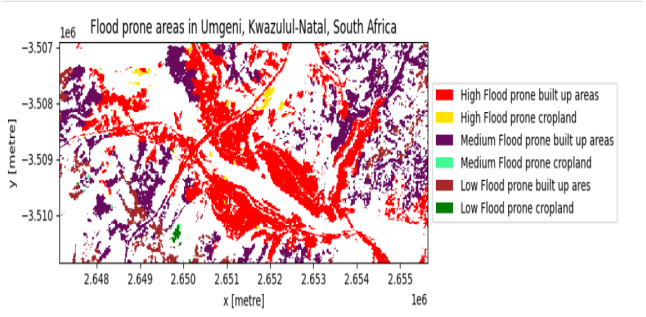


Left Image: Before Heavy Rainfall
Right Image: After Heavy Rainfall

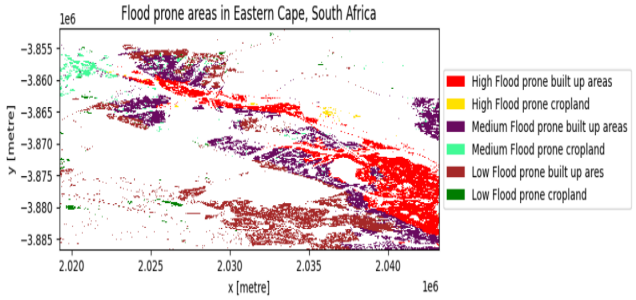


Left Image: Before Heavy Rainfall
Right Image: After Heavy Rainfall

The map below shows that areas that are close to the Umgeni River are the ones that are at high risk of being affected by floods.
The map was generated using the Digital Elevation Model (30m Resolution).
From the figures above, we can see that Umgeni, Durban, and areas on the coast were at high risk of floods.

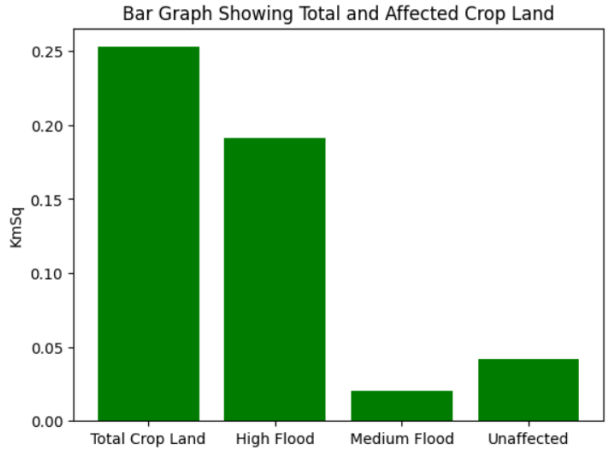


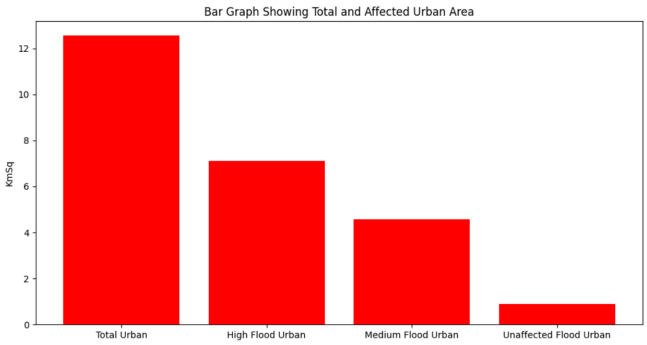
More areas that were close to the coast/ocean during the event of a tornado, are at high risk of being flooded, based on the Digital Elevation Model and the amount of rainfall it receives.
From the figures above, areas such as Kariega, Bluewater Bay, and Gqeberha were at high risk of floods.



GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

Impacts of Flood on cropland and built-up areas.

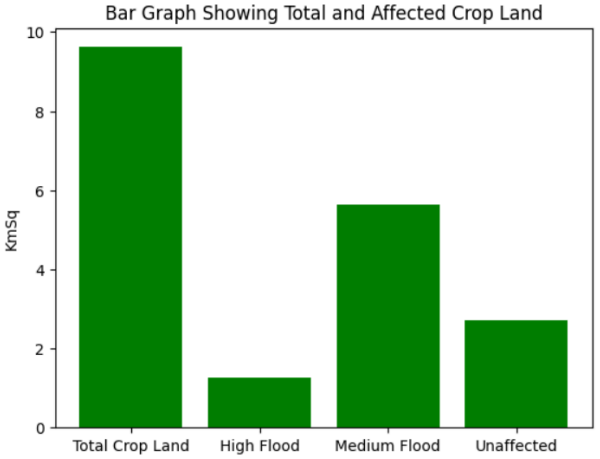


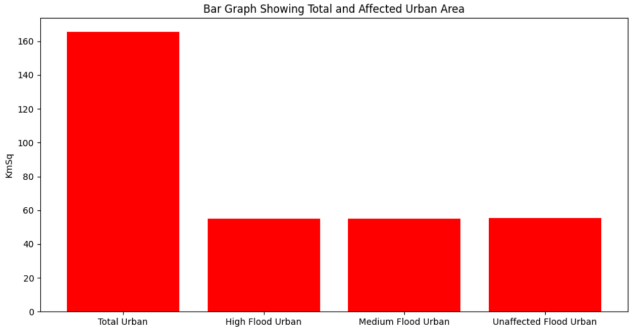


The flood risk assessment reveals that built-up areas are the most vulnerable to flooding, with a significant portion highly prone, followed by areas with medium flood risk. Cropland is less affected overall, though some areas remain at risk.

This distribution highlights the need for balanced flood mitigation strategies across both land types, particularly in areas facing the highest risk.

Impacts of Flood on cropland and built-up areas.

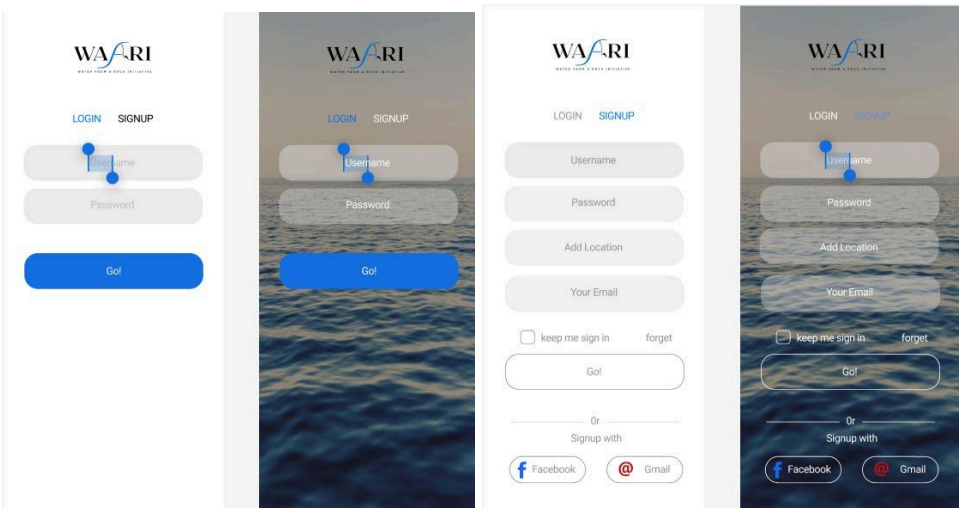


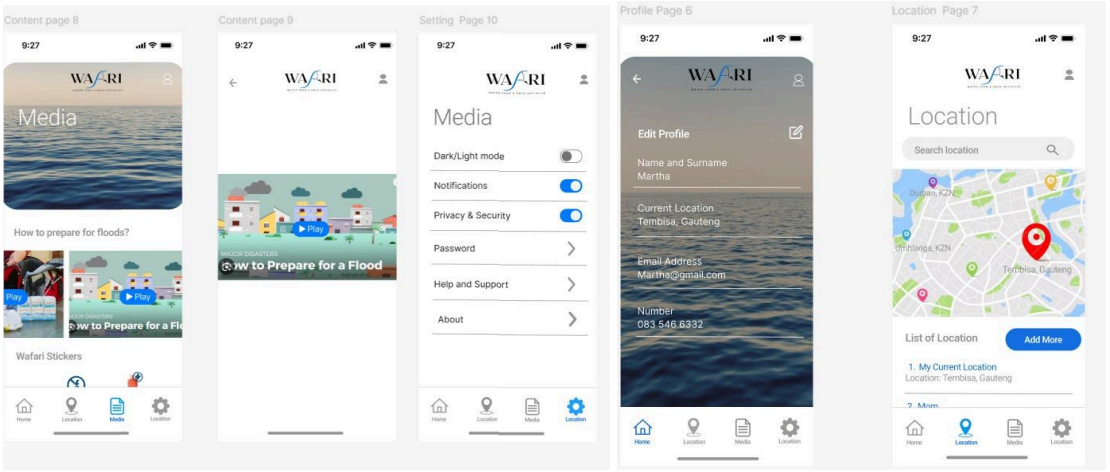


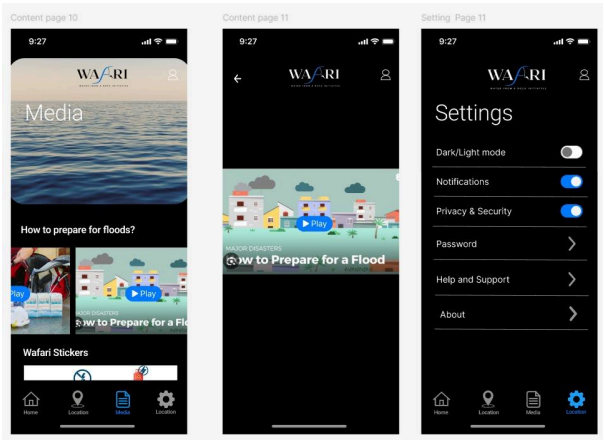
The assessment shows that built-up areas are almost equally divided between high, medium, and unaffected flood risks, with each category having a considerable portion. Cropland, while also affected, shows a more pronounced division, with medium-prone areas being more significant than highly prone or unaffected areas.

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

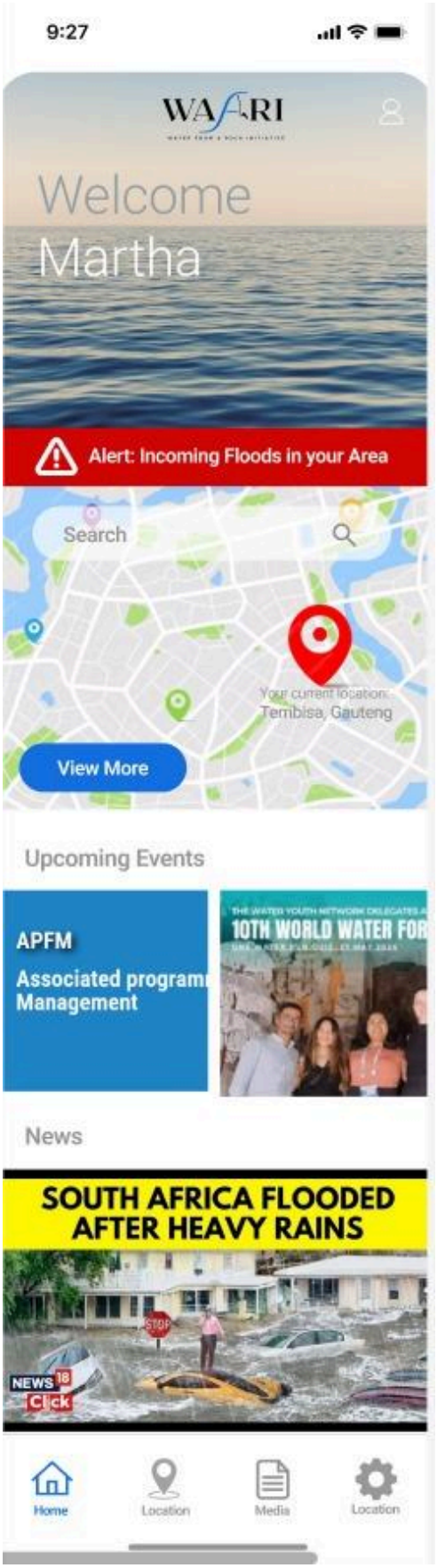
9.3 Wireframes

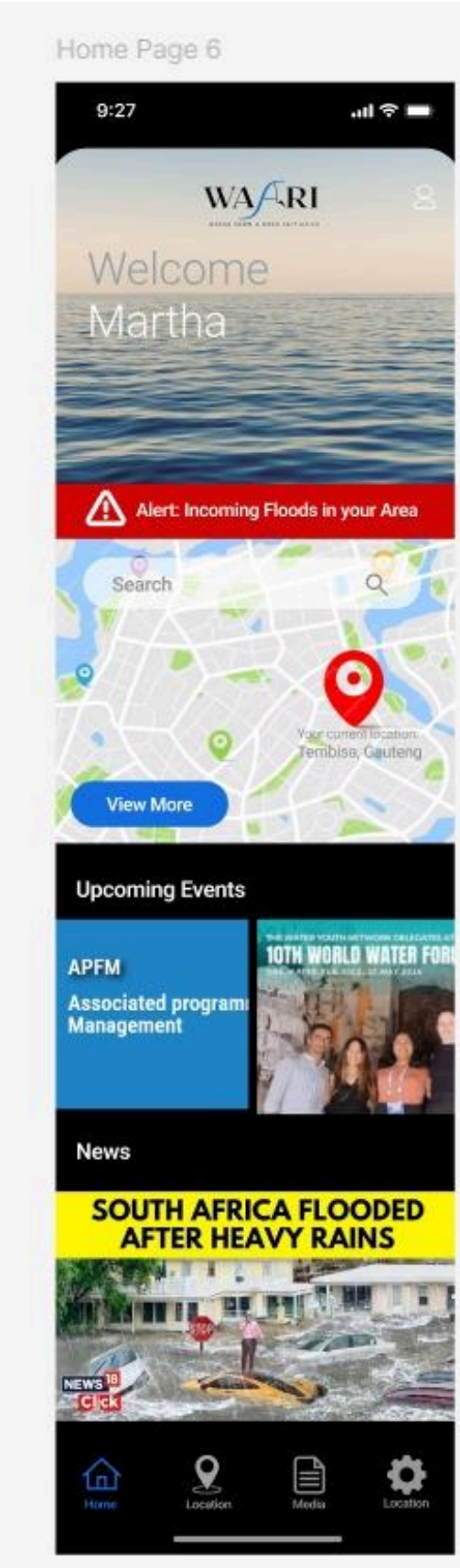






GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION





9.4 Survey Results

Flood Awareness Survey: Building Resilient Communities

The Water From a Rock Initiative (WAFARI) is a youth-led project focused on enhancing the preparedness and resilience of communities vulnerable to extreme weather events. As a proud recipient of the 2023 Youth Changemaker Award, presented by the Global Water Partnership, WMO, and Water Youth Network, WAFARI is committed to driving impactful change.

To support this mission, a flood awareness survey was conducted to gather essential insights on flood awareness and preparedness within the targeted communities. The survey targeted a diverse population, including students, professionals, and general community members across various age groups and regions. The online survey allowed us to reach a wide audience across the country & continent, ensuring broad accessibility and participation. Participants were assured that all responses would be kept confidential and used solely for research purposes. Participation was entirely voluntary, and individual identities were not disclosed.

The engagement of individuals aged 18-35 (Diagram 1) was particularly high, suggesting that younger community members are more actively involved in flood awareness efforts. The country demographics highlighted varying levels of flood awareness across different regions, offering valuable insights for targeted interventions

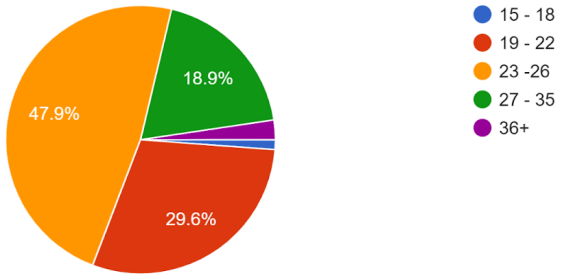


Diagram 1: Age of participants

The country demographics (Diagram 2) of the WAFARI Flood Awareness Survey highlight the varying levels of flood awareness across different regions.

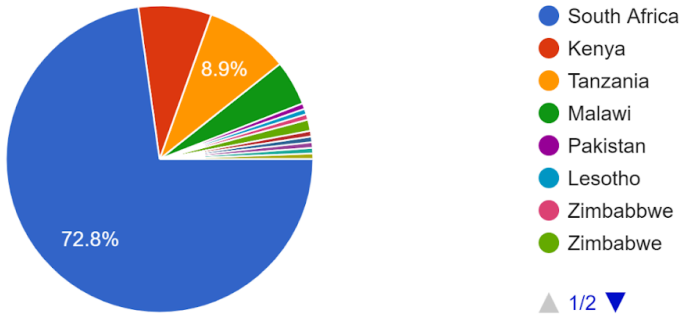


Diagram 2: Demographics of participants

The WAFARI Flood Awareness Survey, initially focused on South Africa and later expanded to other African nations. Diagram 3 includes detailed insights on the provincial distribution within South Africa.

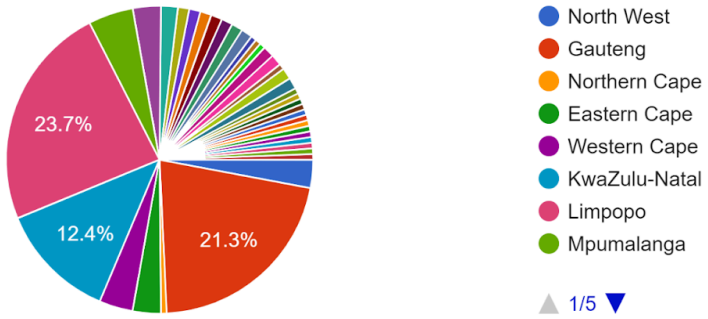


Diagram 3: South African Provinces

The WAFARI Flood Awareness Survey reveals that a significant portion of respondents have experienced floods, with varying severity from minor inconveniences to severe damage. These experiences have heightened their flood awareness and motivated proactive measures such as staying informed and creating emergency plans.

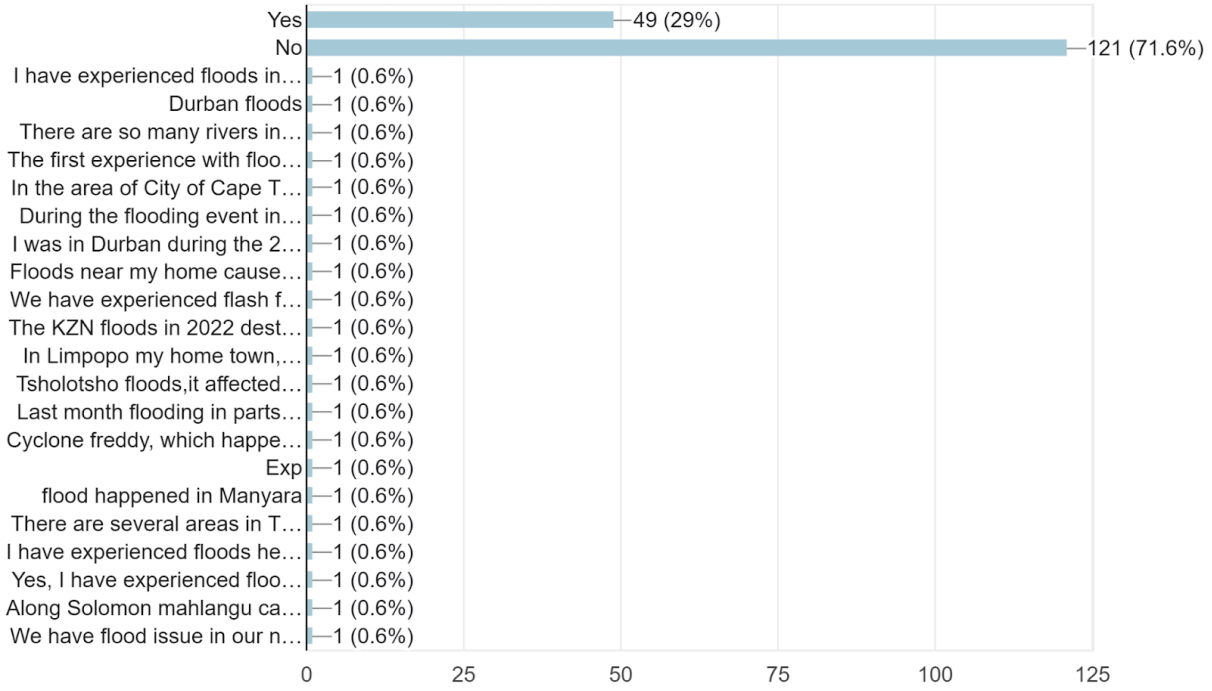


Diagram 4: Flood Experience

The WAFARI Flood Awareness Survey captured a broad spectrum of employment statuses, reflecting the diverse backgrounds and professional stages of the participants. Notably, students showed a high level of participation, indicating strong engagement from the academic community.

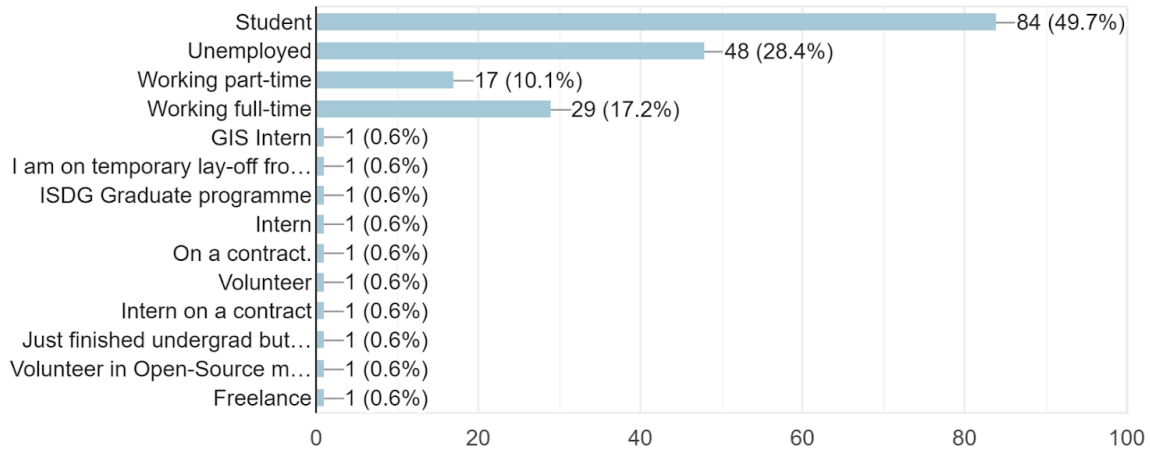


Diagram 5: Work Experience

GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

Students from various university institutions showed a high level of participation.

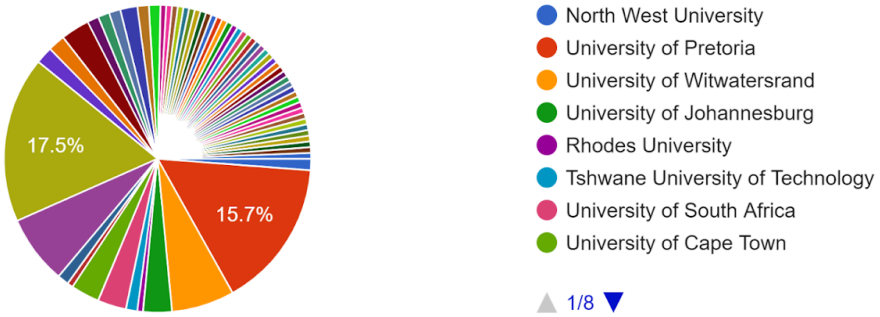


Diagram 6: University Institution

The WAFARI Flood Awareness Survey included questions about whether respondents know someone who had experienced floods. The results indicate that many participants are connected to individuals who have faced such events. The survey reveals that many participants are personally connected to flood victims, enhancing their awareness of the severe impacts of flooding.

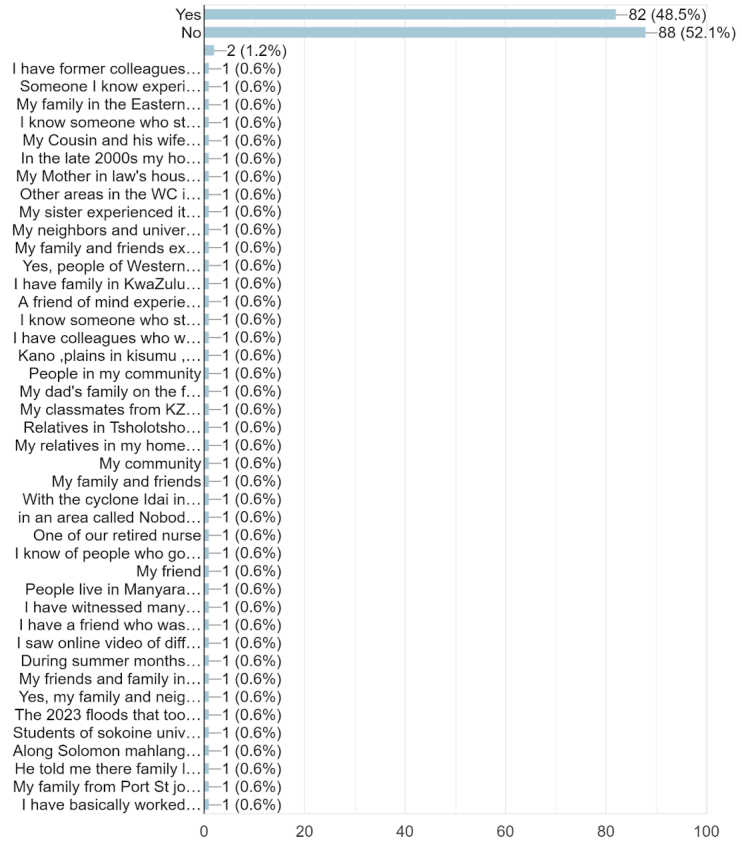


Diagram 7:

The WAFARI Flood Awareness Survey assessed the level of awareness about floods among participants. The findings reveal a mixed level of awareness within the community. The survey results indicate a varied level of flood awareness among respondents, with some being well-informed and others needing further education. This highlights the importance of tailored communication and educational efforts to enhance flood preparedness across the community.

Diagram 8: Flood Preparedness Level

The WAFARI Flood Awareness Survey assessed respondents' knowledge about where to find weather alerts and warnings. The findings highlight varying levels of awareness and preferred information sources. The survey indicates that while many respondents are aware of where to find weather alerts and warnings, there is still a need for improved education and communication strategies to ensure everyone has access to reliable information.

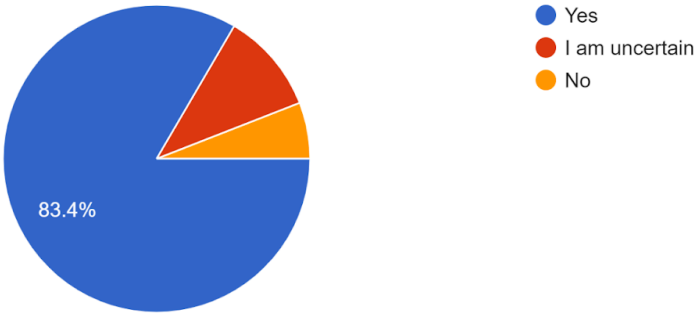


Diagram 9: Awareness of Weather Alert Sources

The WAFARI Flood Awareness Survey examined where respondents receive weather alerts and warnings, and evaluated their response to these alerts.Respondents primarily receive weather alerts through TV-News, websites, traditional media, social media, and word of mouth. The overall response to these alerts is positive, with most individuals taking timely action based on the information provided.

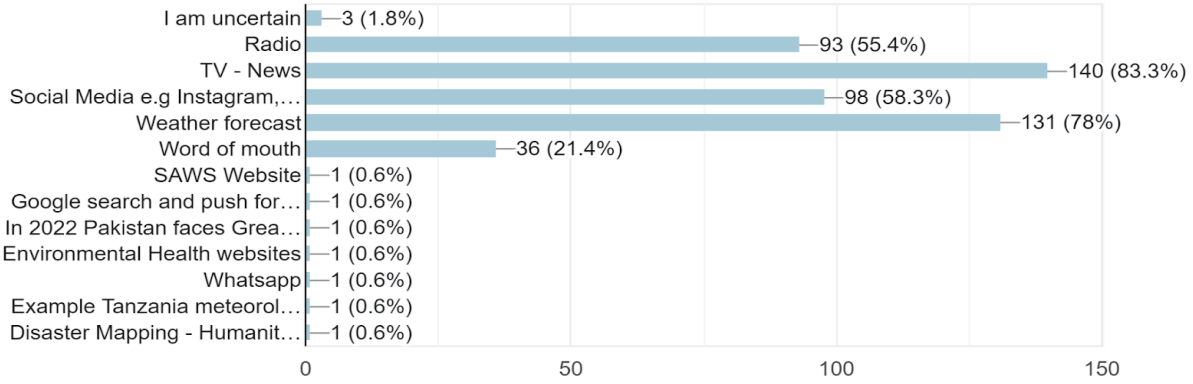


Diagram 10: Weather Alert Sources

The WAFARI Flood Awareness Survey evaluated how well respondents were informed about extreme weather events on a scale from 1 to 5, where 1 indicates not informed and 5 indicates very well informed. The survey reveals varied levels of awareness about extreme weather events among respondents, with the majority falling in the moderate to well-informed range.

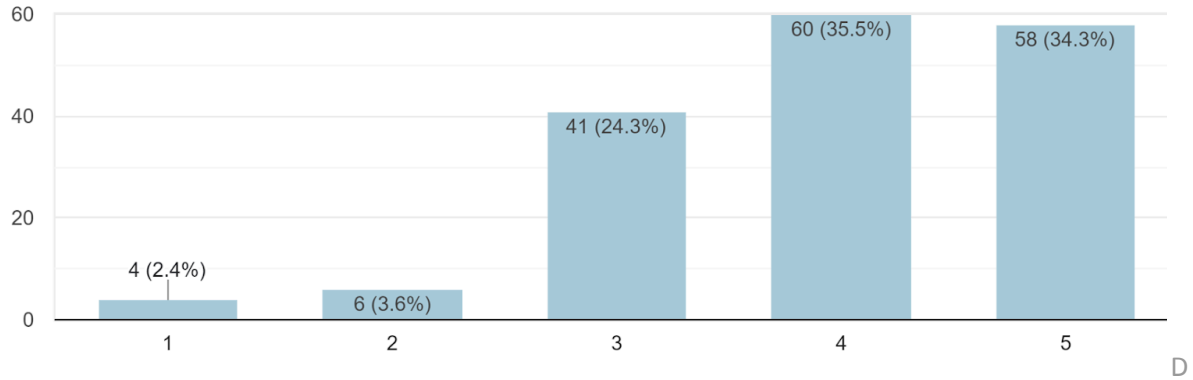


Diagram 11: How Informed are Participants about Extreme Weather Events

The WAFARI Flood Awareness Survey shows a strong interest among respondents in understanding the causes, risks, and impacts of extreme weather. Participants seek reliable information from authoritative sources and prefer accessible formats like online resources and community workshops.

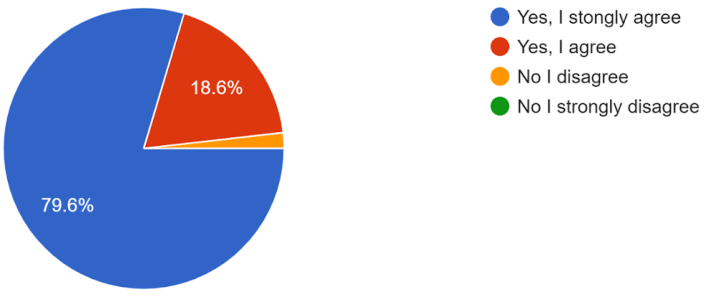


Diagram 12:

The WAFARI Flood Awareness Survey highlights the importance of equipping vulnerable communities with skills and knowledge to improve their flood response. A significant majority of respondents agreed on the necessity of such education.

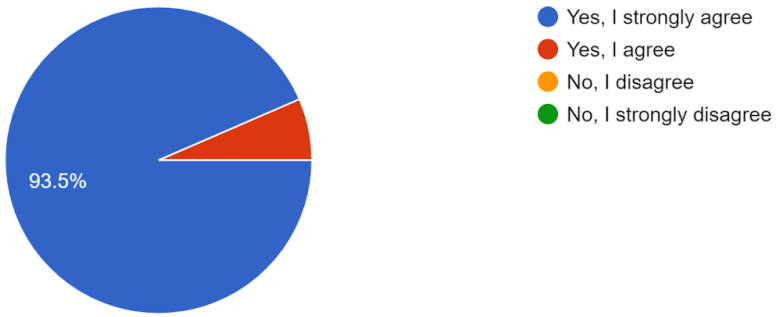


Diagram 13: Agreement on the Importance of Equipping Vulnerable Communities

The WAFARI Flood Awareness Survey revealed a significant interest among respondents in volunteering with the initiative. The emphasis on confidentiality and voluntary participation highlights the ethical considerations of the initiative, while the acknowledgment of contributors fosters a sense of community and shared purpose.

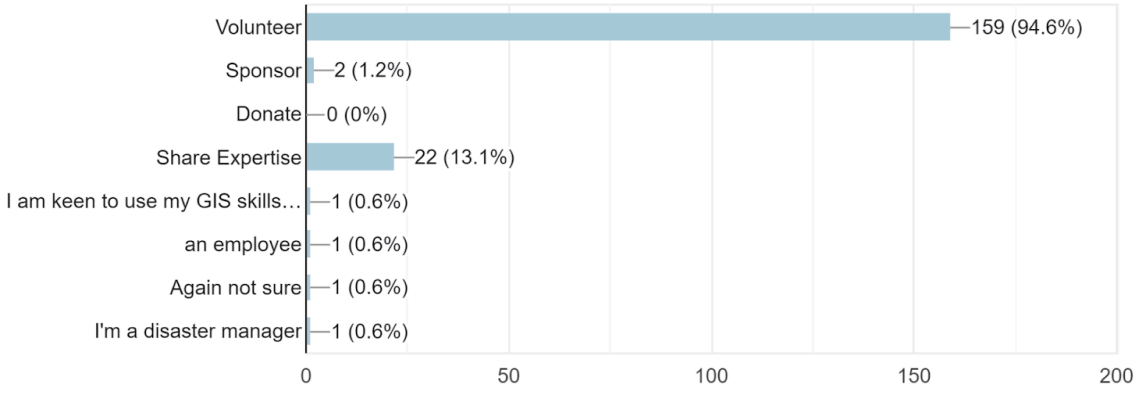
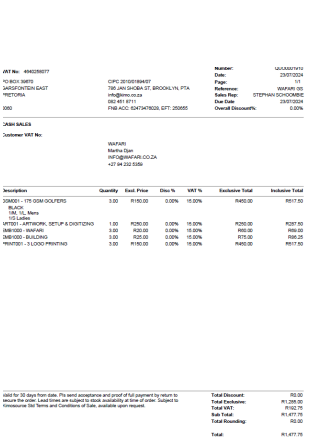


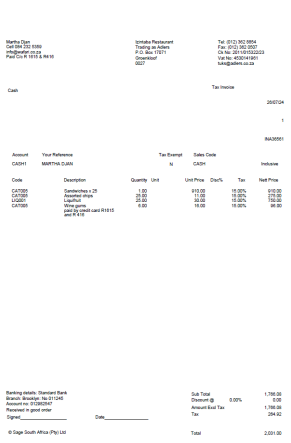
Diagram 14: Interest among Participants

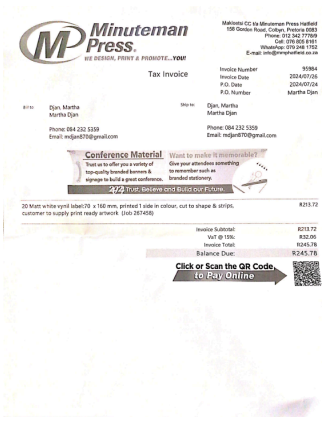
The survey provided a holistic view of how WAFARI can better assist and support communities in becoming more resilient during extreme weather events and increasing the awareness and preparedness of individuals. We express our gratitude to every individual who completed the survey and those that expressed their interest in supporting the youth-led initiative.

10. Annexes

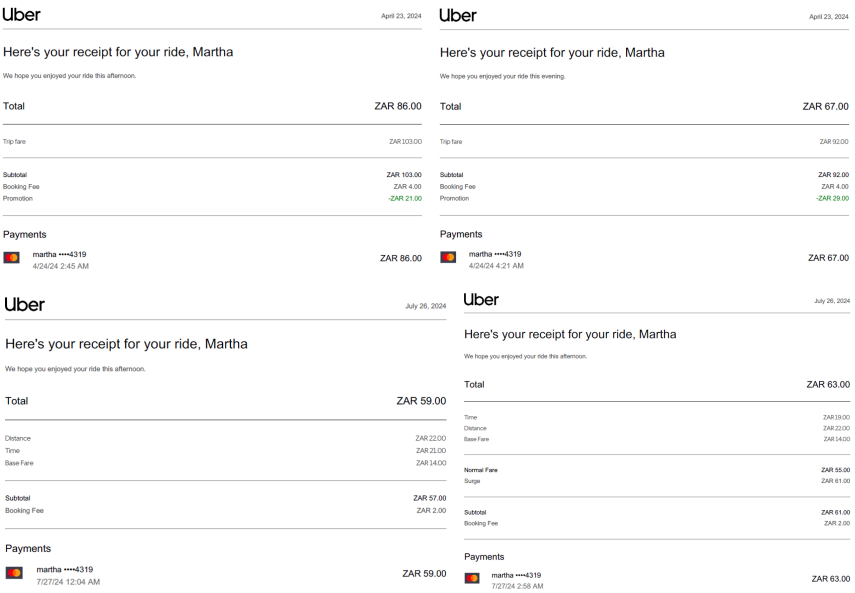
10.1 Copies of invoices







Transport:



GLOBAL INTEGRATED FLOOD AND DROUGHT MANAGEMENT COMPETITION

10.2 Media

10.2.1 Pictures




10.2.2 Links to videos

- Water from a Rock Project - Intro Video (2023 APFM/IDMP youth competition)
- Water from a Rock - Phase 1 - 2023 APFM/IDMP youth competition
- Water from a Rock - Phase 2-3 - 2023 APFM/IDMP youth competition
- Water from a Rock - Phase 4 - 2023 APFM/IDMP youth competition

10.2.3 Social media

LinkedIn: https://www.linkedin.com/in/water-from-a-rock-intiative-3066a5313/
Instagram: https://www.instagram.com/wafari_za/?hl=en
University of Pretoria website: https://shorturl.at/n4uX2
Email: info@wafari.co.za