INFORMATICS INSTITUTE OF TECHNOLOGY

Foundation Certificate In Higher Education

Early Warning Alert System for Flood

Module : DOC330- Designing Innovative Solutions

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Abstract

This is the main problem facing Sri Lanka which has been aggravated by climate change, deforestation, and bad drainage systems. The current ones include poor communication, small coverage areas, and inadequate public awareness on the early warning systems. In fact, this research work suggests a smartphone application called “Hydro Alert” which is an early warning system that applies real time data, geofencing and multilingual alarm to improve the community preparedness and response to floods. Floods also continued to pose a great threat hence features like dynamic evacuation routes, offline SMS alerts, and mental health support are intervention measures meant to help affected community. This means that this system aims at encouraging early evacuation; prevent disaster and enhance safety by integrating modern technology and user oriented designs. Hydro Alert is a new approach for disaster management and it successfully identified the problems of communication, education and efficacy of the response.

Acknowledgement

We would like to express our sincere gratitude to the Informatics Institute of Technology for providing us with the opportunity to undertake this research project on an early warning alert system for flood (Hydro Alert) [IFD]. The valuable resources and course materials offered by the institute were instrumental in guiding our investigation and analysis.

We are also deeply indebted to our dedicated academic team. Our Module leader, Ms. Jananie Mayooresan, along with our tutorial lecturers, Ms. Dilki Weerakoon and Ms. Indika Thuiyadura, provided invaluable guidance, support, and feedback throughout the project. Their expertise and patience were essential in shaping our understanding of the topic and ensuring the successful completion of this report.

Team “C6”

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1.Introduction and Description of the Project

1.1 Background

A Proposal for an Improved “Early Warning System” ,The Limitations of Current Early Warning Systems in Sri Lanka are these, lack of communication and a small coverage area, low awareness of users, and an institutional focus on relief over alert systems such as the ‘Early Warning Alert System for Flood’. The team highlights the fact that current methods cannot disseminate information in a timely manner hence causing other adverse effects such as these.

The suggested solution includes smartphone-based alert that could be updated in real time and with possibility to have multilingual notification and SMS-based important alerts; this means the tool would be available in any case even if the smartphone is not used at the moment. From this system, users in the flood prone areas would be advised, and in addition to the warning, they would also be given information regarding safety measures to be taken, the best evacuation routes to take as well as the available shelters. One aims to be as progressive and effective in the reduction of risks brought by disastrous events through the use of shared Short Messaging System as a form of communicating geofencing and virtual perimeters.

The reason for this topic selection is due to Sri Lanka’s vulnerability to floods and also because some problems have been identified such as a poor notice and a poor level of prepared and preventive measures. This project has the specific objective of developing a ‘simple to operate’ warning system to promote early evacuation, increase safety and decrease risks where flooding is present.

1.2 Problem Statement

Incidents such as development cutting down and climate change are some of the aspects that have compounded Sri Lanka’s severe flooded situations. Unfortunately, the current early warning systems are insufficient because they have low public visibility and are poorly communicated, seldom reach most people. Earlier the (DMC) has prioritized the bureaucratic response mapping of the disaster and providing the post-disaster aid higher importance than the preventive measures which include timely and widespread flood warnings.

What is urgently needed to resolve these weaknesses is a comprehensive and easily accessible early warning system. Such a system must in addition offer the users necessary information in real-

time such as shelters, evacuation routes and other safety measures available. This would reduce the impacts why flooding happens and help flood prone area residents prepare themselves for future disasters.

1.2.1. Why the Problem Requires a Solution

1**. Ineffective Communication and Public Awareness**:

•There is a lack of effective communication channels to disseminate timely and accurate flood warnings to the public.

•Many people may not understand the severity of the threat or know how to respond appropriately to warnings.

•This lack of awareness can lead to delayed or inadequate responses, exacerbating the impact of floods.

2. **Post-Disaster Focus**:

•The Disaster Management Center (DMC) has historically prioritized post-disaster relief efforts over proactive measures like early warning systems.

•This approach delays timely interventions and limits the ability to mitigate the impact of floods.

3.. **Lack of User Education and Preparedness**:

•Many people are unaware of the existence of early warning systems or do not know how to use them effectively.

•This lack of user education hinders the effectiveness of these systems and reduces their potential to save lives and property.

1.3 Gap Analysis

2 Features	Similar Apps / Existing solutions (Local / Global)						Proposed solution
	LS1	LS2	LS3	GS1	GS2	GS3	
F1	Y	Y	Y	Y	Y	Y	Y
F2	N	Y	Y	Y	Y	Y	Y
F3	Y	N	N	Y	Y	N	Y
F4	N	Y	Y	Y	N	N	Y
F5	N	Y	Y	N	N	Y	Y
F6	N	N	Y	N	N	Y	Y
F7	Y	Y	N	Y	Y	Y	Y
F8	N	N	N	Y	Y	Y	Y
F9	Y	Y	N	Y	N	Y	Y
F10	Y	Y	Y	Y	Y	Y	Y
F11	N	N	N	N	N	N	Y
F12	N	N	N	N	N	N	Y
F13	N	N	N	N	N	N	Y
F14	N	N	N	N	N	N	Y
F15	N	N	N	N	N	N	Y
F16	N	N	N	N	N	N	y

F1	Real-Time alerts
F2	Multilingual notification
F3	Emergency contact
F4	Regular updates
F5	Two-way communication (Survivor communication)
F6	Offline readability (Alert messages via SMS)
F7	Geofencing capabilities (Location based tech)
F8	Integrated mapping (Structuring user's physical connections)
F9	Pre evacuation guidelines (Provide evacuation plans)
F10	Flood severity (Amount of perception in an area)
F11	TAV educational resources
F12	Integration with smart devices
F13	Historical flood data
F14	Mental health support (To locate treatment facilities)
F15	Hyper-localized alerts (Flood can be localized to specific areas)
F16	Offline Accessibility (One to one communication among rescuers and survivors)

LS1	T.V and Broadcast [Sri Lanka]
LS2	SMS alert from DMS [Sri Lanka]
LS3	DEWN system in Dialog [Sri Lanka]
GS 1	GDACS.org [United Nations]
GS 2	Disaster alert app [U.S organization]
GS 3	AEM.eco [Germantown, USA]

	Innovative Solution
Y	Yes
N	No

TAV	Text, audio and video

2.Methodology

2.1 Structured Evolutionary Prototyping Model (SEP Model)

The development of the “Hydro Alert - Early Warning Alert System for Floods” is based on the Structured Evolutionary Prototyping Model (SEP). This paradigm is appropriate for the project as the project’s nature and the focus on the constant interaction with the system and its gradual improvement based on user feedback.

2.1.1Why this model

2.1.1.1.Iterative Development:

- Enables creation of a functional prototype early enough in the process affording an earliest possible look into back-end functionality such as real-time alerts, geo-fencing, and multiple language support.
- Allows for small continuous enhancements based on the users’ experience and other incorporating other stakeholder opinions.

2.1.1.2.Flexibility:

- Can integrate modifications of requirements that participants recognized in a course of the interviews and questionnaires and fix them in the final version of the system.

2.1.1.3.Focus on User-Centric Design:

- Great relevance to the project goal of improving usability and accessibility, for example, trilingual notifications and offline mode.

2.1.1.4.Risk Mitigation:

- Prototyping in the early phases is useful because it exposes issues that might relate to the technical or design structure of a project, thereby preventing users from delivering a less than desirable end-product.

3.Solution outline

This early warning flood alert app has the potential of intensely transforming disaster management in Sri Lanka by offering complementary information that is timely, easy to comprehend and enables action to the affected people in the flood prone areas. This is achieved with innovative technologies incorporated in the alerting system, friendly user interface design, timely alerts, guided evacuation and offline communication all integrated to transform the disaster response and help build safer communities.

1. Essential Operative Machineries.
    a. Real-Time Flood Monitoring and Data Collection.
        - The app is designed in such a way that it is constantly receiving data from river scales, flood sensors and weather predictions and many others. A backend system gathers this data algorithms and machine learning models which incorporates previous rainfall records, seasons and previous floods to determine the flood danger level. Only when the condition specified by the key reaches a certain point, warnings are issued through the backend system to the app. It also helps user receive alert on time and be informed on when to expect a flood.

    b. Instant Pop-Up Alerts with Advanced level Notifications.
        - Push notifications are used by our app to send alerts and make sure people see them straight away whether they are on their phone or not. An advanced notification system is used to decide between a “WATCH”, “WARNING” and “EMERGENCY” alert based on the severity of the flood risk. This provides the users, with describing the problem, an idea of how quickly do they have to take a particular action.

2. Geofencing and Virtual Perimeter Technology.
    a. Location-Based Targeting Through Geofencing
        - Created by the powerful combination of GPS, cell tower triangulation and Wi-Fi data, geofencing locates a virtual boundary around areas considered to be receive alerts specific to that region’s conditions. For disaster management, this feature is crucial as it allows the app to issue hyper localized warnings that are both relevant and timely, in the first instance delivered to those in the highest risk zones. This feature of geofencing is to ensure that residents outside of immediately danger zone

are not overloaded with unneeded notifications and keep alert fatigue low and have impact of critical alert preserved.

3. Enhanced Accessibility with Trilingual Support.
    a. Language Inclusivity for Broader Reach
        - The app supports English, Tamil and Sinhala which enables the application in addressing Sri Lanka's language diversity effectively. At setup, users can select a language they prefer, and all notifications including emergency instructions, notifications from the app and app interface are in the language the user prefers. Voice notifications are supported with language as this may be very useful for elderly users or less literate people. A voice alert could be played in the user's preferred language in case of emergency.

4. Backup SMS-Based Communication System for Offline Alerts.
    a. SMS Alerts for Robust, Offline Communication
        - The app includes an SMS-based backup system that recognizes userr mobile data or Wi-Fi may not be available in the occurrence of a disaster. In the event of a critical alert, a text message is automatically sent to users located within the affected area, to keep them in the know. SMS communication typically just basic cellular connectivity (as opposite to internet connectivity) and is consequently a more reliable way to alert if internet based communication is not functioning. The SMS alerts can contain only the minimum thing, that is flood level, location, nearest shelter, evacuation instructions from the app so that can keep a record of it. Finally, this offline functionality improves app's strength in running flood alerts no matters what conditions.

5. Safety Assistance with Real-Time Evacuation Routes and Nearby Shelters.
    a. Dynamic Safety Information and Evacuation Path Guidance
        - In addition to alerting the users, the application assembles a package of practical tools and tips to interact with floods for the users. Besides, it ensures that in cooperation with the local governments, users are informed on the location of nearby shelters and evacuation centers, medical help stations and other relevant facilities. Using GPS and real time data, it is possible to provide users with flexible routes depending on the actual water levels and road blockages. For instance, if

some of the routes are blocked or filled with water, the app will redirect the users to another secure path. This routing is dynamic and always presents the user with the correct directions to the closest safe zones, therefore minimizing confusion and maximizing safety during the evacuation.

b. Safety Protocols and Emergency Guidelines

- These protocols and guidelines provide accurate information that includes advice on safety precautions such as working out maximum caution when indoors, emergency electrical switch off and what essentials should be taken along in a case of evacuation. These protocols, which are built for each alert level, gives the users warning so that their lives and that of their beloved once could be protected; it fills the gap between an alert and the prepared to do something about it.

6. User Engagement and Feedback Mechanism.

a. Two-Way Communication for Real-Time Updates

- Two-Way communication will also alert the users to get alerts but also to conditions such as rising water levels or blocked evacuation routes. This feedback helps improve the systems response capabilities and adds more data available to emergency services. Users can also report if they need any help or alert any dangerous areas to help have another layer of real time situational awareness that comes from the app. Disseminating the information will speed the speed of emergency responders making data determined inventions.

7. Technical Design and Integration.
   a. Backend Infrastructure and Data Security
      - The app's backend handles high capacities of real time data, with terminations to make sure the alerts get delivered. This makes use of strong encryption and access control to ensure that data user send to RGeo (key component of location-aware applications). When user share it with it (Such as user location) is still complete even in the case of disaster. For example, the app could be used to generate predictive analytics around and prepare for known flood events, so hopefully, for government planners, it would help them plan in advance and issue proactive warnings.

4. Innovative Features

4.1. Educational Resources for Flood Preparedness

Communities should be prepared before floods arrive fast. Finally our system provides easy to use educational resources for everyone to know how to be safe before, during and after a flood. How these are provided include clear written instructions with easy audio guides and helpful videos to make sure that people of all ages and reading levels can properly understand what to do. We simplify safety measures to the point where everyone knows what to pack into an emergency kit, that they should secure their home, and signs of rising water. We want to make it so that everyone feels confident and prepared to protect themselves and their family and friends. We also keep the content updated with the most recent safety advice plus.

4.2. Smart Device Integration

What if your home warned you the moment water starts to rise, before you can even detect it? That's what this system does. It can instantly send you phone alerts when there’s even a risk of flooding through an app that connects to smart home devices like water level sensors and alarms. Even if it's a fire early warning, it’s got you time to act, whether it’s moving your family to safety or protecting your possessions. Imagine, for instance, that a sensor in your basement sees water, which would then automatically kill the electricity to the area to avoid accidents. But if you’re not at home, you can be alerted and even remotely turn off devices or trigger pumps to avoid damage. We have our goal: to give you peace of mind and deliver a quick response in case of emergencies.

4.3. Historical Flood Data

Planning for the future must take into account, how floods have affected your area in the past. This feature allows you to have access to historical flood data in order to understand the risks to your neighborhood in particular. Looking at past events will help you make better decisions too, for example safer route to get away quicker, or places that are more likely to flood. This information is for anyone looking to protect their homes and their families. This data transforms complicated information into usable tips, whether you’re a property owner who is interested in improving your home or just trying to decide how best to get in and get out.

4.4. Mental Health Support

Being emotionally hard as well as physically hard to deal with a flood. That's why we are including mental health information in our system. Having support can really help when you're stressed, anxious or when you're dealing with the mess left behind from a flood. It contains some breathing exercise, relaxation techniques, and mindfulness practices intended to help you relax. There's also practical advice about how to cope with stress when you lose your belongings or when situations are changing in the short term. We connect you to professionals for help one on one if you need more. During tough times you need to stay mentally strong as much as you need to stay safe.

4.5. Local Alerts

Every second counts when you have a flood. And our system is unlike general alerts that cover large areas we send real time alerts that are based on GPS and are targeted to your specific location. This means you'll be alerted to what's happening in your neighborhood, so you can react quickly. Anyone with a sense for the area where you live will know immediately if it's time to evacuate, find higher ground, or take any other action if, suddenly, water levels around your home climb significantly. Also, these alerts can notify you to accompany at the closest shelters, or give updates on the traffic conditions, or tell you of the closest rescue services. With that, you know you will only get the most appropriate info on your safety.

4.6. Offline Access

The internet can go down when a disaster hits. In such situations, it's good to have access to important information offline. This means essential resources, like emergency contact numbers, safety checklists and evacuation guides, will be stored on your device, so that even when you're off the internet you can still locate them. In addition, the system can also send you SMS alerts to your phone to let you know if the internet isn't working. So if you're stranded in the middle of nowhere or during a huge storm, the information in your hand is the only thing that will help you stay safe and take the appropriate action, even when worst comes to worst.

5.Requirements and Analysis

5.1Requirements Elicitation methods

5.1.1. Questionnaires

By giving questionnaires to get the feedback from the stakeholders will drastically help the application to become more user-focused. Questionnaires are about set of questions about what are the needs in this app and what to improve to get the feedback from the users and it will be helpful to identify the weakness, needs, issues and improving it to the application.

5.1.2. Interviews

Our app also learned about the roles and preferences of each stakeholder through interviews. They provide rich qualitative data, allow probes to clarify responses, explore more discussions and get instant feedback from the stakeholders and all that will refine the application.

5.1.3. Background reading

A background reading is done to comprehensively and deeply understand the topic in order to carry on the development of our application. This shall enable our application to stay abreast of the latest news, to enable smooth and effective decision-making, enable strategic planning, and finally succeed in the development of the application.

5.2. Detailed and Specific Requirements of the Project

5.2.1 Functional Requirements

Requirements	Description
Data Collection	Collecting Real time weather and geolocation data (such as Rainfall levels, River water levels and soil moisture)
Flood prediction and analysis	Predict the possibility of floods using machine learning technology with the use of collected real time weather data and display risk zones in the map.
Alerts	Allow users to set preference of notifications and also can be sent through In-app notifications, SMS, email, and social media.
User interaction	Enables users to report about the ongoing flood in their area for real time data.
User Feedback	Feedback on how relevant and accurate this information is given so users can input their contribution.
Emergency Responses and Resources	Offering safety advices and providing users with evacuation routes, Emergency Contacts and Nearby safe places.

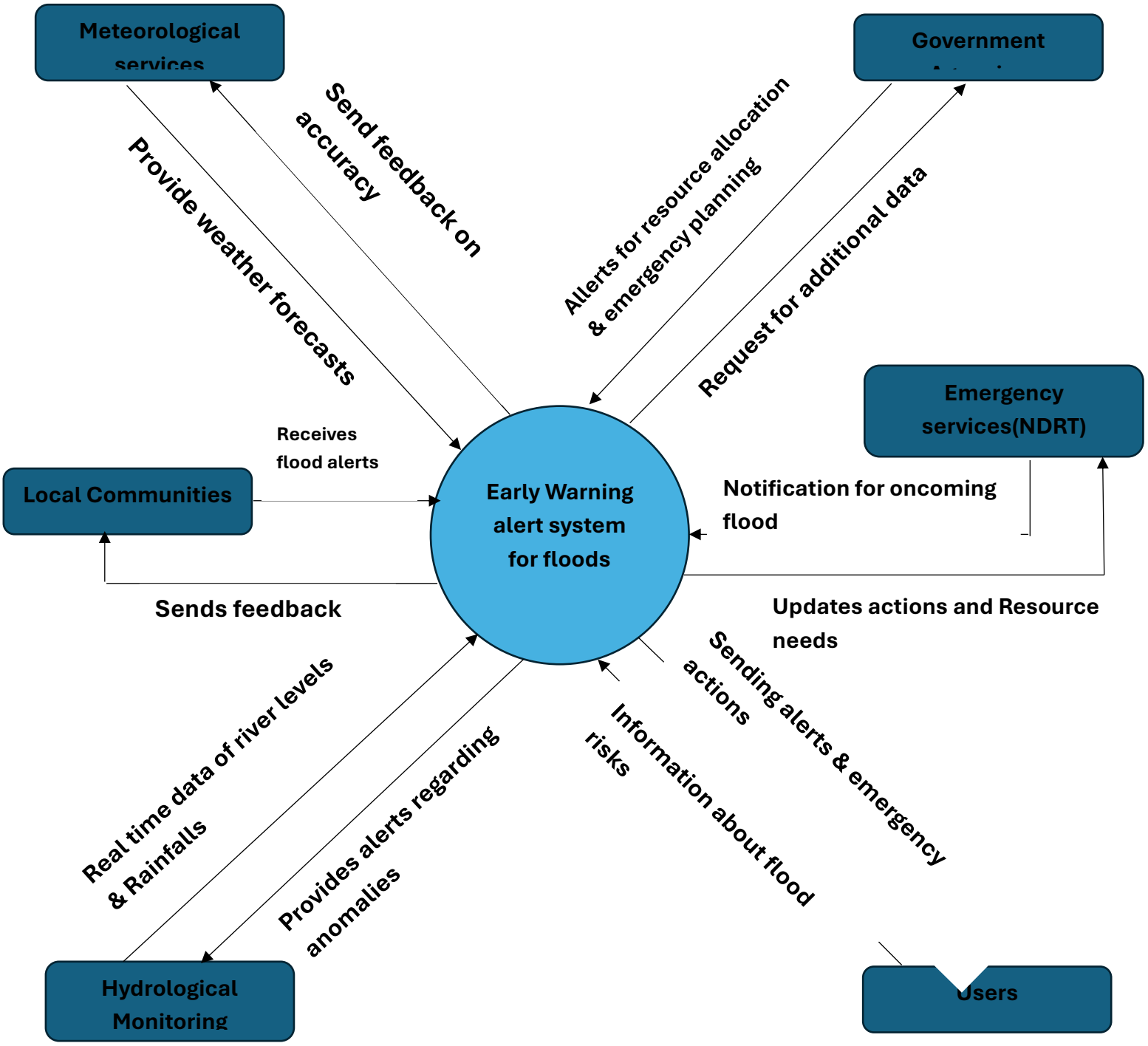
Table 1 Functional Requirements

5.2.2.Non-Functional Requirements

Requirements	Description
Scalability	The platform has to scale to the increasing volume of data and the number of users, the platform we are creating has to be scalable enough to handle this.
Reliability	Collect from multiple resources for continuity in information in one of the sources fail.
Availability	It may influence user safety, so we need to have high availability and fault tolerance.
Performance	Look to utilize near real time updates, enable quick data processing and alert production and reduce latency when you're notifying consumers.
Usability	Support a multilingual user interface in different regions and the aim is to create a simple, intuitive user interface that can be understood by a large variety of people who are or are not tech literate.
Security and Privacy	Sensitive user data and location information being encrypted and access controls to obtain backend being enforced on unauthorized access.

Table 2 Non-Functional Requirements

5.3 Context Diagram



6.Prototype

6.1Login & Sign up Page

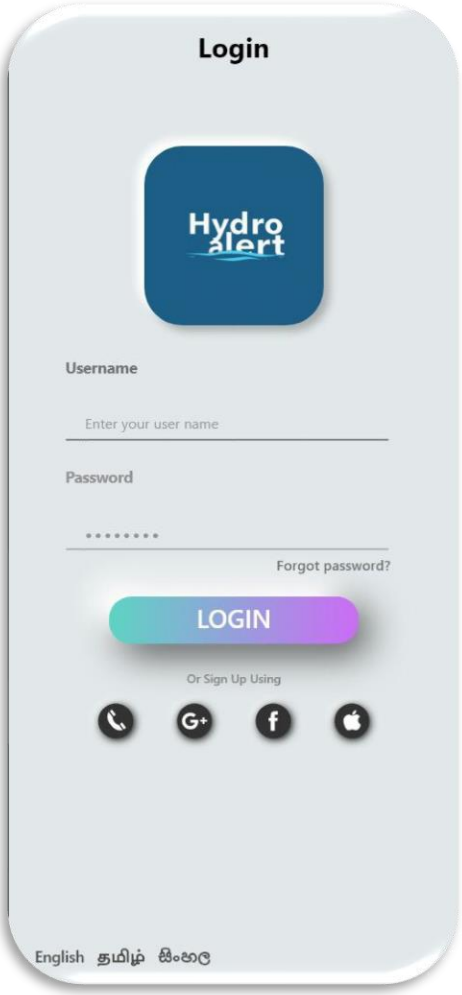


Figure 1Login & signup page 6.1

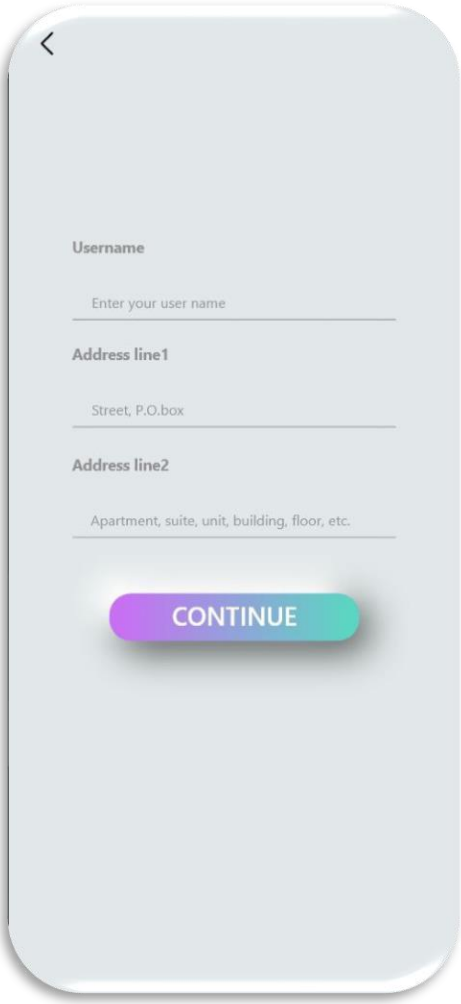


Figure 2 Login & signup page 6.1

6.2Verification Page

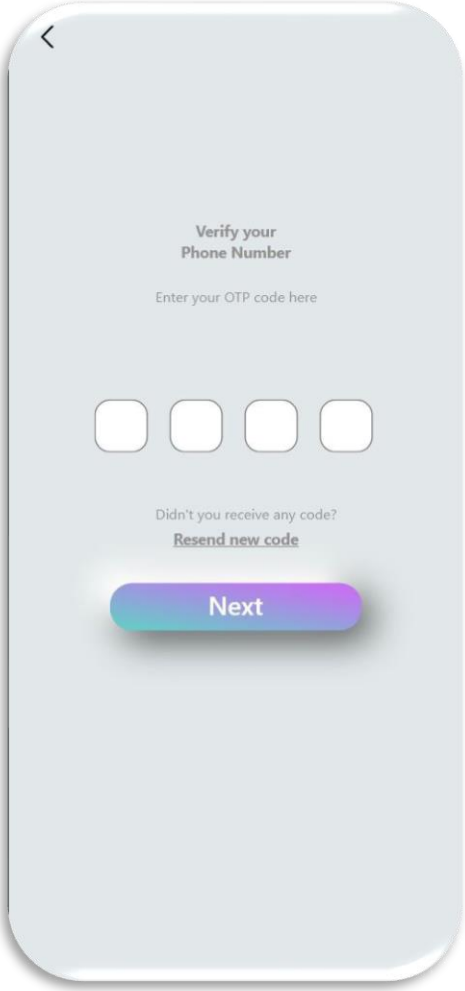


Figure 4 Verification page 6.2

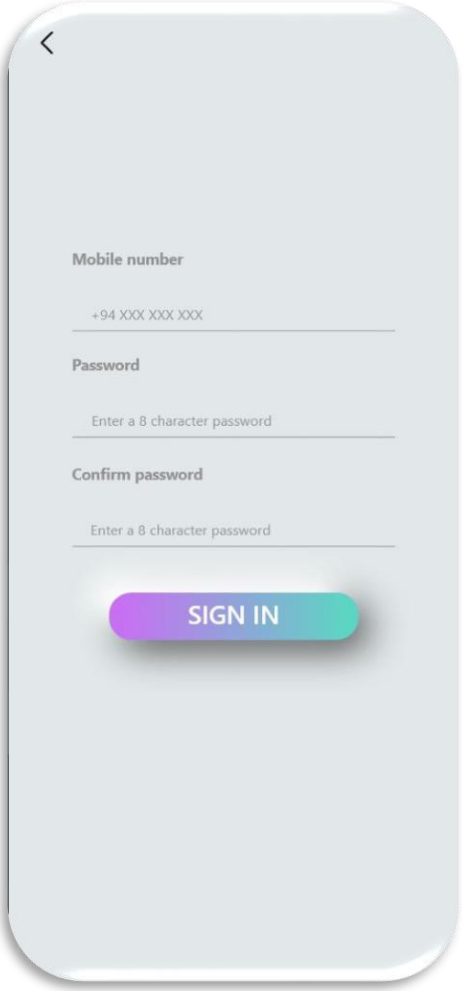


Figure 3 Verification page 6.2

6.3 Home Page

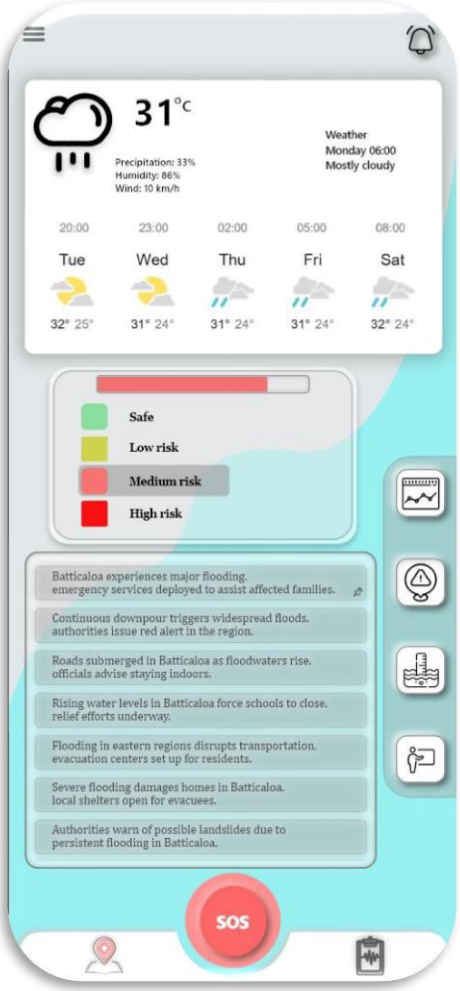


Figure 5 Home page 6.3

6.4 Historical Flood Data

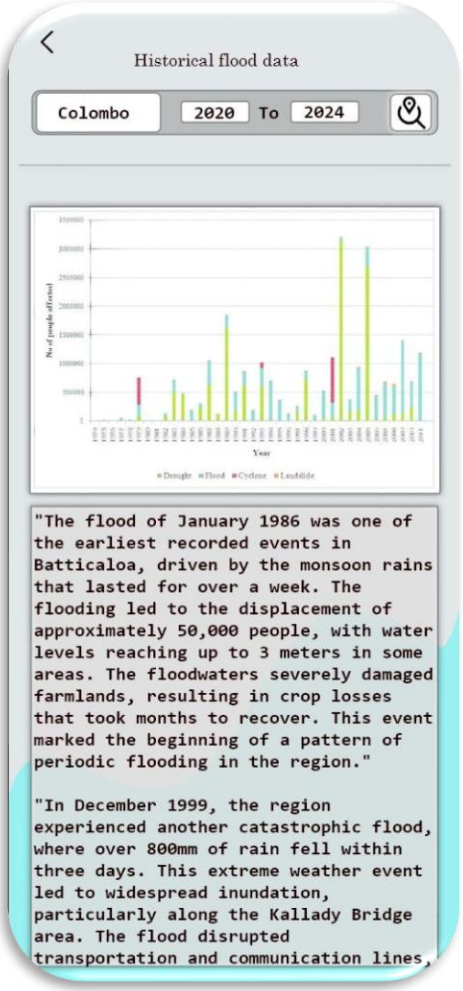


Figure 6Historical flood data 6.4

6.5 Hyper localized Alert and Collaboration

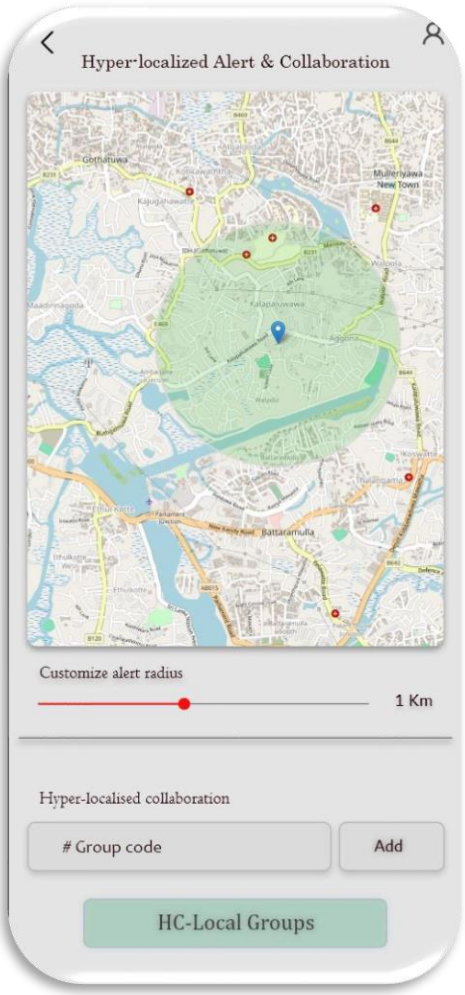


Figure 7Hyper localized Alert & Collaboration 6.5

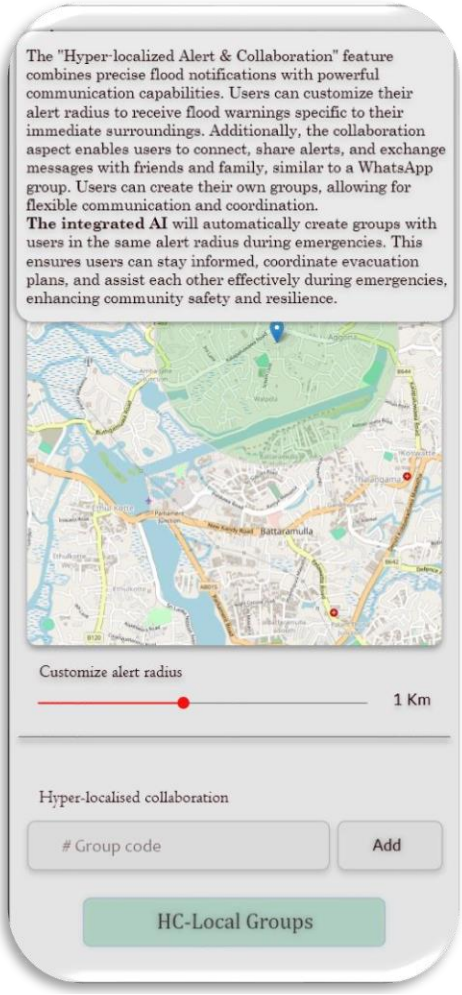


Figure 8Hyper localized Alert & Collaboration 6.5

6.6 Flood Level

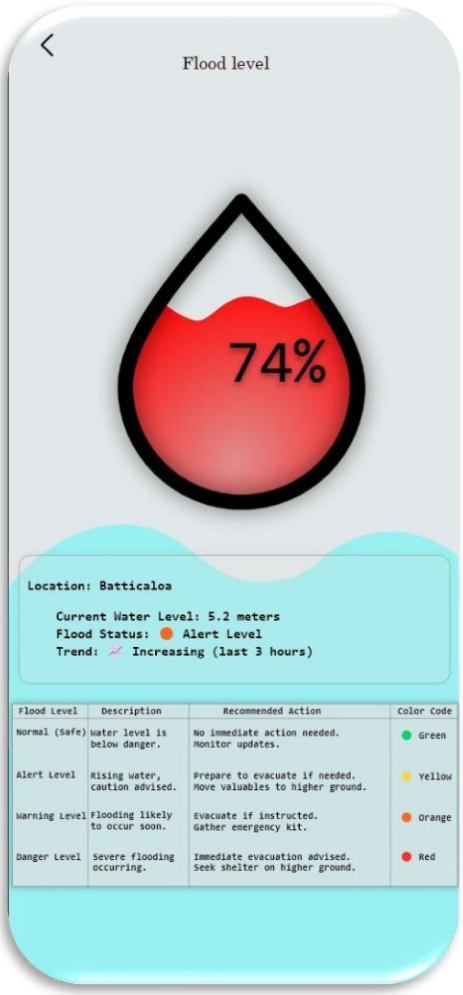


Figure 9Flood level 6.6

6.7 Educational resources

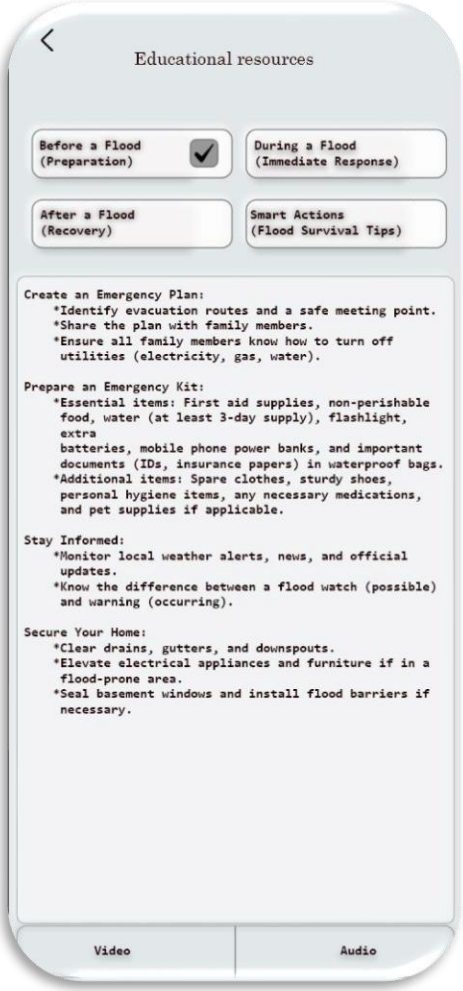


Figure 10Educational resources 6.7

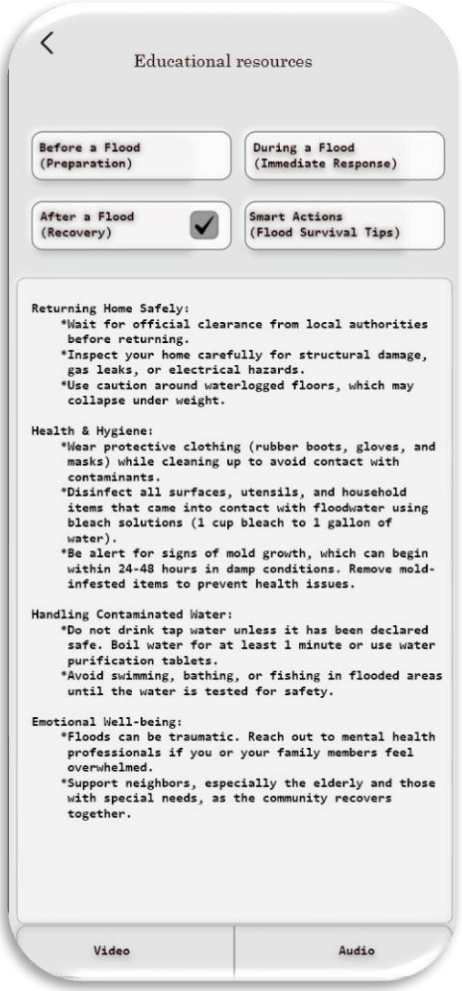


Figure 11Educational resources 6.7

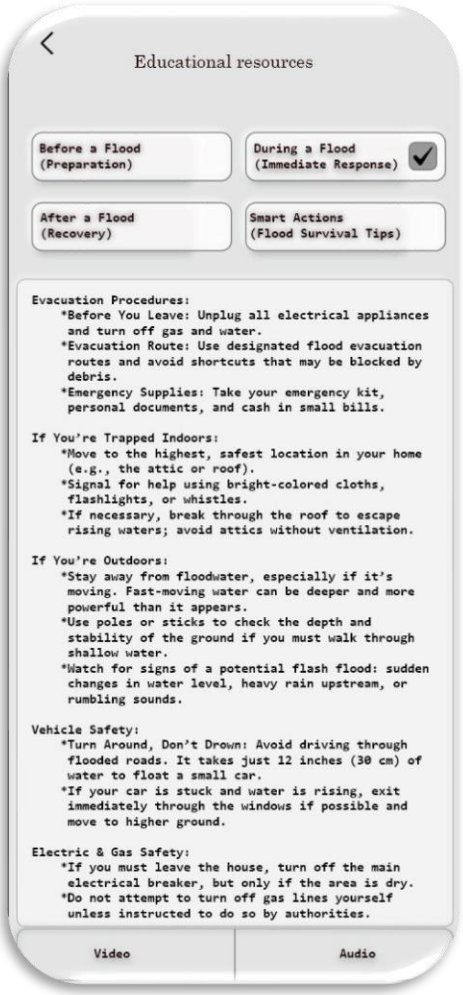


Figure 12Educational resources 6.7

Figure 13Educational resources 6.7

6.8 SOS

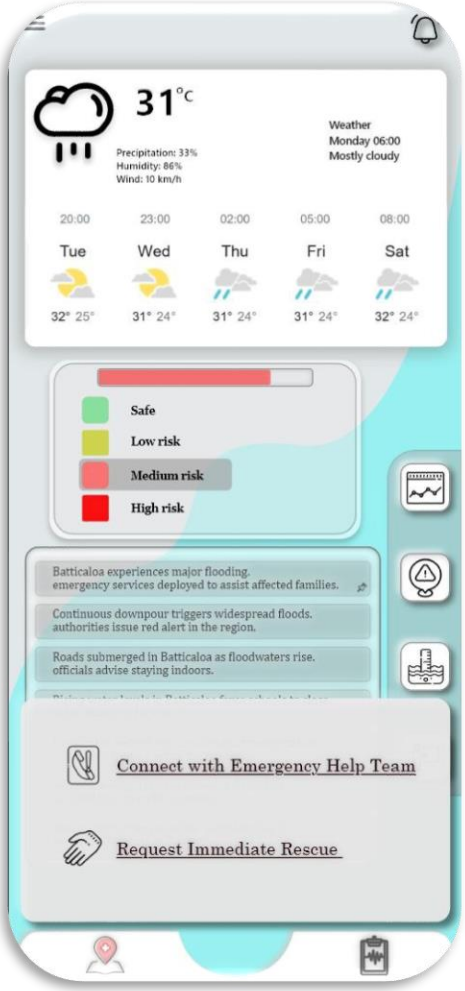


Figure 14SOS 6.8

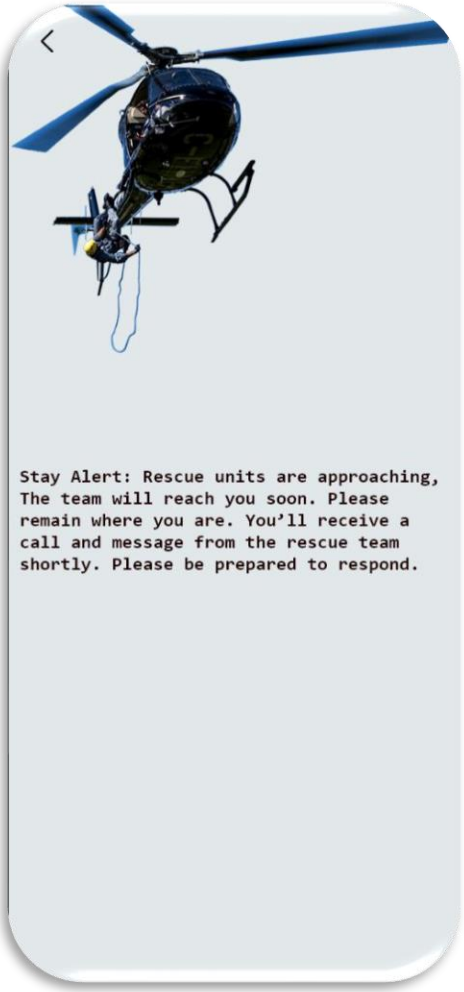


Figure 15SOS 6.8

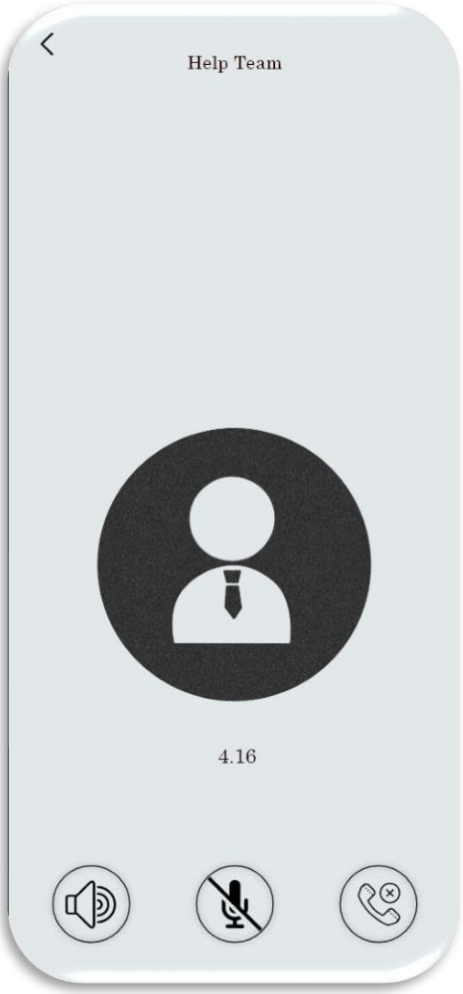


Figure 16SOS 6.8

6.9 Health Update

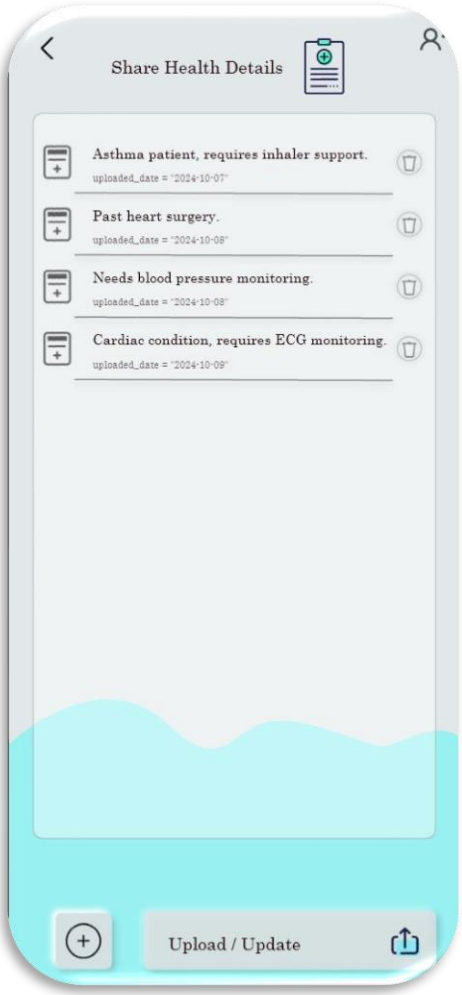


Figure 17Health Update 6.9

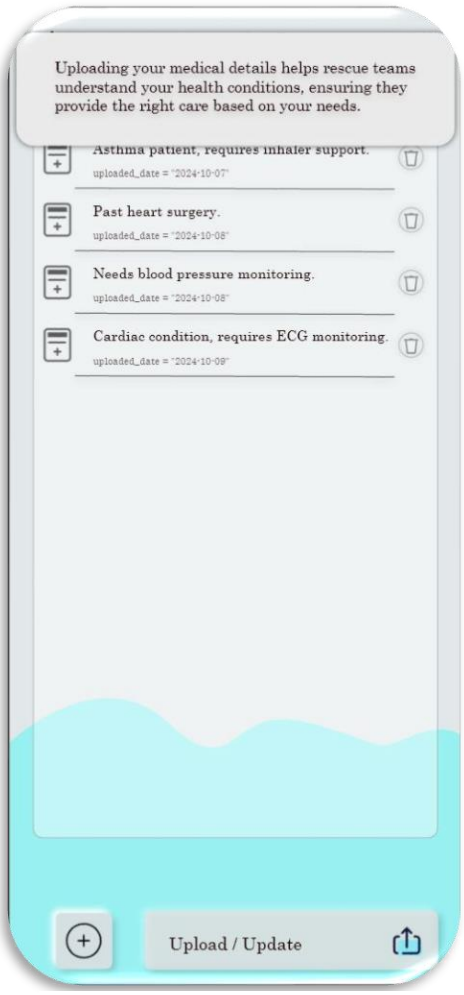


Figure 18 Health update 6.9

6.10 Notification

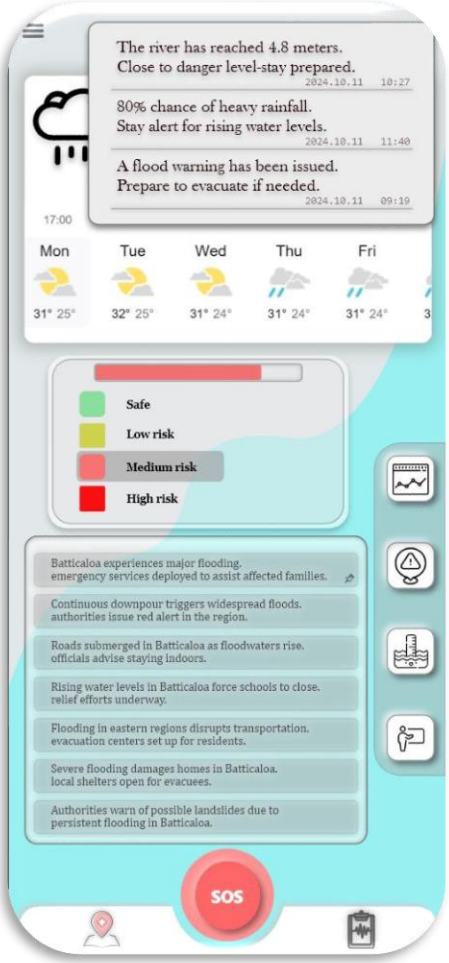


Figure 19 Notification 6.10

6.11 Safe zone

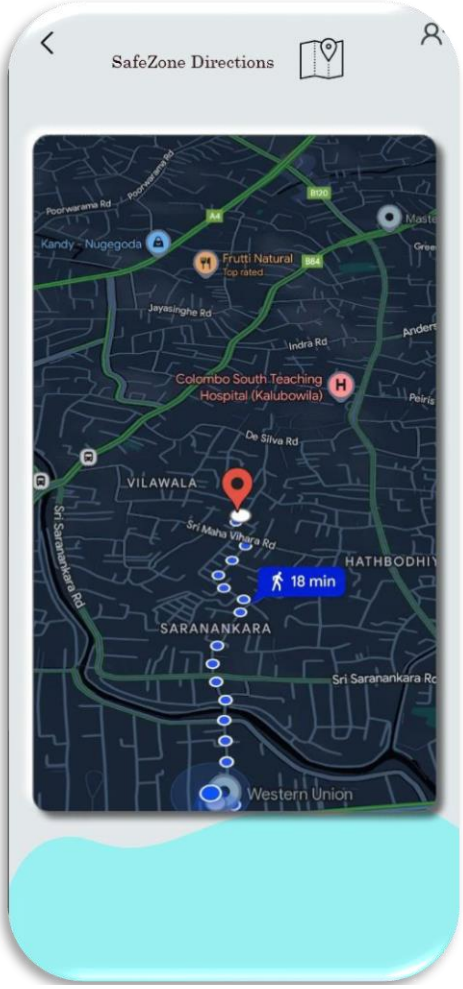


Figure 20Safe zone6.11

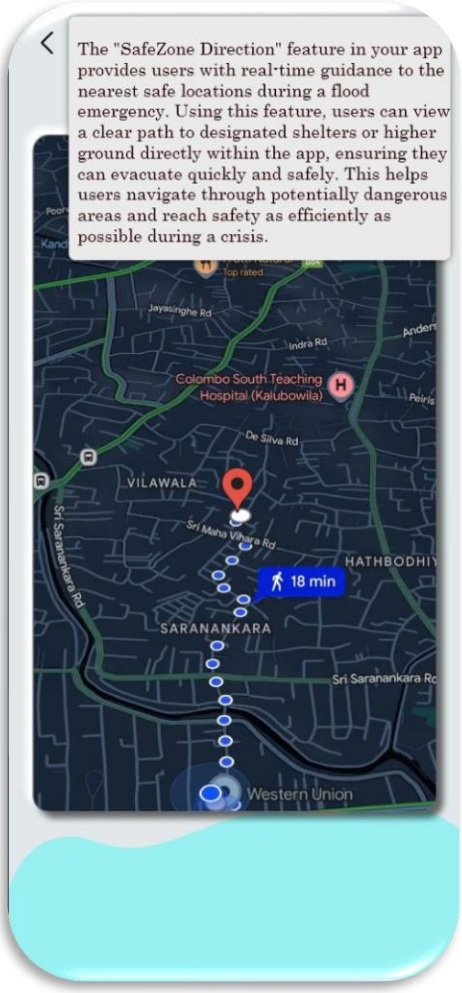


Figure 21Safe zone 6.11

6.12 Dashboard

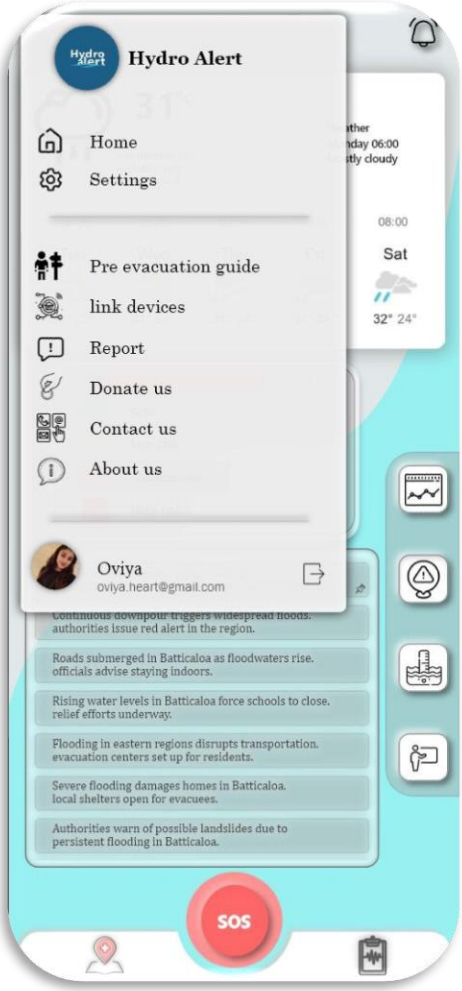


Figure 22Dashboard 6.12

6.13 Settings

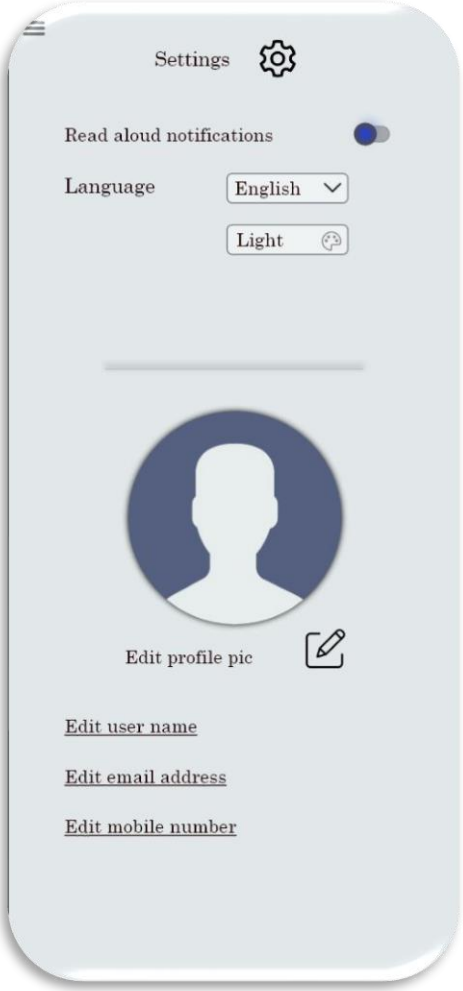


Figure 23Settings 6.13

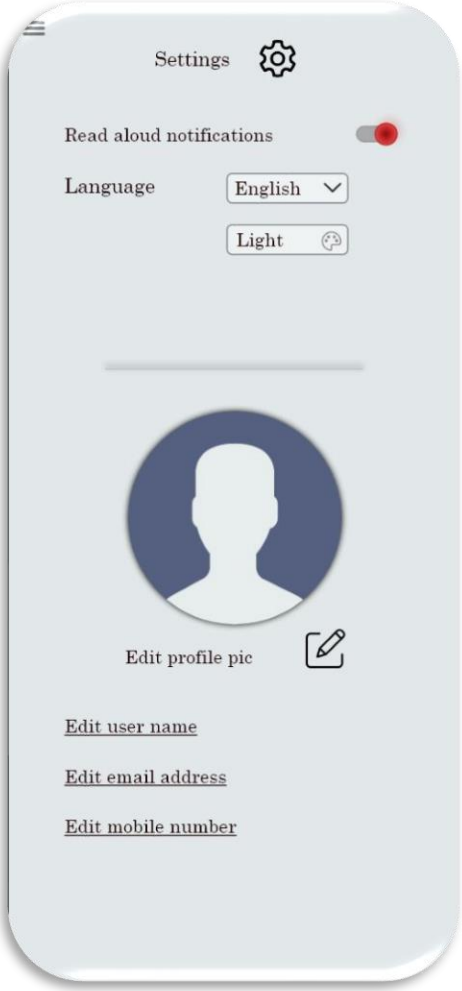


Figure 24Settings 6.13

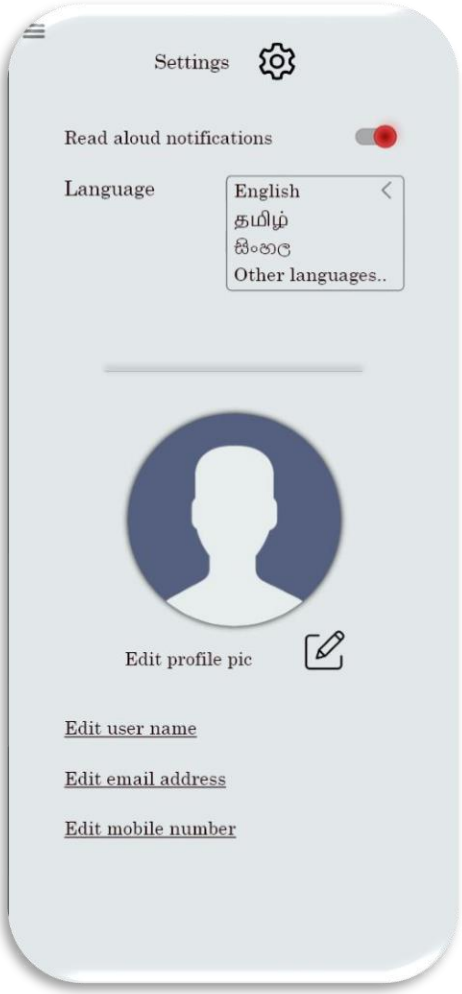


Figure 25Settings6.13

6.14 Pre evacuation guide

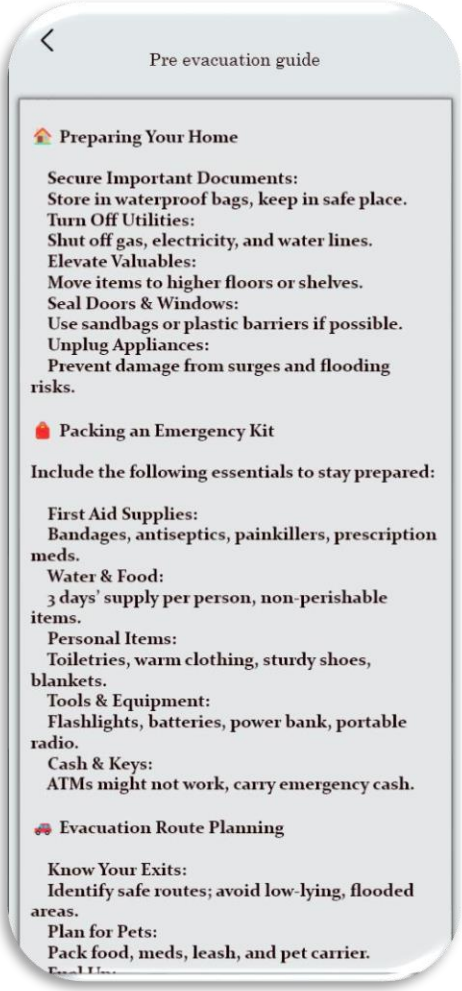


Figure 26Pre evacuation guide6.14

6.15 Link Devices

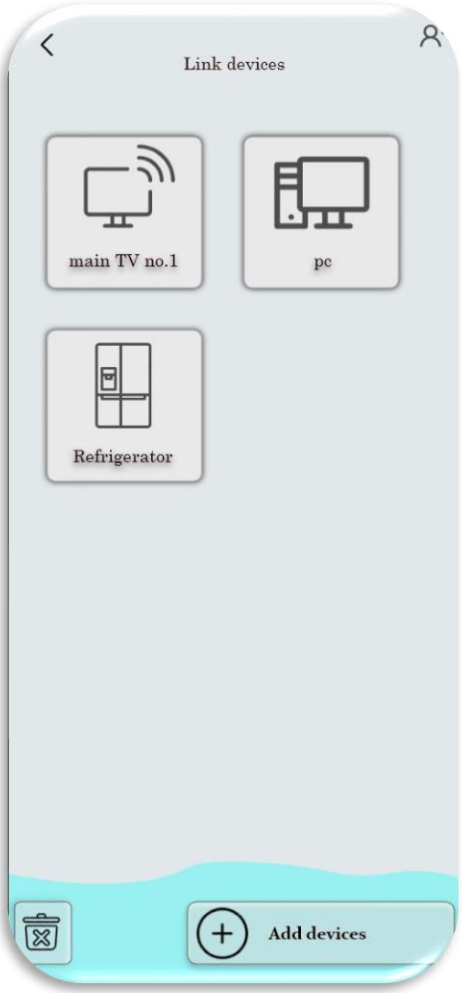


Figure 27Link Devices 6.15

Figure 28Link Devices6.15

7. Evaluation

7.1. Detailed analysis of the solution

The Hydro Alert system comprehensively fills the missing links in the flood early warning mechanisms in Sri Lanka through the provision of real time data, multilingual and offline alerts. Modern technology of geofencing and GPS based evacuation route mapping is useful for timely, localized warnings. The design of safety assistance into the system and user feedback system offer user-centered design. Yet, it still has a left for desiring for even more usability optimization and the inclusion of more contingent attributes.

7.1.1. Internal testing

The development team conducted internal tests to validate system functionalities, focusing on:

1. Real-time Data Integration: Verifying the consistency of current measurements provided by the weather stations and river gaging stations.

2. Geofencing Accuracy: Specifying the criteria of location-based alerts and guaranteeing they are localized for the particular area.

3. Notification System: Confirming the order in the alert messages/WATCH/ WARNING /EMERGENCY, and their delivery time.

4. Multilingual Accessibility: Verifying translations for interface and alerts for Sinhala Tamil and English to ensure trilingual.

7.1.2. User Validation Testing (UVT)

A field test evaluated the user-friendliness, accuracy of the alert and SMSs, the performance of the OTA during Internet emergencies, and the feedback mechanism as used in flooded regions.

7.2. Lessons Learned

7.2.1 Need for UI/UX improvement

From the user responses, it was ascertained that the structure of the interface needed improvements in its visualization issues and the change would be best felt by elderly or less computer literate persons. The need for better illustration, including the combination of an ordinary map with a clickable one, was claimed. Particularly for older and less tech-savvy users and Enhanced graphic representations, such as interactive maps, were requested.

7.2.2 Offer more functions

This is not only about the live traffic updates, water quality, connecting with smart homes, or various other hyperlocal broadcasts of information to smaller group.

7.3. Future suggestions (Recommendation)

The concept of the app is to improve access to services, work with others, and allow the expansion. It will include voice commands, simplified for basic phones, go beyond floods to cover landslides, droughts, and storms. There will be also participating users within the framework of the workshops and game parts.

8. Conclusion

The Hydro Alert system therefore currently encompasses a radical change to disaster management, focusing on the previously unaddressed aspects of flood in Sri Lanka. This is informed by the current early warning systems which compromised because of underlying threats such us; poor communication infrastructure in many regions, low public awareness and; restricted access to such systems while operating in an emergency situation. Hydro Alert combines the powerful approaches of available technology with usable design features to develop a robust system for early warning of floods that can sensitize the community to be more sensitive to the disasters.

Some of the most notable features include alerting, which serves users with real and constantly changing evacuation routes when a danger is looming. Separation of the multilingual functionality enhances reachability for Sri Lankan linguistic difference while the SMS alert functionality in the offline mode keeps essential communication going irrespective of network disruption. These features are augmented by geofencing that provides personalized alerts despite the high-risk areas streamlining the system to enhance the effectiveness of the critical alert.

However,, longer term risk alleviation strategies are also encompassed at Hydro Alert as a part of a current safety improving system. Preventative and historical information about floods include educational multimedia such as informative papers and articles, which help the user to combat the psychological and organizational consequences of floods. Besides, pulling society into anticipation, the CP system is designed to help reduce loss of lives and future societal disruptions caused by disasters.

Conducting field and internal testing of the system has shown that the system contributes to enhancing flood communication and safety. But it has also shown us where there is room for improvement, for instance, improving the front-end to be more touch friendly for elders or those who cannot easily maneuver around various programs on a computer. As for the future developments one can imagine that the next versions of Hydro Alert can include voice control, immediate actual traffic details and interaction with other smart devices. Extending it to other disasters including landslide and droughts would also greatly increase it practical usage.

Hydro Alert is a technological intervention, which supports community recovery and prepares it for disasters as it helps fill communication, education and response gaps. It presents a theoretical framework that can be easily scaled and suitably applied to Sri Lanka and other parts of the world more generally.

9. References

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10. Appendices

10.1. Workload Matrix

Table 3 Workloadmatrix

Contents	20240138	20240229	20240209	20240342	20240217	20240156
	S.Thanushan	K.Kabileshwar	G.Vatshangan	B.Arkshayan	S.D.Kumar	N.M.Nijath
Abstact	✓		✓			
Acknowladgement	✓					
Table of content		✓		✓		
List of figures		✓				✓
List of tables					✓	
Introduction and Description of the project	✓					
Methodology						✓
Solution outline		✓				
Innovative features incorporated in the project				✓		
Requirements and Analysis			✓		✓	
Screenshots of the prototype		✓		✓		
Evaluation	✓					
Conclusion	✓				✓	✓
References	✓	✓	✓	✓	✓	✓
Appendices	✓		✓			

10.2. Meeting minutes and Meeting agendas

1st Meeting

Location: 1st Floor

Date: 24/10/2024

Time: 11.00am to 1.00pm

Attendees: S. Thanushan , K.Kabileshwar, G.Vatshangan, B.Arkshayan, S.D.Kumar, N.M.Nijath

Table 4Agenda1

Time	Minutes
11.00	Introduction & Appoint S.Thanushan as a leader
11.10 to 12.00	Talk about our domestic issue and expand the project titles.
12.00 to 1.00	Allocate the topics .

2nd Meeting

Location: Online

Date: 26/10/2024

Time: 6.00pm to 7.00pm

Attendees: S. Thanushan , K.Kabileshwar, G.Vatshangan, B.Arkshayan, S.D.Kumar, N.M.Nijath

Table 5Agenda2

Time	Minutes
6.00	Start the meeting
6.30	Talk about the process of topics with group mates
6.30 to 7.00	Discuss about current process of IFD with our team mates

3rd Meeting

Location: 1st Floor

Date: 29/10/2024

Time: 11.00am to 12.00pm

Attendees: S. Thanushan , K.Kabileshwar, G.Vatshangan, B.Arkshayan, S.D.Kumar, N.M.Nijath

Table 6Agenda3

Time	Minutes
11.00	Start the meeting
11.10 to 12.00	Disscuess the sub topics and improve the innovative features in IFD.

4th Meeting

Location: Online

Date: 10/11/2024

Time: 4.00pm to 6.00pm

Attendees: S. Thanushan , K.Kabileshwar, G.Vatshangan, B.Arkshayan, S.D.Kumar, N.M.Nijath

Table 7Agenda4

Time	Minutes
4.00	Start the meeting
4.00 to 5.10	Send the Survey to all students
5.10 to 6.00	Talk about proto types and get some innovative ideas from group members.

5th Meeting

Location: 3LA

Date: 11/11/2024

Time: 12.30pm to 1.15pm

Attendees: S. Thanushan , K.Kabileshwar, G.Vatshangan, B.Arkshayan, S.D.Kumar, N.M.Nijath

Table 8Agenda5

Time	Minutes
12.30	Start the meeting
12.30 to 1.00	Team mates summarize the Conclusion and done the prototype.
1.00 to 1.15	Discussion about finalize the report.

6th Meeting

Location: 1st Floor

Date: 19/11/2024

Time: 12.30pm to 1.15pm

Attendees: S. Thanushan , K.Kabileshwar, G.Vatshangan, B.Arkshayan, S.D.Kumar, N.M.Nijath

Table 9Agenda6

Time	Minutes
12.30	Start the meeting
12.30 to 1.00	Team correct the report topic vise.
1.00 to 1.15	Put the survey details and finalize the report.

10.3. Questionnaires and Responses

10.3.1. Survey Questionnaire

The questions are separated under one topic (among age groups)

1. Have you ever experienced flooding in your area before? If yes how often?

Yes / No

1. One major flood each year

2. During the rainy season

3. Many times,

4. Rare

2. How can community collaboration be encouraged during floods?

1. Establishing Local Emergency Networks

2.Clear Communication Channels

3. Resource Sharing

4. Organizing Evacuation Plans

3. What methods do you think would be most effective in raising awareness?

1.Community Meetings and Workshops

2. Local Radio and Newspapers

3. Posters and Flyers in Public Spaces

4. Community Demonstrations and Drills

4. How would you prefer to receive flood alerts?

1. Real time alerts
2. Regular updates
3. Social media / TV and broadcast
4. Other ways

5. What language do you prefer to receive alerts?

1. Sinhala
2. Tamil
3. English
4. Sign language
5. Other

Young people

6. What additional information would you find helpful in a flood alert system?

1. Mental health guidelines
2. Physical health guidelines
3. Historical flood data
4. Emergency two-way communication

7. What sources do you currently rely on for flooding warnings?

1. TV and broadcast

2. SMS alerts

3. Applications

4. Other

8. What challenges do you face in disseminating flood alerts?

1. Lack of reliable communication infrastructure

2. Not understanding the severity of the warnings

3. Alert fatigue (due to frequent flooding in certain areas)

4. Problem with coordination between local authorities and community groups

9. What features would you like to see in a new early warning system?

1. Real-Time Alerts

2. Localized Alerts

3. Two-way communications

4. Offline Access

10. How do you currently communicate flood risks to the public?

1. Use of social media platforms

2. loudspeakers or announcements at local gathering spots (mosque / markets)

3. Rely on word of mouth

4. Emergency Alerts through Local Networks

Response

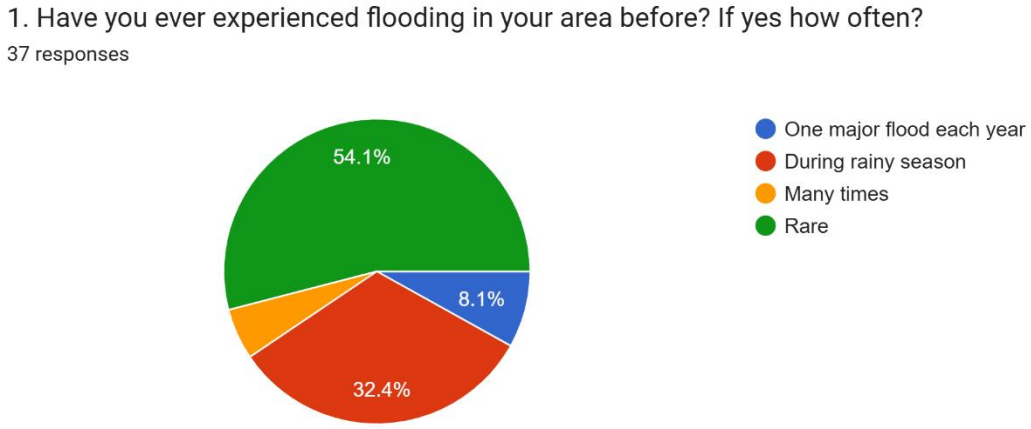

Figure 29 Q1

- The survey results show that most respondents have experienced flooding in their area, but this occurrence is considered to be "rare'. This shows that floods may not frequent disasters in their area, but it still happens occasionally to be recognized by the community. Also, there's a considerable response that this survey shows the second majority of people have responded during rainy seasons' it indicates that flooding in their area is most likely to happen during rainy season (heavy rains).
- This may occur due to the block of drainage systems.

During rainy season /rare

Executions -

- By checking the condition and capacity of the drainage system, Cleaning and upgrading the existing drains or building new ones. Warning the community in advance about the rainy season and reminders about not blocking the drainage.

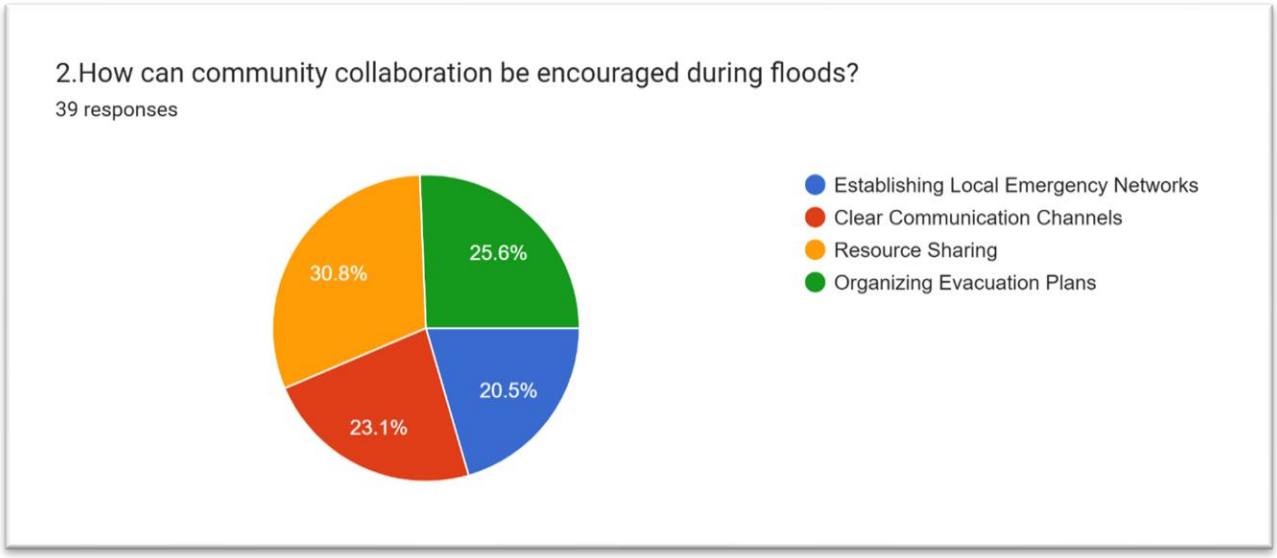

Figure 30Q2

Resource Sharing

Execution -

- Organizing a resource Sharing hub, so that people can donate and pick up necessary items during floods.
  E.g.: first aid kits, water, food, medical supplies.
- By having a resource Sharing platform(digital/physical) it helps community people to share resources.

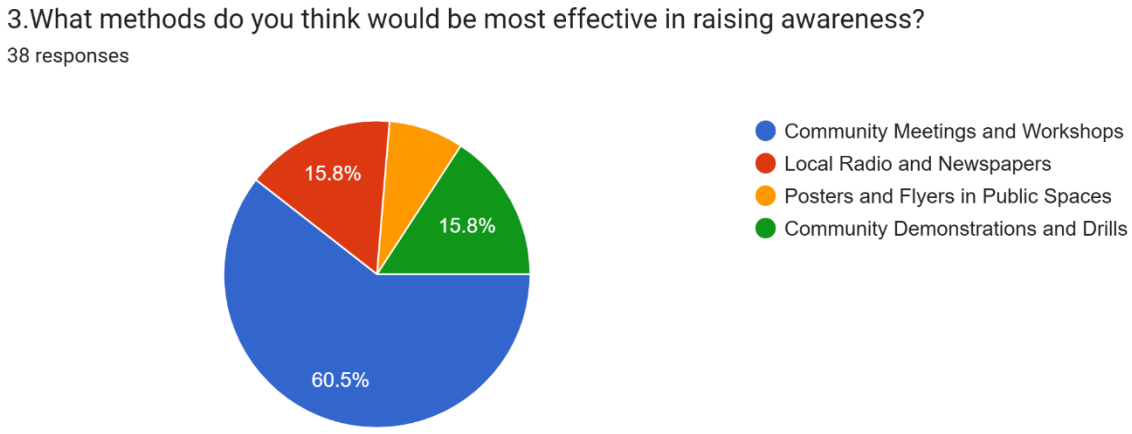

Figure 31Q3

Community meetings and workshops

Execution -

- Organizing community meetings and workshops in all areas (digital - using what's app, Facebook or community apps.

- With the use of technology, we can help people with presentations about flood risk and actions to be taken during flood. This makes the information more accessible.
- Gathering feedback after every meeting or workshop about what was useful and what could be improved.

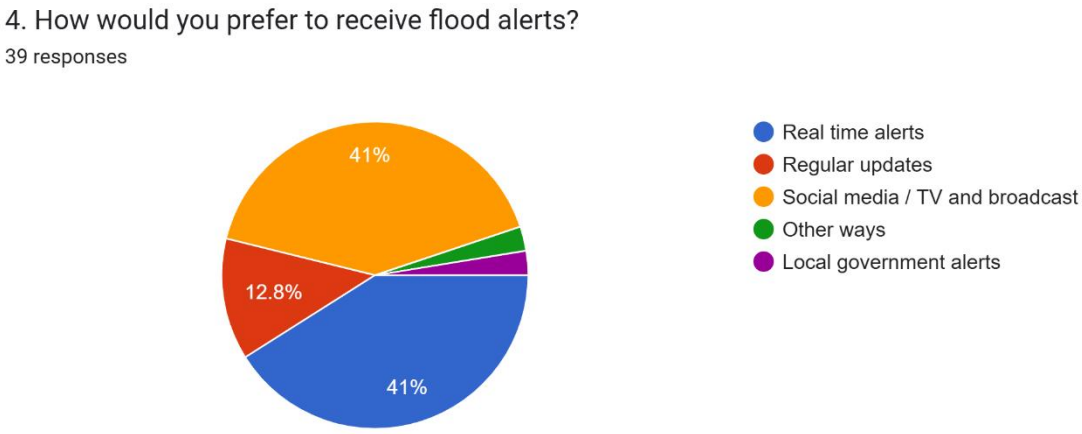

Figure 32Q4

Real time alerts & social media / TV and broadcast

Execution -

- By setting up real time alert system by developing or utilizing and existing app (specific flood alert application).

- Pop up notification about whether with the information about water levels and Evacuation routes.

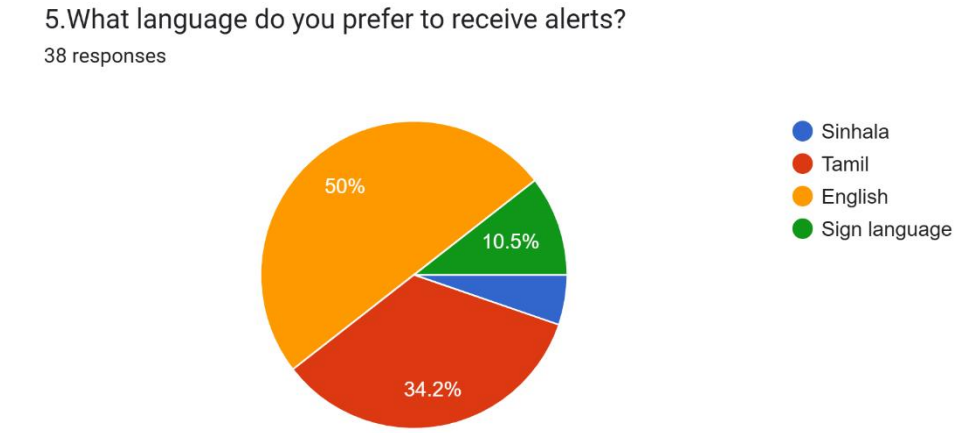

Figure 33Q5

English

Execution -

- Making English language as a primary language to send message and Inform people about the flood risk and Evacuation.
- Regularly asking for feedback from the community people to ensure the clarity of alerts and whether the English language used is easily understood by everyone.
- Anyways a multi-language option should be given so that everyone can be able to get the message so that information will reach the audience effectively and clearly.

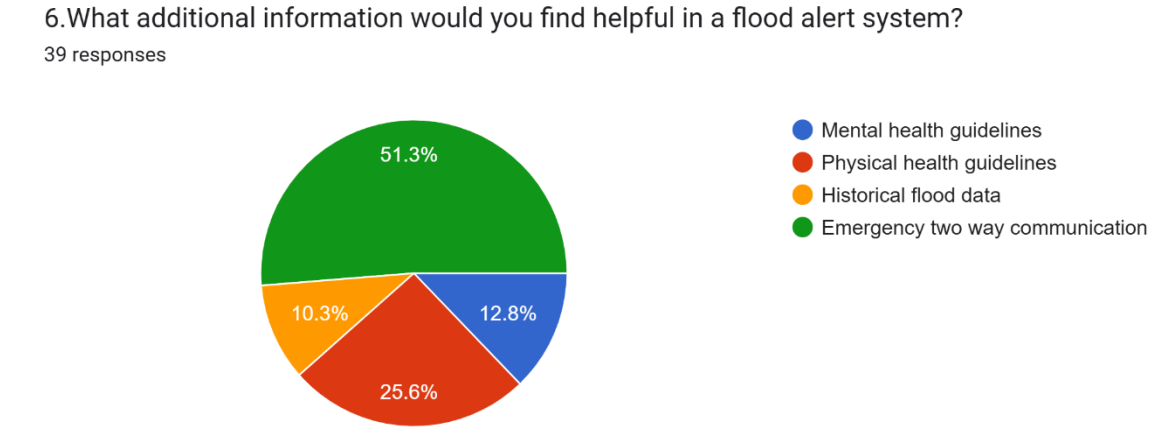

Figure 34Q6

Emergency two-way communication

Execution -

- Using an automated SMS system to receive instant response. Developing or using an existing flood alert app that allows two-way communication between residents and emergency services. Enabling IVR system (interactive voice response) for landlines and mobile phones so that people can call a toll-free number and interact with an automated system.
- Providing 24/7 hotline or call center for live interaction.
- Reporting flood areas using location sharing in a specific flood-alerts app so that residents can report and ask for help.
- This enables authorities to respond more effectively by understanding where the most urgent needs are.

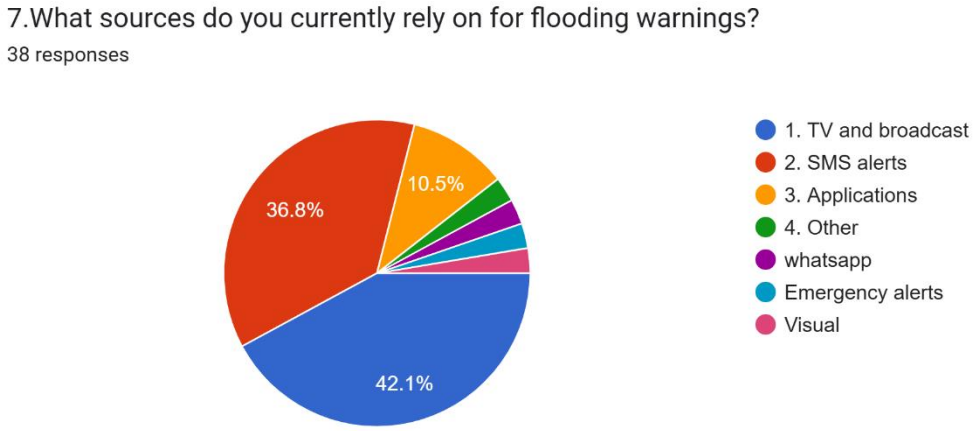

Figure 35Q7

TV and broadcast

Execution -

- Pop up notification and alerts on TV screens during regular programs.
- Live streaming on TV and social media to broadcast emergency management briefings, flood updates and guidelines, and expert advice in real time.

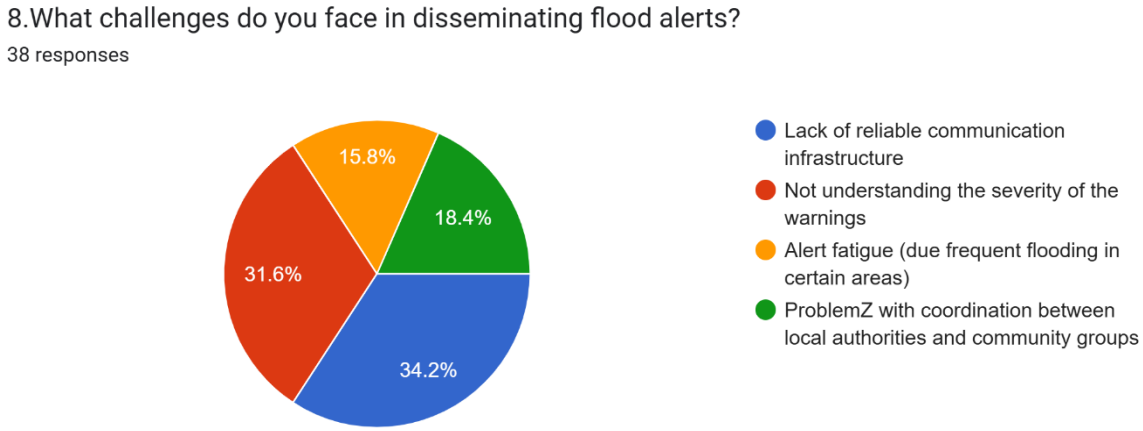

Figure 36Q8

Lack of reliable communication infrastructure

Execution -

- Mobile first flood alert system - developing light weight mobile apps that can work with low bandwidth connection.
- Setting up an SMS based alert system
- Improving network reliability during critical times.

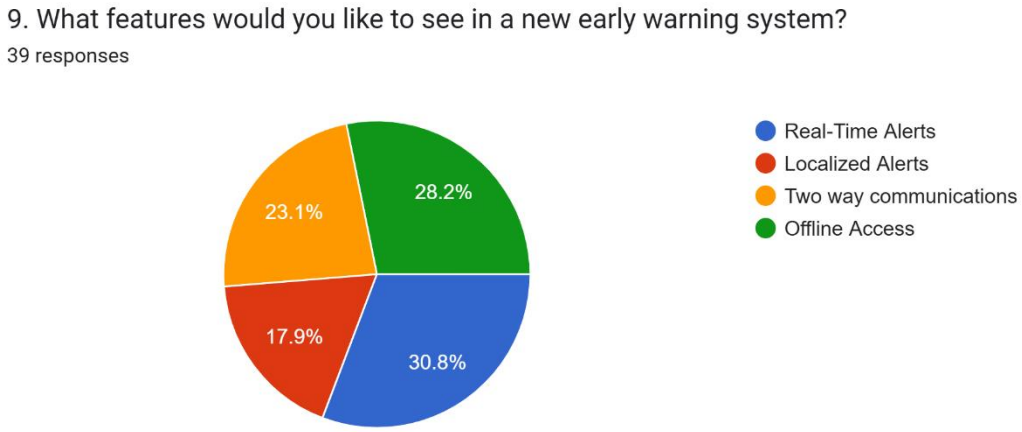

Figure 37Q9

Real time alerts

- Execution - real time alerts using SMS, social., Media live streams, real time voice alerts, push notification, using real-time pop-up video presentation about flood risk and Evacuation so that people can easily get the message.

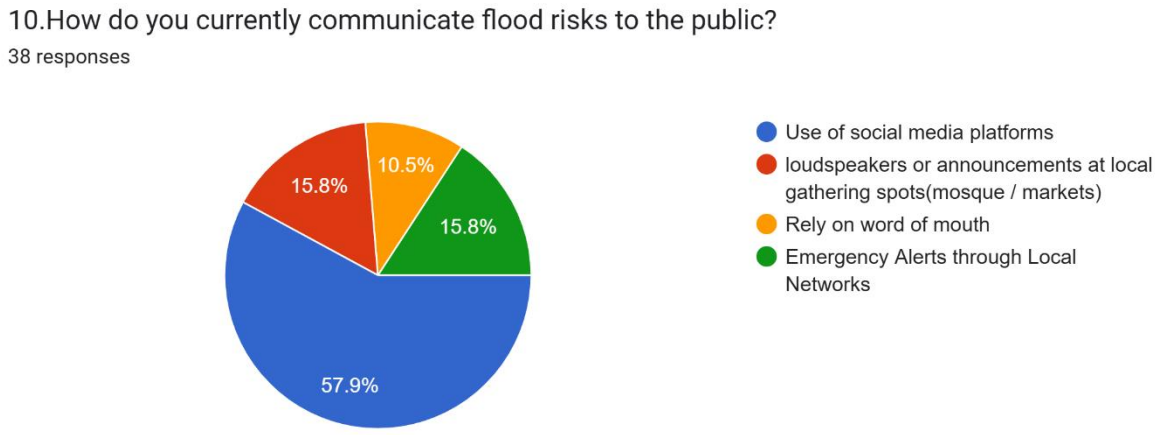

Figure 38Q10

Use of social media platform

Execution -

- Using Instagram, Facebook, YouTube to broadcast real time updates about flood risks, safety measures, and Evacuation routes.

10.4 Test cases

Table 10 Test cases

1	Creating User Profile	1. Open the Hydro alert app 2. Go to the "Create Profile" section. 3. Fill in all required fields (mobile number name, age, ,address.) 4. Submit the profile information. 5.verify the user 5. After profile is created and visible on the user's dashboard.	Full name, age, address, mobile number	The profile is created successfully, and all entered information is displayed correctly.	Expected Result Happened	Pass
2	Home interface	1.View app home page. 2.view features. 3. select the features. 4. View the performance of features.	Features displayed	User need displayed successfully.	Expected Result Happened	Pass

3	Immediate rescue	1. Go to the "Immediate rescue “. 2. Select the feature. 3. Choose a area. 4. Confirm the rescue way . 5. Check the rescue confirmatio n and addition to notification bar.	Facility to navigate immediate rescue methods	Rescue way added successfully	Expected Result Happened	Pass
4	Evacuation Guide	1. Go to the evacuation guide. 2. Select from address. 3.request the evacuation guide.	Feature creates a emergency evacuation guide.	Guide created & navigated successfully.	Expected Result Happened	Pass
5	Emergency SOS	1.Tap the SOS button to get the rescue methods & navigations instantly, 2.Helps to calling a emergency team.	Feature helps in higher emergency situations.	Emergency SOS Team assigned successfully.	Expected Result Happened	Pass

6	Current weather reporter.	1.Go to the current weather reporter feature. 2.To update ideal weather updates instantly.	Feature helps to remark the weather updates & priority alert areas.	Weather live update Successfully.	Expected Result Happened	Pass
7	User profile edit	1.Go to the dashboard 2.tap the user edit option to edit the user details & update the live location .	Feature helps to change user location & data	User profile edited successfully.	Expected Result Happened	Pass