USER EXPERIENCE DESIGN OF FLOODGUARD: AN AI-BASED FLOOD MANAGEMENT SYSTEM

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Multimedia and Creative Technology

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APPROVAL

This Project titled "**User Experience Design of FloodGuard: An AI-Based Flood management System**", submitted by **Ayesha khatun punam (212-40-762)** to the Department of Multimedia and Creative Technology, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Multimedia and Creative Technology and approved as to its style and contents. The presentation has been held on 15th November 2025.

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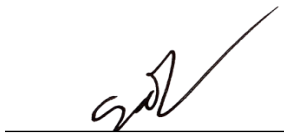

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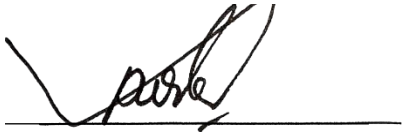

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Md Salah Uddin, Assistant Professor and Head, Department of MCT** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

The damage of floods is very huge and the people have very little time to prepare and act. We developed FloodGuard, a mobile application that would be a safety tool to communities during, before, and after a flood to address this significant issue. The application has a full set of tools: real-time alerts, interactive flood maps, guidance to shelters, SOS emergency assistance, road blockages, even offline support (where the network connection is inadequate). In contrast to a standard weather application, FloodGuard uses official, reliable state data, incorporates reports by the community, and as a consequence, the information is precise, highly local, and indeed, an actionable one. The level of risk is immediately indicated by a basic color-coded system and easy instructions on how to remain safe during the flood are presented in clear cut steps that a user can follow each stage of the flood. FloodGuard has been designed with the purpose of being user-friendly and non-technical, with high usability among low-technical, low literacy, or low internet access individuals. It was all developed in a human-centered approach to UX design and included the user research process, prototyping, and testing on different groups. This design orientation assisted us in developing a user friendly interface that facilitates fast and assured decision making even during the stressful moments.

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CHAPTER 1

Introduction

1.1 Introduction

FloodGuard is a mobile app that aims to establish direct contact between citizens living in flood-prone areas and vital, real-time data, thus allowing to conduct informed and timely decision-making in emergency situations (Bangladesh Water Development Board, 2023).

The app specifically motivates all users, regardless of their age levels, to participate in pre-emplaces preparation, responsive response, and post-event recovery by providing early flood warnings, interactive cartographic displays, shelter positioning information, SOS assistance, and recovery instructions; these are the major functionalities of the application. The intensification of the floods and other natural disasters, which can also be linked to the anthropogenic climate change, is well-documented (UNDRR, 2020).

FloodGuard is envisioned as a solution to address the informational gap that has existed between the general population and the reliable sources of information on disaster-management, which would serve as a reliable safety ally during a disaster. In Bangladesh and other high-risk areas, the seasonal floods usually provide societies with insignificant time to react (World Meteorological Organization, 2021).

Populations who have access to the internet usually face problems with finding accurate, localized and timely information necessary in making operational decisions. FloodGuard overcomes this drawback by providing hyper-localized, geospatially targeted updates, lightweight functionality that can be expanded to suboptimal service conditions, and the interface designed in a manner that is as clear and user-friendly as possible.

The ultimate goal of FloodGuard is to save human lives by making flood preparedness and response systems easier, inspire trust with the help of data integrity, and build confidence in users to act during crisis situations (Bangladesh Water Development Board, 2022). The platform also removes complexities caused by fragmented and unreliable flows of flood information, and thus turns the entire spectrum of continuum, which encompasses preparation to post-disaster recovery, to a smooth user experience. As a designer, I wanted to create a solution that is simple, reliable and

widely available, aware of the differences in age group and technological skills (Baymard Institute, 2023). The use of Human-Computer Interaction (HCI) principles like design thinking and empirical testing of the usability also helped to make sure that FloodGuard meets pragmatic and affective user needs.

The ability to come up with effective solutions is based on a thorough comprehension of worries and working difficulties of people in case of disasters. FloodGuard is the epitome of this vision: a human-friendly, one-tap interface that will enable people to stay safe, receive information, and be prepared in case of floods (Sweller, 2011).

1.2 Problem Identification

Floods are one of the most common and impactful calamities in Bangladesh and many other territories; it is ironic that a significant percentage of impacted people do not receive adequate attention of modern digital solutions (Bangladesh Meteorological Department, 2023).

The current flood-management or weather apps (e.g., AccuWeather, Disaster Alert by PDC, or Red Cross Emergency) usually have complex interfaces, which one has to navigate through multiple screens before the urgently needed information is provided (Pacific Disaster Center, 2021). Users in emergency situations report a high level of desire to receive quick, simple and practical guidance; existing applications are often poor in providing alerts in easily understandable (non-technical) words or using color-coded severity alerts, which leads to confusion about what should be done. Even the concept of connectivity becomes a major problem.

According to the user surveys, 28.6 percent of residents of flood-prone areas have intermittent or mobile-only access to the internet (UNICEF Bangladesh, 2022). However, most of the applications that exist do not have offline or lightweight versions, making them untrustworthy in reality in the case of flood emergencies as the network infrastructure suffers. It still lacks a specific application that would offer the basic functionality, including shelter locators, SOS-emergency mode, safe-route-navigation, offline-support and multi-language accessiveness, which this project aims to offer (Bangladesh Water Development Board, 2023).

Existing flood-management apps have accessibility and usability shortcomings across platforms; they tend to be poorly organized, have low fidelity and do not support all Android/iOS devices, limiting their availability in the app stores (AccuWeather, 2023).Existing flood management app's are not good enough and access able for everyone. Its messy, unorganized and low fidelity design. And most important these app don't exist for every android/IOS mobile phone. This has limit on version in app store *(AccuWeather, 2023)*.

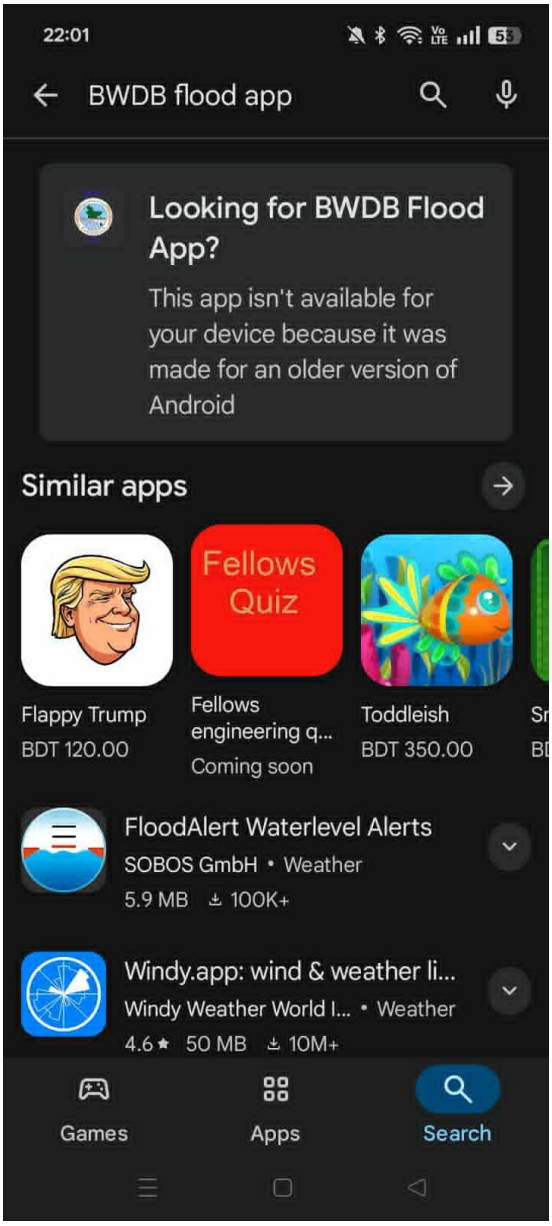

Figure 1.1: App store Finding for BWDB

As BWDB is a old app, it cannot be find in app store. It requires older version of android phone. BWDB is not for all age groups and communities. It is for experts who can read the water level and flood forecast.

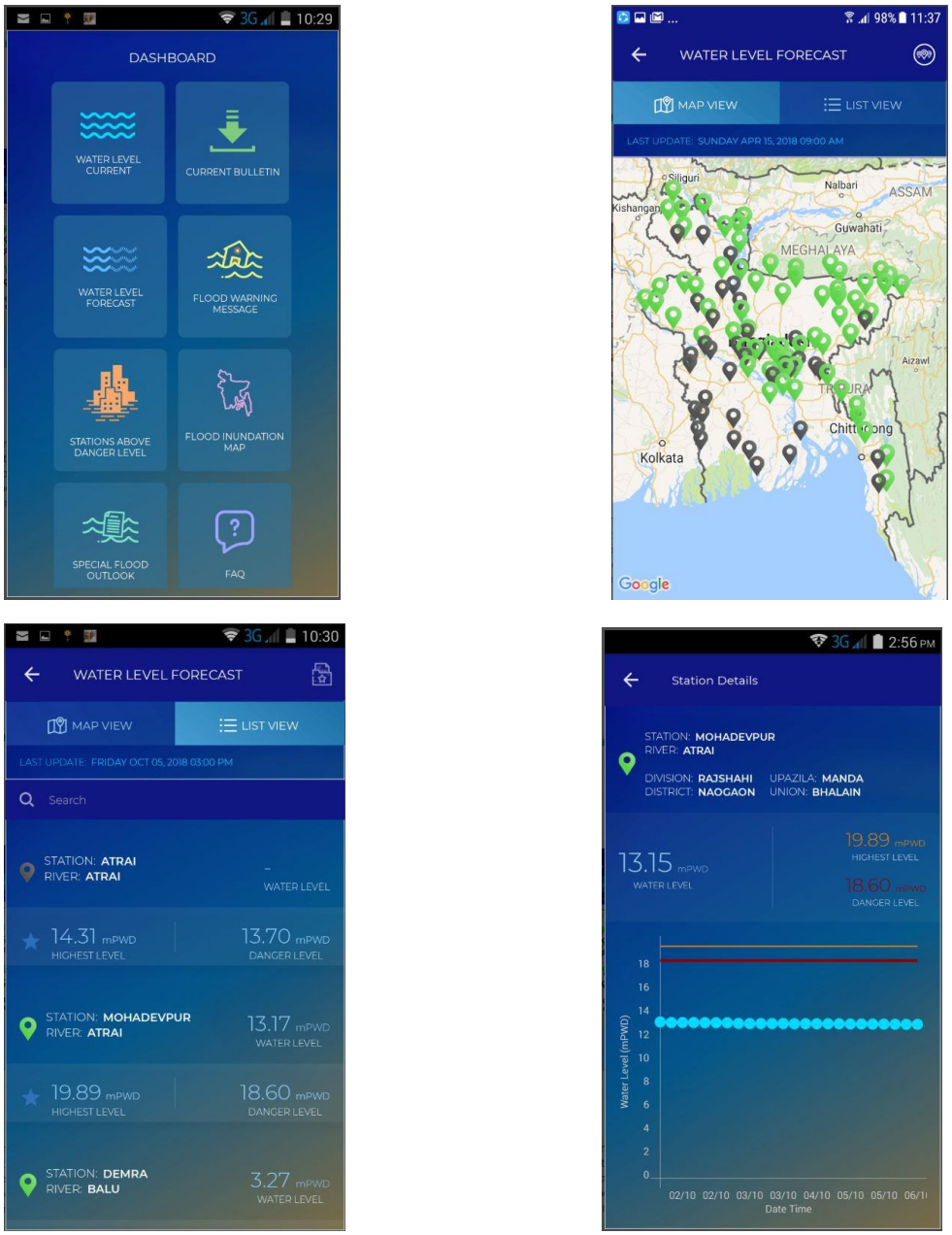

Figure 1.2: BWDB App

In any emergencies people wanted to know what should I do now! So according to this home page, this is not high fidelity design it is just showing some water level options. It is not containing emergency features that floodGuard do. The BWDB app is data-rich but not user-friendly. It's designed for technical accuracy, not community use. FloodGuard can stand out by being simpler, more human-centered, and community-driven, while still integrating official data sources.

1.3 Objective

FloodGuard is trying to introduce an absolutely new service, a user-friendly, trustful, and community-oriented flood management service (Bangladesh Water Development Board, 2023). The users will use FloodGuard to get updated on the flood threats, safe locations, and get real-time life updates. The app has an interactive flood map, which vividly shows the current water level, hazardous areas, and secure evacuation pathways (Google Maps Platform, 2023).

FloodGuard, unlike the conventional apps that require the use of technical data, converts it into easy-to-understand images and notifications, which implies that users do not need to conduct an advanced analysis of complex charts, but rather act immediately. FloodGuard gives straightforward geographic notifications, color coded warning signs, safe refuge maps and emergency numbers. As speed plays a crucial role in a disaster, the app will save their preferences and send instant push messages, and alerts even in poorly-serviced areas (World Meteorological Organization, 2021)

It is actually user-friendly to users of all ages with offline guides, SOS mode, and support of various languages. FloodGuard is an intelligent platform that is designed to enhance disaster preparedness and response to a significant level to respond to the increased demand of quick, convenient, and reliable flood management to be available in the vulnerable areas (UNDRR, 2020).FloodGuard is a smart platform built to significantly improve disaster preparedness and response, addressing the growing need for fast, accessible, and dependable flood management tools in vulnerable communities

1.4 Related Work and Research

In our study, we researched on different current flood management applications, government sites, and community organizations in Bangladesh. We discovered that there are such solutions as the BWDB Flood Forecasting & Warning Centre app and SMS alerts, but the number of individuals who use them is extremely low. According to the results of the survey, most people (28.6%) are not using any flood-related mobile apps actively despite the high risk of floods. To determine the reasons behind this, we compared the local BWDB Flood Forecasting application and the global Red Cross Emergency application (International Federation of Red Cross, 2020).

Key Pain Points Identified:

• **Search & Navigation:** BWDB applications are not user-friendly to rural or older people as they are based on technical language (such as mPWD and station codes) and poorly organized menus. The Red Cross application is more straightforward yet does not provide any specific search filters on the river information in Bangladesh. Some survey revealed that 41 percent of BWDB users abandoned the application during use because of their browsing (Bangladesh Water Development Board, 2022).

• **Alert Systems:** BWDB alerts can be very slow and too general and affect areas of the entire district rather than individual communities. The Red Cross alerts are on timely but not precise to the situation of floods in Bangladesh. This keeps users guessing over their imminent personal threat (World Meteorological Organization, 2021).

• **Community Integration:** The BWDB and the Red Cross app do not have any crowdsourced features, such as photo or location reporting. It implies that no live, super local information of the population. 35 percent of respondents surveyed indicated that they would provide reports in case a feature is available (UNICEF Bangladesh, 2022).

• **Data Visualization:** BWDB applies complicated raw technical graphs which are difficult to comprehend. Although the Red Cross is also based on simple color codes, the red cross does not provide the local river context needed in Bangladesh. 56% of the users favored simple color-coded visuals of risks compared to technical charts (Adobe, 2023).

• **Accessibility:** BWDB is not as much compatible with the Bangla language and does not have low-data or offline version. The Red Cross app is also English-centric and fails to offer an offline-friendly feature into rural areas (W3C, 2018).

• **Emergency Features:** The app of BWDB does not contain an SOS option, shelter maps and clear safety advice. The Red Cross application covers the general safety precautions but no specific evacuation during the flood in Bangladesh (42 percent of the surveyed respondents stated that they would use the application with SOS and shelter options (Pacific Disaster Center, 2021).

1.5 Competitive Analysis

Competitive analysis is essential to know how the available flood management tools are doing, where they are doing well and where they are not serving their users (Bangladesh Water Development Board, 2023). Attempts to introduce a product without sufficient knowledge about the prevailing environment can spell doom in the form of miserable adoption by the users and lack of clarity in positioning. Following the analysis of applications such as the BWDB Flood Forecasting app and the Red Cross Emergency app, it was easily possible to understand the population of users that is underserved and where FloodGuard can be best applied (International Federation of Red Cross, 2020). The given analysis will assist us in determining how to attract the users, the value of the features, and the extent to which the user experience is essential when creating trust and making people use the app. In the case of FloodGuard this analysis provided us with the information necessary to create a strategy that not only complements but also outperforms the available solutions due to its localization, accessibility, and emergency-oriented features (Baymard Institute, 2023). It makes sure that FloodGuard is not an app, it is a trustworthy and human-oriented platform that will address the most pressing needs of thos people in Bangladesh who are prone to floods.

Competitor Analysis

Company	💥 Key Differentiator	Strength	Weaknesses
American Red Cross	This app focuses entirely on Flood-related emergencies, offering essential features like real-time alerts, interactive flood maps, shelter locator, road blockage updates, SOS mode, and offline access. Unlike Red cross emergency app,this deliver hyper-local, not only for flood, but broadly for other disasters.Users get timely guidance,navigation.	• Huge brand trust, wide adaption • Quick access to key actions, minimal loading time. • Covers multiple disaster types(earthquake, flood, wildfire,etc) • Keeps users focused on survival info • Easy to digest and trusted • Sends alerts even without much internet access • reliable, official.	• Not localized for Bangladesh or South asia • Too broad-not deep for any single disaster like flood. • Not support for Bangladesh rivers, floods, embankments, or local shelters • Not very modern visually; could feel boring to users • No integration with local community data or hyperlocal warnings • No Emergency SOS
BWDB Flood App	This app focuses on official hydrological data, providing real-time river level monitoring and official flood forecasts across Bangladesh. It acts as a trusted government-backed platform for water-level insights. FloodGuard combines official government data with community reports to provide hyper-local, real-time alerts. It focuses on life-saving actions such as shelter locator, SOS mode, offline mode, and safe route navigation — designed for all ages with a human-centered UX	• - Government-backed, high credibility. - Accurate hydrological & forecast data. - Coverage of multiple stations across Bangladesh. - Reliable for researchers and policymakers.	• - UI not user-friendly, technical for general people. - No shelter locator, SOS, or navigation. - No offline/low-data support. - Alerts are generic, not personalized. - Lacks accessibility for elderly/low-literacy users. - No community-based reporting.

Figure 1.3: Competitive Analysis

Here Is the competitor analysis of two existing competitor who are running their software in existing system.

1.6 Hypothesis of My Solution

At the time when the people are trying to prepare and remain safe during floods, they require so much more than merely the bare data at the water level. The existing tools such as the BWDB app offer technical information, but general safety style can be found in the global apps such as Red Cross Emergency.

Nonetheless, neither of them benefits the users of Bangladesh: BWDB is too technical, whereas Red Cross is too general (Bangladesh Water Development Board, 2022; International Federation of Red Cross, 2020). FloodGuard is a highly qualified app that boasts such functionality as localized real-time alerts, interactive flood maps, SOS emergency mode, shelter navigation, road blockage notifications, and offline/low-data options.

The users would want the correct alerts and all the essential safety tools to be conveniently located in a single location (Pacific Disaster Center, 2021). We are not merely providing the flood forecasts at FloodGuard but it is a full safety platform that is constructed in the vulnerable communities with easy design in Bengali. Our interface is specifically created to minimize confusion, faster decision making and assist users to take action in times of emergencies.

It is a flood-related safety site created according to the real needs of the user and aimed to enhance the resilience of the community with the help of the governmental information and the information provided directly by the residents (UNICEF Bangladesh, 2022). In real time, the system is able to assess the most critical risks and provide clear and actionable advice to the users rather than technical terms. Simply put, the alert system and the presentation of the data were the largest user issues. Surveys and interviews revealed frustration with delayed and general alerts, incomprehensible technical graphs, which most individuals could not interpret.

The creation of user flows, sketches, and prototypes created on the basis of this research were aimed at the accessibility, clarity, and credibility of the appMy solution is:

- Adding hyper-localized ward-level alerts instead of generic district warnings.

- To substitute raw technical graphs, the introduction of color coded severity indicators (safe/warning/danger) should be introduced.
- Creation of customizable alerts depending on the severity and location.
- Offering Bangla language support and offline/low-data access for rural communities.
- Integrating SOS emergency support and nearby shelter navigation.
- Adding customizable alerts based on severity and location.
- Providing safety guides, tutorials, and checklists for preparedness.

The user that needs to take rapid action in the event of a flood, and may have a limited connection or technical understanding, will be in a position to perceive the risks in a straightforward manner, be able to react swiftly and stay secure. FloodGuard would not leave anyone behind during disaster.

CHAPTER 2

User Research

2.1 User Research

In order to see what people really require and what inspires them in relation to FloodGuard, I conducted the surveys and user interviews with people of various ages (Patton, 2015). This enabled me to fully put myself in the position of the users and make the design really user centric.

User interviews can be best used to capture the way people think, feel and interact with apps hence I used the structured, semi structured and unstructured formatting. The structured interviews offered uniform information whereas semi-structured interviews were more balanced in terms of guided questions and open-ended response to allow more in-depth information.

The unstructured interviews were aimed at free flowing interviews on the major issues that may reveal emotions and experiences that would not be identified otherwise (Dix et al., 2004). As an illustration, I could get critical usability problems, emotional frustrations, and unmet needs by interviewing Ms. Fatima Rahman about her experiences with flood apps. These results became the foundation of human-focused design of FloodGuard in terms of its emphasis on simplicity, accessibility, and actionability.

The interviews allowed clarifying clearly the issues that users are experiencing at the moment and the features that they prefer the most (Norman, 2013). We were able to investigate their motives, feelings, actions, and behaviors to understand their experience further. The key issues were very evident by mapping these insights to their frustrating points. The analysis of the mentioned conversations helped to clarify most of the doubts and provided a significantly better picture of the direction that needs to be taken when designing a solution that would be user-centered.

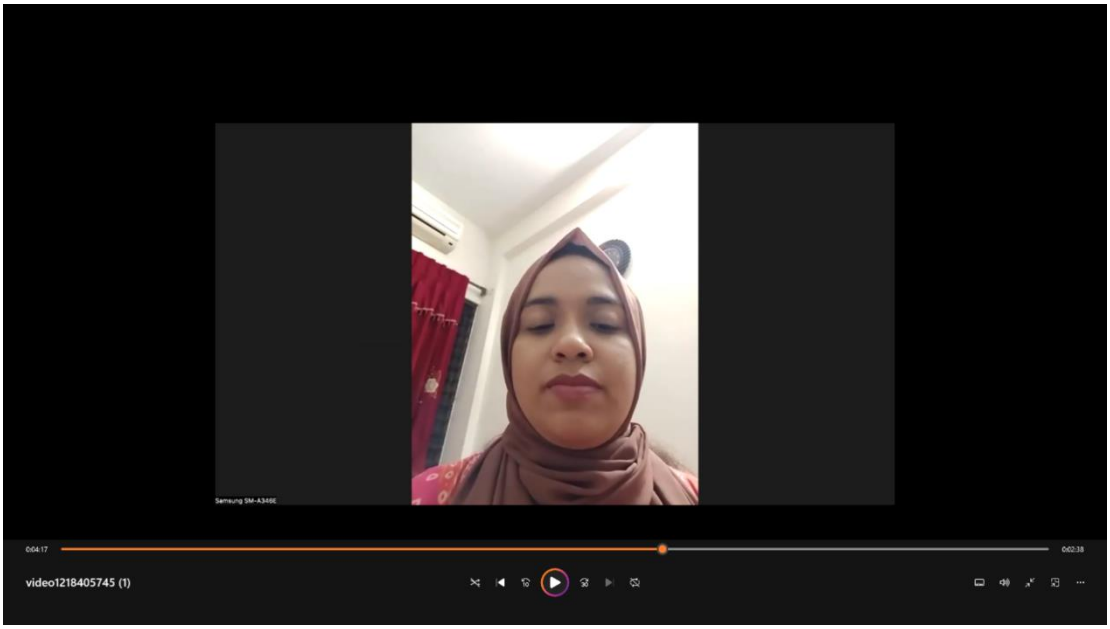

Figure 2.1: User Interview

I have took interview of users those who are suffering from flood and need a solution in a smart way to solve their problem

2.2 Target Users

I implemented surveys and interviews to the residents of flood-prone regions to have a better insight into their needs and inspirations. The results assisted me in determining who the best beneficiaries of FloodGuard would be and their application. Our prospective viewer market comprises the neighbor-hoods that are directly at risk of floods. According to the research and surveys, the app may be used (UNICEF Bangladesh, 2022):

• **Households & Families (45%):** Families in rural and semi-urban areas who need quick alerts, shelter information, and offline access to keep safe.

• **Service Workers & Daily Commuters (25%):** People whose jobs or travel require them to move through flood-affected zones and who need timely road and safety updates *(Pacific Disaster Center, 2021)*.

• **Medical & Vulnerable Groups (15%):** The elderly, patients, and persons with disabilities, who need SOS support, medical care, and evacuation during floods (World Meteorological Organization, 2021).

• **Community Volunteers & Others (15%)**: NGO staff and local leaders and volunteers that support in emergency response efforts, and can assist by reporting on road blockages, shelters, and real time updates on flood conditions (International Federation of Red Cross, 2020).

Target Age Group: The app is aimed at individuals aged 18-50 years old, including young and mobile-advanced users and middle-aged adults who have to take care of their family (Baymard Institute, 2023).

2.3 User Persona

A user persona is a fictional yet research-grounded description of a person who uses FloodGuard in an attempt to describe its normal behavior, objectives, and frustrations (Cooper et al., 2014). These personas enable us to put ourselves in the shoes of the user and come up with realistic solutions, which are both practical and accessible to the users.

The process of personality development started with surveys and interviews of various age groups and regions. These results demonstrated the current flood management practices, information sources individuals depend on, and problematic areas (Patton, 2015).

Their emotional responses, habits, and decision-making process in case of an emergency provided us with the clear picture of the human obstacles to the technical issues. In the case of a disaster management instrument as FloodGuard, personas prove to be extremely significant as they reveal the immediate demands of various audiences: rural families with lower digital literacy rates and young professionals who observe the situation in their elderly parents (UNICEF Bangladesh, 2022).

These personas will make the team focus on simplicity, trust and real time action. The research and design have a point of contact at personas. They assist in maintaining similarity in the product where all features such as localized alerts is ensured to benefit the real people behind the data i.e. SOS button and shelter maps. **“Will this make the app easier and safer to use during a flood?”**

Fatima Rahman

Age: 29

Title: Private Service

Location: Dhaka (occasionally flood-prone area)

Technology Use:

- Owns an Android smartphone
- Uses both Wi-Fi/Broadband and Mobile internet
- Familiar with apps but not highly technical

"The app is not much user friendly... I don't understand the information it is providing. There's no clear alerts, no shelter information, no emergency help. It doesn't feel useful."

Goals

- Wants clear, easy-to-understand flood alerts without technical jargon.
- Needs real-time and localized information (not broad, delayed updates).
- Expects actionable guidance like shelter locations, emergency contacts, and safe evacuation routes.

Pain Points

- Confusing navigation: Current apps (BWDB) require multiple steps and use unfamiliar terms like "mPWD" and "station codes."
- Lack of clarity: Doesn't understand graphs or technical data; prefers color-coded warnings (safe, warning, danger).
- Missing features: No shelter information, no SOS button, no road blockage updates.
- Delayed alerts: No immediate alarms or push notifications, making the app feel "not useful."

Motivations

- Wants to protect family and community during floods.
- Seeks simplicity and reliability in digital tools.
- Would actively use the app if it offered safety guidance, shelters, and alerts in real time.
- Likely to abandon an app if it feels too complicated or provides no immediate value.

Figure 2.2: User Persona

This persona represents a young professional woman living in Dhaka, an area that occasionally experiences flooding. She is comfortable using a smartphone and common apps but does not consider herself highly technical. Because of this, she needs digital tools especially emergency-related apps to be simple, clear, and immediately useful.

2.4 Survey Questions

Before starting this project, I wanted to truly understand the people who would eventually use FloodGuard. This involved reaching out and talking to people of different ages, backgrounds, and experiences to hear their stories and views on floods. The survey wasn't just a list of questions; it was a way to connect with real human lives, their challenges, and their hope that technology could improve their safety.

Through this process, I realized how varied people's needs are, but how universal their desire is for clarity, trust, and safety during floods. Every answer, no matter how small or detailed, helped me uncover blind spots and guided me toward designing a more user-friendly solution. Some responses revealed issues I hadn't considered, while others inspired new features that could make the app much more reliable.

Ultimately, these surveys breathed life into this project. They grounded the design in human experience, transforming abstract ideas into practical solutions. Each response was like a piece of the puzzle, clarifying the bigger picture and helping me become a problem solver who could create something truly meaningful for real communities

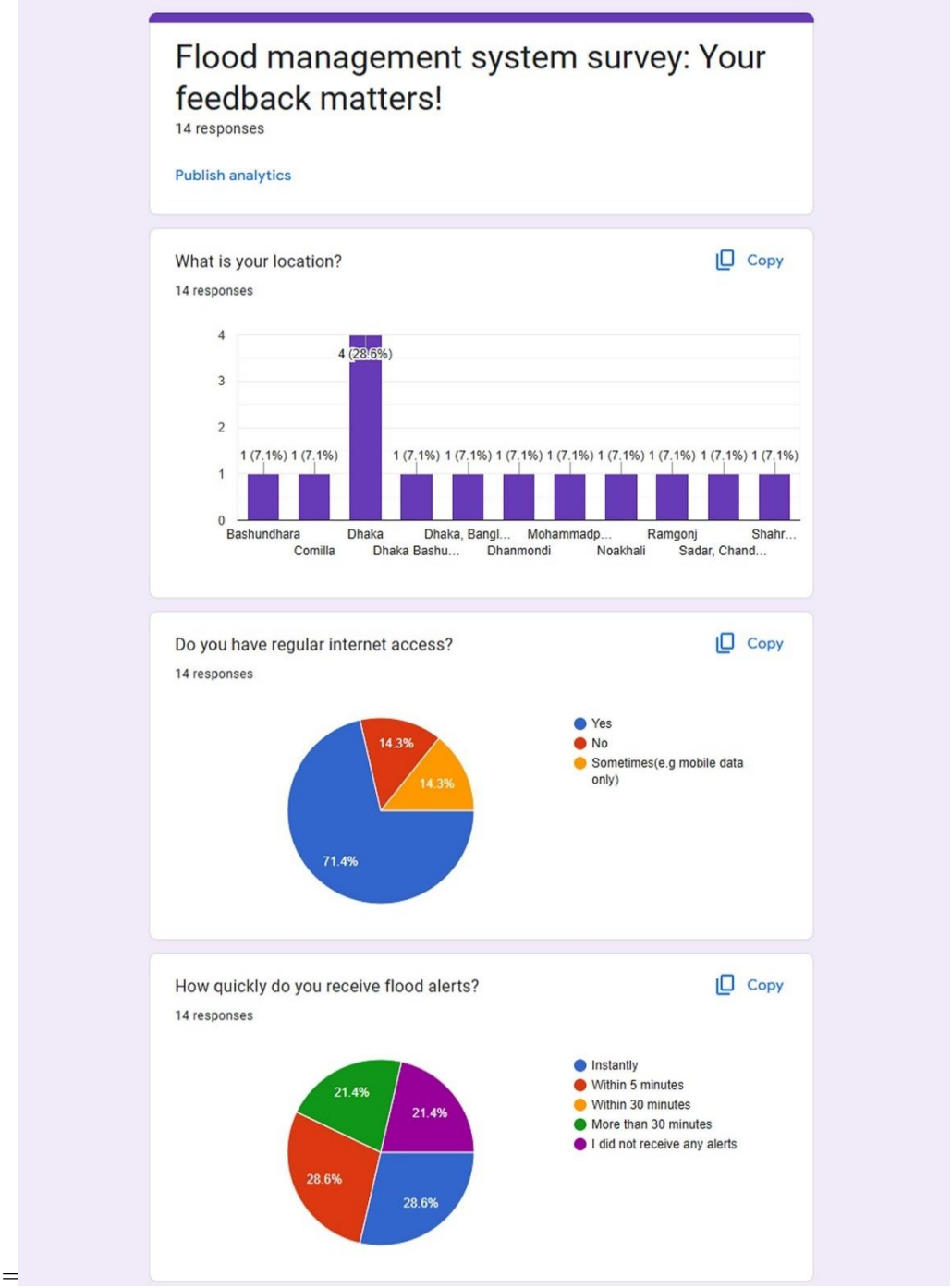

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Figure 2.3: Survey Question

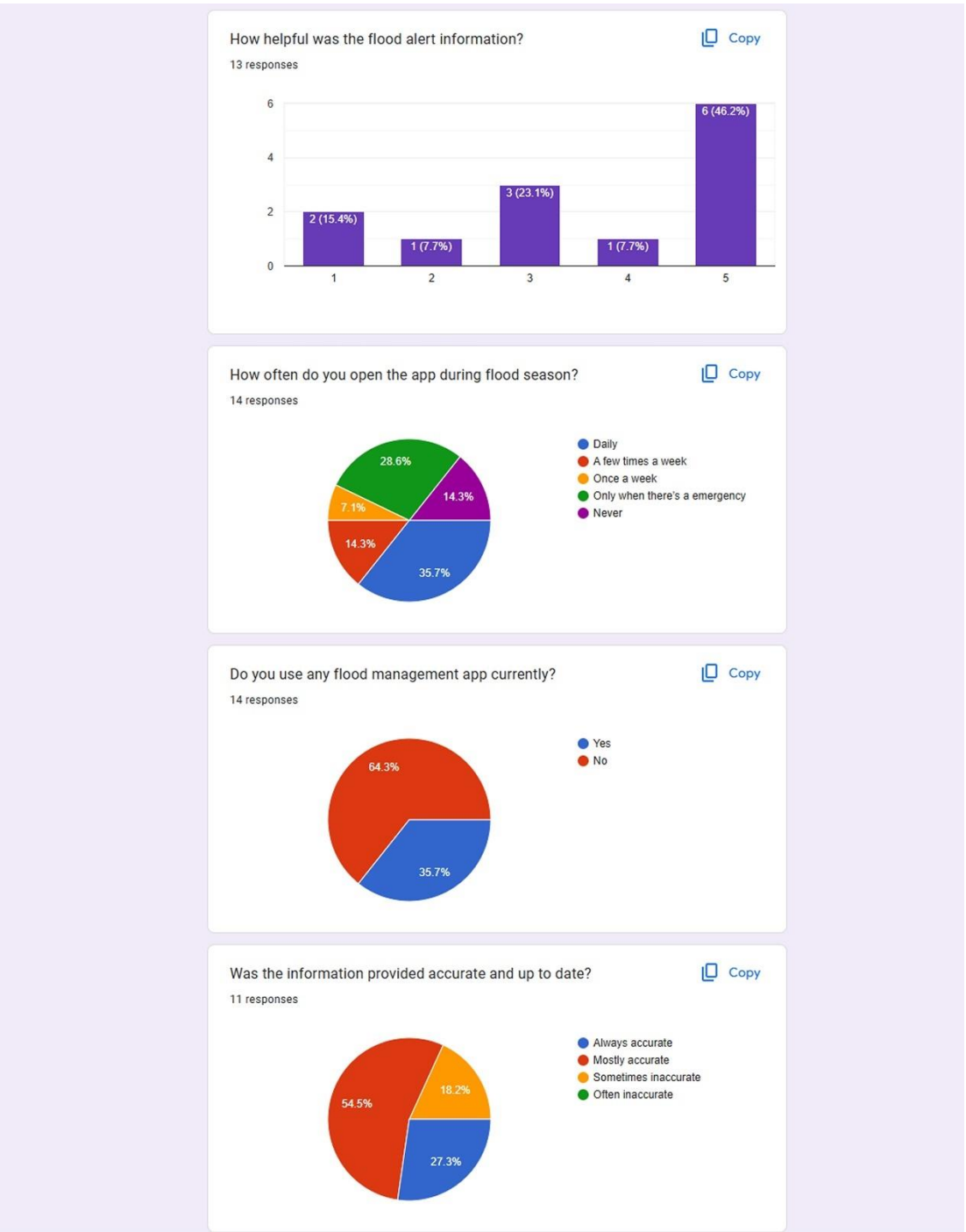

Figure 2.3.1: Survey Question

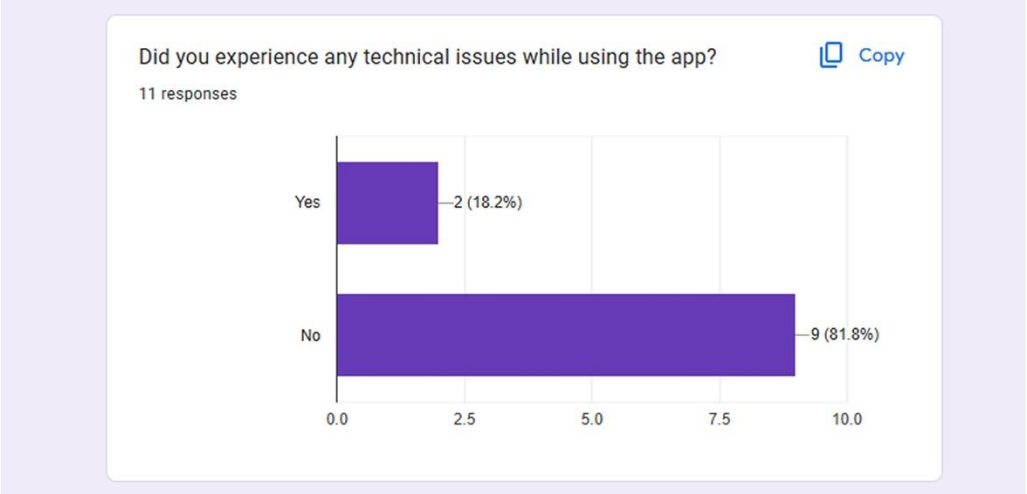

Figure 2.3.2: Survey Question

In the end, these surveys gave life to this project. They turned abstract ideas into practical solutions by grounding the design in human experience. Each response worked like a piece of the puzzle, making the bigger picture clearer and helping me become not just a designer, but a problem solver who could create something meaningful for real communities.

2.5 Customer Journey Map

Customer journey map is an effective methodology of knowing what drives users, what they require, and what anxieties they have (Dix et al., 2004). Simple data collection is a good tool although in real life scenario it fails to capture emotions and frustrations experienced by people. A journey map transforms these insights into a tale, and it shows how users think, feel, and do at various points of engaging a product. In the case of this project, the journey map identified shared challenges such as the inability to use available flood apps, frustration with the use of too much technical terminology, and frustration due to slow or vague alerts (Bangladesh Water Development Board, 2022).

At the same time, the map emphasized what users value most: timely localized alerts, clear and simple visual indicators, and easy access to emergency help *(Pacific Disaster Center, 2021)*. By mapping the scenarios, actions, emotions, and pain points, the journey map showed us exactly

where to focus to create a more human-centered solution. This visualization not only clarified the failures of existing systems but also guided the design of a product that builds trust, reduces panic, and empowers communities to respond more effectively during floods *(Norman, 2013)*.

Meanwhile, the map focused on the aspects that are the most important according to the users, including timely and localized alerts, visual indicators are simple and clear, and access to emergency help is easy (Pacific Disaster Center, 2021). Mapping the scenarios, actions, emotions and pain points, the journey map demonstrated where to concentrate on to develop a more humane solution. This visualization not only helped understand what wrong with the current systems is present, but it also informed the creation of a product that creates trust, removes panic, and enables communities to react better during a flood (Norman, 2013).

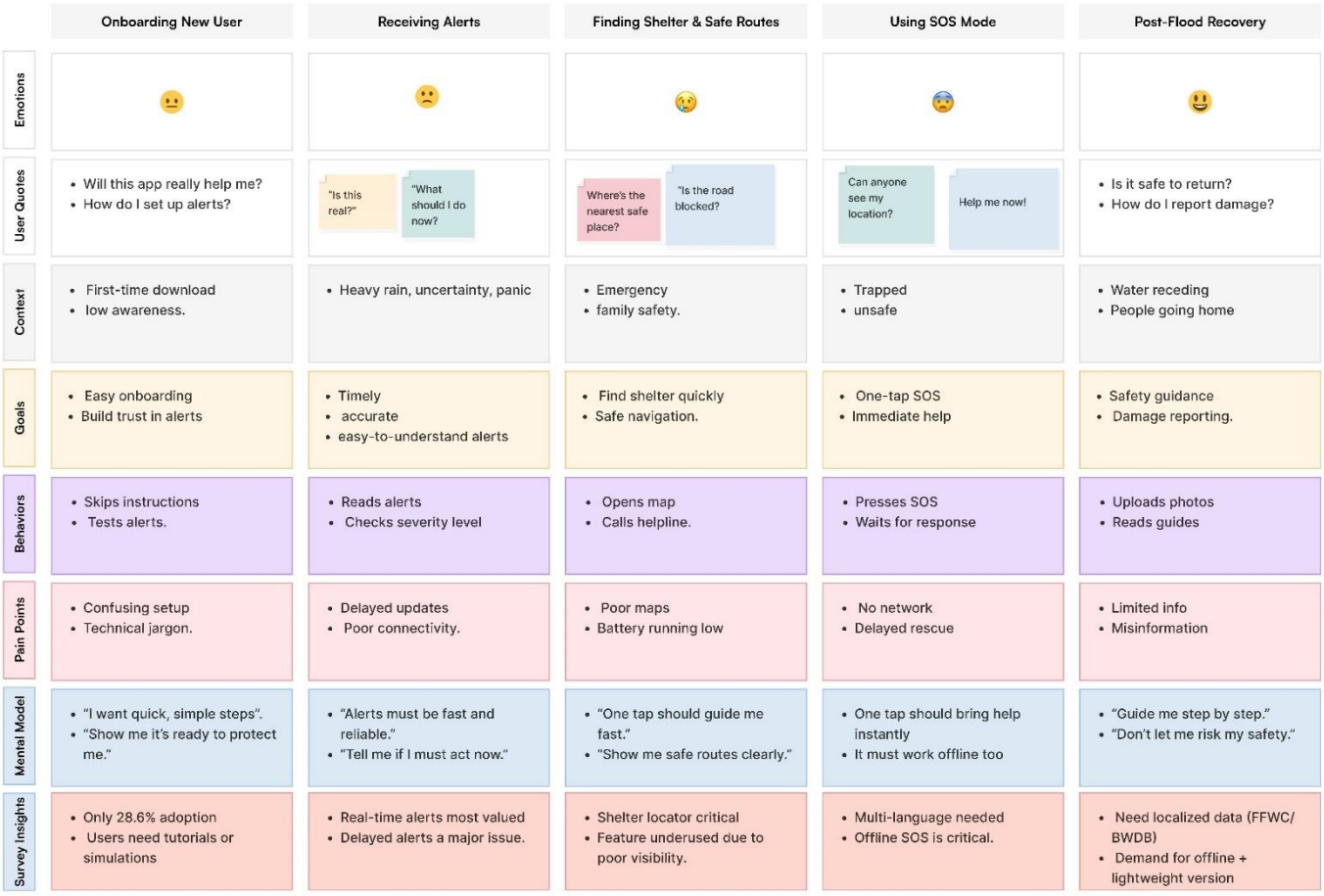

Figure 2.4: Customer Journey Map

This customer journey map illustrates how a user experiences a flood-alert and safety app across six critical stages—each with different emotions, behaviors, needs, and obstacles. It helps identify where the app succeeds, where users struggle, and what features matter most during emergencies.

2.6 Card Sorting

A card sorting is a basic but efficient activity whereby the user can organize a list of concepts into what appears to them as meaningful (Nielsen, 1994). In the case of FloodGuard, the approach assists us in knowing how consumers want to be presented with flood-related features and information within the app. It is one method of discovering the mental models of our target users, the structure of the app needs to be aligned to their natural expectations when faced with an emergency. There are two methods of conducting card sorting open and closed (Baymard Institute, 2023).

- Open Card Sorting: The user creates his/her categories. As an example, when provided with such features as real-time alerts, flood map, shelter locator, SOS button, and safety guides, users would rather tend to organize Shelter locator + SOS as Emergency Help, and real-time alerts + flood map as Updates
- Closed Card Sorting: This is with pre-existing categories, and the user puts the cards in those categories. In the case of FloodGuard, there may be categories such as Alerts, Shelter and Safety, Community Reports and Guidelines. After which features would be placed in the groups by users. It particularly works well with FloodGuard, as clarity and speed are vital in the case of a flood (W3C, 2018).

Card sorting allows us to see:

- Expectancy of users to have SOS and Shelter Locator in a single section.
- Should Weather Forecast be under Updates or Guidelines.
- The distinction between preparedness features (e.g. safety tips) and response features (e.g. SOS, blocked road updates).

Conducting card sorting with the users of various age groups and levels of tech-literacy, we will be able to gather several different points of view (Patton, 2015). The synthesis of their findings will help highlight the most popular organizational patterns, and it will be used to organize menus and navigation within the application. Briefly, there is the card sorting that is making sure that the content and the features of FloodGuard are not only functional, but that they are also positioning in a manner that makes sense and intuitive to the users that will rely on it most (Dix et al., 2004).

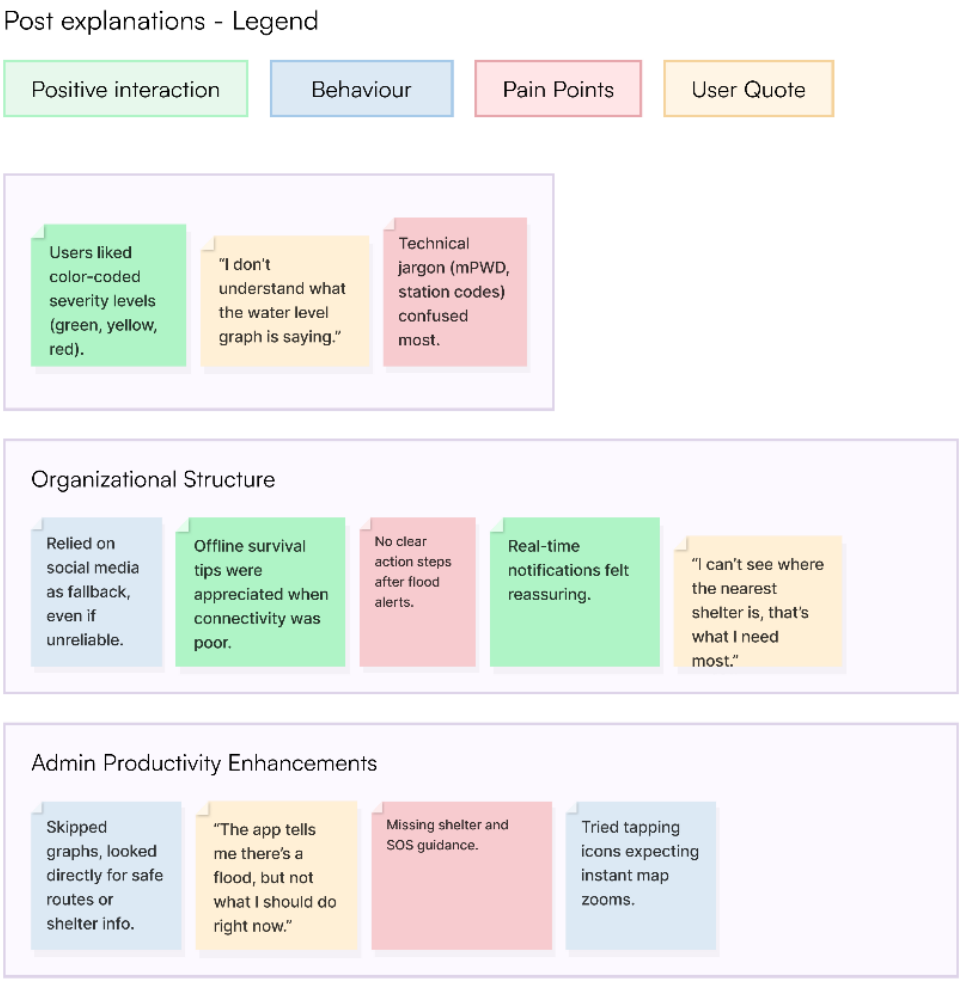

Figure 2.5: Customer Journey Map(Note Taking)

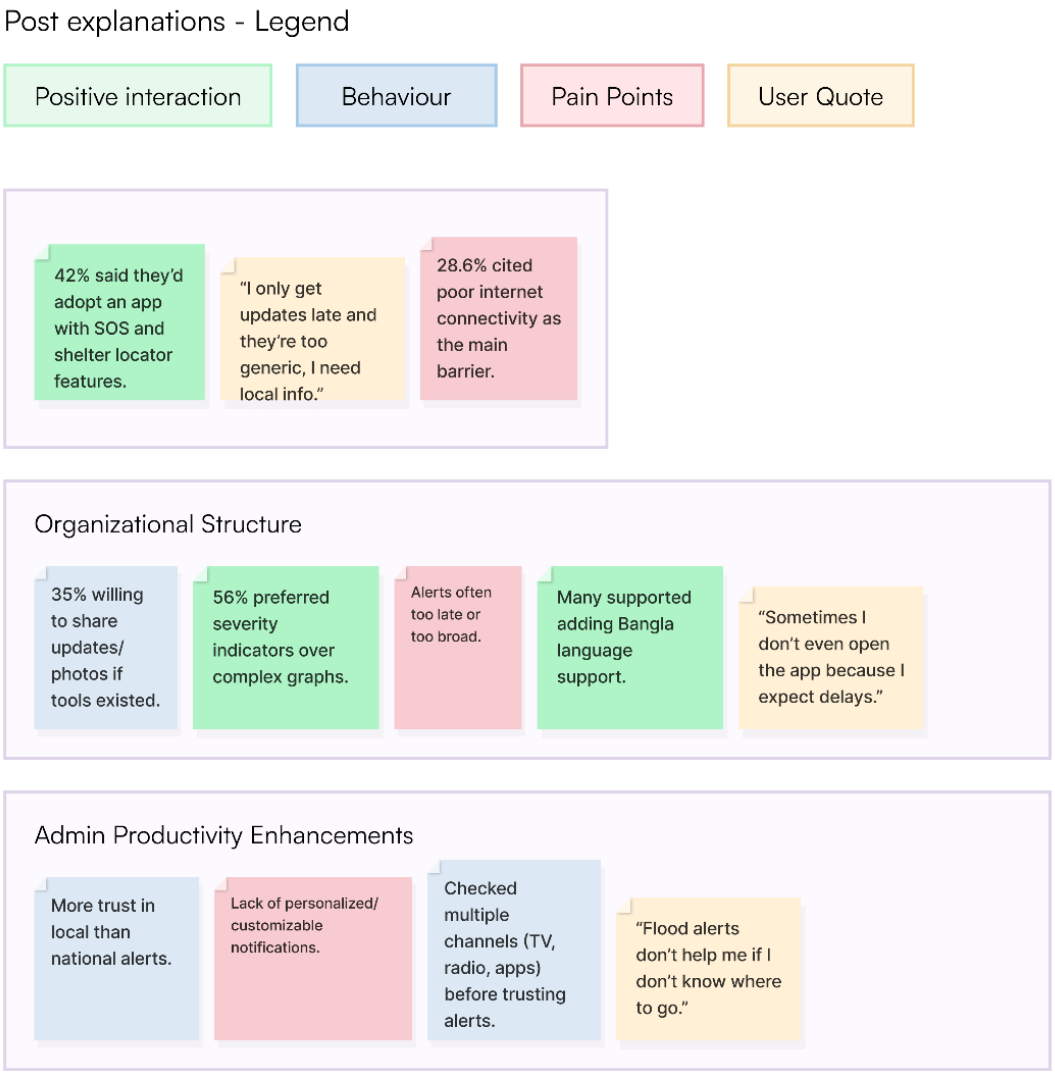

Figure 2.6: Customer Journey Map (Survey)

This survey snapshot captures what people genuinely struggle with during emergencies—from delayed or unclear alerts to poor connectivity—and what they wish they had, like local info, Bangla support, and tools they can actually trust. It reflects real frustrations, real needs, and real opportunities to build something that truly helps

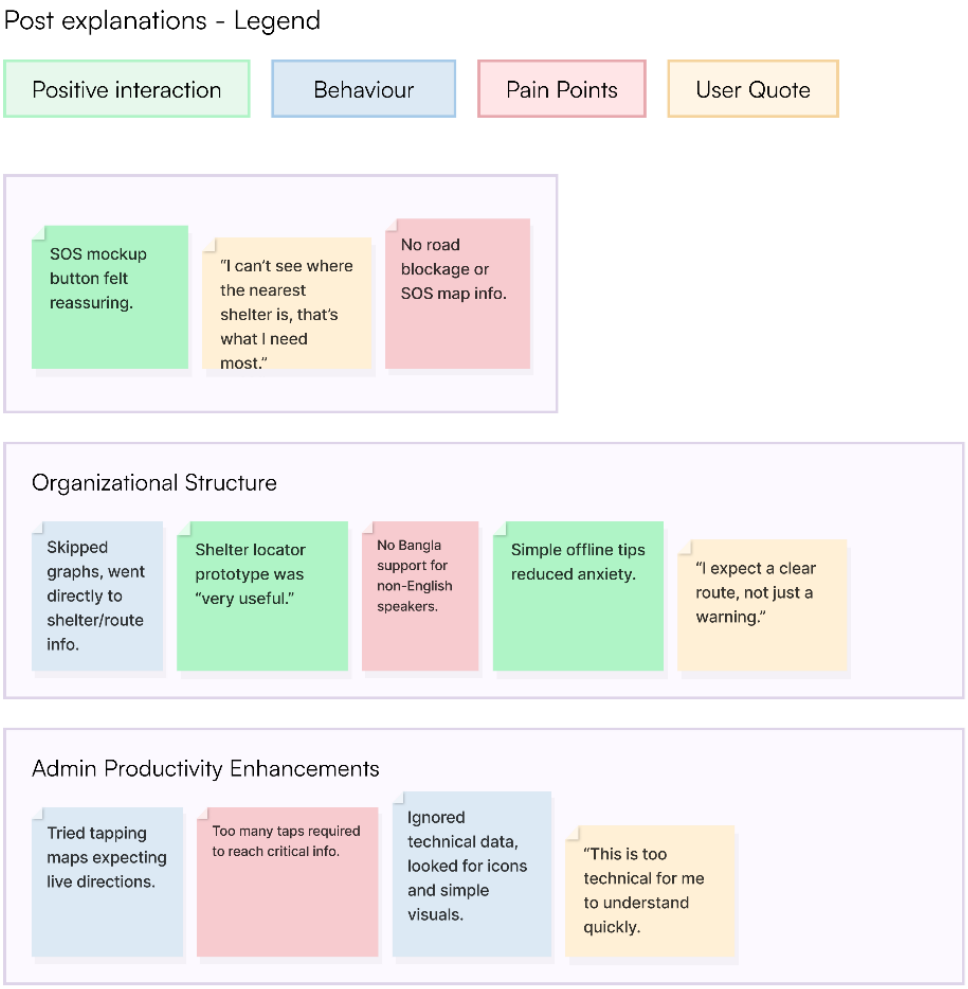

Figure 2.7: Customer Journey Map (Usability Testing)

This survey board captures how people actually interact with emergency tools—what reassures them, what confuses them, and what they desperately wish worked better. From wanting simple routes instead of technical data to needing Bangla support and clearer shelter info, these insights highlight a very human need: quick, calm, and accessible guidance when stress is at its peak.

Figure 2.8: Customer Journey Map (Usability Testing)

This survey view shows how people try to navigate floods with whatever information they can find—and how current tools often leave them guessing. They rely on social media for updates, struggle with technical graphs, mute irrelevant alerts, and constantly cross-check multiple sources just to feel safe. The insights reveal a clear need for hyper-local warnings, simple visuals, reliable blockage maps, and practical support like shelter, food, and water info—all the things that matter most when every minute counts.

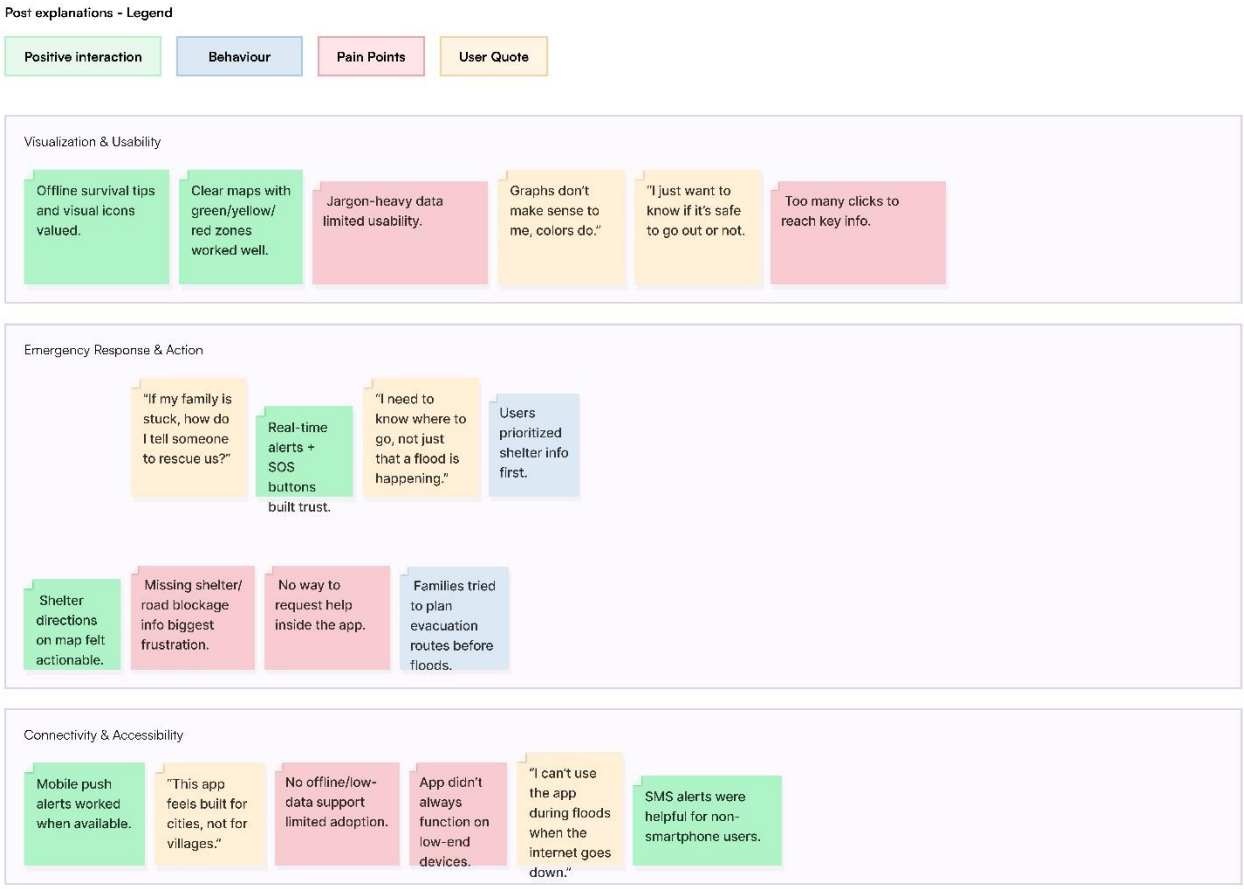

Figure 2.9: Affinity Diagram Grouping/Themes

This set of survey insights shows how people try to make sense of emergencies while juggling fear, confusion, and limited tools. Clear visuals and offline tips helped them feel more in control, but jargon-heavy data, too many clicks, and missing rescue or blockage info left them frustrated. Many just wanted one simple thing: to know if it's safe, where to go, and how to get help—especially when the internet drops or their device can't keep up. These findings underline how essential clarity, accessibility, and real-time action tools are when everything else is uncertain.

2.7 Cognitive Analysis

FloodGuard has been created with the solid realization that during an emergency, individuals do not have time or mental ability to process complex data that they require straightforward and instant instructions (Sweller, 2011). The mental emphasis of this application is to alleviate stress and the burden of decision-making in a user by displaying the most essential information at the most crucial times. The system employs the use of simple visual clues as opposed to flooding the users with technical information such as mPWD readings or river station codes.

This involves severity levels with color-coded severity, universally accepted icons, and localised Bangla help to be understandable when the user is in a hurry (Adobe, 2023). It was found that the features valued the most by the users were the shelter directions, SOS access, and hyper-local real-time alerts as compared to charts or raw statistics.

Through these behavioural patterns, FloodGuard has been designed in a way so as to minimize the cognitive load and ensure that all the screens are able to aid in quick comprehension and immediate action (Dix et al., 2004). Additionally, the offline service will ensure that individuals will still have access to life-saving information even in cases when the internet is unavailable (Bangladesh Water Development Board, 2022).

CHAPTER 3

Design System

3.1 Design System

The design system is simply the foundation of the consistency of the products- it gathers together, style guides, component libraries and rules that allow teams to collaborate harmoniously (Atlassian, 2023). In the case of FloodGuard, the design system will make sure that all the elements of the app, including the fonts and the colors, the buttons and the alerts, will be on the same standard and logic. This removes inconsistencies, shortens the design time and accelerates the design and development. The system determines and validates components on accessibility and usability to provide clarity even in extreme situations such as floods (W3C, 2018).

As an example, the design system of FloodGuard brings out strict color-coded levels of severity (green, yellow, red), has particular typography guidelines in both Bangali and English to be inclusive, and has components that operate even when not connected to the internet. SOS, shelter and water level icons are maintained as simple and easy.

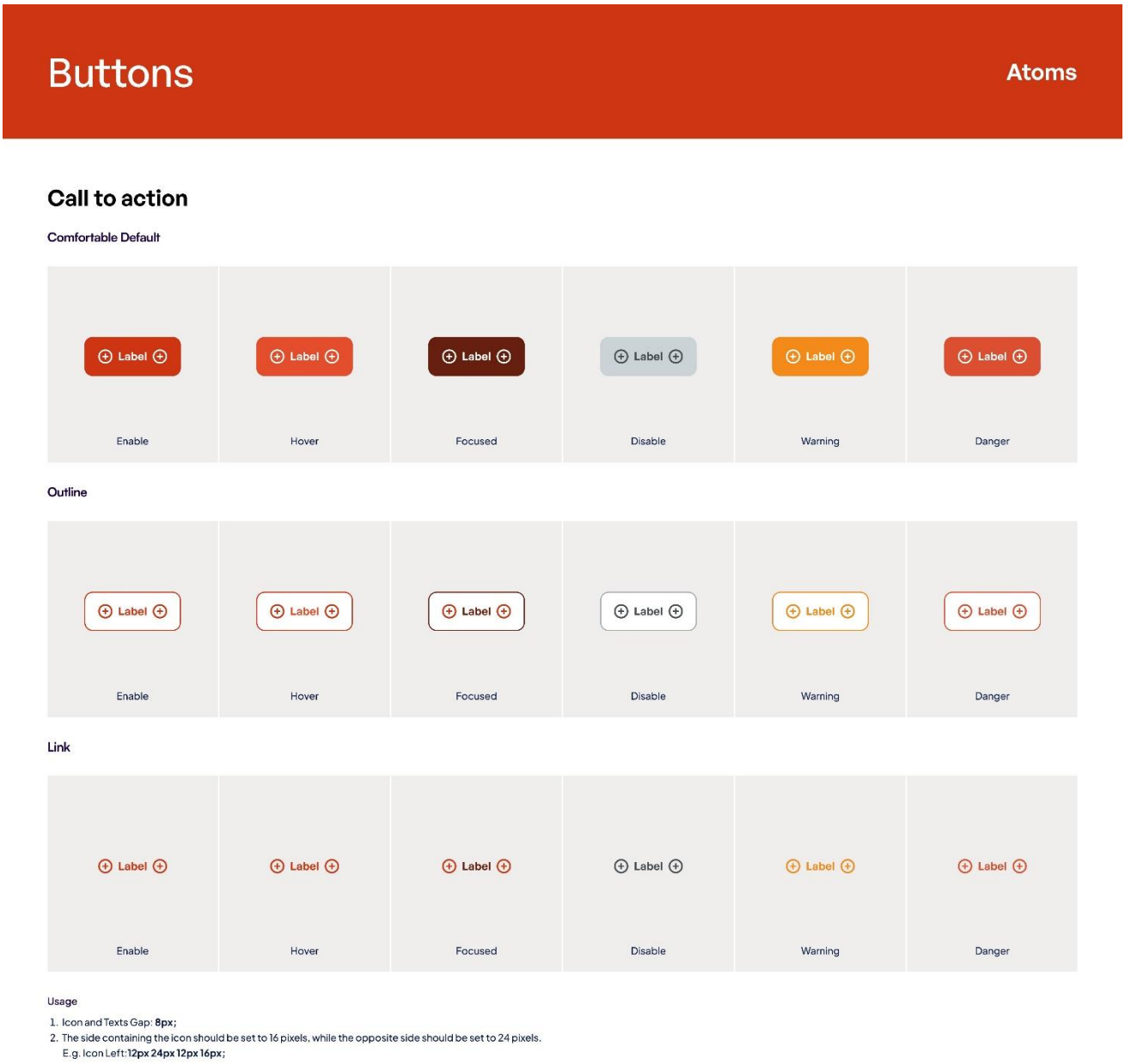

Figure 3.1: Button

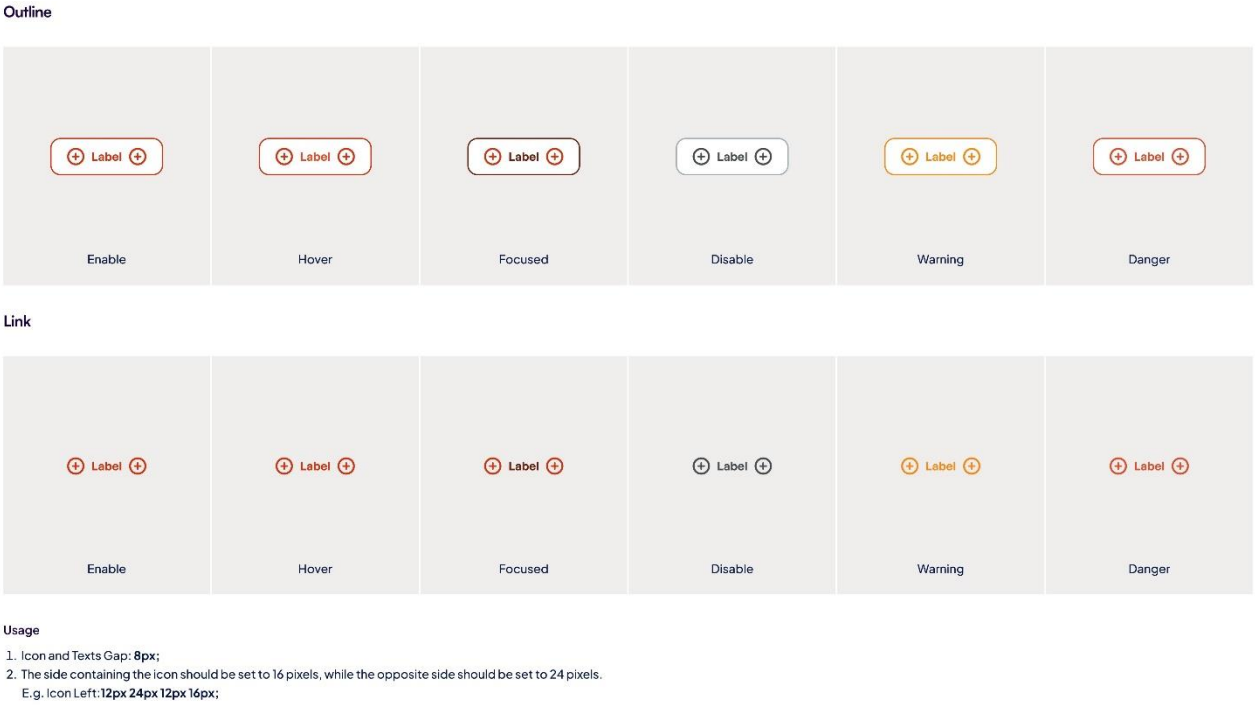

Figure 3.1.1: Button

I have created the all buttons for my component so that I can make the app more easy and clean. These are all the action default outline link button that i have used in my project.

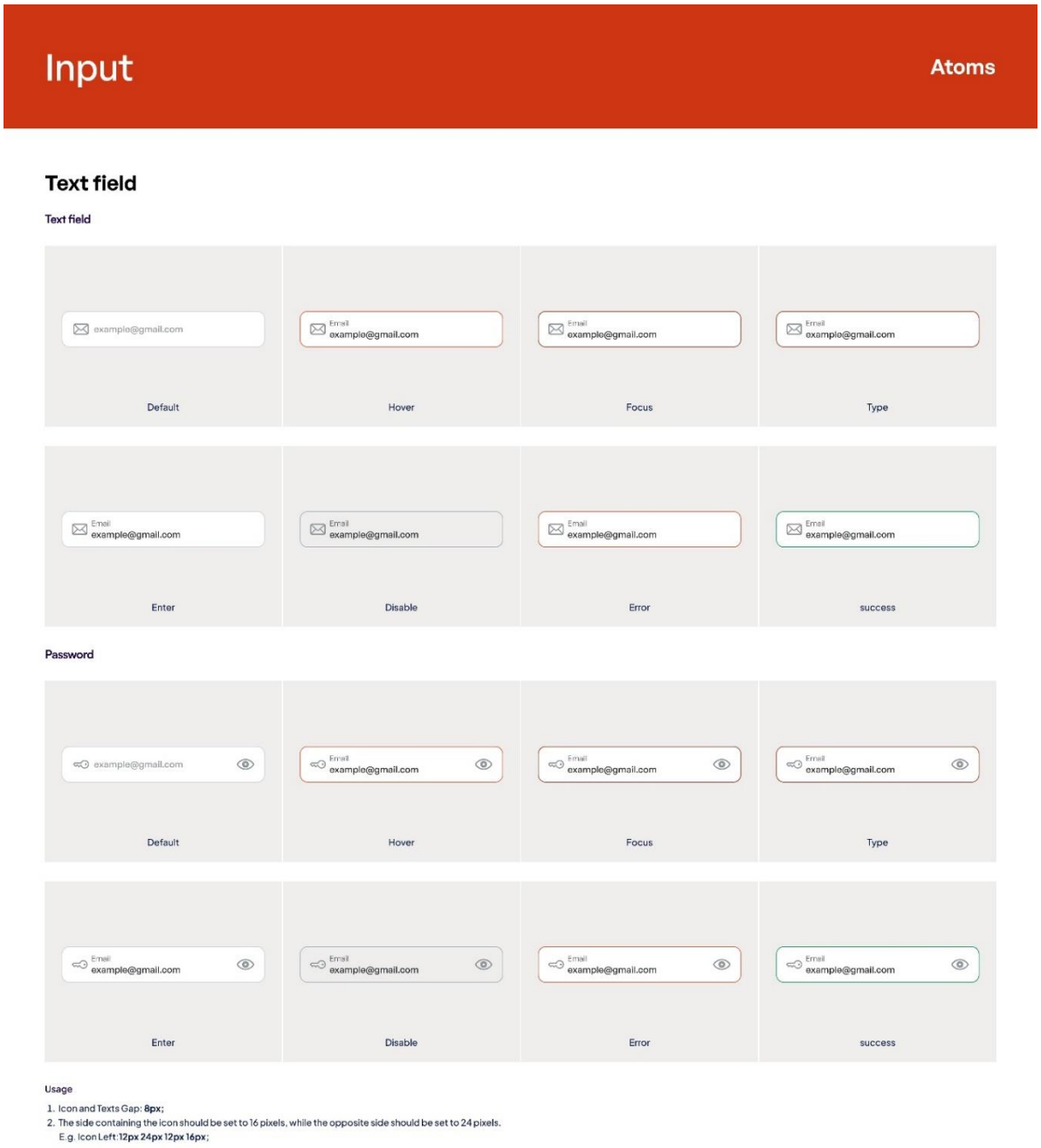

Figure 3.2: Input

This screen showcases the full input field system for both text and password fields, displayed across all interaction states—default, hover, focus, typing, enter, disabled, error, and success. Each variant keeps consistent spacing, icon placement, and border behavior, ensuring a predictable and accessible experience. The documentation also highlights usage guidelines, including icon–text spacing and sizing rules, making the components easy to reuse across the product

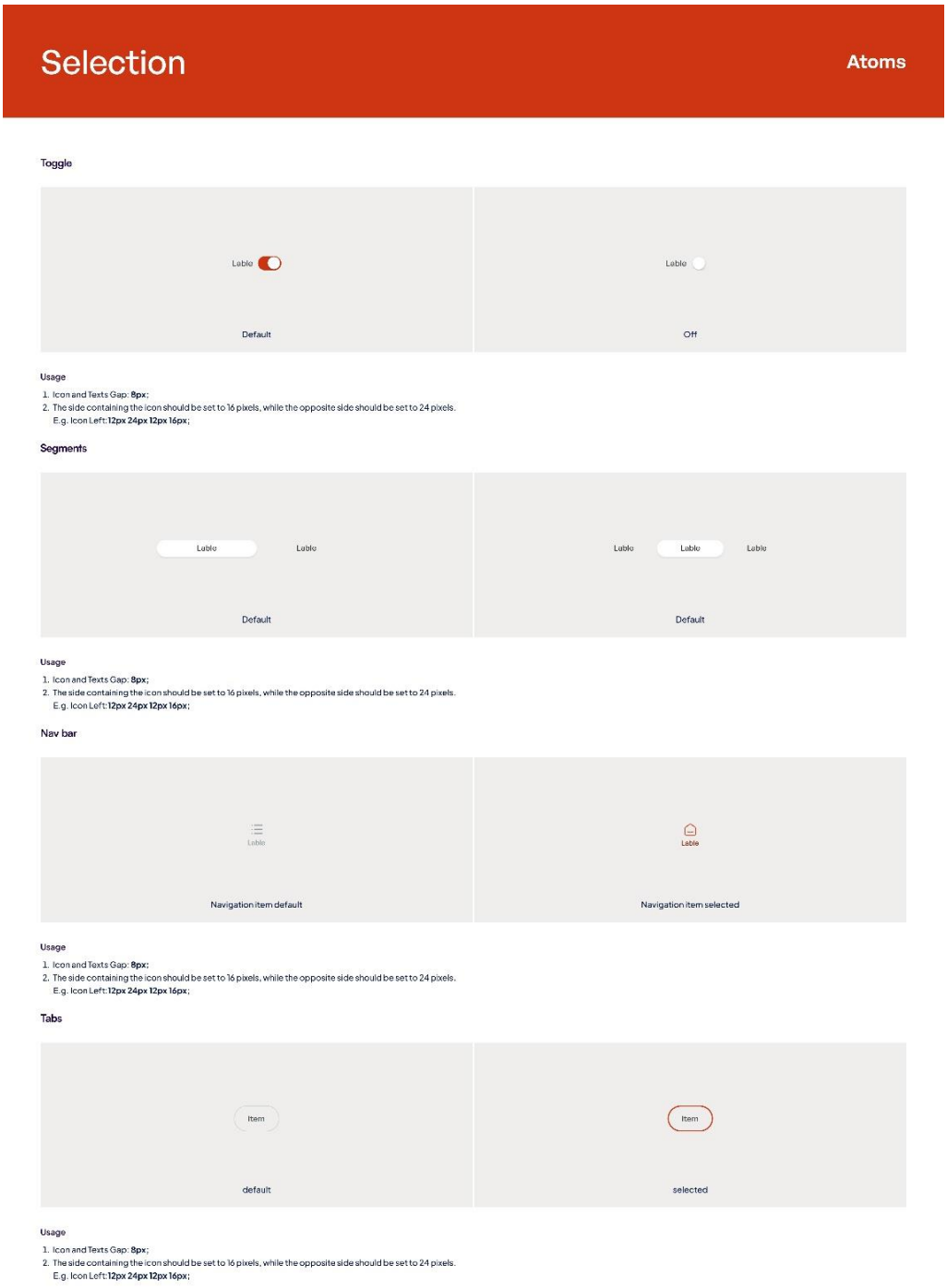

Figure 3.3: Selection

Figure 3.3.1: Selection

This screen outlines the core selection components of the design system, including toggles, segmented controls, navigation items, and tabs. Each component is shown in its default and selected states, making it easy to understand interaction behavior at a glance. Spacing, icon alignment, and usage rules are documented consistently across sections, ensuring every selection element feels cohesive and intuitive when applied throughout the product.

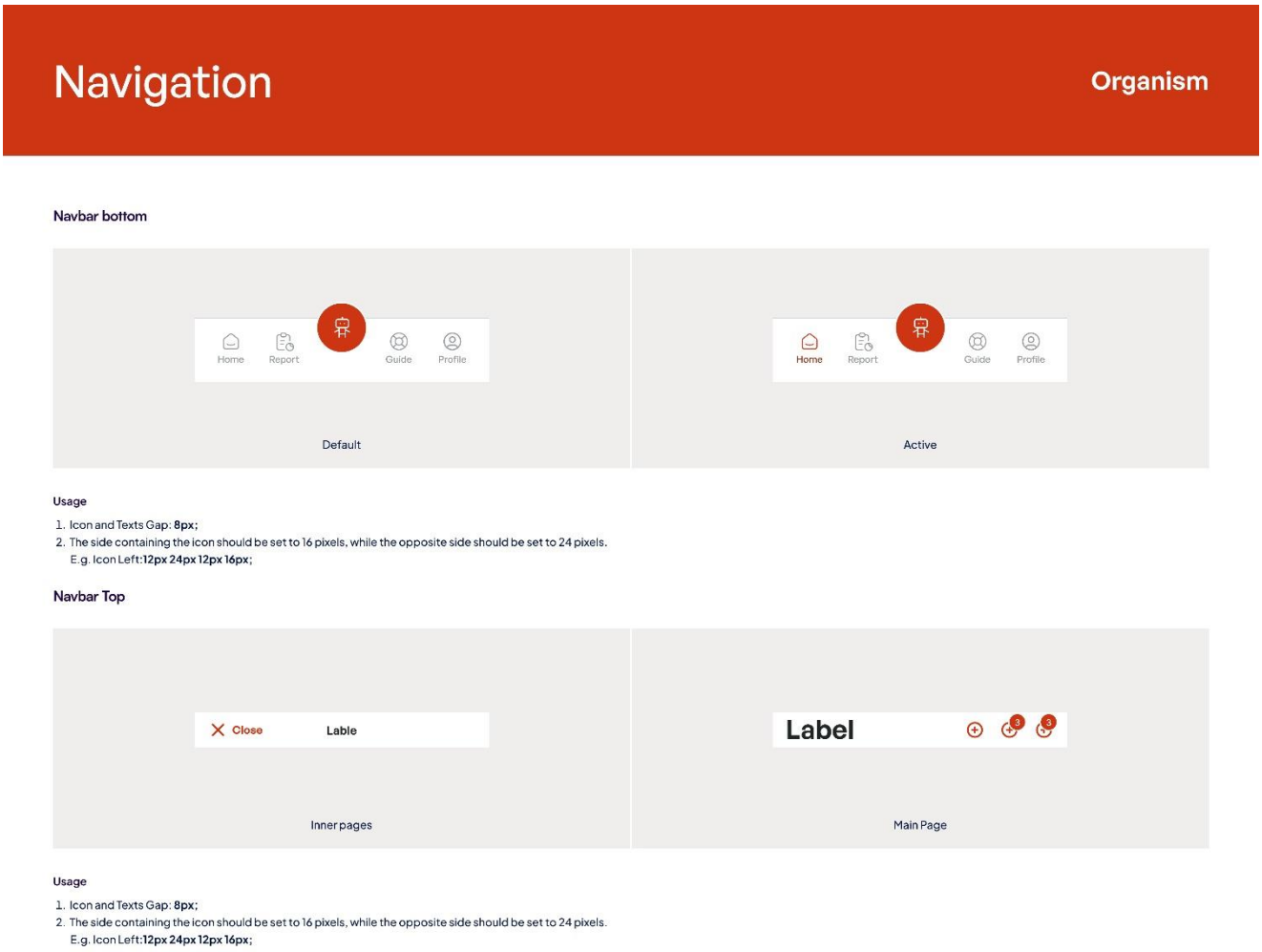

Figure 3.4: Navigation Bar

This screen illustrates the navigation structure of the design system, covering both bottom and top navigation patterns. The bottom navbar showcases default and active states for core sections like Home, Report, Guide, and Profile, with clear icon and label behavior. The top navbar displays variations for inner pages and the main page, demonstrating how actions and icons adapt based on context. Consistent spacing, icon–text alignment, and usage guidelines ensure a cohesive and predictable navigation experience across the app.

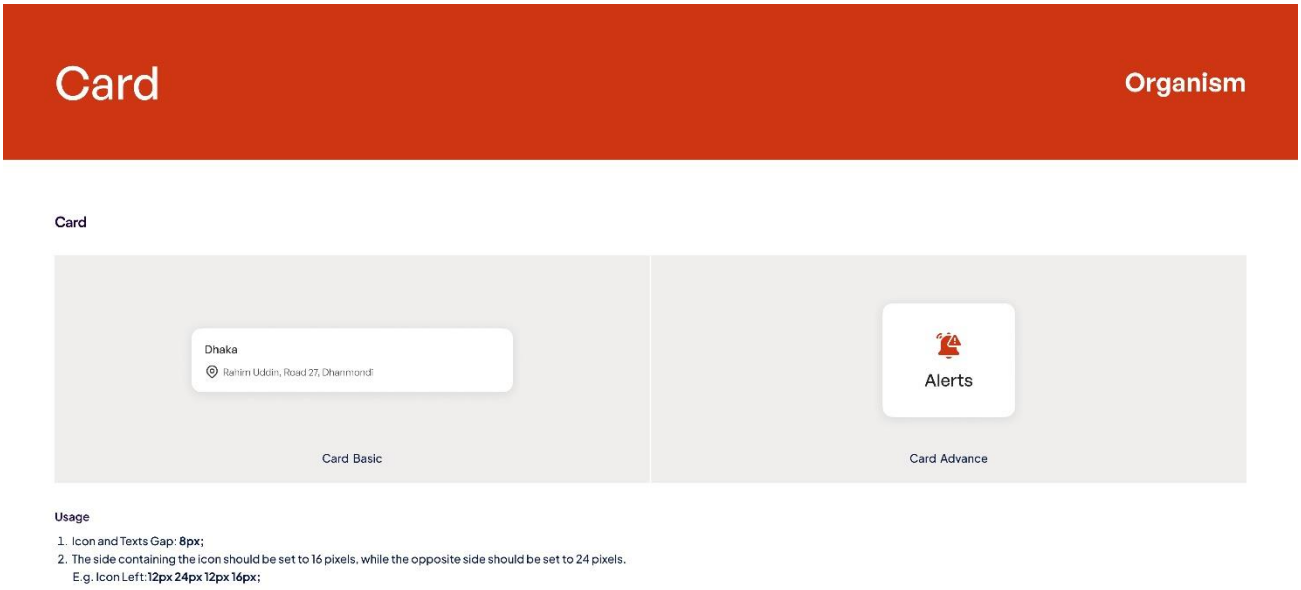

Figure 3.5: Alert card

This screen presents two core card patterns in the design system: a basic information card and an advanced action-focused card. The basic card is used for structured details like location information, while the advanced card highlights key actions such as alerts. Both follow consistent spacing, icon alignment, and elevation styles, ensuring they feel unified across different contexts. Usage guidelines reinforce how icons and text should be placed to maintain visual clarity and balance.

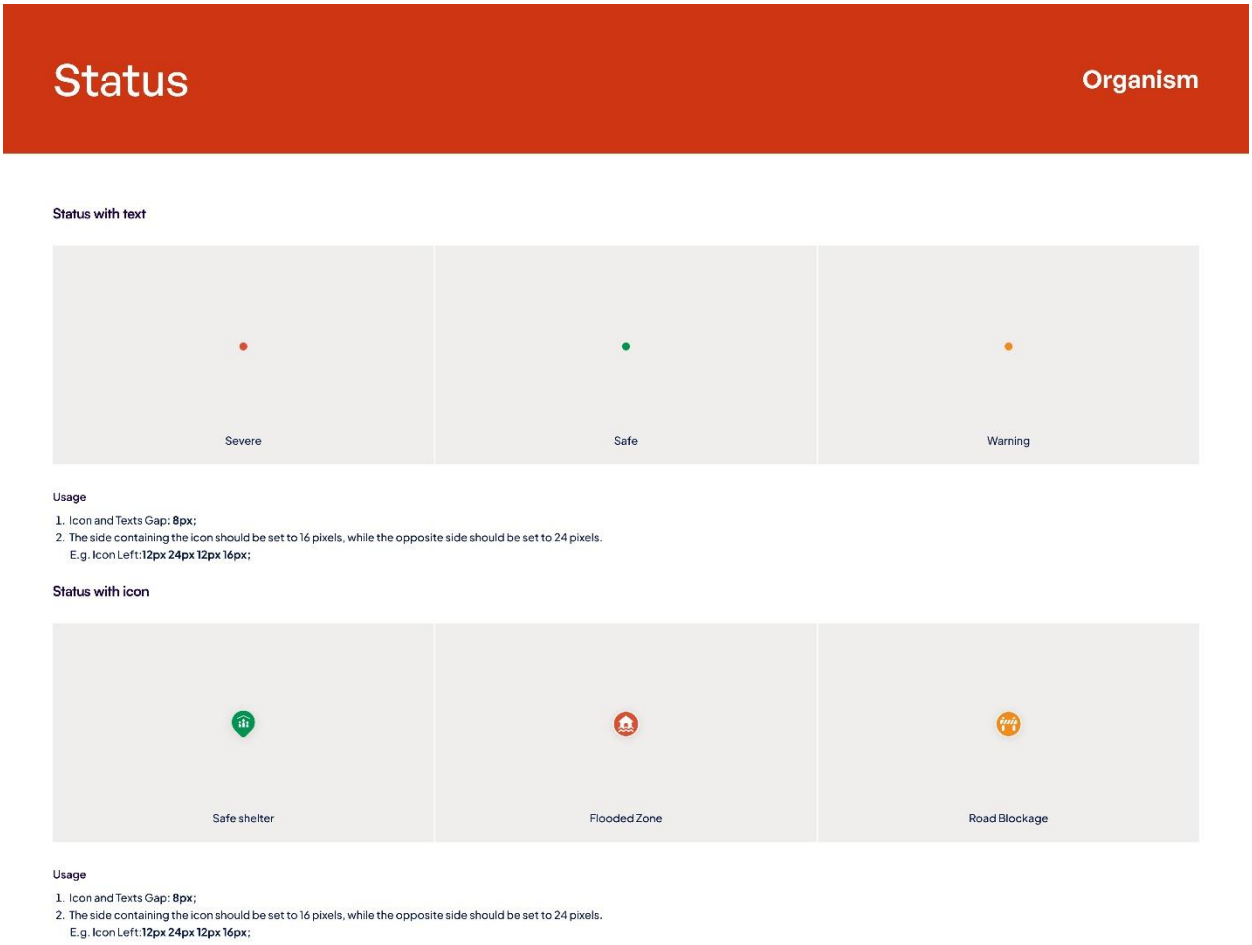

Figure 3.6: Status

This screen showcases the status indicators used across the system, presented in two styles: simple text-based statuses and icon-based statuses. The text version communicates severity levels like Severe, Safe, and Warning using clear color cues, while the icon version highlights contextual states such as Safe Shelter, Flooded Zone, and Road Blockage. Both formats follow consistent spacing and alignment rules, ensuring status information remains easy to scan and instantly recognizable in emergency-related interfaces.

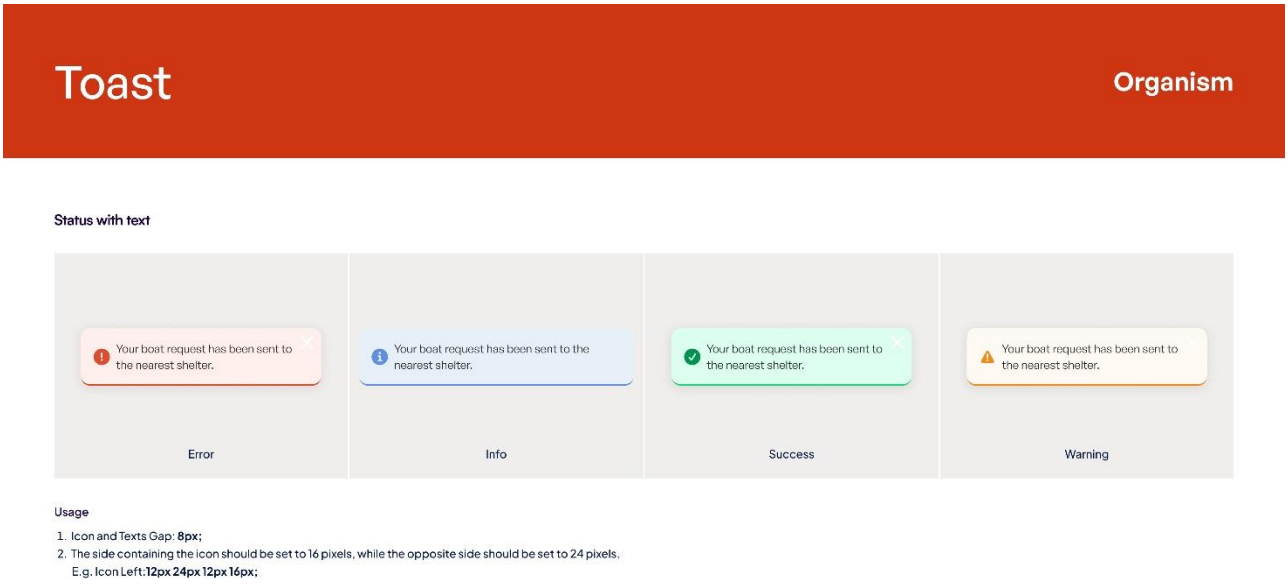

Figure 3.7: Toast

The toast notification system, showing how quick status messages appear across different scenarios—Error, Info, Success, and Warning. Each toast uses clear iconography, soft background colors, and consistent spacing to help users instantly understand the message without breaking their flow. These lightweight alerts are designed to be noticeable but not intrusive, making them ideal for time-sensitive updates like rescue requests or status confirmations

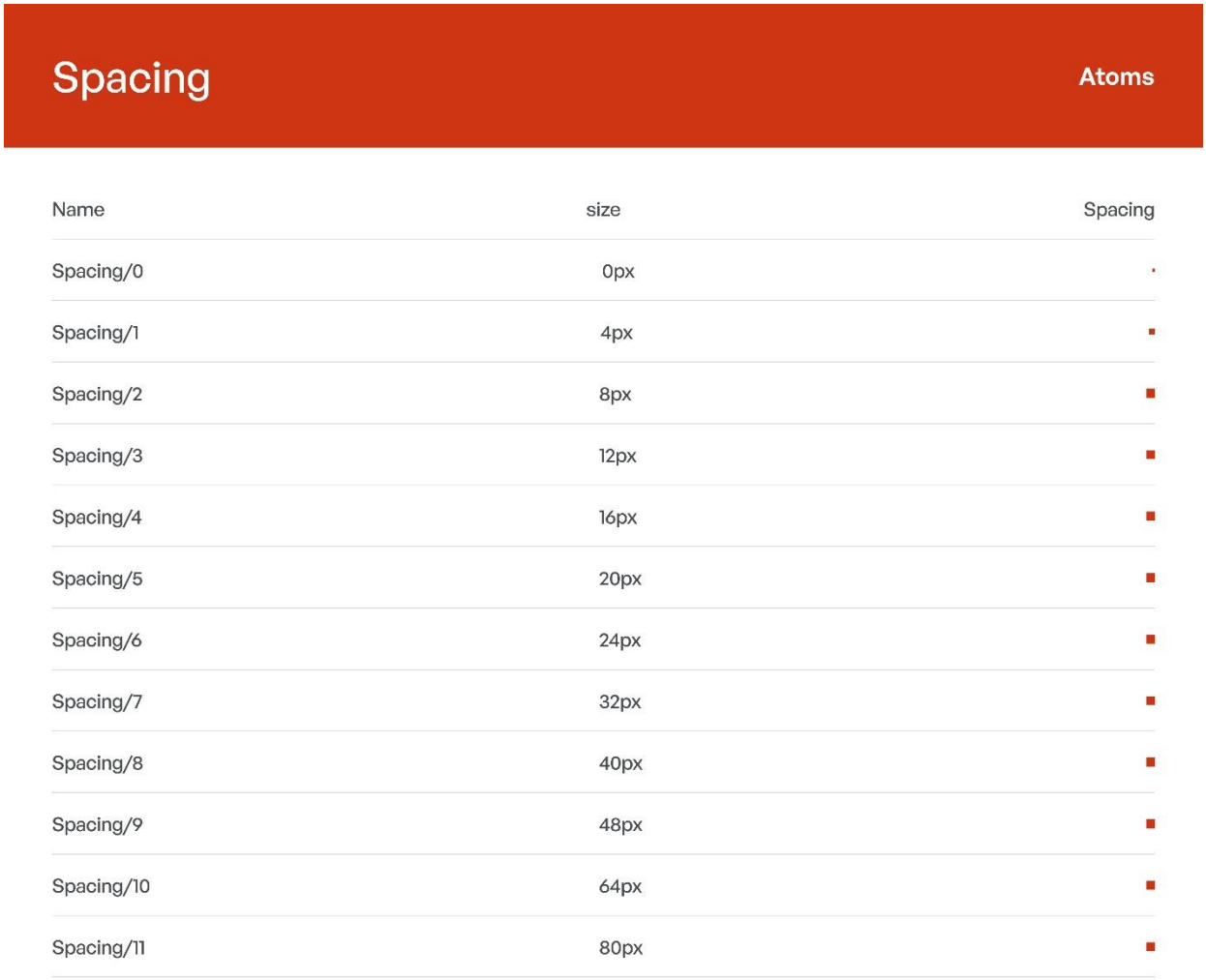

Figure 3.8: spacing

This is the all spacing ratios that I have used while creating my project. These are the spaces in pixels that used while creating the app.

3.2 User Flow

A user flow basically involves the route which one follows within an application to accomplish something (Dix et al., 2004). Consider it as a basic map which represents the process that one goes through- opening the app to attaining the objective. In the case of FloodGuard, it involves mapping out how the process should appear like once one recieves a flood alert, to going to find out which

shelters are open nearby and to call an SOS. The trick here is that each succession must be easy and natural with no misunderstanding and time wastage.

We then chart out the process step-by-step: the starting point of the user (perhaps an alert), what actions he or she implements (such as clicking Find Shelter), and what are the choices. The information needs to be straightforward, concise, and presented at the most appropriate time at each stage (Norman, 2013). The Flow of FloodGuard is specifically made to allow individuals to act swiftly and securely in a flood disaster. The process starts with the opening of the app or a push notification, and this is immediately followed by the choice of language, and at this point, the user is asked to allow access. The users can instantly access safe routes, nearby shelters, or view comprehensive alerts and maps, which indicate road blockages (Google Maps Platform, 2023). During an emergency, the SOS feature enables one to send their position to people or colleagues, place a power alarm, or communicate via a flashlight. Additional features are an off-line friendly safety manual, weather predictions and flood reporting services through which people can post local updates. Lastly, the profiles can be customized to the language preferences, notifications and history of reports

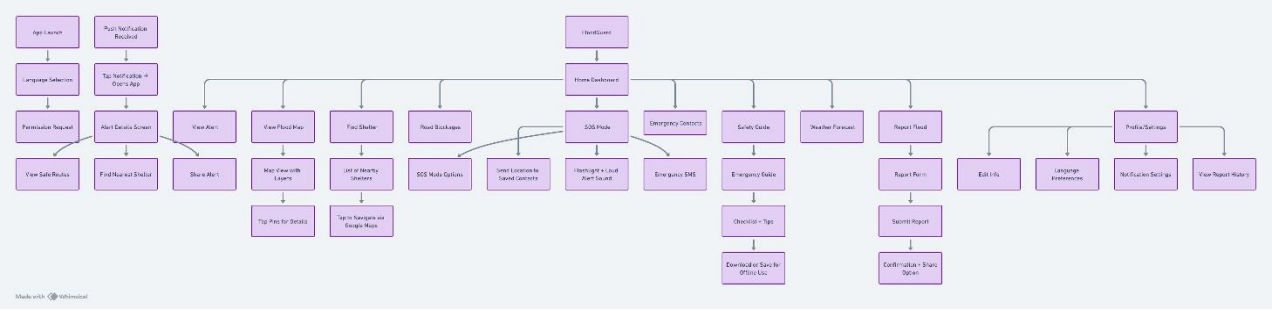

Figure 3.9: User Flow diagram

The FloodGuard user flow aims at assisting individuals to take prompt and secure actions in flood emergencies. The user will receive app launch or push notifications, language choice, and request permission, and its usability will be guaranteed at the very beginning. The users will be able to see all the safe routes, locate their shelters, or read-only their detailed alerts and maps with interactive

pins showing a blockage or shelter on the roads. During emergency situations, the user can send his/her location to contacts, restart a loud alarm or use flashlight signals using the SOS mode. Other features include a safety guide which has offline tips, weather forecasting and flood reporting features which allow the users to post local updates. Lastly, one can personalize language and notification as well as report history using profile and settings options. Generally, the flow focuses on clarity, speed, and reliability, which makes the information provided to the users actionable at the time of need

3.3 User Story

An average FloodGuard user would be any person in a flood-prone region who requires an easy, reliable method to keep them safe when emergency sets in (Bangladesh Water Development Board, 2023). They must quickly evaluate the level of risk, locate the closest shelter when an alarm sounds or make an emergency SOS. The user will see clear color-coded warnings, simple navigation, and real-time data that can be accessed even in case of the poor internet connection instead of wrestling with technical graphs or getting delayed updates (World Meteorological Organization, 2021). They do not want to know that there is a flood coming, but what to do exactly to save oneself and their family at the moment. The user flow of FloodGuard makes such a critical path as alert to action quick, intuitive, and stress-free (Norman, 2013).

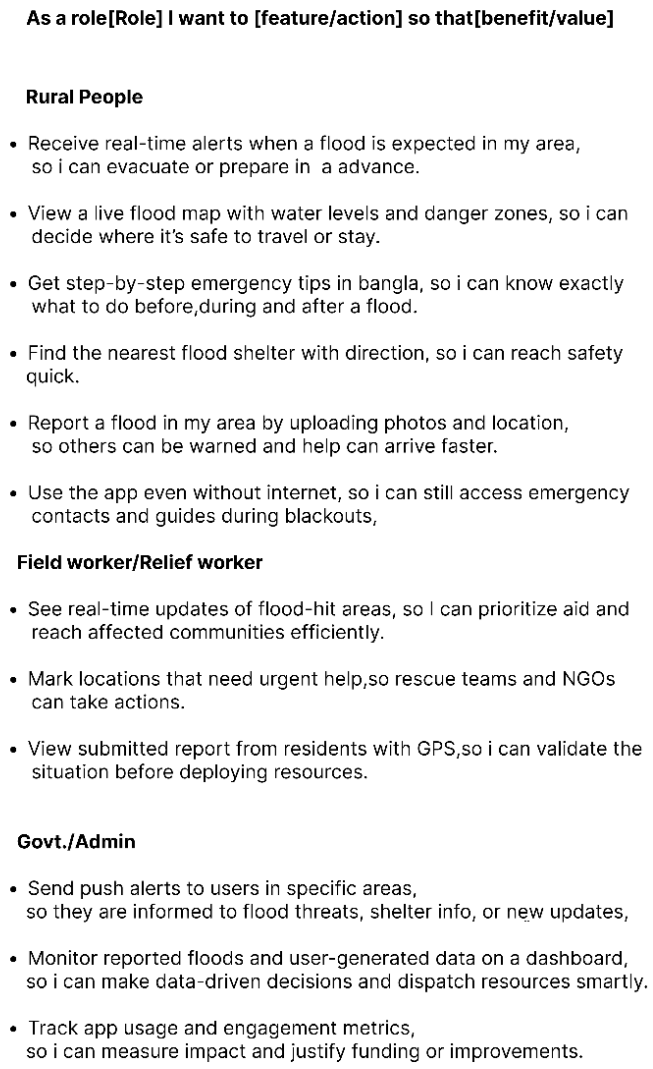

Figure 3.10: User Story

This screen outlines key user stories across three main roles—Rural People, Field/Relief Workers, and Government/Admin. Each story captures what these groups need from the flood-response app and the value it provides them. Rural users focus on safety, guidance, offline access, and local alerts. Field workers need real-time updates, validated reports, and location-based information to deliver aid faster.

CHAPTER 4

High-Fidelity Prototype Design

4.1 Storyboarding

The storyboard of FloodGuard app concerns the need to relate the design to the underlying human experiences of experiencing a flood (Cooper et al., 2014). It is not only some crude drawings, but a step-by-step narrative of how a user reacts, makes decisions, and attempts to be safe. Imagine that it is a short film in which a user receives an alert, opens the application, and finds out the risk level, after which he/she performs an action, whether it is to find a shelter, initiate an SOS, or maneuver at a flooded road.

It begins with actual evidence of surveys, interviews, and usability test (Patton, 2015). These discussions brought out such issues as tardy notifications, technical charts that were not easily understandable, and absence of localized and understandable information. The design is not grounded on abstract guesses but on the real plights that people have to endure through the transformation of these facts into stories.

The narrative is minimalistic, in the form of comic-like frames with brief descriptions of the scenes, because the attention should be on the user experience, their behaviors, and feelings. The main situations presented in every scene are the fear of an alert, the relief of having a safe place, or panic when the internet connection is lost (UNICEF Bangladesh, 2022). The chief strength of storyboarding is that it does not only benefit the designers, but also the entire team and stakeholders to view the big picture in a clear manner.

It makes complicated issues more straightforward and demonstrates precisely how the functions will assist the users when they feel the pressure. In the case of FloodGuard, storyboarding will be used to make sure that each of the functions like alerts, offline tips, or SOS will have a link with the real world, such as providing people with clarity, trust, and expedient decisions when they are most in need (Dix et al., 2004).

4.2 Wireframe Design

Wireframe resembles a skeleton of a web-based product- it demonstrates the layout and layout of a web page or a screen prior to the addition of any color, branding, or final design. You can consider it the blueprint of a website or an app (Cooper et al., 2014). A wireframe brings attention to where something will be: titles, buttons, pictures, and all the important navigation items. Wireframes may be drawn with a pencil on paper or created digitally, however, they are always kept to a bare minimum, typically in grey or white private to ensure that layout and usability are given priority. They do not have refined design elements such as fonts or gradients, but they define what is in which position and how users will navigate one part of the application to another (Figma, 2023)Mapping the structure will enable the designers and the programmers to have a clear picture of what requires construction and the stakeholders can contribute their feedback concerning the entire flow. This allows identifying issues way easier and addressing them in advance before transitioning to high-fidelity design (Google Material Design, 2023). As a nutshell, wireframes are a prerequisite in designing a user-friendly, functional, and effective application or web site. I have drawn hand sketching to visualize the vision of how many screens would appear to be in the case of digital version of wireframe. Wireframe is in fact a low fidelity design to visualize the requirement of customer/user.

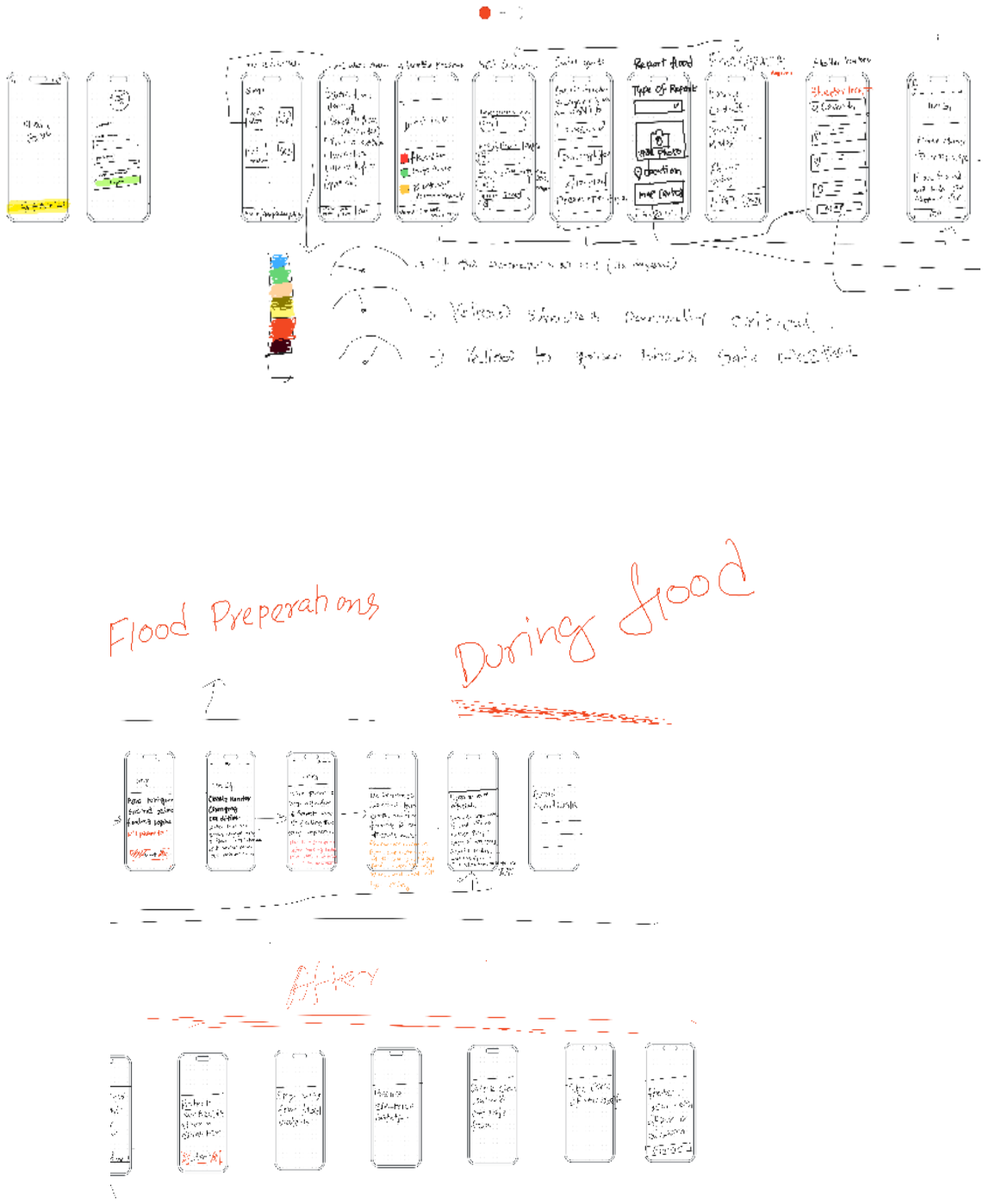

Figure 4.1: Wireframe (hand sketching)

This is the sketched version wireframe that I created to visualize all the screen in should look like to better understanding.

Figure 4.2: Splash screen

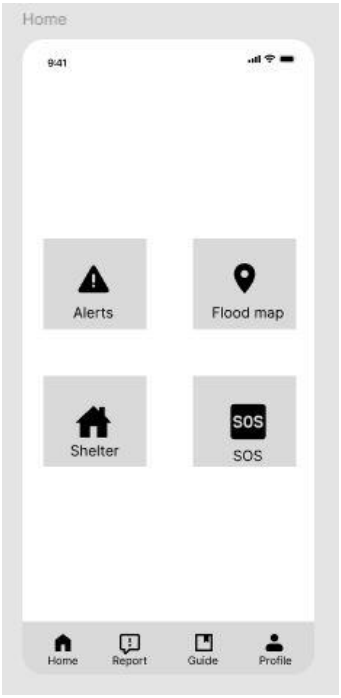

Figure 4.3: Home screen

This is the splash screen and home screen that I made for wireframe in low fidelity design-frame. In splash screen only logo will show up and in home screen 4 menu button and nav bar will show.

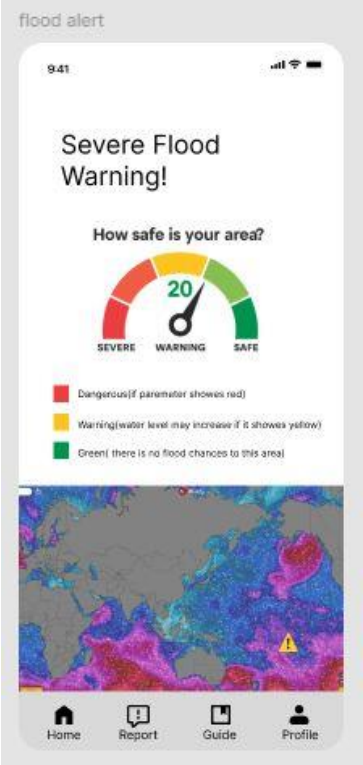

Figure 4.4: Flood alerts

Figure 4.5: Interactive flood map

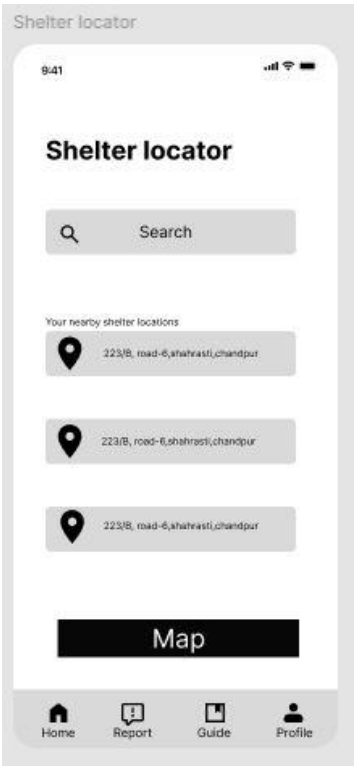

Figure 4.6: Shelter Locator

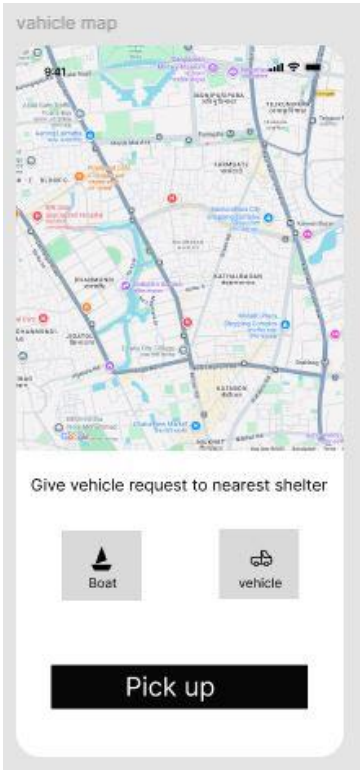

Figure 4.7: Interactive flood map

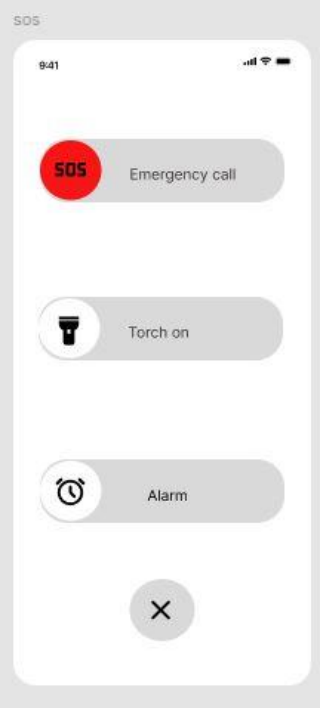

Figure 4.8: Emergency SOS

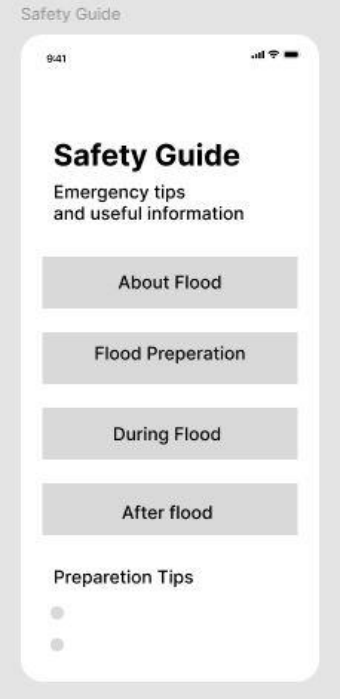

Figure 4.9: Safety Guide

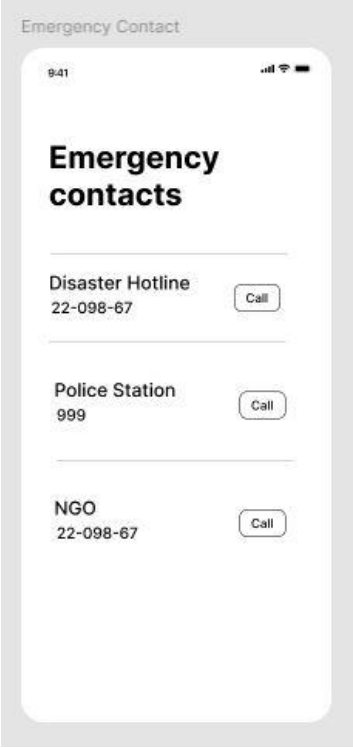

Figure 4.10: Emergency Contact

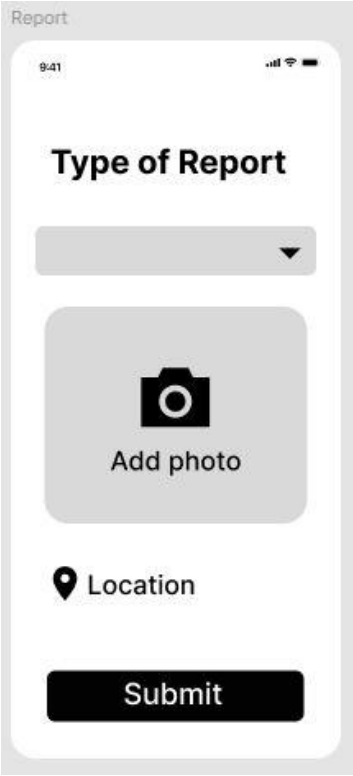

Figure 4.11: Report Flood

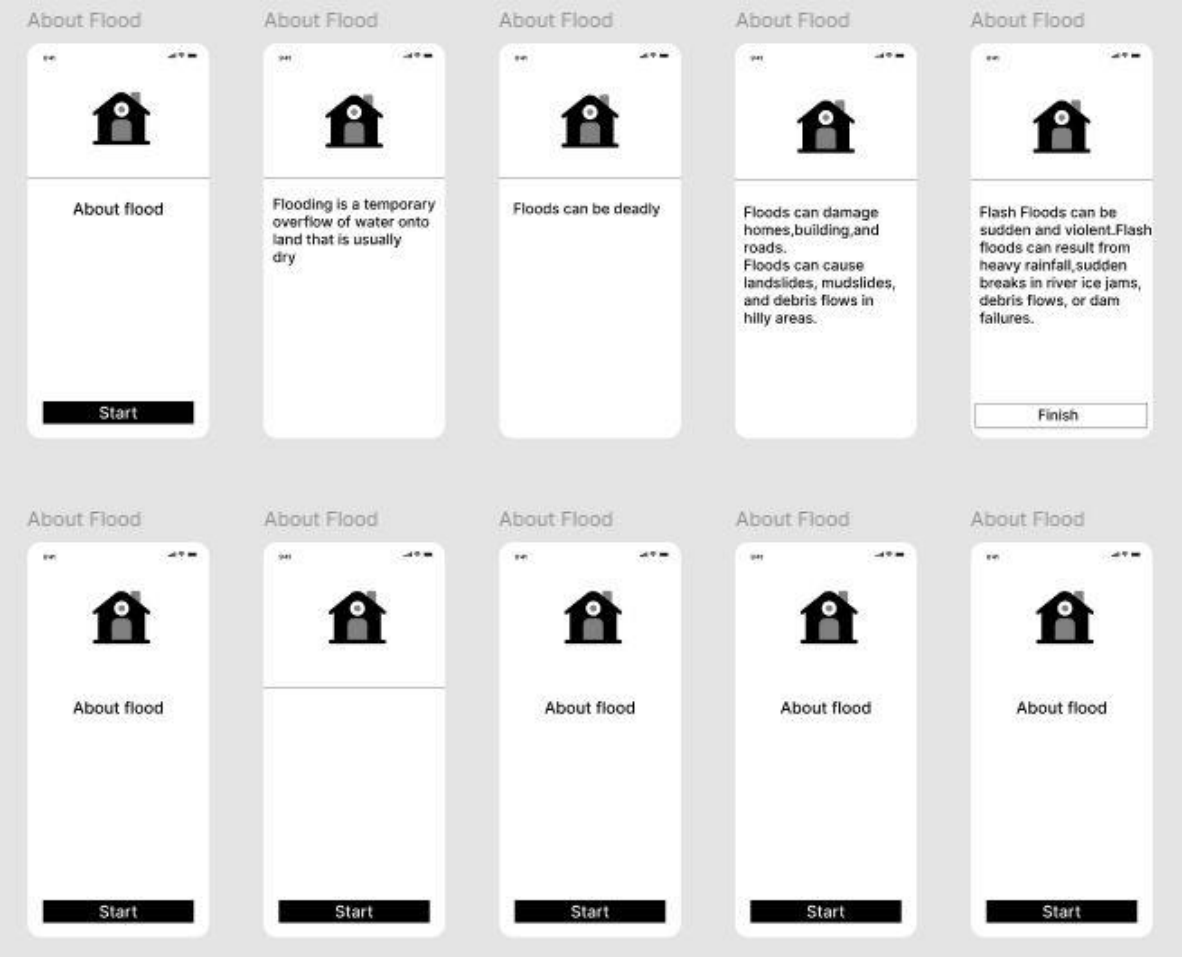

Figure 4.12: About Flood(Flood Instruction)

4.3 Color Analysis

Color Analysis Color analysis entails the study of the impact of colors on perception, usability and emotion of a product, design, or brand (Adobe, 2023). In design, it is not simply about the selection of beautiful colors, but it is about how the particular hues can change the behaviors of the users, accessibility, and even the trust of the users. The main color which is used in the FloodGuard app is red and the decision to choose this color is both symbolic and practical. Red is inherently a sign of urgency, danger, and alertness and hence a good color to draw attention when one has to act in case of an emergency like floods. Psychologically, it elicits more rapid recognition and reaction

which is in line with the mission of the app delivering rapid and actionable alerts. As an illustration, Blue reminds of water, confidence, and serenity, combining the effectiveness of red and rendering the app dependable. Neutral backgrounds can be made in grey or white, which make it readable. Such a palette implies visual hierarchy, with red being the colour of the instant action, blue being the colour of the guidance and trust, and neutral colour being the colour of the readability and balance (W3C, 2018). All in all, red is not merely a color but a psychological weapon that will enhance the usage of the app as a life-saving and human-centric platform.

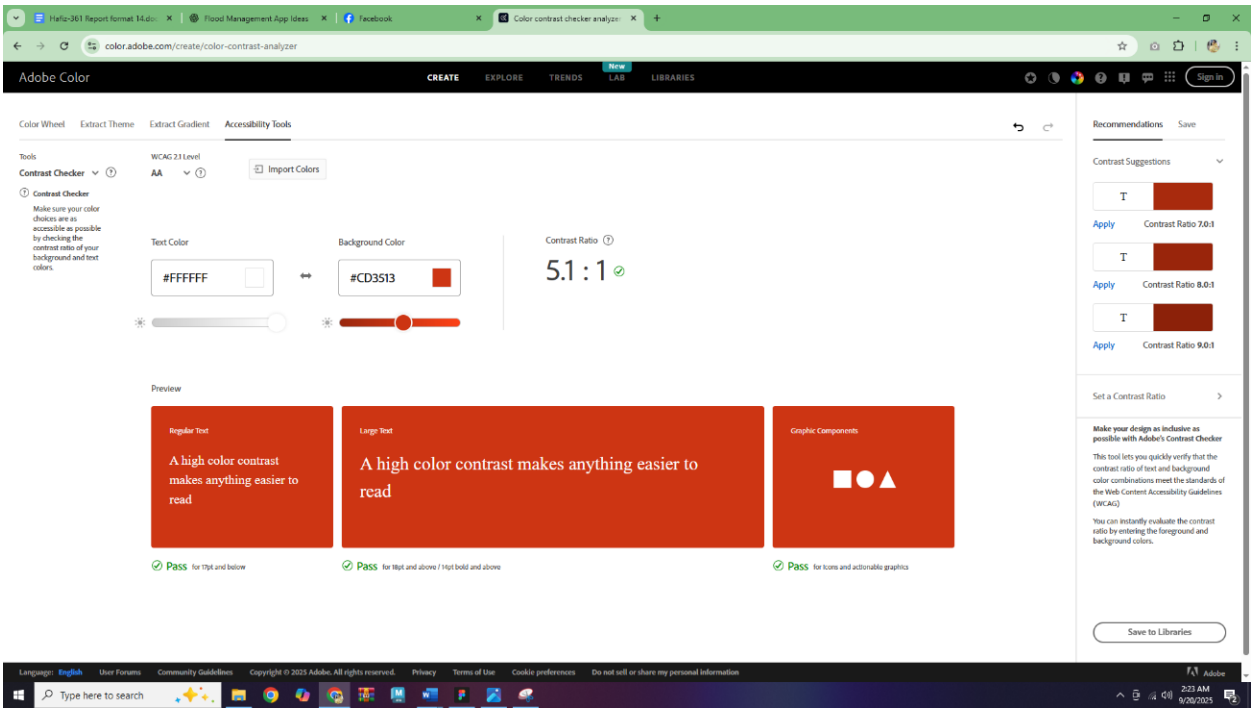

Figure 4.13: Adobe color analysis

The color analysis of Adobe Color demonstrates that the color combination red and white you have selected to use in your app is available and safe (Adobe, 2023). The contrast ratio of the white text (#FFFFFF) and red background (#CD3513) calculated by the tool is 5.1:1. This ratio is more than the minimum required accessibility level of 4.5:1 in regular text and 3:1 in large text, as stipulated in WCAG 2.1 accessibility standards, thus hits the AA compliance level (W3C, 2018). The sample images affirm that this color combination is user-friendly to read normal and large text, icons and graphics. On the recommendation side, Adobe proposes a bit of darker color of red that would raise the contrast ratio to 7:1, 8:1, or 9:1, which would satisfy the higher standards of AAA level of maximum readability. In the case of FloodGuard, it means that your existing branding of red and white is already as readable as it can be in an emergency, but is you wish to make the red just a little bit darker in order to make readability as high as possible, to all users.

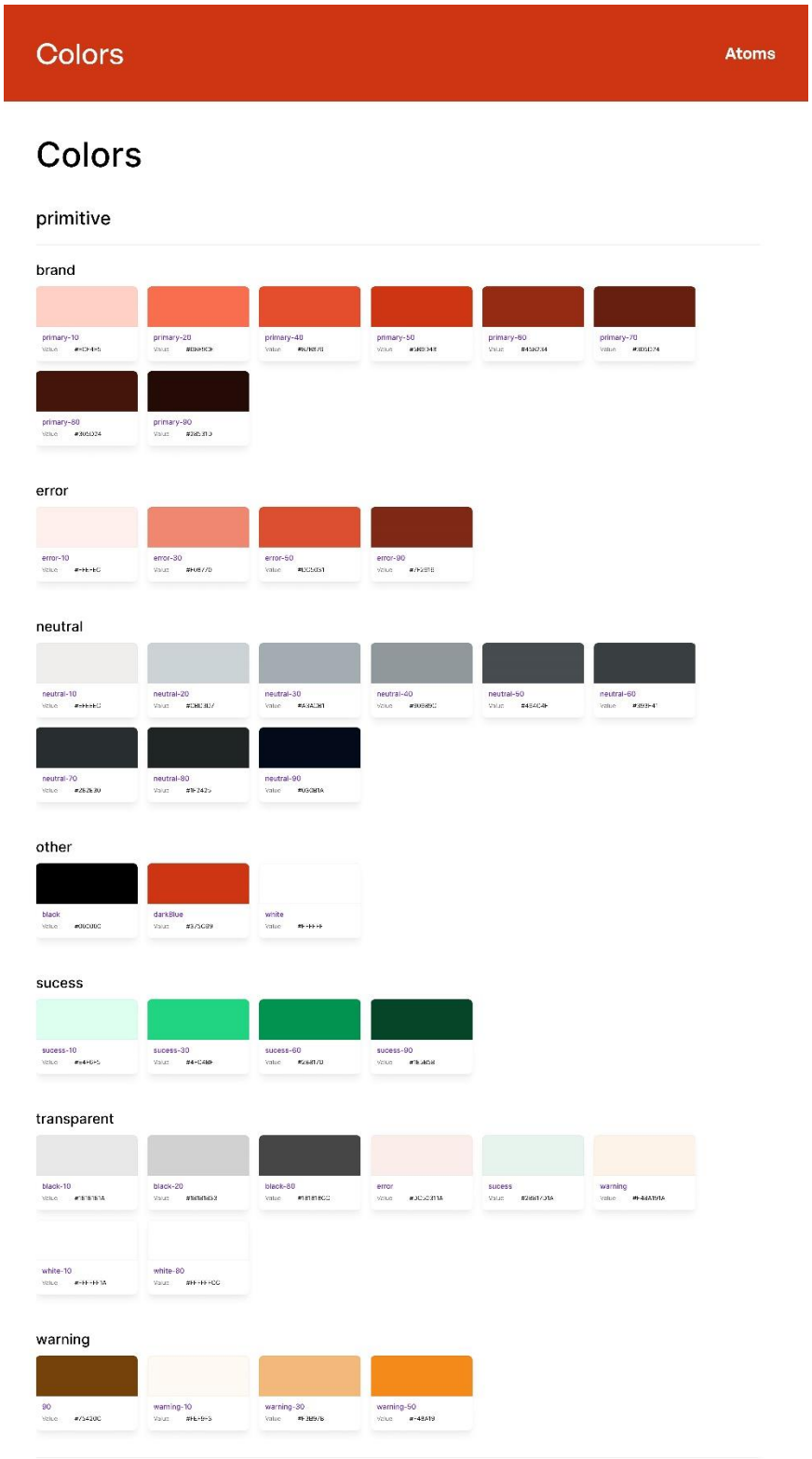

Figure 4.14: Primitive color palatte

This is the color that I have used in my design system so that I can easily input those color to my UI design. This are the primitive color that I used in my design.

4.4 Font Analysis

Visual communication within a design system is based on typography. It creates order, brevity and uniformity, enabling the users to easily understand what is most pertinent in the information (Atlassian, 2023). Typography can be used by establishing guidelines on font sizes and styles to use on titles, body text, and other features such as buttons, to ensure a consistent experience across Simply put, typography within the design system does not only concern the selection of fonts, but rather the easiness, understandability, and reliability of information (Google Material Design, 2023).

FloodGuard typography system is created with a clear, consistent and easy-to-read typography. It relies on the General Sans font family as the key typeface used in different weights (Regular, Medium and Semibold) to establish a strong visual hierarchy. The most important alerts and banners have large display sizes (57px to 36px) to make sure that the key messages can be noticed immediately. Headlines (32px-23px) establish priorities among sections and are smoothly used to present the user with the important information.

Emphasis in cards, dialogs or smaller highlights sometimes have titles (20px to 14px). Body text (16 and 14-pt) is geared in reading lengthy passages or crucial updates. Forms, buttons, and tags contain labels (16px to 11px) to keep a consistency among smaller interface elements (Apple, 2023). This system will guarantee the users that they can easily distinguish between alerts, guidance, and action which is imperative in flood disasters where rapid interpretation and decision-making is required. priorities and take a user through important information. Cards, dialogs or smaller highlights are written in titles with font sizes of 20 to 14pt, and stress is usually written in capital letters.

The sizes of 16px and 14px are optimized to use body text, which is simple to read by users in extended passages or important update. Labels are written in buttons, tags and forms in any of 16 pixel to 11 pixel to ensure uniformity in smaller user interface components.

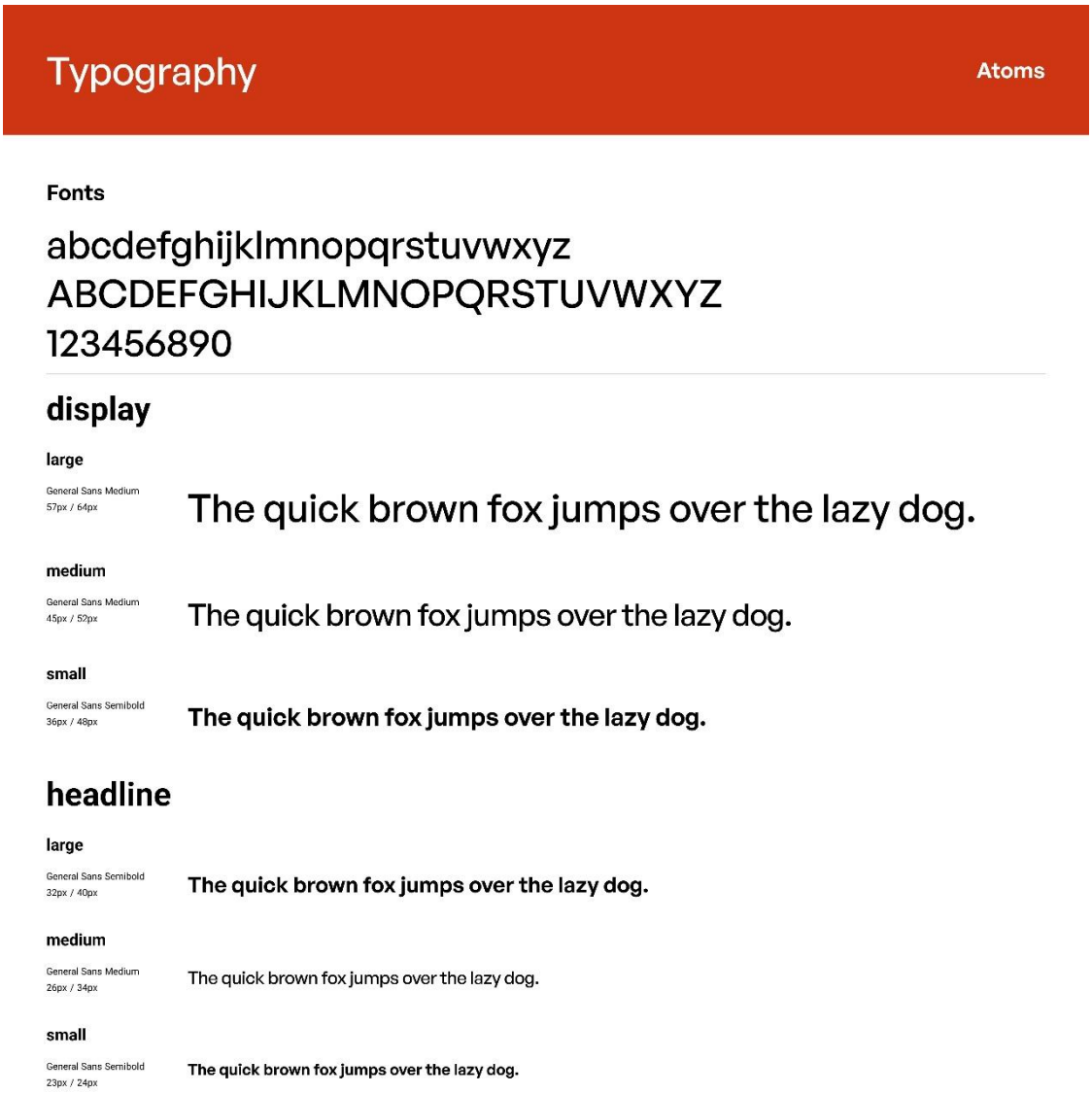

Figure 4.15: Typography

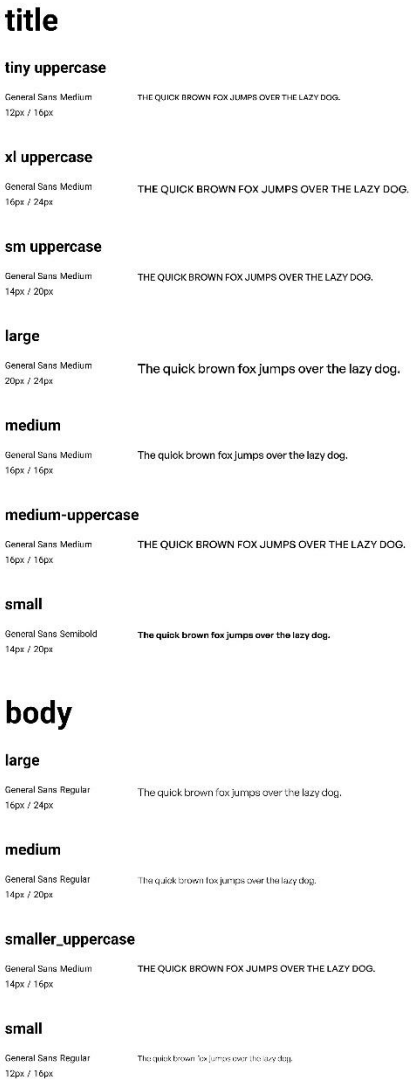

Figure 4.15.1: Typography

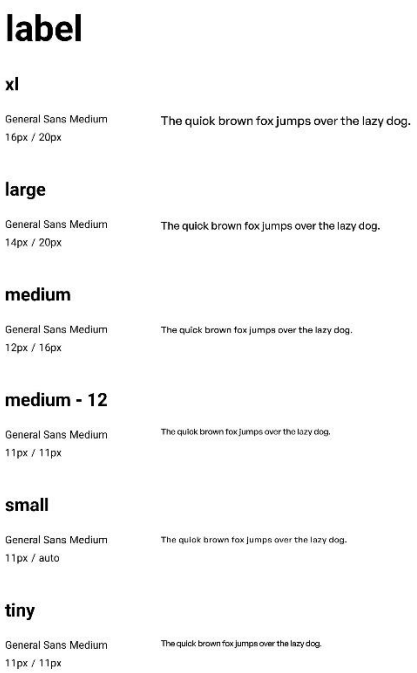

Figure 4.15.2: Typography

priorities and guide the user smoothly through key information. Titles, ranging from 20px to 14px, are used in cards, dialogs, or smaller highlights, often in uppercase for emphasis. Body text is optimized for legibility with sizes of 16px and 14px, making it easy for users to read longer passages or essential updates. Labels, used in buttons, tags, and forms, vary between 16px and 11px to maintain consistency in smaller interface elements.

4.5 Prototype Design

A prototype design is essentially a working model of a product that demonstrates how it will look and function before it goes into final development *(Figma, 2023)*. It acts as a draft or simulation that allows designers, developers, and real users to test the flow, layout, and usability of the product. Prototypes can range from low-fidelity sketches focusing only on structure to high-fidelity, interactive mockups that closely resemble the finished app, complete with colors and clickable elements *(Cooper et al., 2014)*.

The main goal of a prototype is to visualize user interactions, collect feedback, and find potential problems early on, which saves both time and money. For the FloodGuard app, a prototype can simulate critical user actions like receiving a flood alert, finding the nearest shelter, or sending an SOS. By testing this with users, the design team ensures the app is intuitive, user-friendly, and truly ready to meet real-life emergency needs *(Google Material Design, 2023)*.

Figure 4.16: Splash screen

This is the splash screen of the application. The logo will pop up after opening the app.

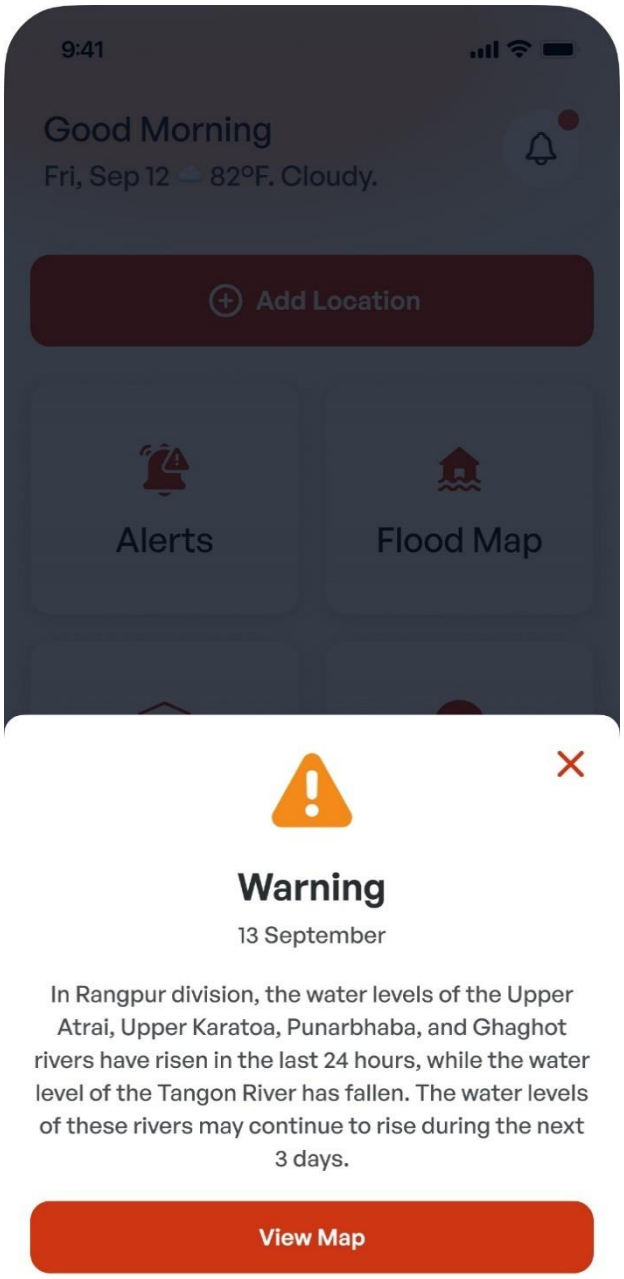

Figure 4.17: Warning Alert

After entering into the app the warning screen will appear with recent warning notifications.

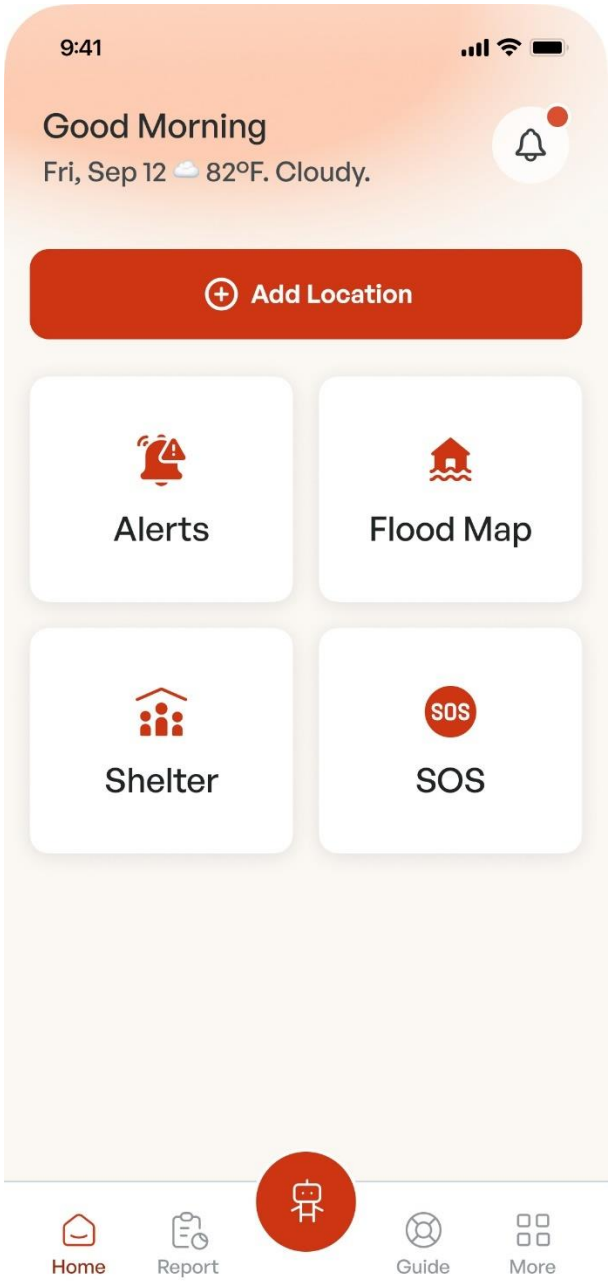

Figure 4.18: Home screen

This is the home screen of the application with interactive button options.

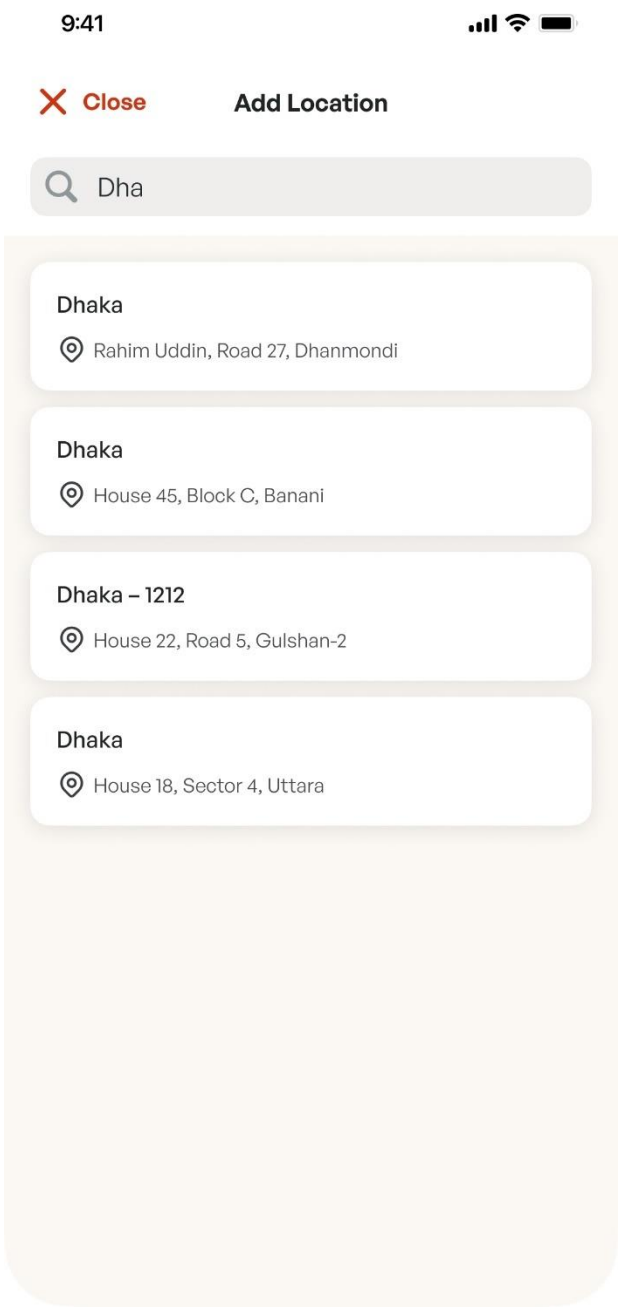

Figure 4.19: Add Location Screen

With the add location screen location must be added to find nearest shelter locations.

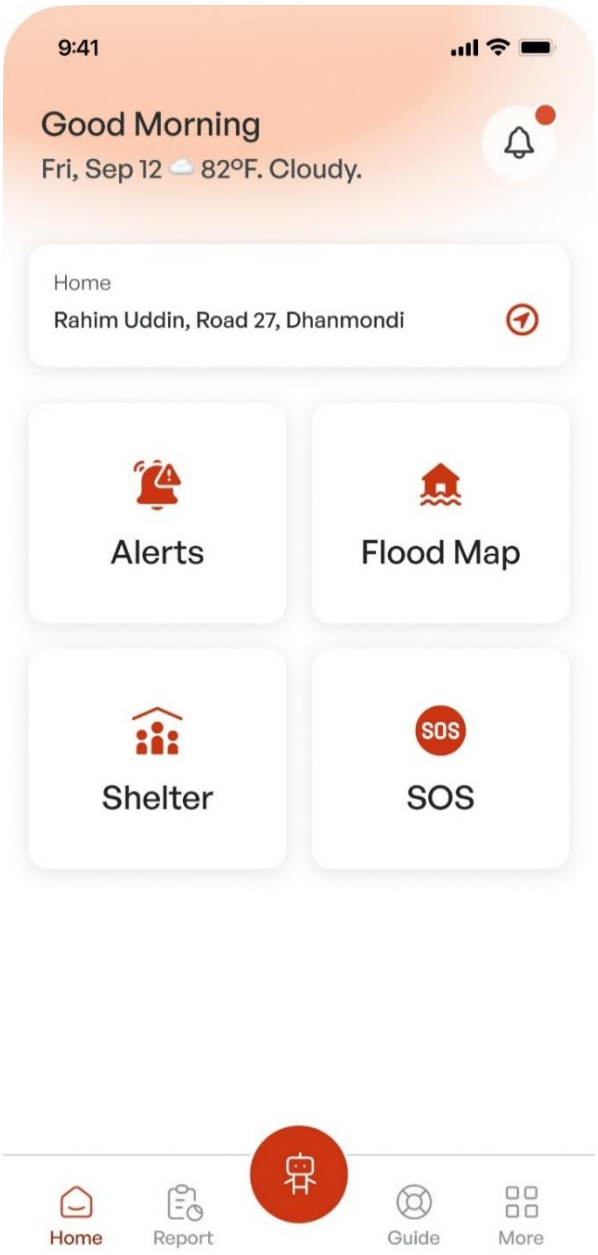

Figure 4.20: Home Screen (After adding the Location)

This is the home screen after adding the location.

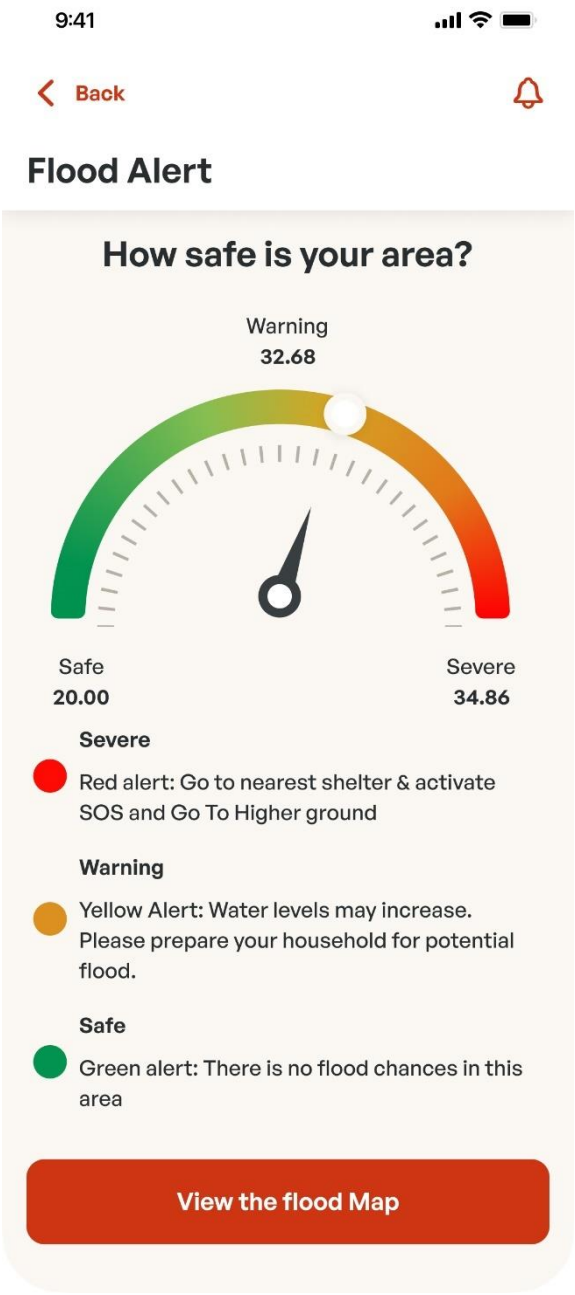

Figure 4.21: Flood Alert Screen

This is the flood alart paremeter that shows the highest chance and the safe percent with radar.

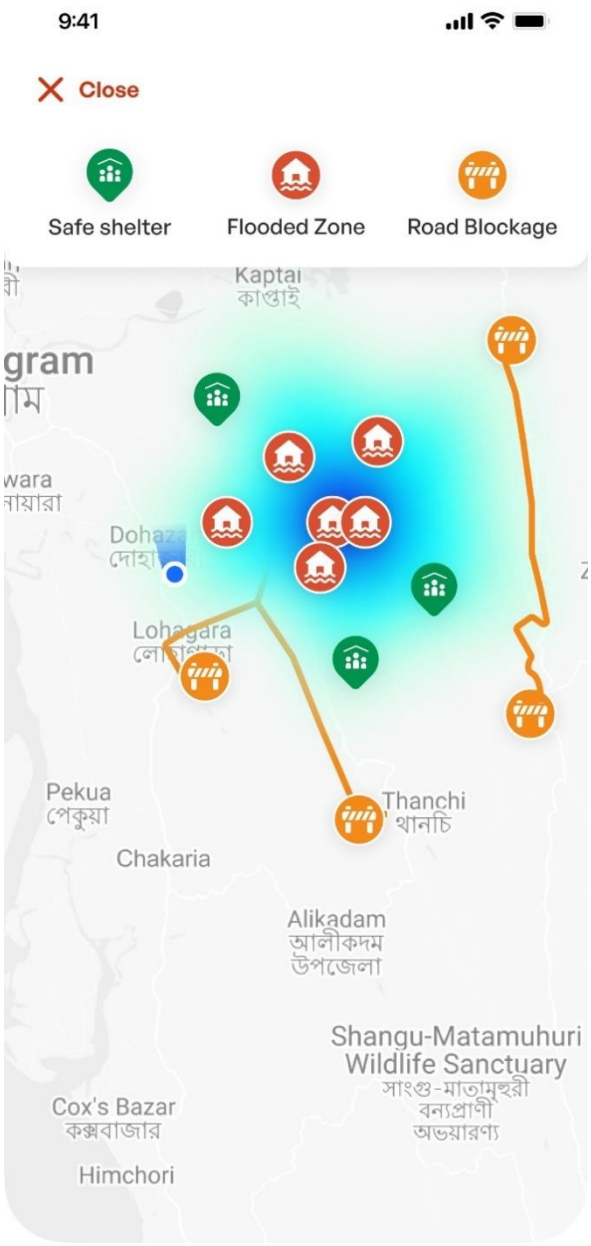

Figure 4.22: Interactive Flood map

This is the interactive flood map

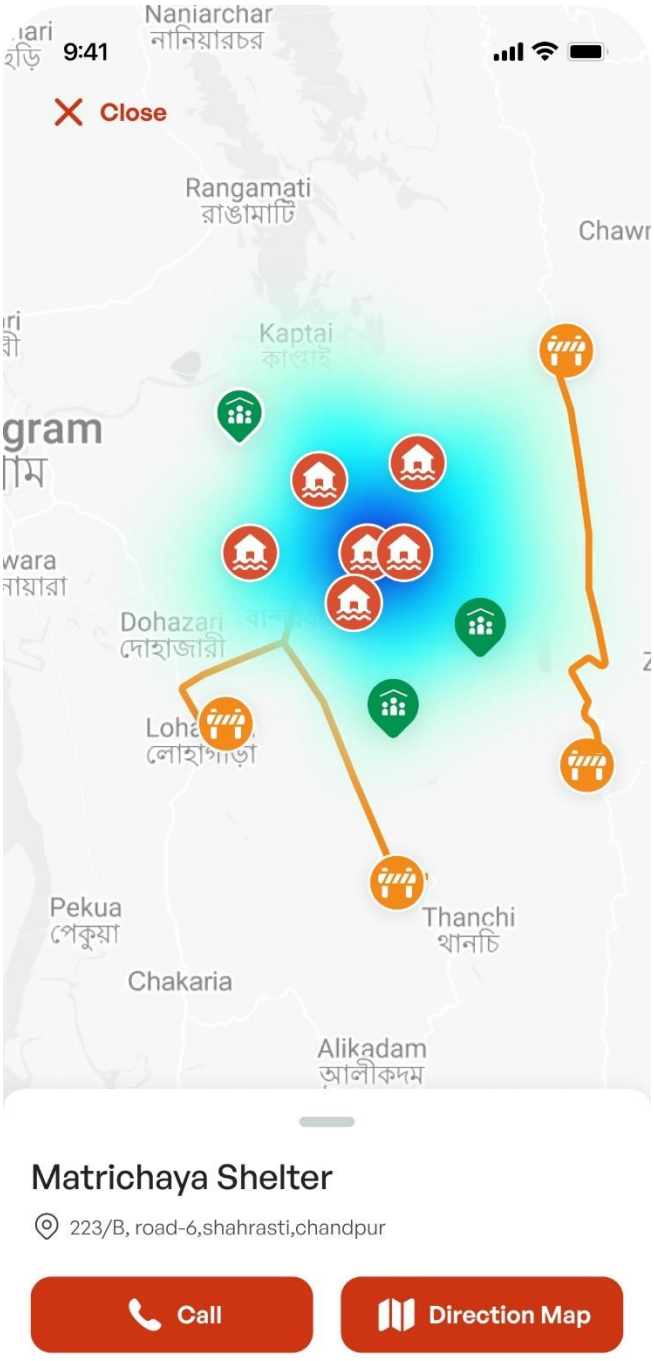

Figure 4.23: Nearest Shelter screen

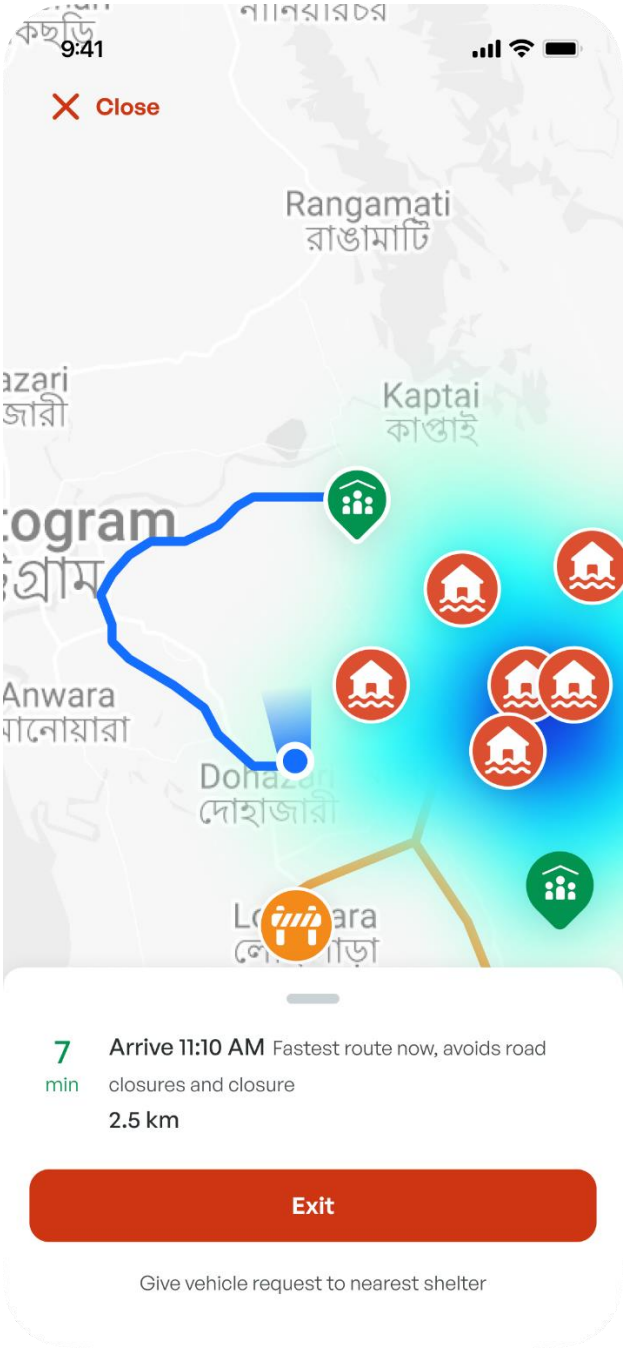

Figure 4.24: Interactive Flood map

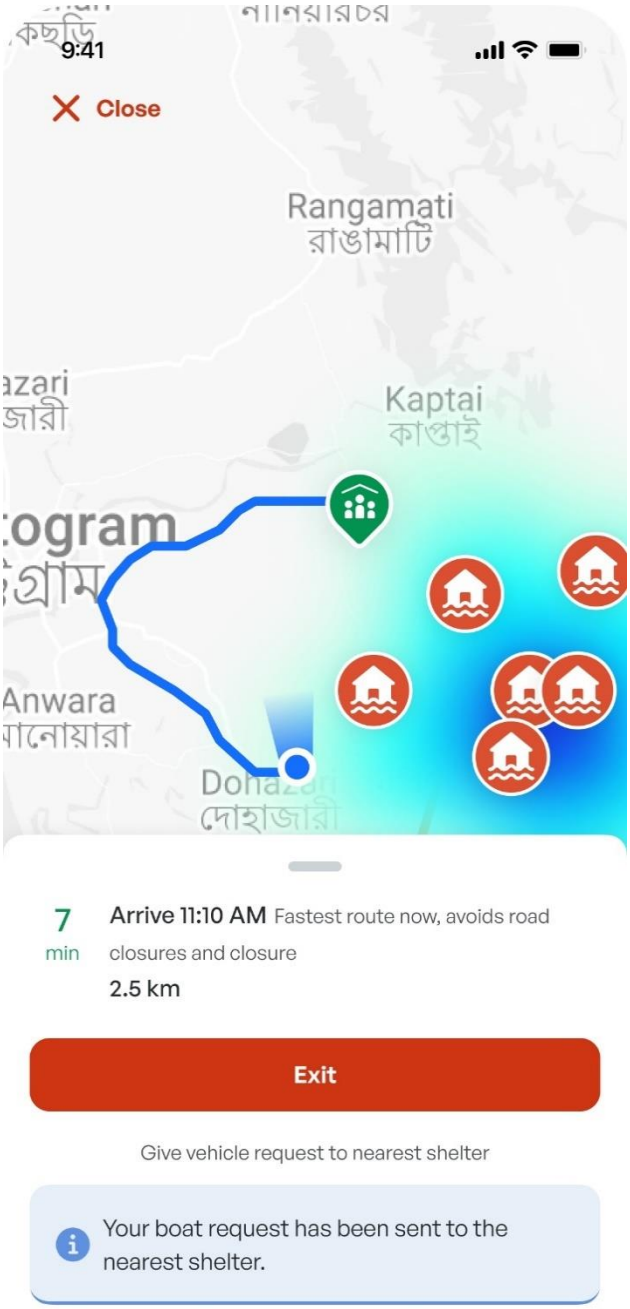

Figure 4.25: Interactive flood map

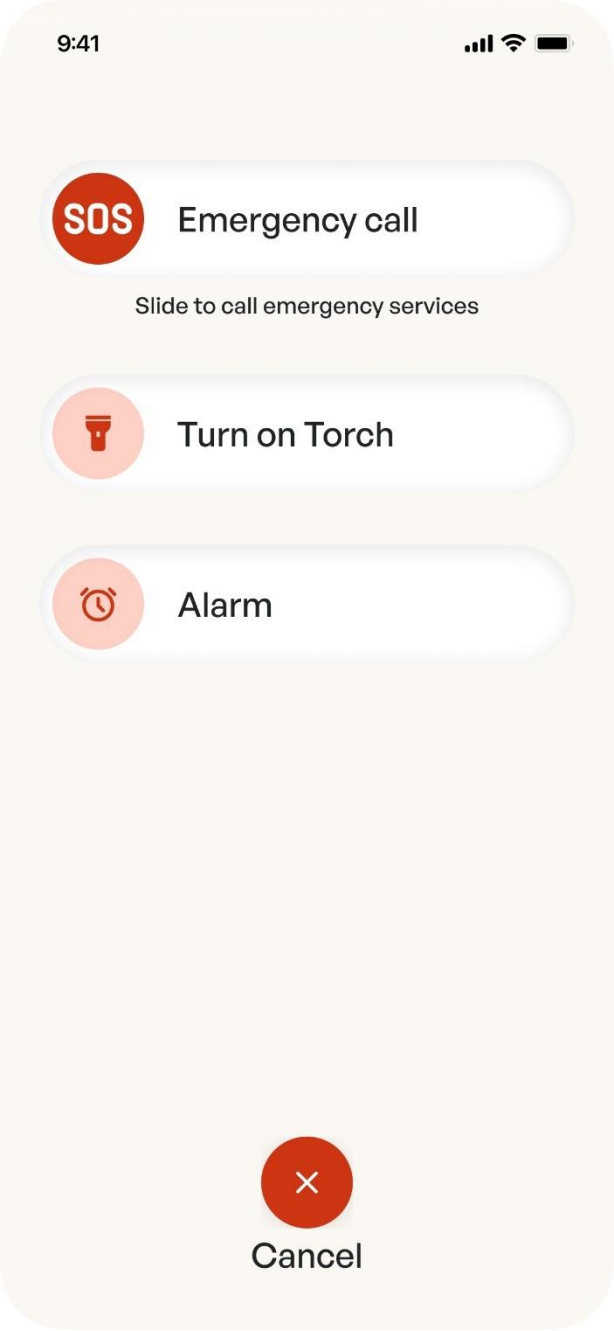

Figure 4.26: Prototype

anyone can turn on the emergency sos on emergency situation. So that report may submit to the nearest shelters.

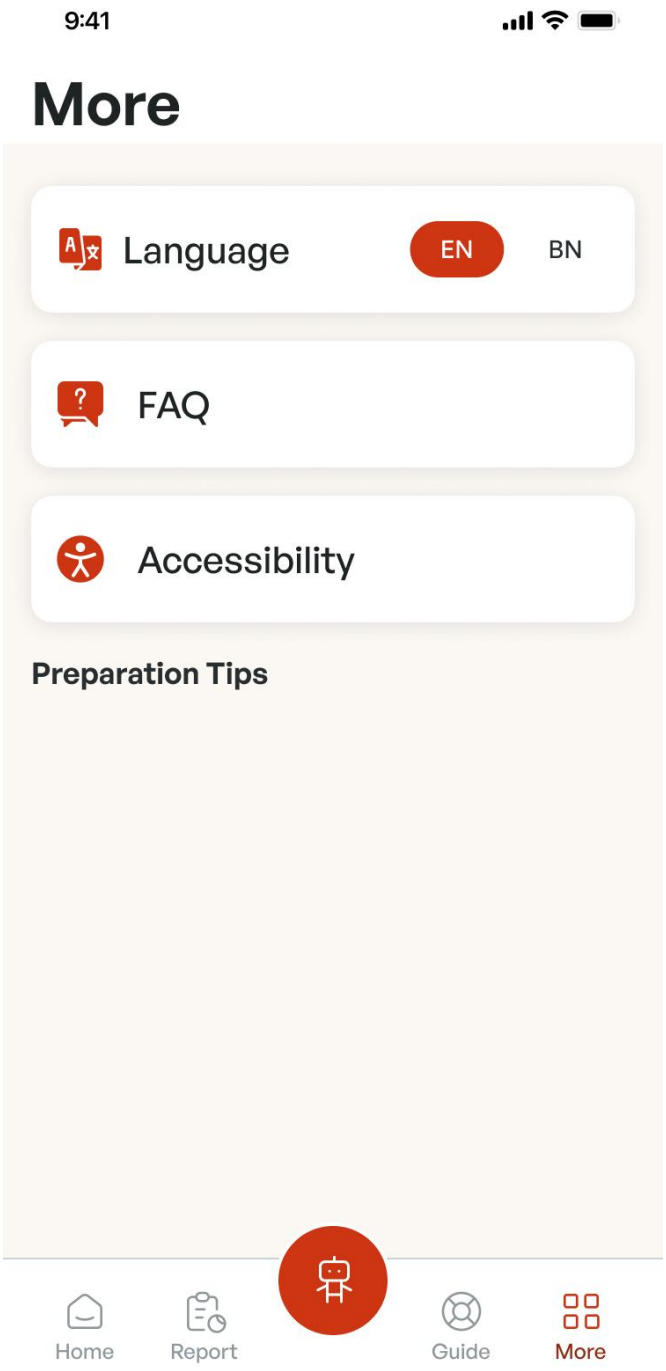

Figure 4.27: More Screen

This is the language changing screen.

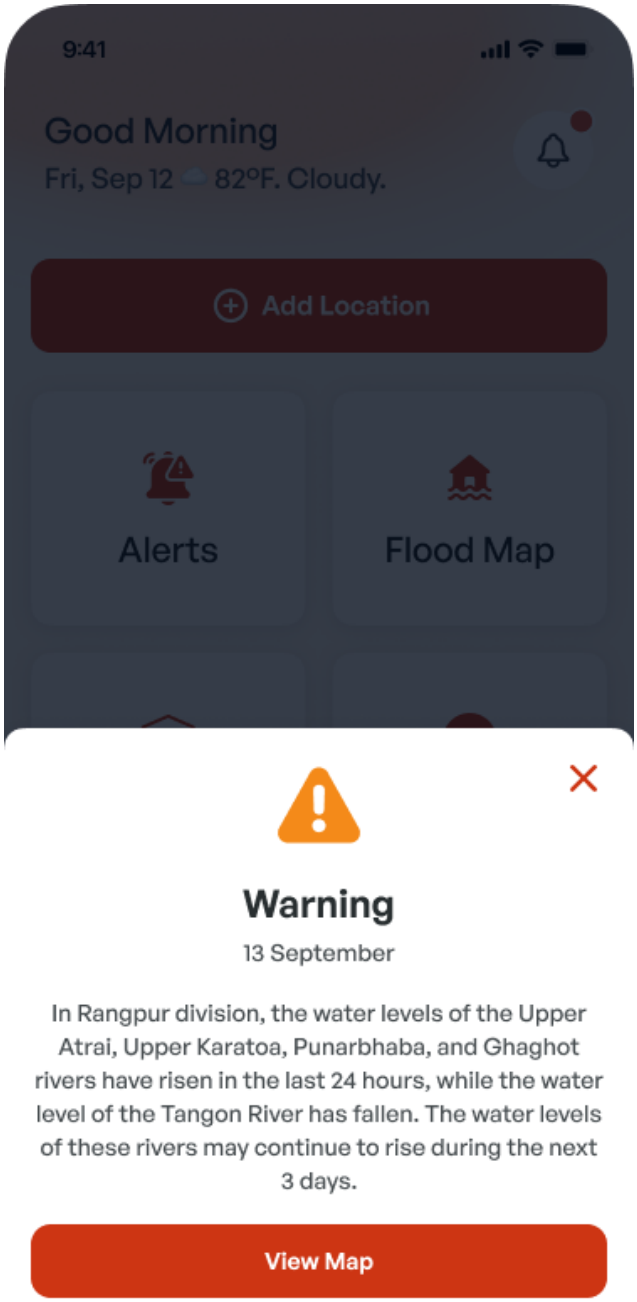

Figure 4.28: Warning alert

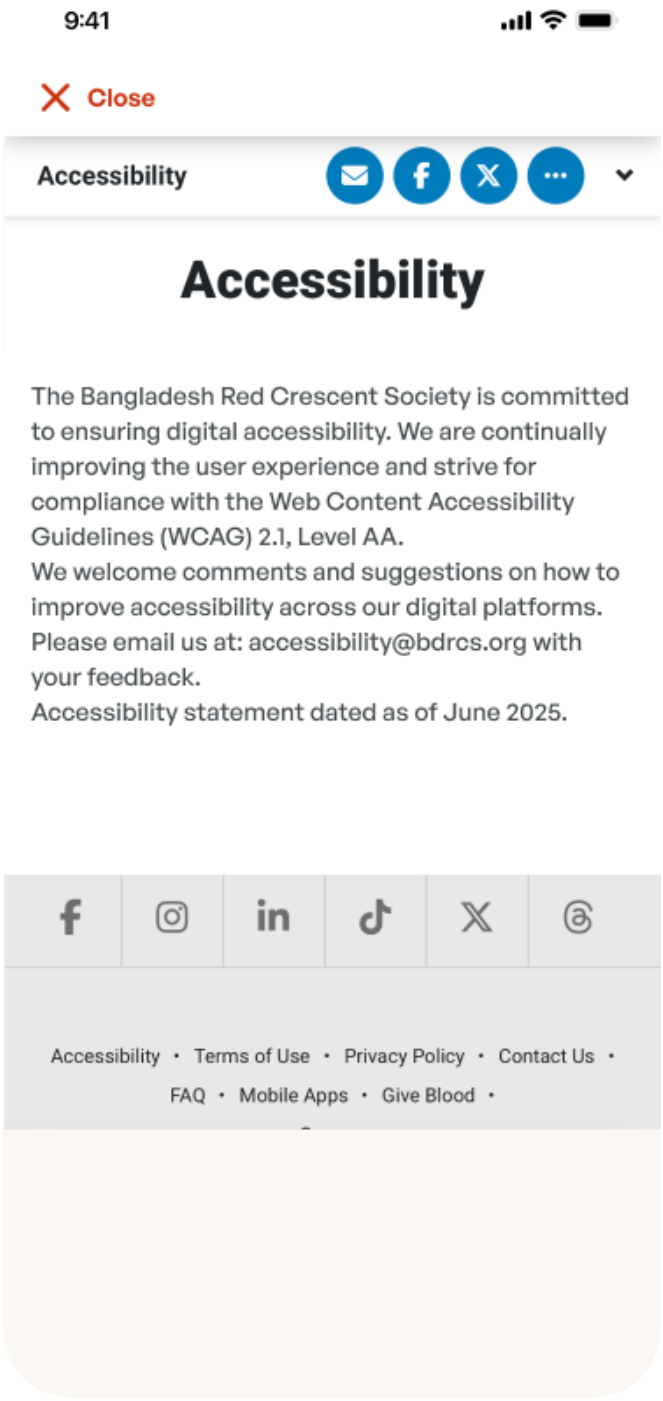

Figure 4.29: Accessibility

Accessibility screen helps for any disabled person who can not use application.

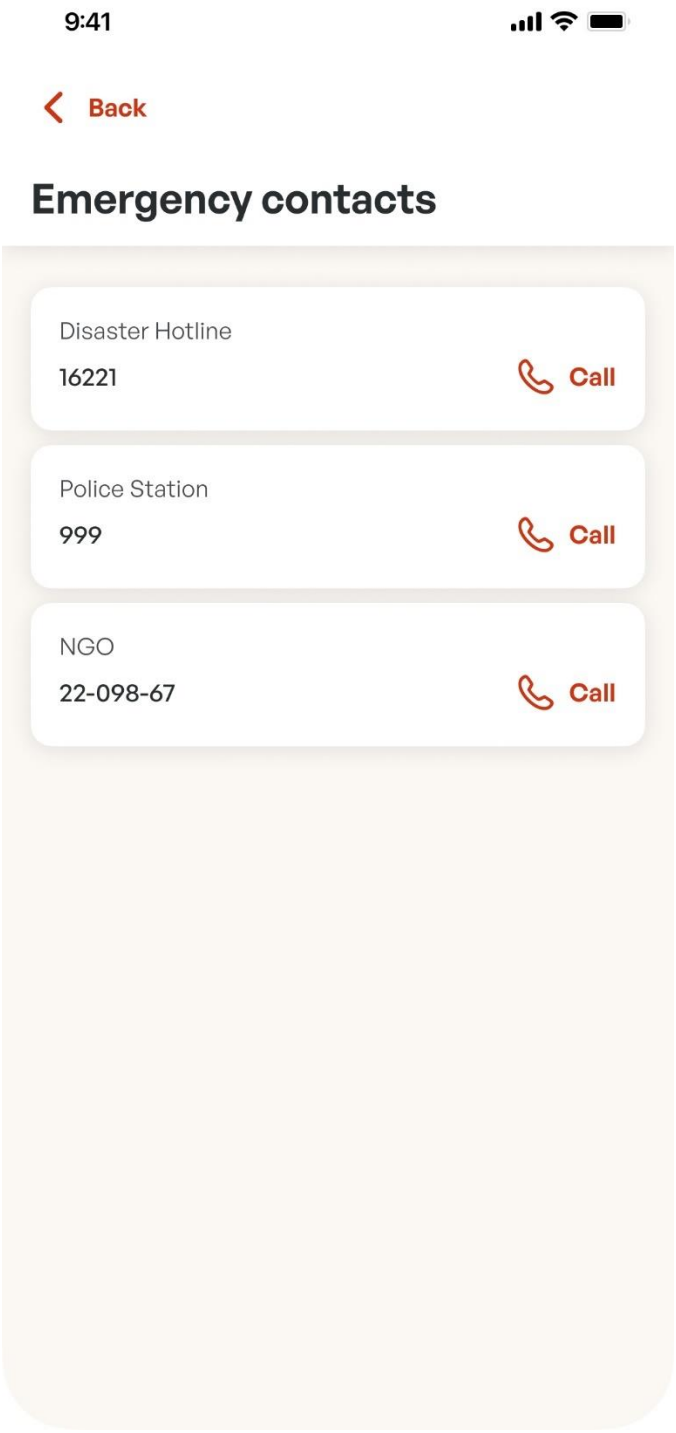

Figure 4.30: Emergency Contact

This is the emergency contact screen for emergency local service providers

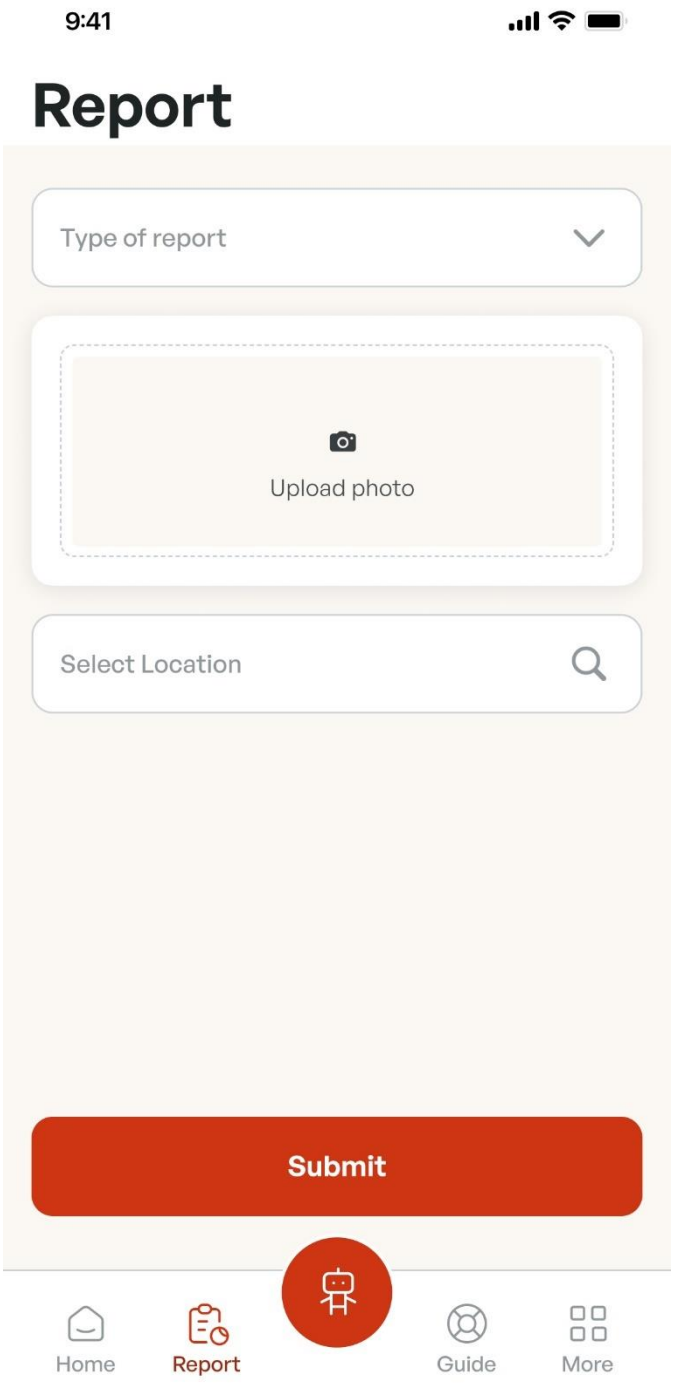

Figure 4.31: Report

This is the flood report screen for any flood report.

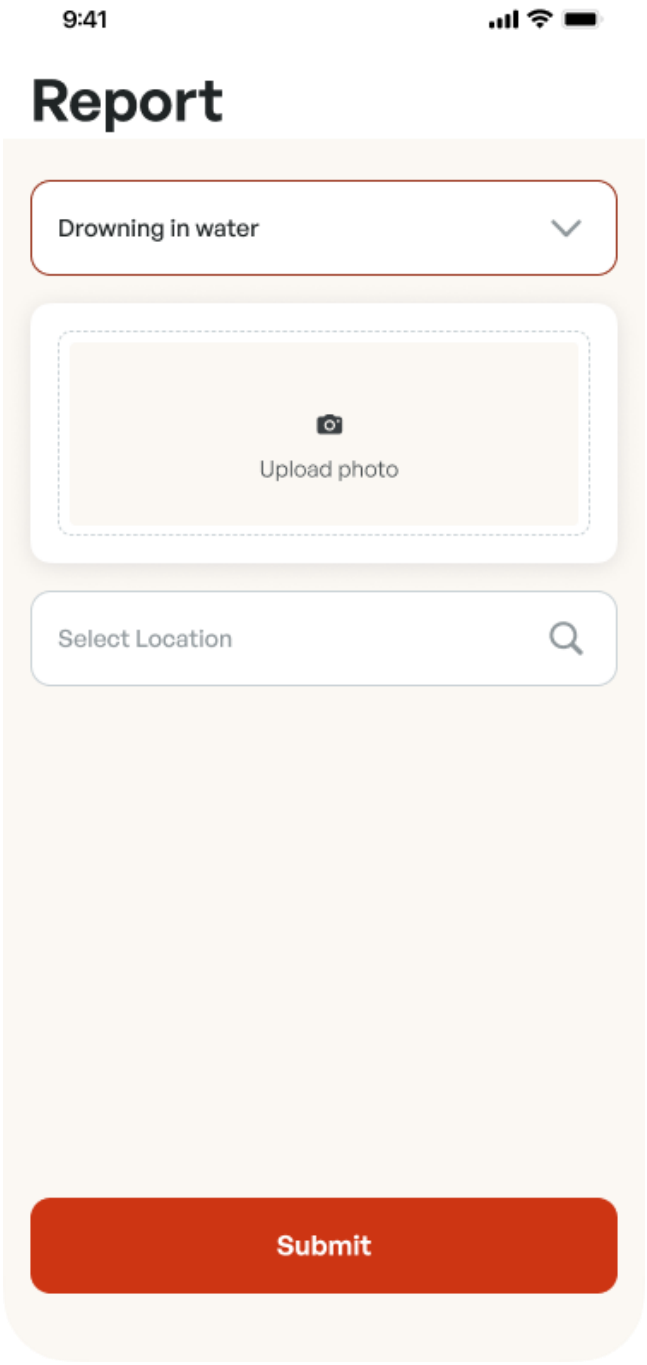

Figure 4.32: Type of Report

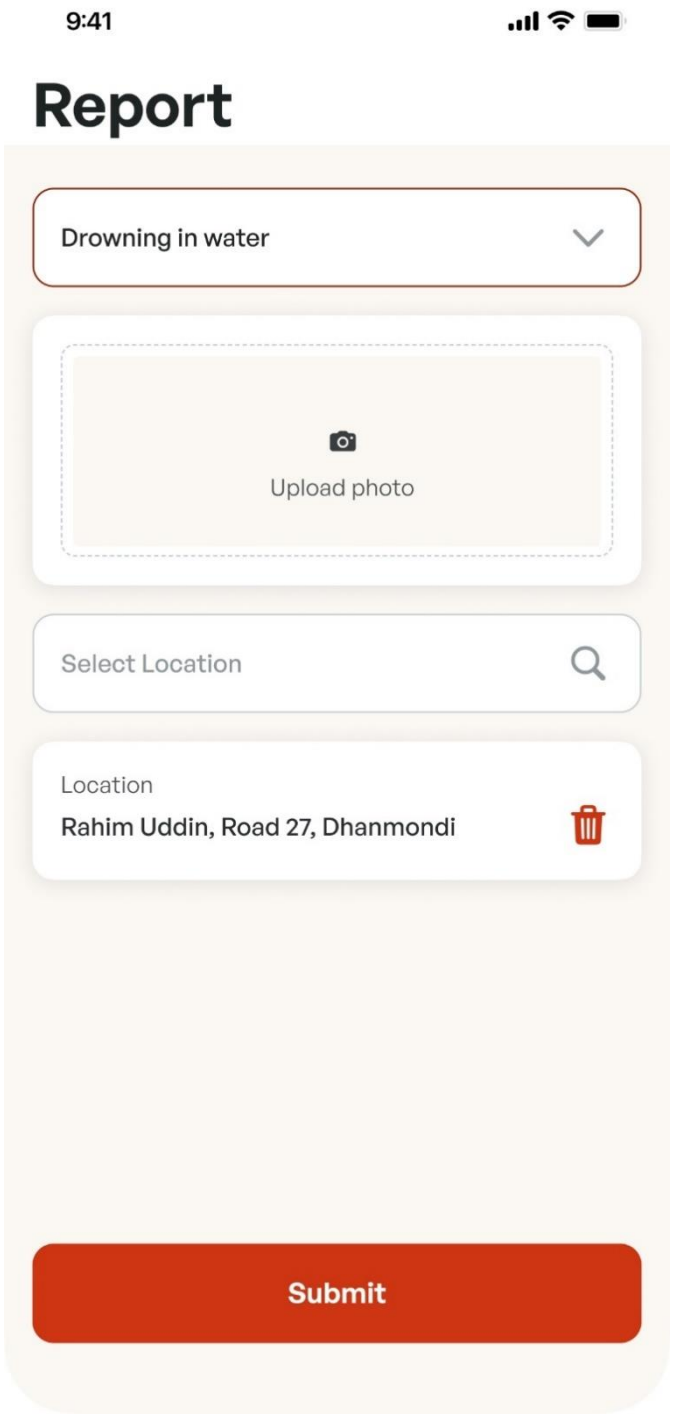

Figure 4.33: Report

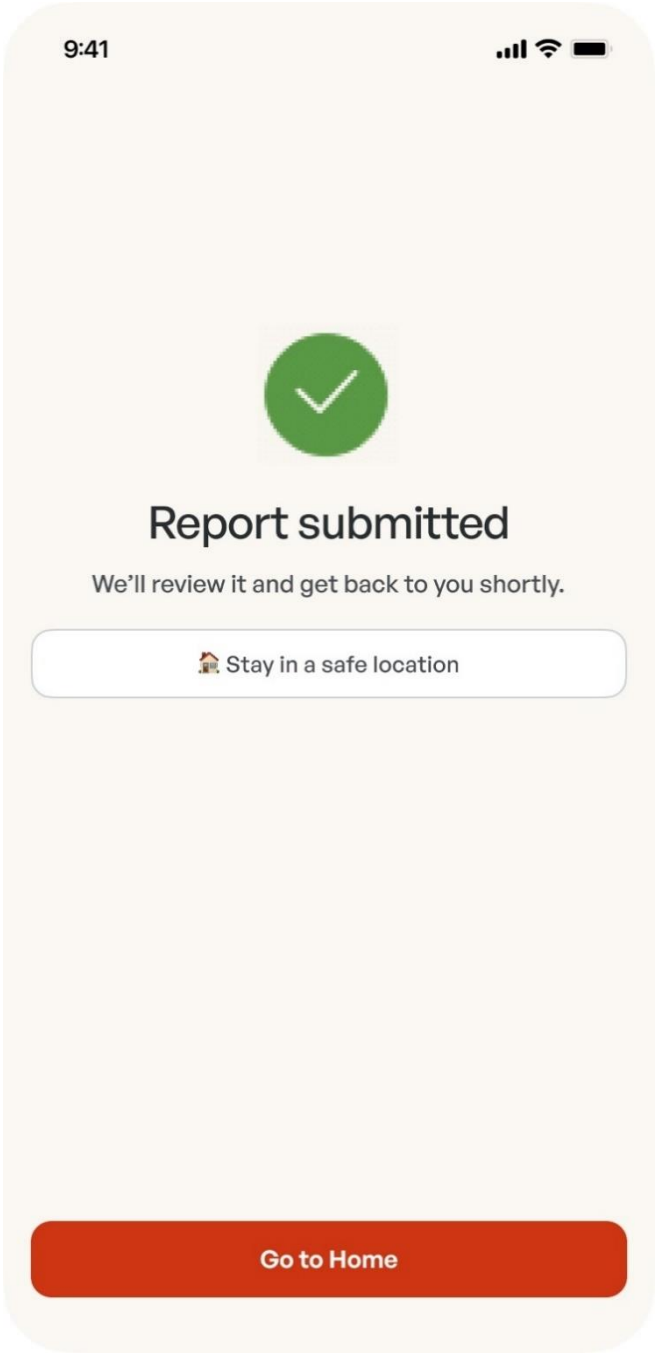

Figure 4.34: Report Submission

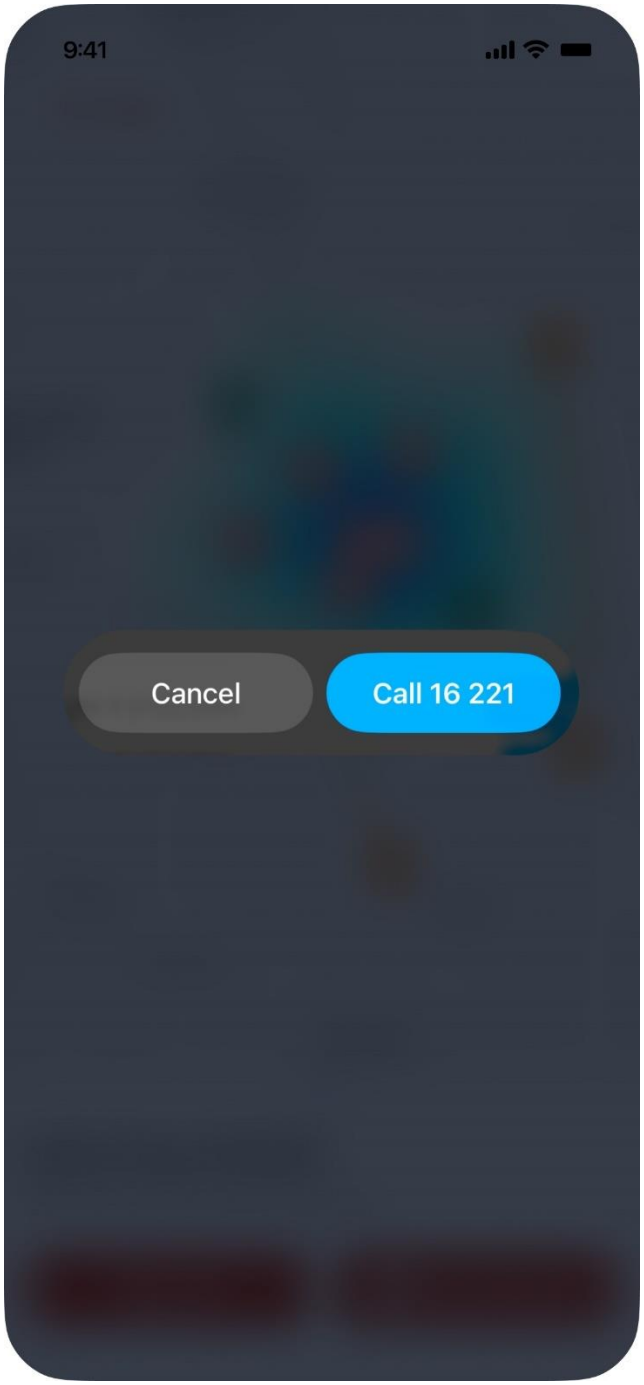

Figure 4.35: Emergency Call

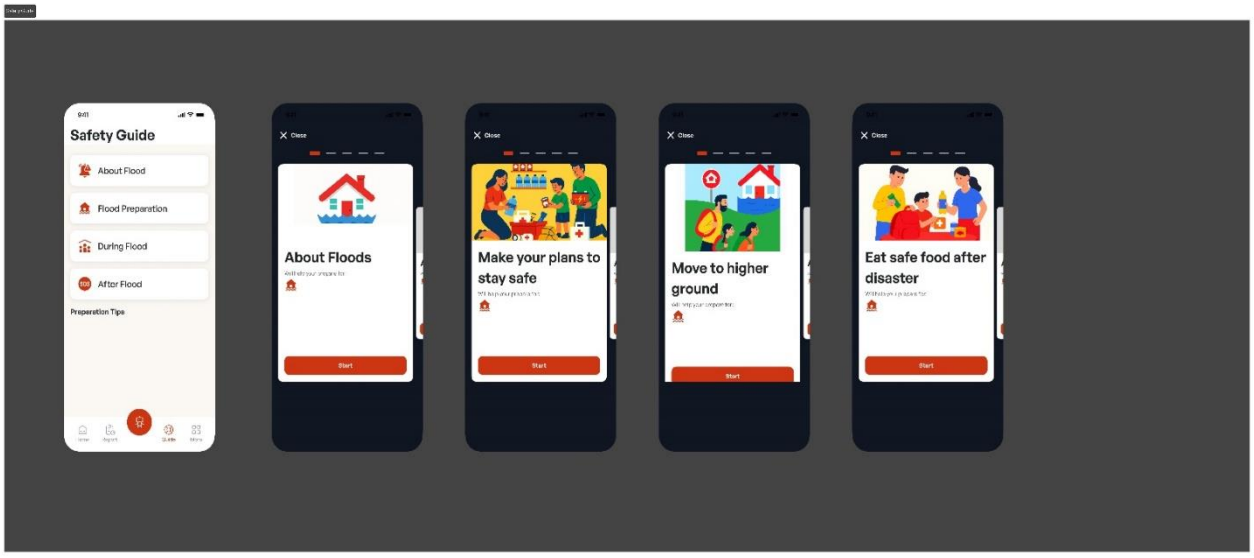

Figure 4.36: Emergency Guide

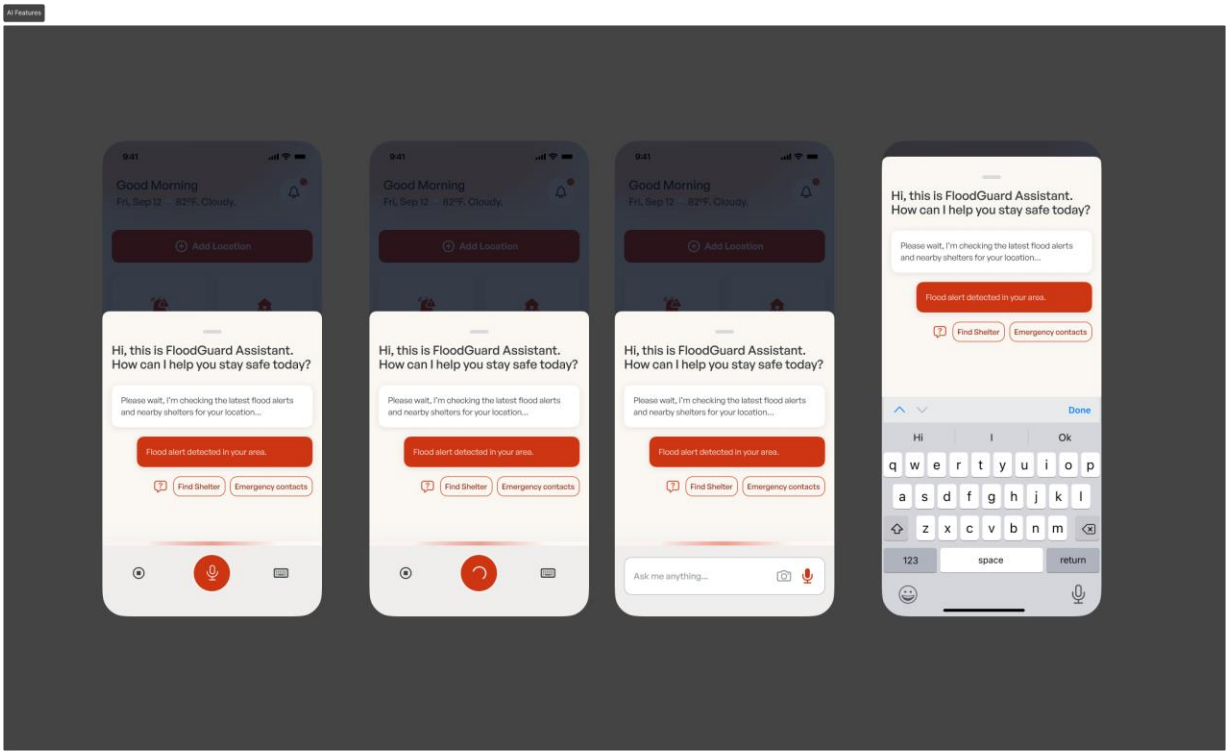

Figure 4.37:AI features

Figure 4.38: Prototype

This is the prototype the application

Admin panel

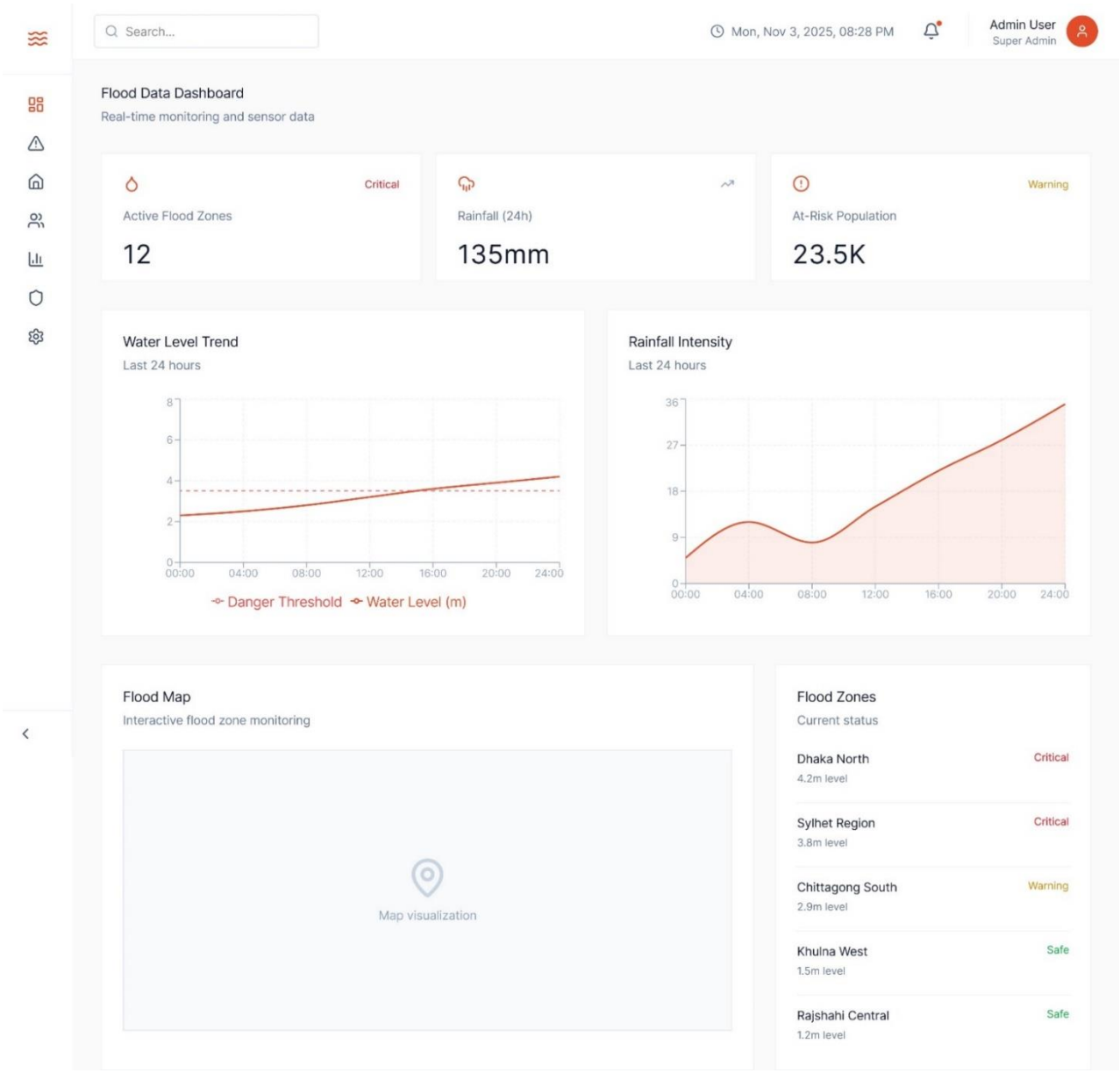

Figure 4.39: Admin Dashboard

This is the admin website screen for manage the flood data where they can give the service to general people according to data. And mostly admin will run the app and response with this landing page

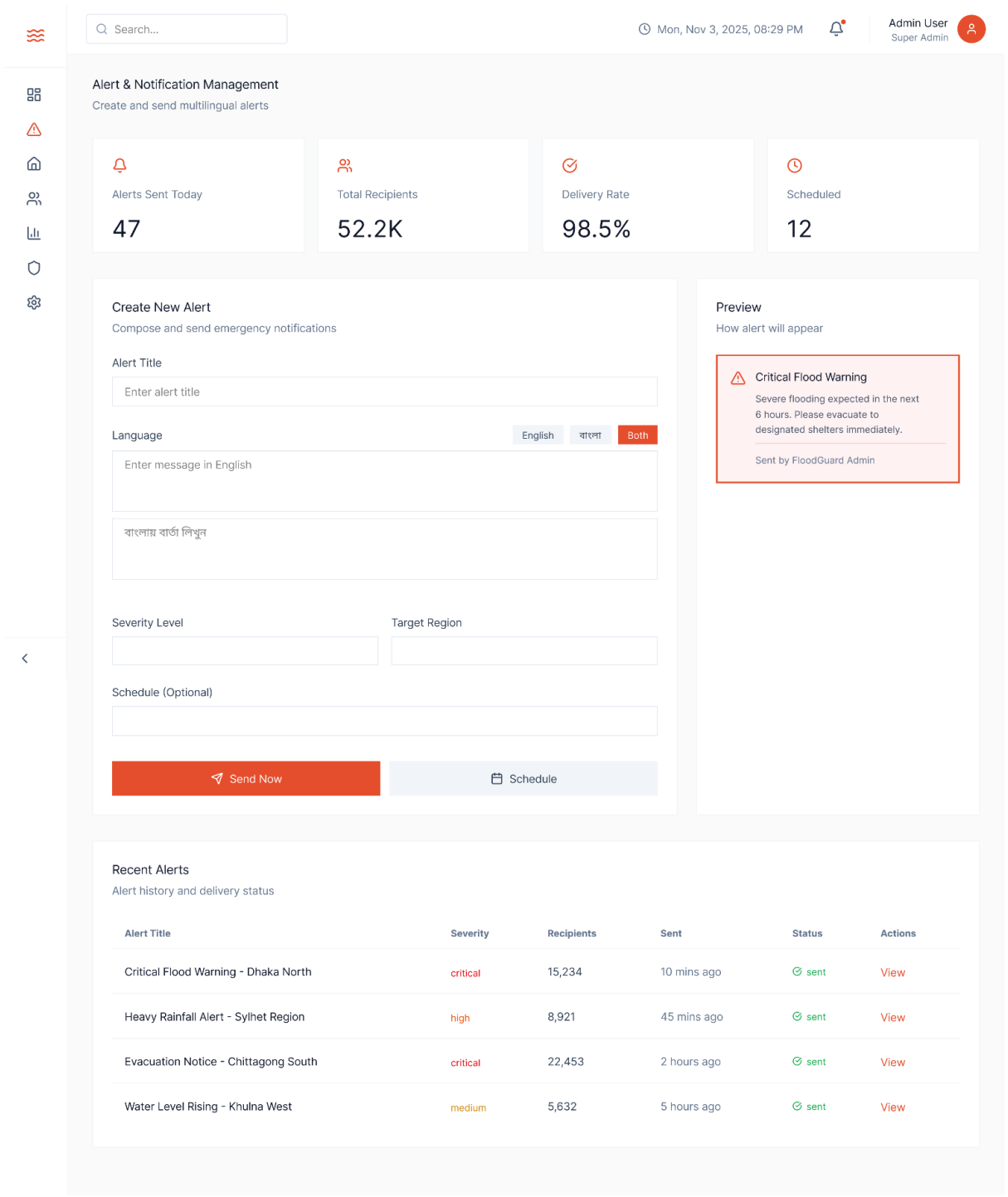

Figure 4.40: Alert And Notification Management

This screen is for alert and notification which admin will provide and publish to app.

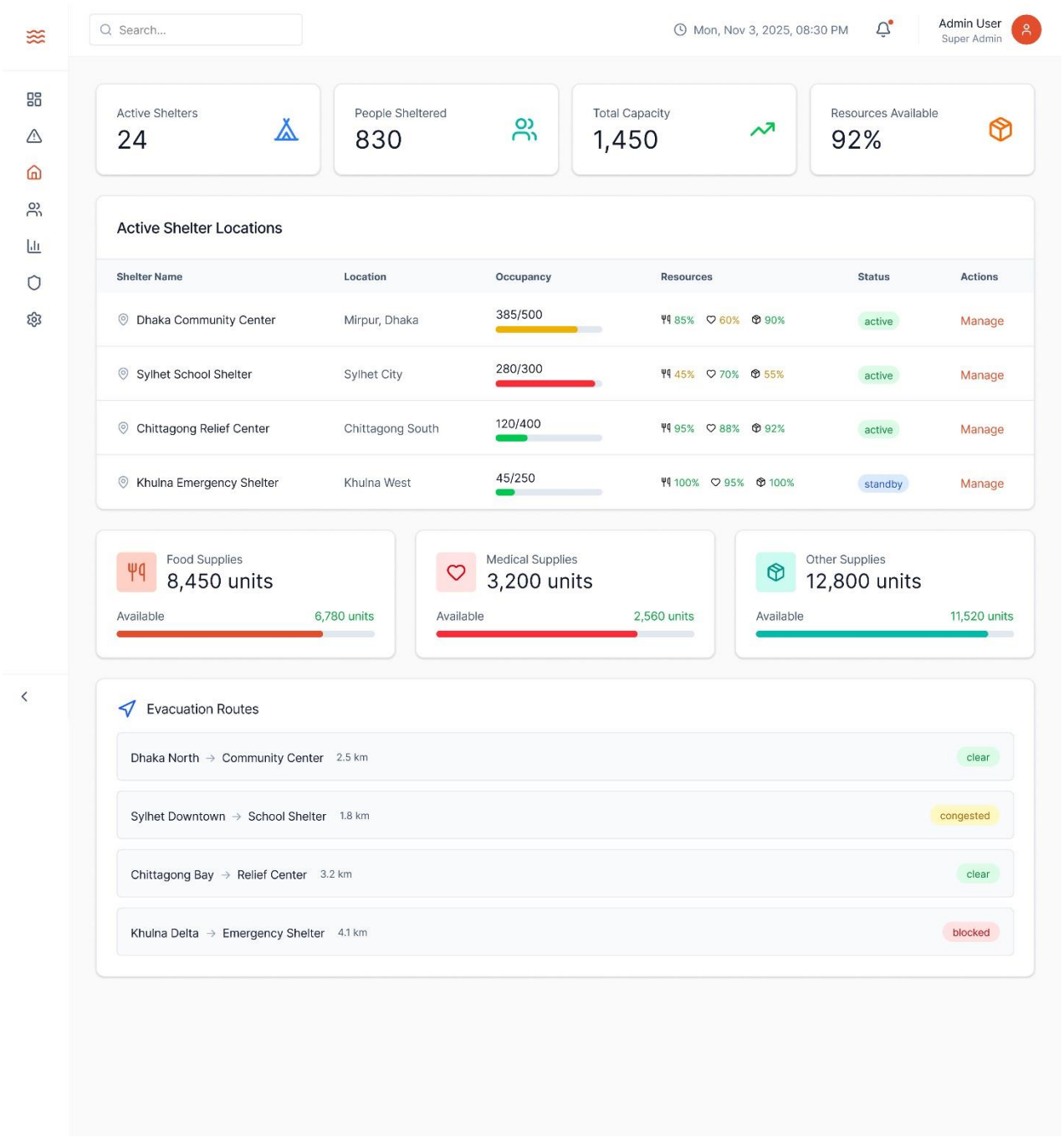

Figure 4.41: Route

This screen will provide the safe routes for the app.

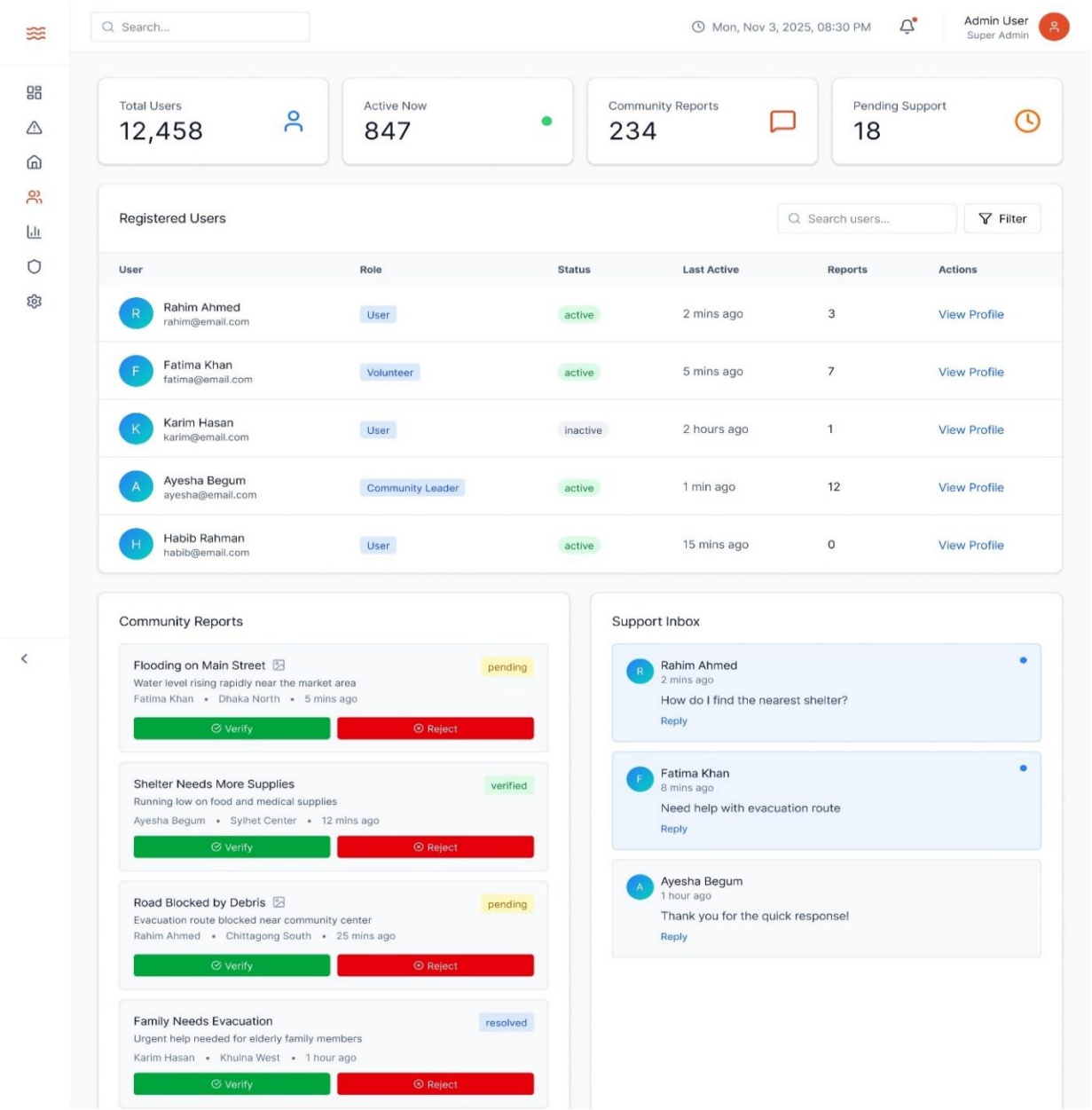

Figure 4.42: User

This is the user control screen.

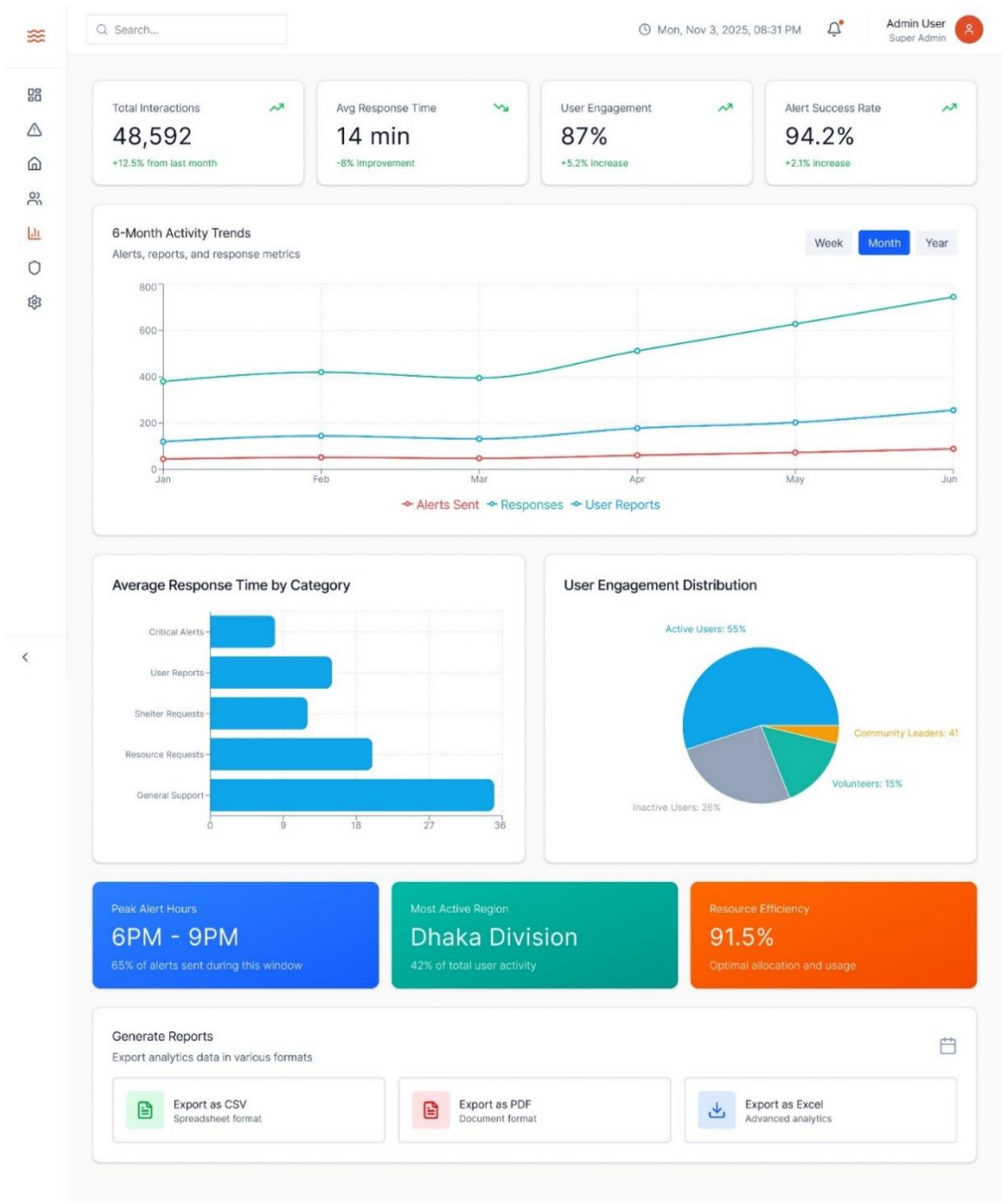

Figure 4.43: Analytics

This screen will show the average analytics of the application that whom are using the app and what are the responses that came from the users.

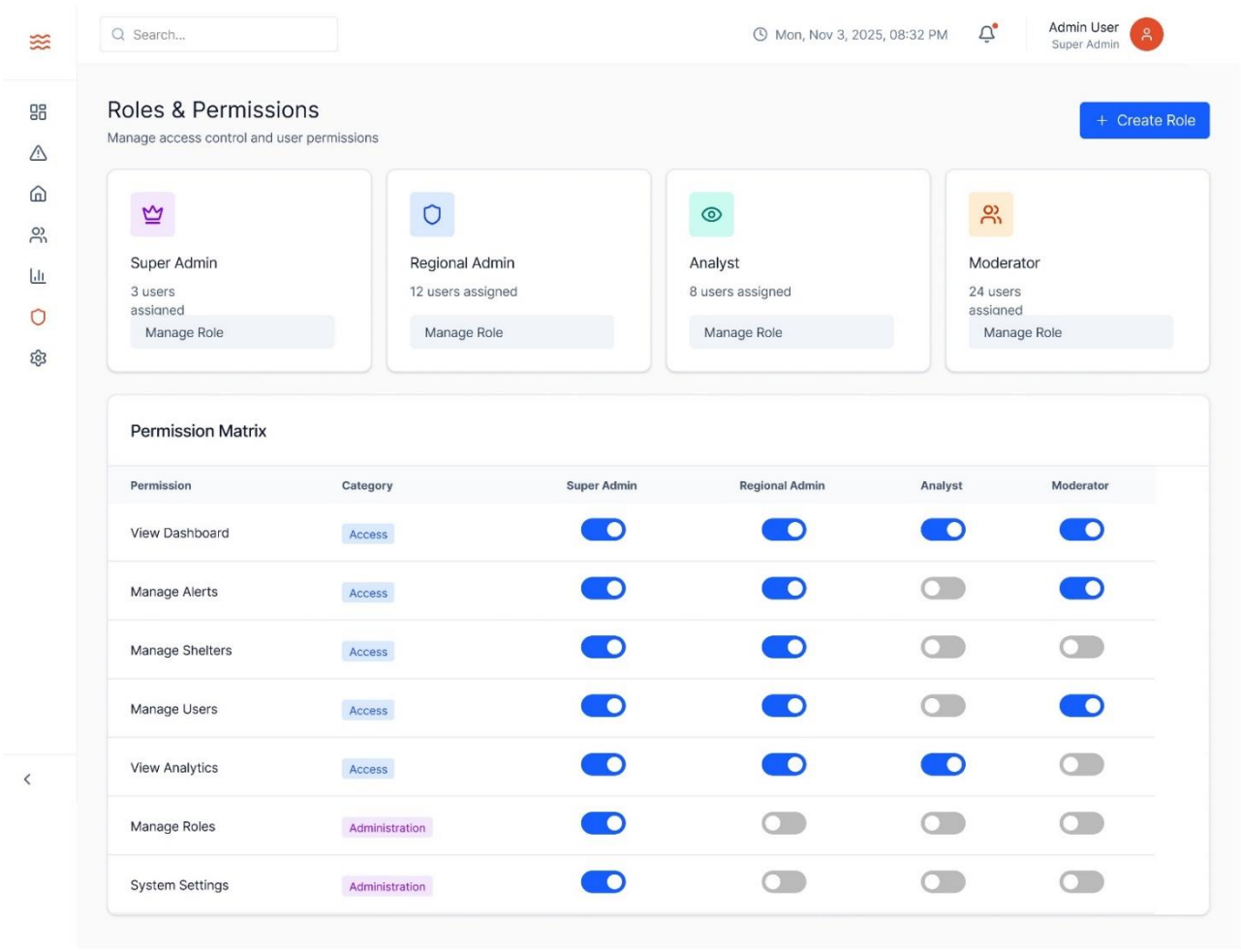

Figure 4.44: Role And Permission

This screen shows the role and permission that who can access the data of the application and management according to the app. This will manage through this screen.

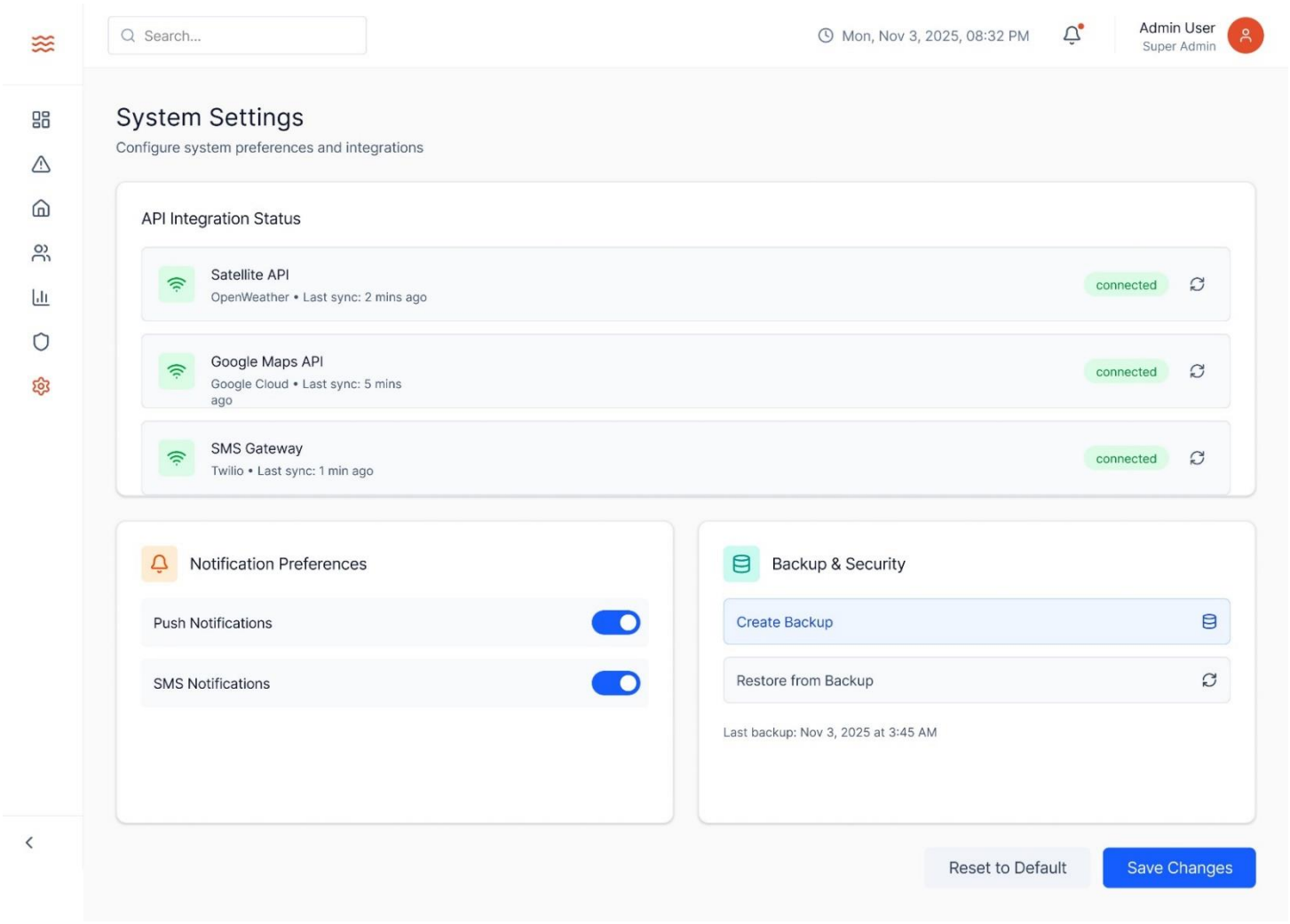

Figure 4.45: System Settings

CHAPTER 5

Discussion and Conclusion

5.1 Design Evaluation

Developing FloodGuard gave me the invaluable opportunity to apply my UI/UX design knowledge to a real-world humanitarian challenge Creation of FloodGuard provided me with the priceless experience to put my knowledge of UI/UX design in practice on a humanitarian issue. Designing to respond to disaster was not like the work on normal products, but the need to develop something that there is no chance of failure under adverse circumstances of stress, uncertainty and high emotion. This project made me realize how a well-considered design may really assist people in life-threatening circumstances rather than make life easier. Personally, as a user experience, my goal was to develop a system that was easy, yet reliable and intuitive, even in the hands of those who are panicked, low literate individuals or even those who are struggling with poor internet access during a flood. All design decisions, such as the color-coded warnings, offline guides, and shelter maps, were aimed at alleviating mental load and enabling the users to take action and do it with confidence.

The most important insights and lessons learned during the design process:

- The biggest lesson was the need for absolute clarity. When users are in a stressful situation, they don't care about aesthetics; they need information they can instantly read and act on. We achieved this by simplifying the layout and relying on familiar cues like colors, icons, and short messages, which made the interface much easier to understand under pressure.
- Research confirmed that users don't want broad forecasts; they want to know what is happening *right near them* and *what they should do now*. This led to key features like ward-level alerts, nearby shelter directions, and real-time road blockage information.
- Because floods often cut off internet and power, reliable offline support became a critical success factor. Creating a usable offline experience taught me how essential redundancy, caching, and lightweight design are for crisis-oriented apps.

- By continuously using user interviews, card sorting, and usability tests, the app evolved significantly beyond my initial assumptions. Users demanded clearer instructions, easier navigation, more visuals, and less technical language. This constant iteration helped transform FloodGuard into a tool people could actually rely on.
- Testers consistently pointed out gaps—like missing SOS shortcuts, confusing icons, or difficulty reading maps—which guided us to make meaningful improvements. Their feedback reinforced that the design must remain flexible and evolve based on user input, not on the designer's best guess.

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