

HELP+US

Disaster Management System for Sri Lanka

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HELP+US

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Declaration

We declare that this thesis is our own work and has not been submitted in any form for another degree or diploma at any university or other institution of higher education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.



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Keshari Hasithangi

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Abstract

Natural or man-made disasters pose serious hazards to people's lives, communities, and livelihoods. The necessity for an effective and accessible disaster management system is critical in the context of Sri Lanka. This project addresses the essential issue of providing the general public with a complete, user-friendly, and accessible disaster management system.

Floods, landslides, wildfires, and other natural disasters threaten Sri Lanka frequently, causing damage damage on its people and resources. Sri Lanka lacks a disaster management system that helps the general public and the existing systems are developed for the government and for other organisations which are complex to understand by the general public to protect themselves and the communities.

Our system HELP+US disaster management system for Sri Lanka aims to develop a system that empowers individuals by delivering real-time disaster information, safety guidelines, and assistance. The existing disaster management solutions inspired us to create HELP+US as a user-friendly, portable, and accessible solution. Using detailed planning and analysis, were able to define and ensure the critical needs of the general public when in a disaster. During the implematetion of the system, an interactive disaster map was implemented. The system delivers important information to users, such as safety rules and donation services.

In a world where natural disasters may occur unexpectedly, HELP+US disaster management system for Sri Lanka will help the general public by providing timely information, safety instructions, and other support channels contributing to the safety of Sri Lankan Communities.

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List of Abbreviations

HTML	:	Hyper Text Markup Language
NBRO	:	National Building Research Organization Sri Lanka
UI/UX	:	User Interface and User Experience
NGO	:	Non-Governmental Organization
GUI	:	Graphical User Interface
CSS	:	Cascade Style Sheet
VScode	:	Visual Studio Code
CSV	:	Comma Separated Values
UML	:	Unified Modeling Language
SDLC	:	Software Development Life Cycle

Chapter 1

1 Introduction

Disasters appear as uninvited visitors in a world that occasionally causes unexpected fury, leaving destruction. Imagine, transforming a beautiful and peaceful landscape into raging flood waters, a landslide that destroys everything in its path which will cause severe damage to homes and livelihoods, leaving people displaced and vulnerable.

So, in an increasingly interconnected and vulnerable world, disasters have emerged as critical challenges that societies face. Also, disaster is a serious problem that occurs which will cause widespread human, resources, economic and even environmental loss that may be caused by natural or man-made even in Sri Lanka and as the global population grows and urbanization continues. The damage caused by those disasters may depend on climate, geographical location, human negligence, and errors occurring in a man-made system. Even though there are systems, still a disaster is crucial.

With the new advances in computer technology, information management has become easier than ever. As a result, people have started to adopt information technologies. Accordingly, people used to develop systems to provide a service. The National Building and Research Organisation (NBRO) issued a landslide evacuation (Red) alert for hilly areas in the Ratnapura district in June 2022. According to the Disaster Management Centre, the flood has caused one death and over 22,338 people were affected including 690 people and approximately 174 houses have been reported damaged [1]. The existing methods of Disaster management systems consist of a range of interconnected elements, including risk assessment, early warning systems, emergency planning and more that play a crucial role in reducing vulnerability, enhancing resilience, and saving lives during disasters by empowering the local authorities.

Sri Lanka is a country that is still developing country and systems like disaster management software are still deployed for the government and selected authorized parties, The general public in Sri Lanka is not very familiar with a system that helps them to reduce the risk of death on their own.

Therefore the website “Help + US” the “Disaster Management System for Sri Lanka” gives pop-up messages about safe and unsafe locations, will find safe and nearest places and will provide a service for donations. Any individual or company who is willing can provide donations to the people who are impacted by the disaster. Also, this application “Help + US” will show information about affected parties and their need which will also be useful for the donors.

1.1 Aims and Objectives

Aim

This project aims to develop a system that helps the general public by alerting them about disasters and providing services for their needs when in a disaster.

Objective

1. To Identify the hazards
2. To Search temporary shelters for victims
3. To Analyse the details of the victims
4. To Provide details of the victims for donors
5. To Give warning before a disaster happens
6. To provide donations for the victims using analyzed details

1.2 Project scope

The main objective of this software is to show the disaster hazards on the map which is visible to every user who uses the map and is also implemented as a web-based application. After the evaluation of the time frame and resources, the project objectives were decided. A realistic set of objectives was denoted to be achieved from the estimation of the time frame and resources available. To meet the client-specified requirements at the end of the agreed time frame, several functions were identified.

- The administrative function of User management and System management is to insert, update, search and delete the details of the camp, refugees, locations, disasters and users.
 - Administers users' system
 - Error correction of the system
 - Permission control management
- Administration of User details
 - Manage the types of users to manage disaster details
- Managing temporary safe shelters for refugees.
- Analyzing the details of the victims.
- Administrative functions of handling quality constraints
 - Data backup and restoration system
 - Manage reports and documents of the camp
 - Manage reports and documents of the refugees
 - Manage reports and documents of the camp and refugees assigned to each camp
 - Manage reports and documents of the disasters
- Communication
 - SMS service through the system
- Administrative functions of handling quality constraints
 - Data backup and restoration system
 - Bi-lingual system
 - Manage reports and documents

- Administration of patron accounts and activity.

By meeting these requirements, the system will be user-friendly, time-saving, and easy to preserve with superior security and system restoration and backup.

Goals that can be achieved with the help of our software are as follows.

- Use of technology to increase efficiency and increase performance.
- Increase the safety of users.
- Search and show temporary and safe shelters.
- Help victims using donations.
- Notify the users by alerting them before a disaster.
- Guide the users by giving the instructions to follow before, during and after a disaster.

The key benefits of the software are as follows.

- The efficiency and quality of daily activity can be increased.
- Better security privileges.
- Easy maintainability.
- Backup and restoration of data will ensure integrity and security.
- Easy maintainability.
- Can be expandable

1.3 Motivation

A disaster which is natural or man-made is a serious problem that will affect people by causing loss of human lives and property all over the world. So in the case of a disaster, it is important to have an organized and effective response effort to take preventive measures in a tragedy. When considering peoples' perspective, in an unexpected situation they are willing to get notified beforehand as well as they prefer to get help immediately when in a disaster.

When we imagine a disastrous situation people are more likely to feel hopelessness, empathy and despair. When we came across we felt to develop a system which would help people in such a hopeless moment.

The motivation behind developing this disaster management system is to help people in a hopeless moment and make them feel safe on their own.

Not only that the inspiration for this application “Help + US” was also taken from an existing system named “Sahan Eden” which is a disaster management software made for organizations. So a similar software will be made which is for the general public and which is portable.

1.4 Method

The project began with research outlining the objectives, scope, and methodology. And identified the components that our disaster management system should output. Also, we conducted a thorough literature review on relevant articles, reports, and case studies to gather existing knowledge, and insights and to understand the current state of the field of disaster management systems. As in our expected system, we are supposed to show real-time disaster details on the map and supposed to notify the communities using an alert system. In order to accomplish those functionalities, we had to collect real-time data from various places related to disaster management organizations in Sri Lanka.

1.5 Overview

The technical area in a disaster management system encompasses the utilization of various technologies to support and enhance the effectiveness of a disaster management system. As a result, we use a disaster management system which includes an early warning system. An early warning system will provide the user with timely details about the disasters. These applications provide real-time information, emergency alerts, and interactive maps to communities enabling citizens to access vital information in a disastrous moment.

Chapter 2

2 Background and Problem Statement

Disaster management is a crucial aspect of ensuring the safety of the communities in the face of natural or man-made disasters. So disaster management systems are designed to mitigate, respond and recover from those disasters. Due to the geographical location and the climatic conditions, Sri Lanka the island nation experiences frequent occurrences of floods, landslides, cyclones, droughts, and tsunamis.

Still, Sri Lanka is a country which is developing, and the technologies and resources are limited, because Sri Lanka consists of a unique geographical location it is difficult to detect and predict disasters that happen beforehand accurately. Even though Sri Lanka is a country that is rich in natural resources and dust particles as sensors are used to detect the rainfall level, it also is crucial to detect it accurately. In addition, employees who work in the field need to do inspections every time to gather accurate data.

2.1 Introduction

In a situation where a disaster occurs, most people become hopeless. It may be critical or not but people are willing to have others help in a situation where they are helpless. Sometimes people are unannounced and even they don't know what should follow in a disaster. So, HELP+US hopes to offer a platform allowing users to check whether there is any disaster, whether it is low, medium or high critical which they can avoid being a victim of any disaster. Even the system has provided guidelines which they have to follow before, during and after a disaster.

The applications that are utilized to offer assistance before or during a disaster are discussed in the following chapter.

The applications that are used to offer support before or during a disaster which can be utilized on mobile platforms, websites, or both are discussed in the next chapter.

2.2 Literature Review

The section that follows undertakes a comprehensive evaluation of a handful of the applications for disaster management and helping; the following are a few examples of applications that are reviewed.

- Sahan Eden Software
- Daily rainfall Data, Real-time water level data from the Irrigation Department Sri Lanka
- Japan Metrological Agency

Sahan Eden Software



Figure 2.2-1 Sahana Eden map Interface

Sahan Eden is an open-source platform built especially for disaster management that assists organizations and governments in efficiently managing disaster preparedness, response, recovery, and mitigation efforts. Features of Sahana Eden Disaster Management.

➤ **Emergency**

- Plan for various needs, including what human resources, assets, facilities, and tasks will be required to respond effectively [2].
- Manages information about the location and status of temporary shelters
- Provides a check-in/check-out system for sheltered and their families, allowing individuals to be traced and monitored [2].

➤ **Health**

- Provide health facilities [2].
- Disease tracking [2].
- Patient tracking [2].

➤ **Logistics**

- Managing the assets by tracking where they are, who they have been assigned to, and what condition they are in. This ensures that assets are used effectively and efficiently [2].
- Allows organizations to manage requests, donations and warehouses [2].
- Plan and respond to human requests [2].

➤ **Population**

- Collects and analyzes information from assessments to help organizations more effectively plan their disaster management activities [2].

➤ **Collaboration**

- Interactive messages allow people to send short message queries to Sahana Eden and receive automatic responses [2].
- Maps provide situational awareness which is essential when either planning to prepare for or respond to a disaster [2].

Also, Sahana Eden provides a highly configurable environment which can be used in a wide variety of different contexts. Even it can be used to build custom solutions [3].

The main advantage of this software is it is an open-source software where any organisation can deploy the system freely. Also as it is a web-based software it can be easily assessed anywhere through the internet. But because it can be customised it might lead to complexity. Not only that though the system is user friendly the learning curve is high when new to the system.

Irrigation Department Sri Lanka

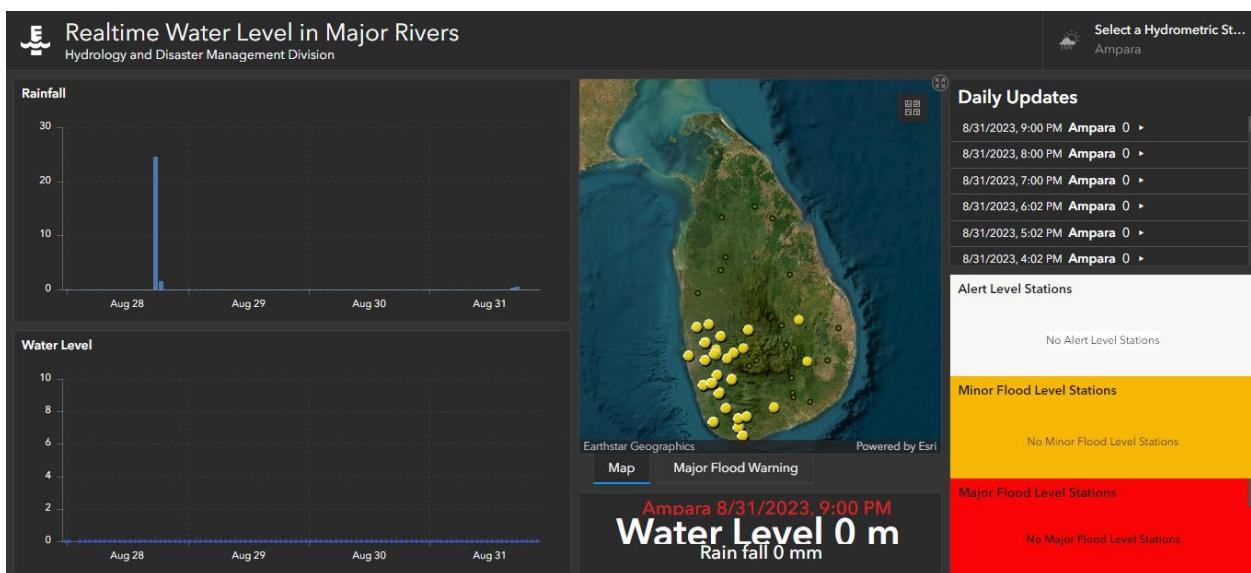


Figure 2.2-2 Irrigation Department Water Level and disaster location Interface

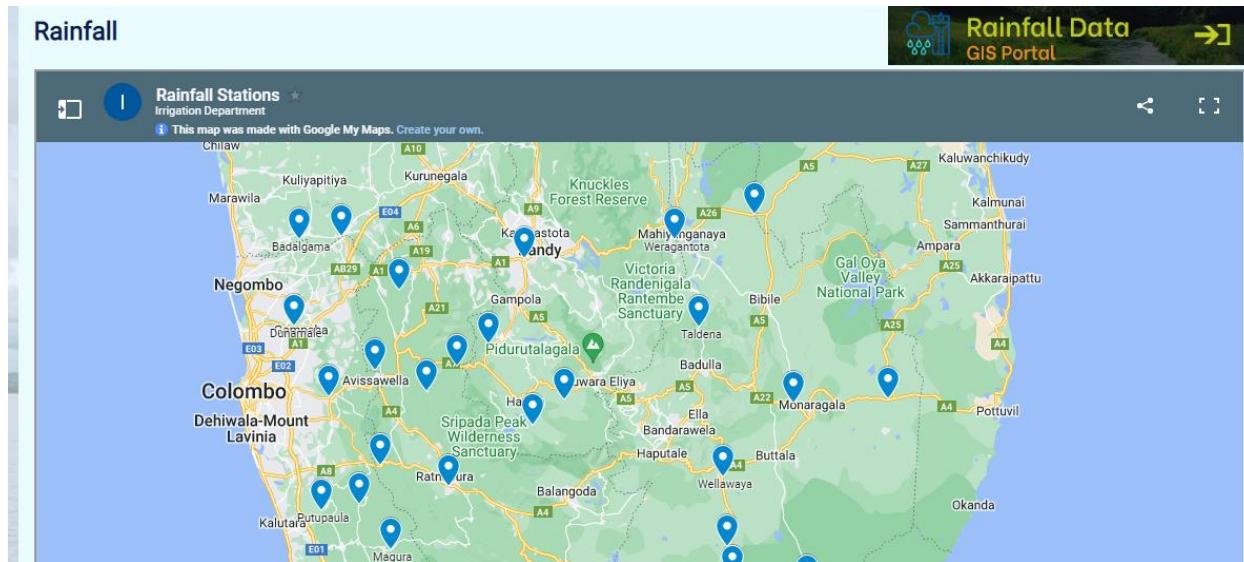


Figure 2.2-3 Disaster map - Irrigation Department

As shown in *Figure 2.2.2* Irrigation Department of Sri Lanka provides real-time water level tracking *Figure 2.2.3* shows the gathering daily rainfall data [4]. The website of the Sri Lankan Irrigation Department is visible to detect disastrous areas that occur in Sri Lanka in real-time. This website is visible Even to government, and organizations as well as to the general public.

Using the website people can view the real-time water level readings. But the people who are not familiar with the readings might not able to understand the information provided. However, it clearly shows the risky areas on the map with colour coordinates to help the website user get the information efficiently.

Japan Metrological Agency

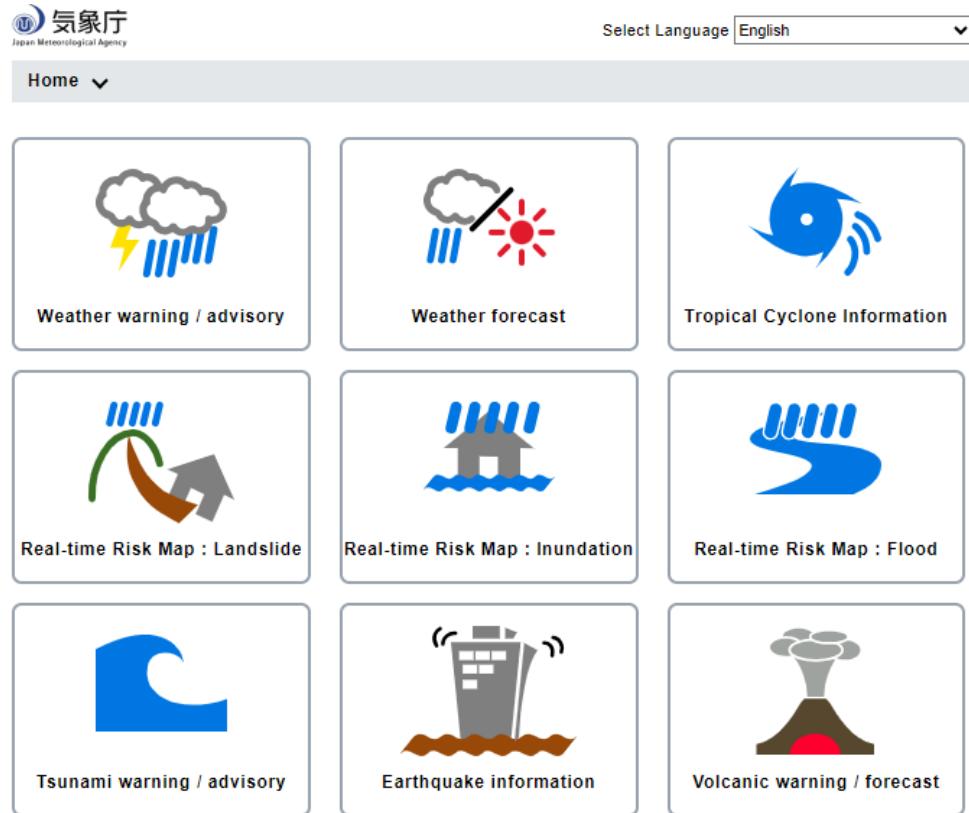


Figure 2.2-4 Japan Meteorological Agency Home Interface

In general Japan's metrological Agency is an agency of Land, Infrastructure, Transport and Tourism. The purpose of this is to gather and report results about weather and forecast data to the general public of Japan [5].

Weather warning / advisory

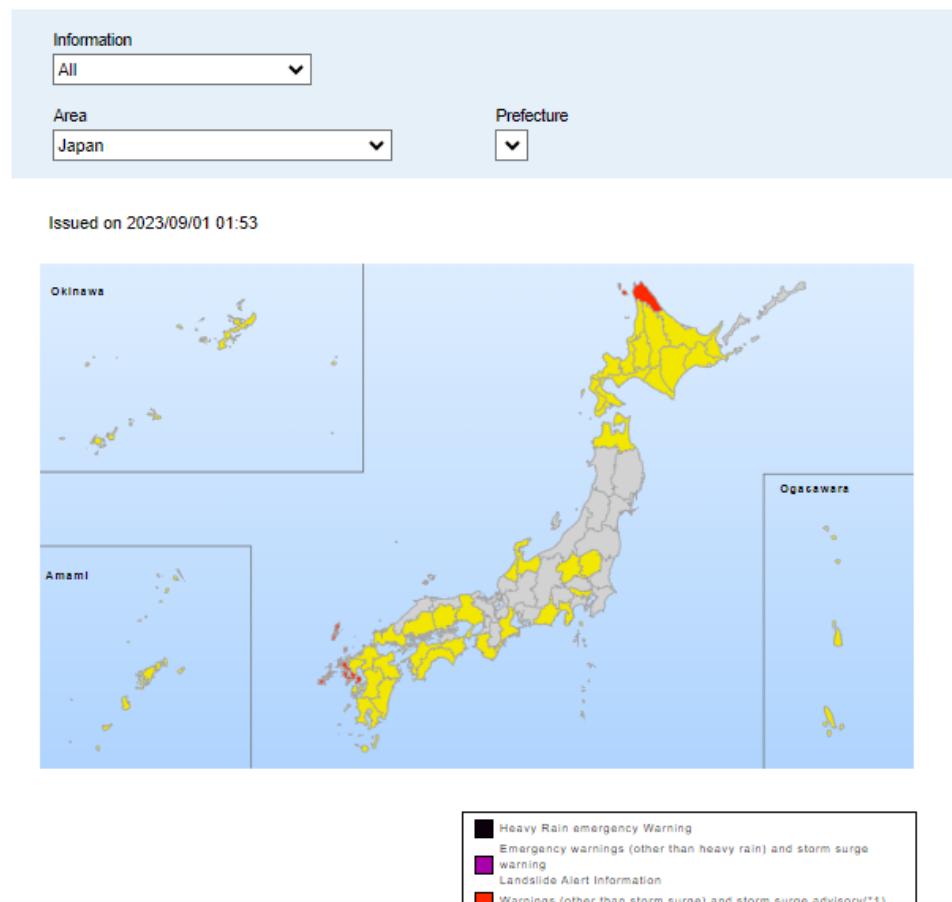


Figure 2.2-5 Disaster map in Japan Meteorological Agency

The screenshot shows the Japan Meteorological Agency's website with the following details:

- Header:** 気象庁 (Japan Meteorological Agency) logo and "Select Language English" dropdown.
- Breadcrumbs:** Home > Earthquake information
- Section Headers:** Earthquake information and Earthquake information list.
- Table:** A table titled "Explanation of the seismic intensity" with the following data:

Observed at	Place name of epicenter	Magnitude	Maximum seismic intensity	Date and time of issuance
2023/08/31 20:26	Off the Coast of Iwate Prefecture	3.4	1	2023/08/31 20:29
2023/08/31 11:36	Off the Coast of Fukushima Prefecture	4.2	2	2023/08/31 11:39
2023/08/31 02:47	Off the Coast of Fukushima Prefecture	4.6	2	2023/08/31 02:50
2023/08/30 23:48	Satsuma Region, Kagoshima Prefecture	3.9	1	2023/08/30 23:53
2023/08/30 16:41	Western Kanagawa Prefecture	3.2	1	2023/08/30 16:44

Figure 2.2-6 Report Generation based on earthquake information

As shown in *Figure 2.2.5* and *Figure 2.2.6*, it provides a platform to easily view the data about the weather warnings and reports (earthquake reports). With the advanced technology that Japan Metrological Agency has the early warning system is highly effective.

2.3 Problem Statement

Sri Lanka faces different natural disasters such as floods, landslides, wildfires, droughts, etc. which pose significant threats to their lives and livelihoods.

With the advancement of technology, still, Sri Lanka lacks a disaster management system that allows the general public to protect themselves and helps them to prevent themselves on their own. Yet the developed systems are for organizations and the government. So the system HELP+US

disaster management system is implemented to help the general public. The solution implemented is a system that everyone can access and which is portable as it is easy to view anywhere you are. With the current systems, people are not able to view the nearest places from the affected area. But through the system implemented it provides an interface to find the nearest location from the affected location. Also, it provides a user-friendly interface to view the map and guidelines that they should follow before, during and after a disaster. Also, it provides interfaces to proceed with donations with either money or needs for the victims of a certain camp.

2.4 Summary

Sri Lanka is a place where proud of nature but, the destructive power of nature is no stranger it is famous for its beauty. Also, floods, landslides, wildfires and other disasters are frequent guests to Sri Lanka.

In a situation where those guests are unwelcome, most of the Sri Lankan people become hopeless and unsure of where to shelter them and what steps to take. As a solution HELP+US disaster management system will empower users to stay informed about disaster risks on their own which system will provide invaluable guidelines, preparing individuals for the challenges before, during, and after a disaster.

The HELP+US is inspired by an existing disaster management system which is impressive with a lot of capabilities though it is not developed for the general public but for the government and other organizations. Even, Sri Lanka's Irrigation Department contributes by providing real-time water level tracking and daily rainfall data which is also a great website although it is complex for the users to understand.

In summary, Sri Lanka's HELP+US disaster management system will help the public by enhancing more facilities for the users.

Chapter 3

3 project management

3.1 Introduction

Project management is essential in any project because it helps to manage changes in a project. Also, it is a successful process to help the team deliver a successful project to the customer environment [6].

Without a proper focus and goals or a product scope and objectives, it is difficult to deliver a quality product. Also, it will result in missing deadlines, wasting time, skills of the team members and. To provide an effective system one needs to have proper knowledge about the scope and objectives. If we can not focus on the scope it will make scope creep at the end. To deliver the project on time, it is very important to have project management. By planning the timeline needs to allocate a relevant timeline for the task to be implemented. Moreover, it is necessary to have efficient communication between the project team members and external parties to proceed with the project. This will give a clear idea of what is to be done and what is completed.

3.2 Approach

Initially, we researched existing disaster management systems that are currently in place, both within Sri Lanka and beyond international borders and we were able to gather many kinds of facts and insights through the systems. Taking what we've just learned in hand, we then turned our attention to defining the scope and objectives for our disaster management system.

Once we have decided on the scope and boundaries, we create a proposal document to extract what our system will persuade and decide the tasks. We have even established the roles and responsibilities according to the requirement list to achieve our project goals.

By communicating with team members we focused on implementing the functionalities to achieve the objectives set when we were at the planning stage while tracking the progress and testing the system to ensure the errors that occurred were carried forward. Also, the documentation was carried out with system design diagrams like use case, class diagram, object diagram, and sequence diagram.

To make our system HELP+US a successful system we did a background study on the existing systems, decided the scope and objectives to be accomplished and gathered functional and non-functional requirements to be implemented. Even we divided our roles and responsibilities to success our system with the time we had.



Figure 3.2-1 Project Management Phases

3.3 Initial Project Plan

The below figure *Figure 3.3.1* and *Table 3.3.1*, depicts the initial plan of the project using a Gantt chart and a table which shows the names of the activities and the timeline of the activities to be completed within a certain period.

Table 3.3.1 Initial Project Plan

Description of Work		Start-end days
Project Planning	<ul style="list-style-type: none"> Conducting a literature review regarding the broader topic area “Disaster Management” 	1 st March – 10 th March
	<ul style="list-style-type: none"> Identify and gather requirements on finalized project topic, “Disaster Management System for Sri Lanka” 	1 st March– 10 th March
	<ul style="list-style-type: none"> Doing a thorough investigation on technologies adapted in social networks 	10 th March – 20 th March
	<ul style="list-style-type: none"> Conducting a stakeholder analysis 	10 th March – 21 st March
	<ul style="list-style-type: none"> Finalizing the project proposal 	22 nd March – 23 rd March
Project Proposal Evaluation		23rd March
Design	<ul style="list-style-type: none"> Design UML diagrams with the identified requirements 	24 th March – 27 th March
	<ul style="list-style-type: none"> Sketch and wireframe the interfaces 	28 th March – 4 th April
	<ul style="list-style-type: none"> Prototype and Visual UX/UI designs 	5 th April – 20 th April
Project Proposal Evaluation		20th April
Coding	<ul style="list-style-type: none"> Create database (tables and relationships) 	21 st April – 26 th April
	<ul style="list-style-type: none"> Create sign up, login pages with user profiles 	27 th April – 2 nd May

	Interim Evaluation (Report + Presentation)	2nd May
	<ul style="list-style-type: none"> • Web application development 	2 nd May – 12 th May
	<ul style="list-style-type: none"> • Mobile application development 	13 th May – 22 nd May
	<ul style="list-style-type: none"> • Unit/ module testing 	23 rd May – 25 th May
	<ul style="list-style-type: none"> • Coding for the search process 	26 th May – 31 st May
	Prototype Demonstration	31st May
	<ul style="list-style-type: none"> • Additional coding and finalizing 	1 st June – 9 th June
Testing	<ul style="list-style-type: none"> • Design test cases and validate requirements 	10 th June – 16 th June
	<ul style="list-style-type: none"> • Testing documentation 	17 th June – 26 th June
Final Report Submission		26th June
Final Project Evaluation		30th June

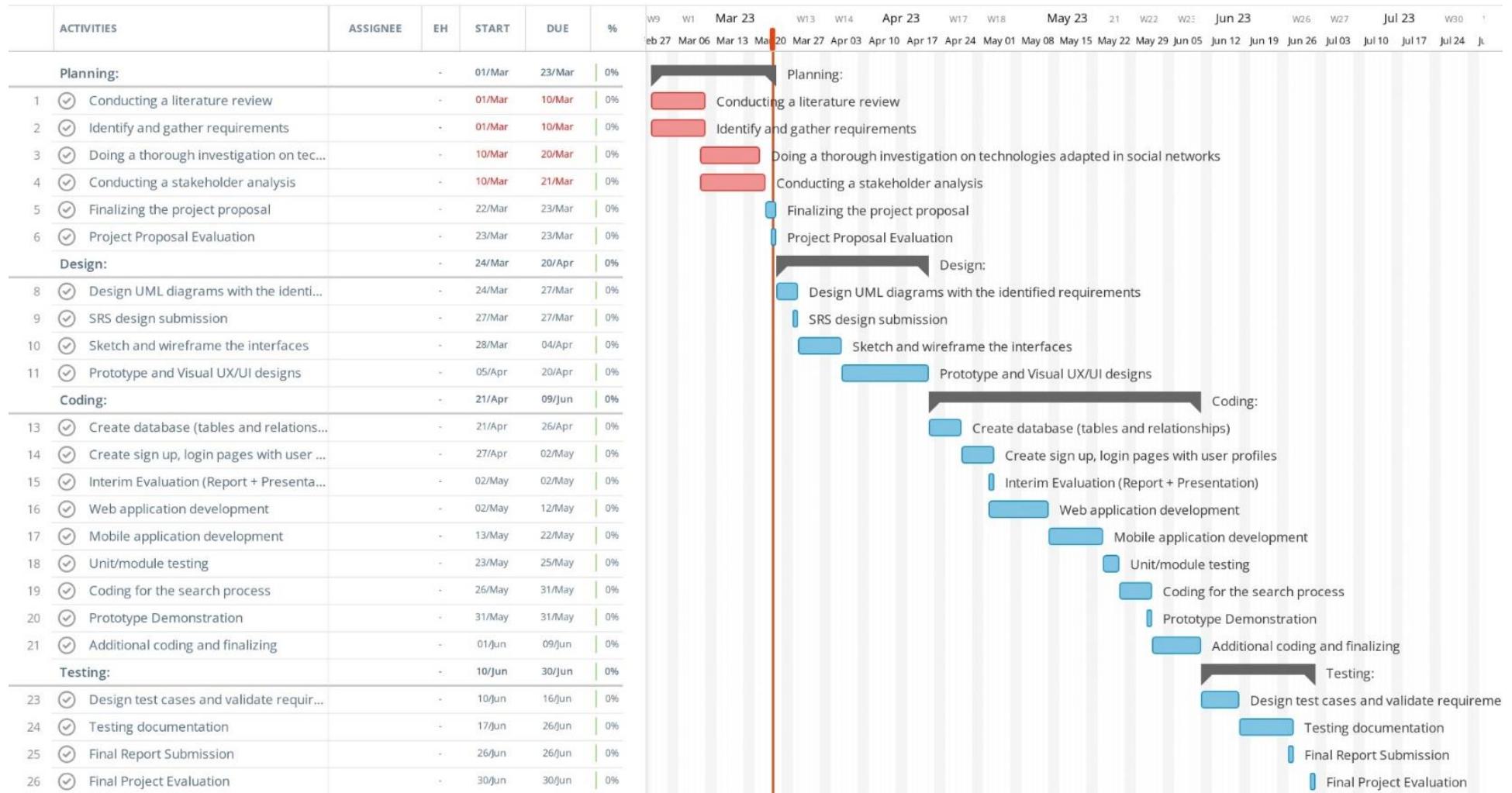


Figure 3.3-1 Gantt Chart - Initial Project Plan

3.4 Problems and Changes to the Plan

In our making of the project procedure, there were a series of problems and challenges that occurred in certain areas that we had to reconsider the initial plan. The changes were justified by the need for the success of the project. The issues that led the initial project plan to change are as follows.

- Changes in particular features

Most of the features we planned to implement were changes due to our current level of knowledge and realized that the time we initially set aside wouldn't be enough to handle the complexity of these features.

- Managing project procedures with limited time

Within a tight schedule, and managing academic commitments like semester exams and other outside factors, compelled us to adapt. As a result, many project aspects were altered to fit within our time constraints.

- Failure to meet assigned deadlines

There were several delays in developing the task to be completed. These delays happened because we had to learn new technologies, and our schedules were tight. This, in turn, led to most of the changes to our plans we had to make to ensure we met the deadlines.

- Team contribution

With the tight schedules, we had to accomplish the tasks within the scheduled time constraints. In that situation, team contribution is highly necessary. But with the limit of team contribution made to change the plan.

Table 3.4.1 Final Project Plan

	Description of Work	Start-end days
Project Planning	<ul style="list-style-type: none"> Conducting a literature review regarding the broader topic area “Disaster Management” 	1 st March – 8 th March
	<ul style="list-style-type: none"> Identify and gather requirements on finalized project topic, “Disaster Management System for Sri Lanka” 	1 st March– 8 th March
	<ul style="list-style-type: none"> Doing a thorough investigation on technologies adapted in social networks 	3 rd March – 12 th March
	<ul style="list-style-type: none"> Finalize the requirements 	9 th March - 17 st March
	<ul style="list-style-type: none"> Finalizing the project proposal 	9 th March – 17 th March
Project Proposal Evaluation		12th March – 17th March
Design	<ul style="list-style-type: none"> Design UML diagrams with the identified requirements 	8 th April – 14 th May
	<ul style="list-style-type: none"> Sketch and wireframe the interfaces 	10 th May – 27 th May
	<ul style="list-style-type: none"> Prototype and Visual UX/UI designs 	16 th May – 09 th June
	<ul style="list-style-type: none"> SRS documentation 	22 th May – 16 th June
SRS documentation Submission		18th June – 25th June
Coding	<ul style="list-style-type: none"> Create database (tables and relationships) 	29 th April – 04 th May
	<ul style="list-style-type: none"> Create sign up, login pages with user profiles 	23 rd April – 30 th April
	<ul style="list-style-type: none"> Create models 	1 st May– 8 th May

	<ul style="list-style-type: none"> • Unit/ module testing 	7 th May– 3 rd July
	Interim Evaluation (Report + Presentation)	9 th May
	<ul style="list-style-type: none"> • Prototytppe Demostration 	16 th June– 27 th June
	<ul style="list-style-type: none"> • Adding styles 	22 nd June– 13 th July
	<ul style="list-style-type: none"> • Additional Coding 	08 th August – 25 th August
	Finalyzing the project	16th August – 1st September
Testing	<ul style="list-style-type: none"> • Design test cases and validate requirements 	09 th August – 09 th September
	<ul style="list-style-type: none"> • Validate requirements 	01 st September – 09 th September
	<ul style="list-style-type: none"> • Final Project Evaluation 	27 th August – 09 th September
Final Report Submission		10th September
Final Project Viva		10th September – 23th September

3.5 Final Project Record

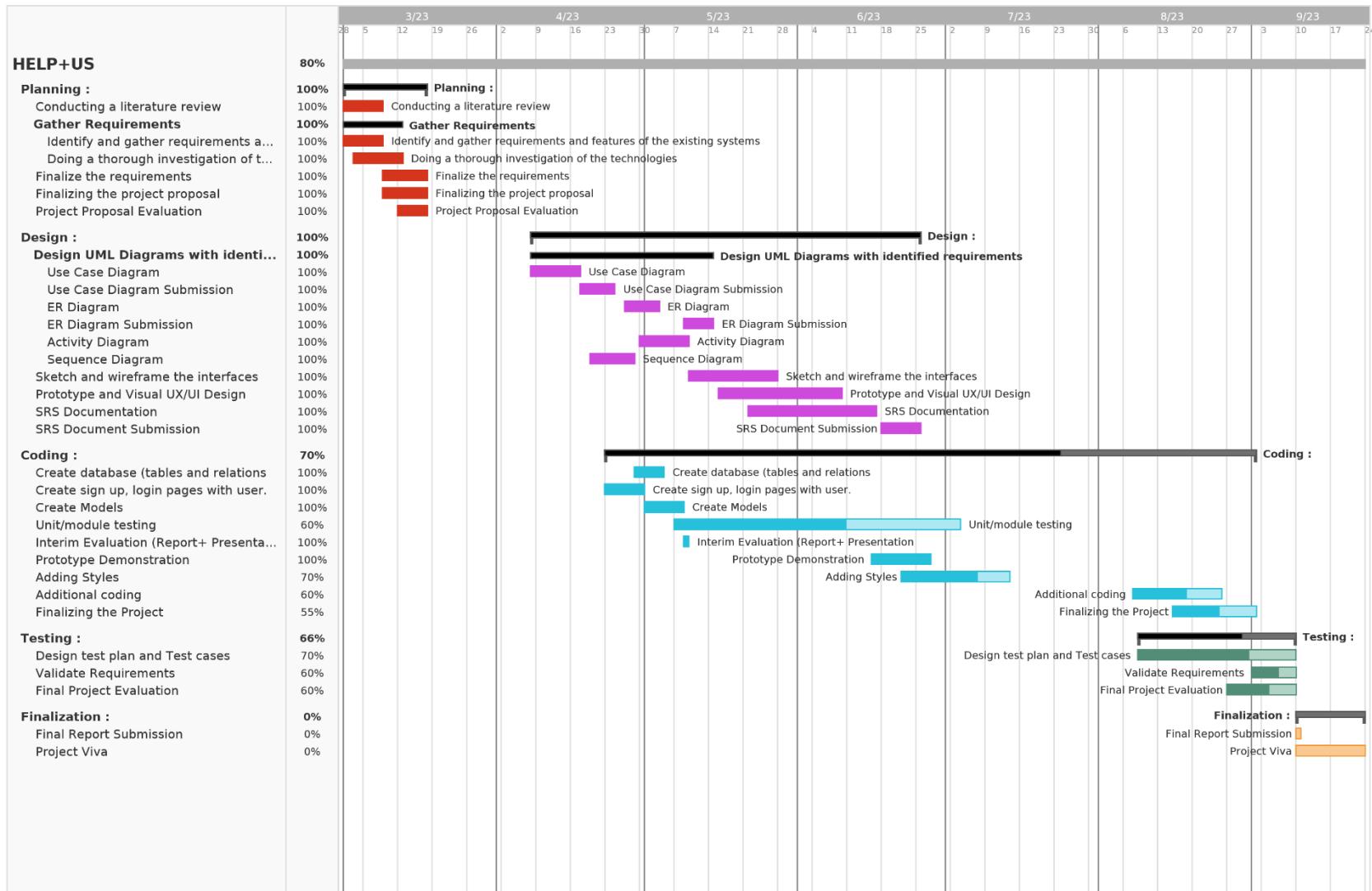


Figure 3.5-1 Gantt Chart - Final Project Plan

3.6 Summary

Project management serves as the guiding star in our project, which navigates the project toward success while responding to changing circumstances. Without a clear focus, objectives, and efficient communication, delivering a quality product becomes a challenge. So project management helps us allocate resources, plan timelines, and maintain the project scope, preventing scope creep and ensuring delivery of the project on time.

As mentioned in section 3.2, our project began with thorough research into existing disaster management systems, drawing insights from both local and international contexts. With this information we got, we established the scope and objectives of our disaster management system. A proposal document was created to provide an outline of the system's features, roles, and responsibilities.

Also, *Figure 3.3.1*, shows the initial project plan through a Gantt chart, illustrating the names of project activities and their planned timelines.

The project was not without its challenges, leading to necessary changes in our initial plan was discussed in *Section 3.4*. Changes in particular features, Managing project procedures with limited time, Failure to meet assigned deadlines, and Team contribution were several problems that faced during the project process.

After the changes were made the final project plan was made. *Section 3.5* shows the final project using a Gantt chart and shows the actual dates of project milestones, showing our project journey from start to completion. Also, it summarizes the progress and accomplishments of our project.

Chapter 4

4 Proposed Solution

4.1 Introduction

In order to give a solution to the gap identified in the previous stages, the disaster management system, HELP+US is implemented. This system will simply provide disaster prevention and guidance to Sri Lankan users. As mentioned in Chapter 2, shows the problems that led us to implement this software and even the alternative solutions are shown in the following chapters.

4.2 Solution

Community-based Disaster Preparedness system

In this system local people initiatives within communities to educate and prepare residents for potential disasters. Mostly, Local governments, non-governmental organizations (NGOs), or community leaders often organize and facilitate these kinds of activities. Within these organizations, they are providing disaster preparedness training and knowledge to the residents of a particular area. This training included how they should react when in a time of a disaster. How they quickly find suitable temporary shelters that are safe for each individual who has faced disasters like floods, landslides, etc. Even they need to train in first aid as they need to provide immediate medical assistance to the injured individuals in the aftermath of a disaster as it might be crucial if they wait for the professionals to visit the place of an emergency. Not only that, they also provide education on basic survival skills as well. They expect and encourage most of the locals to be involved in these disaster preparedness activities for the best of the individuals. Within these community-based systems, they establish early warnings and evacuation orders to residents. This ensures that every person is aware of the disaster to react when in need. The purpose of community-based disaster preparedness is to lower local people's threat to disasters while also increasing their capability to cope with and recover and to take an active role in disaster management even by having unity among community members.

Mobile app for reporting an emergency and assistance

Is developing a smartphone application that is a tool that serves when in a disaster. This may help the people or the users to directly and quickly report about emergencies including floods, landslides, wildfires etc. The users who have the application can upload the location and the type of emergency and other relevant details. Also, this app will assist when people are in danger. As these applications use GPS technology users can be tracked and they can be rescued easily as well. Also, these apps will receive and display real-time alerts about disasters including weather information, warnings, and evacuation notices by providing evacuation step-by-step procedures. These apps are beneficial because they provide rapid responses, and allow communication between the people to have a collaborative approach to disaster management.

Public awareness campaign

In these public awareness campaigns, it is to inform and educate the general population about how to prepare for, respond to, and stay safe during various types of disasters. The main objective of these campaigns is to ensure that people are well-informed and prepared to face disasters like landslides, floods, wildfires etc. The campaign will provide education on disaster preparedness and responses to follow when evacuating safely from any place when in a critical situation. Also, they have provided emergency contact details of the emergency service providers like police, medical facilities, and firefighters. By providing education to the public about preparedness and response measures, these campaigns contribute to the overall safety and resilience of communities which help them to cope with disasters when they occur.

The selected solution is to develop a system where users can get real-time warnings, and provide guidelines on how they should react before a disaster, during and after a disaster. This system is a monitoring system that consists of advanced technologies including weather forecasts, real-time detection and prediction of disasters like floods, landslides and wildfires. This solution emphasizes the need for disaster prevention rather than disaster response. Also, it emphasizes that taking preventive measures and being prepared for a disaster is more essential than trying to deal with a disaster after it occurs. Even early warning systems provide a crucial role in these disaster

management procedures. It allows people to evacuate from the places to prepare for the disaster. This will decrease the number of casualties and deaths. Also as there are similar systems that track the users using GPS and provide the users with real-time warning, it was determined to include and show the number of refugees, and casualties in a certain camp which will provide a brief idea to the donors who are willing to donate.

So Real-time Monitoring, Early Warning Systems and donation were chosen because they emphasise prevention, timely response, and technology integration and also empower communities and have the potential for long-term positive impacts.

4.3 Summary

Throughout this chapter, it provides an introduction to the chapter and the alternative solutions are analyzed. As the solution, Real-time Monitoring, Early Warning Systems and donation were selected and this shows how the HELP+US disaster management system's final form was derived after several studies and is the final solution to be implemented.

Chapter 5

5 Analysis and Design

5.1 Introduction

System analysis and design is a structured process for developing and improving the systems whether they are computer based or any other. This involves understanding, defining, planning, and developing solutions to different problems or difficulties inside an organization. In developing a system like disaster management, system analysis and design are crucial in order to maintain the efficiency of the system.

In this chapter it will discuss, the software development process model used in the system, feasibility study, process of requirement gathering, Hardware and software requirements, designing processes and evaluation.

5.2 Software development process model

The main software development method to be followed in this project will be “Iterative and Incremental methodology”. This application “Help + US” will work by segmenting the product into individual sections which are referred to as an “Iteration” and building them separately [7]. After finishing an individual section, combine it with the previously designed one in order to make a whole. As this methodology works as a progression, it is adapted to changes that occur during the processes like adding new features or adding unexpected technologies. By this model, we can,

- reduce the risk as can test the integrated increment at least once per sprint.
- Changes are acceptable even when in an unexpected situation.
- Deliver working software.
- Provide important or prioritized functionalities easily [8].

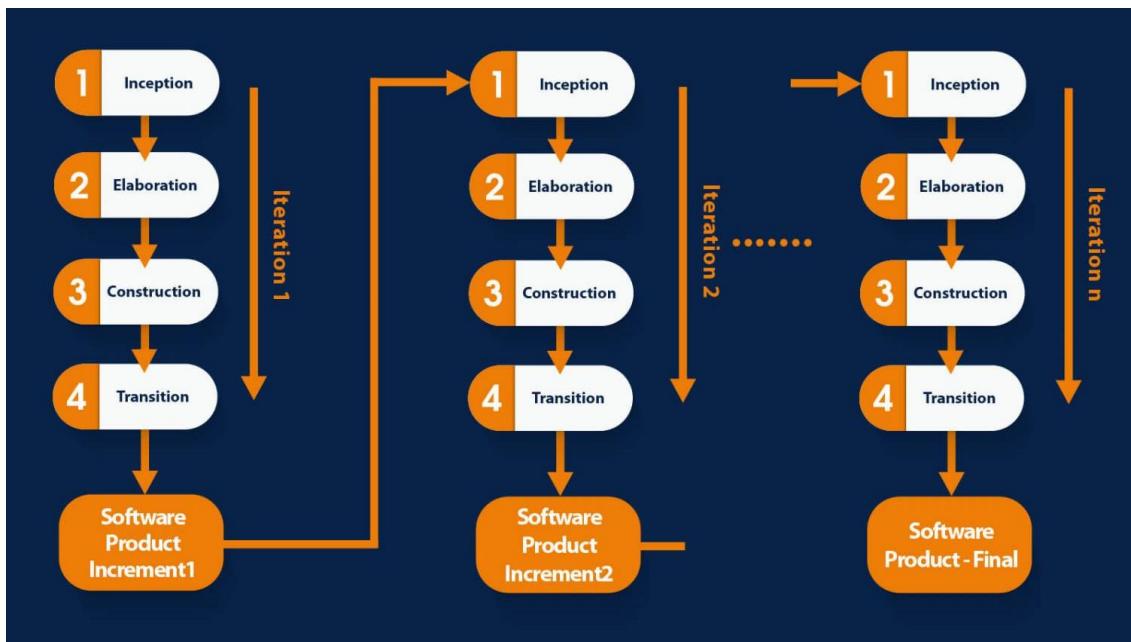


Figure 5.2-1 Software Development Process Model

5.3 Feasibility study

5.2.1. Time feasibility

Time feasibility is a critical aspect of project management that can significantly impact the success or failure of the project. Time feasibility is whether a project can be completed within a specified timeframe or deadline. For this project, initially, the time was scheduled from March and reached till June. The time frame was given as 3 months and a half and there were only two members assigned for the group. But with the academic schedules with exams, gathering new knowledge on technologies and other external factors, were able to manage the time.

5.2.2. Cost feasibility.

Cost feasibility is another main aspect of project management. It assesses whether the project can be completed within the allocated budget. As the system HELP+US, is a project for the undergraduate level, it was determined to complete the project without any direct cost. Throughout the project, used free IDEs and tools such as Visual Studio Code, and Figma to develop and design. Except for the direct costs, the indirect cost was there for electricity, internet usage and others. Therefore can be shown that this project is feasible.

5.2.3. Scope feasibility

In scope, feasibility focuses on determining whether the project's objectives and requirements can be realistically met within the scope defined. As mentioned in *Chapter 1 Section 1.1, Section 1.2 Aims and Objectives*, it consists of basic crud which is of create, delete, update and search and the scope of this project is possible to implement which shows that it is feasible.

5.2.4. Technical Feasibility and Technology Adoption

Technical feasibility assesses the availability of required technology and infrastructure and it considers the organization's preparedness for accepting new technologies.

Table 5.2.4.1 Technical Feasibility and Technology Adoption

Hardware	Desktop - allows users to do operations using the Graphical user interfaces (GUI).
	Python – use to develop the back end of a web application.

Languages	<p>Java Script - use to make web pages more dynamic.</p> <p>HTML – use to structure the web page and its content.</p> <p>CSS – use to create different layouts on web pages.</p>
Platforms	<p>Django – is a framework used to develop the backend of a web application.</p>
Database	<p>SQLite - Is a lightweight, serverless, and self-contained database engine that is suitable for projects with low to moderate database traffic.</p>

Having the mentioned technologies to assist throughout the project shows that the project is feasible from the technological aspects.

5.2.5. Economic feasibility

economic feasibility is similar to having a thorough look at the financial side of things. As mentioned in above *Section 5.2.2*, as this project is developed at the undergraduate level, and as the cost is feasible, it shows that economically the system is feasible.

5.4 Requirement Gathering for the Design Phase

The collection of requirements for the design phase is an important step in the software development process. It involves gathering, documenting and analysing the needs and expectations of the stakeholders in order to determine the functional requirements and non-functional requirements.

Through research, document analysis, prototyping and observations gathered and validated the requirements which include research on existing systems as well. To gather requirements and to collect data, had visited the Irrigation Department of Sri Lanka and the National Building and Research Organization (NBRO) and the proofs will be attached in the *Appendix* section. Also, a public feedback survey was created to get feedback for the system we implement. For further reference, the survey is attached in *Appendix A*.

5.5 Hardware and software requirements

Through web applications, the system is designed to meet the different needs of all stakeholders. This will provide an interface to visible disaster places, and safe places, find the nearest places for disaster places and will show an interface for donors as well. The features offered by HELP+US will be listed below.

Login Controller:

Allows the users to log in to the system using user credentials.

Admin Panel:

Allows the admins to update and delete the data entered and can control whole system data.

User Panel:

Allows the users to access the system by viewing the map and other functionalities.

Disaster map :

Allows the users to view the disaster area and nearest safety places from the disaster area.

Donation Panel:

Allows the users to donate money or other materials to the refugees in specific camps.

Guidelines panel:

Allow all users to view guidelines to follow before a disaster, during a disaster and after a disaster.

5.6 Requirement specification

5.6.1 Functional requirements

Authenticate User

Table 5.6.1 Authenticate User Table

F1 :	Authenticate User
Summary :	The system should allow the users to successfully login once the validated username and password are submitted.
Input :	Username/ Email/ password
Process :	The system will check with the database for a valid login. If the provided username and password are valid, the main home page applicable to the user is displayed, else the user will be denied of access.
Output :	Message of successful login and display of the home page else an error message for invalid login.

Add refugee details

Table 5.6.2 Add Refugee Details

F2 :	Add refugee details
Summary :	Gathered information on refugees will be added by the relevant data entry operators to the system. Hence each record added to the system will acquire a unique ID, thereby, being able to easily keep track of the relevant records.
Input :	Refugee details
Process :	The system will save the entered details in the database after validation of each input data.
Output :	A successful message is given if the data has been added and will show the detailed view of the already entered refugee otherwise, an error message will be displayed.

Add Camp Details

Table 5.6.3 Add Camp Details

F3 :	Add Camps
Summary :	The gathered information about the camps located in the safety locations will be added by the relevant data entry operators to the system. Hence each record added to the system will acquire a unique ID,

	thereby, being able to easily keep track of the relevant records.
Input :	Camp Details
Process :	The system will save the entered details in the database after validation of each input data.
Output :	A successful message is given if the data has been added and will show the detailed view of the already entered camps else, an error message will be displayed.

Add disaster Location Details

Table 5.6.4 Add disaster Location Details

F4 :	Add disaster locations
Summary :	Gathered information on the disaster locations will be added by the relevant data entry operators to the system.
Input :	Disaster type, location Details
Process :	The system will save the entered details in the database after validation of each input under the Added disaster type table and the identification table.
Output :	A successful message if the data has been added else, an error message will be displayed.

Search Safety location

Table 5.6.5 Search Safety location

F5 :	Search
Summary :	Allows any user to easily find safety locations and the nearest safety camps that can move when in a disaster.
Input :	Search field
Process :	The system should search the word given by the user in the database. If the system found any results, it will display a complete set of details on the screen for the users.
Output :	Details of the searched item or an error message notifying “There is no matched data/ No results “

Search for location

Table 5.6.6 Search for location

F6 :	Search
Summary :	Allows any user to easily find any location that is safe, risky or affected by dropping the pointer on the map.
Input :	Drop the pointer

Process :	The system should search the location given by the user in the database. If the system found any results, it will display a pop-up on the screen for the users.
Output :	Details of the searched item or an error message notifying “There is no matched data/ No results “

Search Camp/ Refugee/Guidelines details.

Table 5.6.7 Search Camp/ Refugee/Guidelines details

F7 :	Search Camp/ Refugee/ Guidelines details.
Summary :	Allows the authenticated users to easily find refugee details and camp details of who are the victims of any disaster.
Input :	Keyword(s) to search
Process :	The system should search the word(s) given by the user in the database. If the system finds any results, it will display a complete set of details on the screen for the users.
Output :	Details of the searched item or an error message notifying “There is no matched data/ No results “

Update Camp/ Refugee/Guidelines Records

Table 5.6.8 Update Camp/ Refugee/Guidelines Records

F8 :	Update Camp/ Refugee/ Guidelines Records
Summary :	The system will allow the authenticated users to update the records which were previously stored about the temporary shelters (camps) in the database at any time on request.
Input :	Field(s) to be updated.
Process :	The system will validate the updated field(s) and store them in the database by replacing the previous data of the record.
Output :	Display a success message or else an error message.

Delete Camp/Refugee/ Guidelines/ Location/ Disaster Records

Table 5.6.9 Delete Camp/Refugee/ Guidelines/ Location/ Disaster Records

F9 :	Deleting Camp/Refugee/ Guidelines/ Location/ Disaster records from the database
Summary :	The system will allow only authenticated users to perform the deletion operation of records stored by the system.
Input :	Record ID

Process :	The system will check with the database for the record and any constraints related to the record to be deleted. And it will retrieve the entire data specific to the provided ID and if constraints are not found related to the record, the system will allow the deletion.
Output :	A successful message or an error message.

User donate camps

Table 5.6.10 User Donate Camps

F10 :	User donate Camps
Summary :	This system will allow the users to donate to the camps where the victims are in.
Input :	User ID
Process :	The system will check with the database for valid inputs. And once validation is successful the relevant donations description will be sent.
Output :	Message of successful sending of the donation to relevant parties else an error message will be displayed.

Retrieve or Change Password

Table 5.6.11 Retrieve or Change Password

F11 :	Retrieval or change of user password
Summary :	The system will allow the user to retrieve the password in any preferred way or change the old password to a new one.
Input :	New password code received by email/ SMS and password question and answer or new password and old password.
Process :	The above input fields will be validated and checked with the database and if the new password is provided it will be saved to the database.
Output :	Display of successful message or else an error message of failure to process.

Create disaster Report

Table 5.6.12 Create disaster Report

F12 :	Creation of reports for the disaster
Summary :	The system will allow administrators to generate statistical reports relevant to disaster moments.
Input :	Disaster type, location, time

Process :	When the details are provided it will be validated with the database. Once proper details are provided statistical reports will be generated.
Output :	Generated reports with tables or graphs else and an error message will be displayed if unable to generate a report.

Send an Email

Table 5.6.13 Send an Email

F13 :	Send an email to the patron(s)
Summary :	The system will allow authenticated users to send reminders on disaster descriptions through an email notification.
Input :	Email address, message, subject
Process :	The system will check the format of the email address provided and validate the email address. Then the relevant notification to be sent to the users will be validated and processed and will be sent.
Output :	Successful message if the email is sent else an error message will be displayed.

Send alerts

Table 5.6.14 Send alerts

F14 :	Send alerts
Summary :	This system will allow authenticated users to send relevant alerts to the users by notifying them about the disasters.
Input :	Mobile number, reminder, User ID
Process :	The system will check with the database for valid inputs. And once validation is successful the relevant reminder will be sent.
Output :	Message of successful sending of the reminder to relevant parties else an error message will be displayed.

Contact using emergency contact numbers

Table 5.6.15 Contact using emergency contact numbers

F15 :	Contact using emergency contact numbers
Summary :	This system will allow the users to contact people with contact numbers which the user has entered when logging in.
Input :	Mobile number, reminder, User ID
Process :	The system will check with the database for valid inputs. And once validation is successful the relevant reminder will be sent.

Output :	Message of successful sending of the reminder to relevant parties else an error message will be displayed.
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Customize User profile

Table 5.6.16 Customize User profile

F16 :	Customize User profile
Summary :	This allows the user to change the appearance of their display screens. The ability to make changes will differ according to the user's privilege.
Input :	Select the required change to be made.
Process :	The changes will be made to the relevant user according to their preference.
Output :	Success message or error message.

5.6.2 Non-Functional requirements

Performance Requirements

The proposed system will be used by multiple users accessing the system simultaneously. The maximum response time will be within 6 seconds. The average response time for the system to respond will be 2 seconds. The web application will be able to handle a huge amount of workload. The system should also be able to handle and adapt to clients' future modifications and changes to requirements.

Safety Requirements

The use of this software system is only a solution to computerize Disaster Management of the data. The safety of the product and its users and ethical issues should be given consideration when using this system. Data could be lost, damaged or harmed due to viruses or technical failures. Therefore, we are taking measures to prevent these hazards. The constraints take effect shaping the software to be more trustworthy, reliable and genuine. Back-up and restoration of data as required by the client to prevent loss of data from unexpected database crashes and avoid the accumulation of data that would affect the performance of the system.

Security Requirements

When the users log in to the system, they must provide an authenticated username and a valid password. The particular user should be given different user privileges according to the disaster management system user hierarchy. Users should adhere to the access permissions given to them and should avoid any malpractices such as violation of access rights. Any attempt to use the system in an unethical way is prevented within the system. Any modification to the system should be regulated by the system administrator.

Software Quality Attributes

- Availability

The Administrator can access all the data stored in the database at any time period. Other users can access the data according to their access privileges. The system is available 24 hours daily for operations. The system will need 10-15 minutes of downtime for database backup purposes.

- Security

Unauthorized persons cannot access the system as it requires an authenticated user name and password. If any user uses the system without login can only view the map. Therefore, the reliability of the data is high.

- Usability

The user-friendly interfaces make the system easier to use and can adapt to it without much constrain.

- Maintainability

The Disaster Management System makes it easy to maintain and the programming constraints are followed consistently throughout the whole application.

- Reliability

The system runs on at least 99% reliability. If any system failure occurs, the crash recovers with back-ups.

- Integrity

All the important data are secured in the system as only authorized personnel can access the system, thus, ensuring the integrity of the data that is being stored.

5.7 Designing Process of the System (System design diagrams, User Interface designs, Database design, Network design, etc.)

Use case Diagram for HELP+US

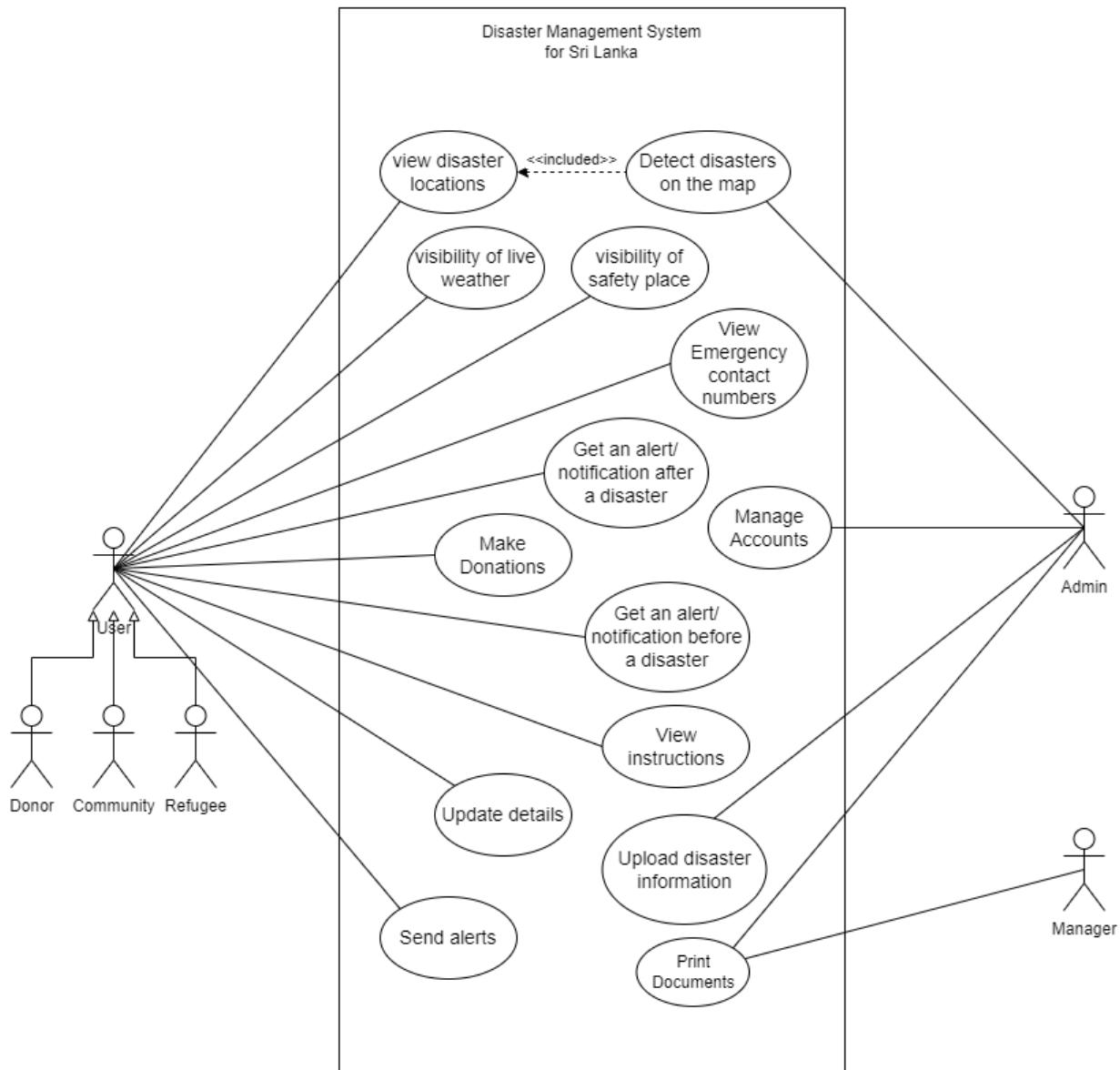


Figure 5.7-1 Use case Diagram for HELP+US

The above figure shows the use case diagram for the disaster management system. The admins can upload the disaster data, manage accounts and manage data related to creating, editing and deleting. The community can be able to make donations, visible a map of disaster and detect the nearest safety location by themselves.

Flow Chart for HELP+US

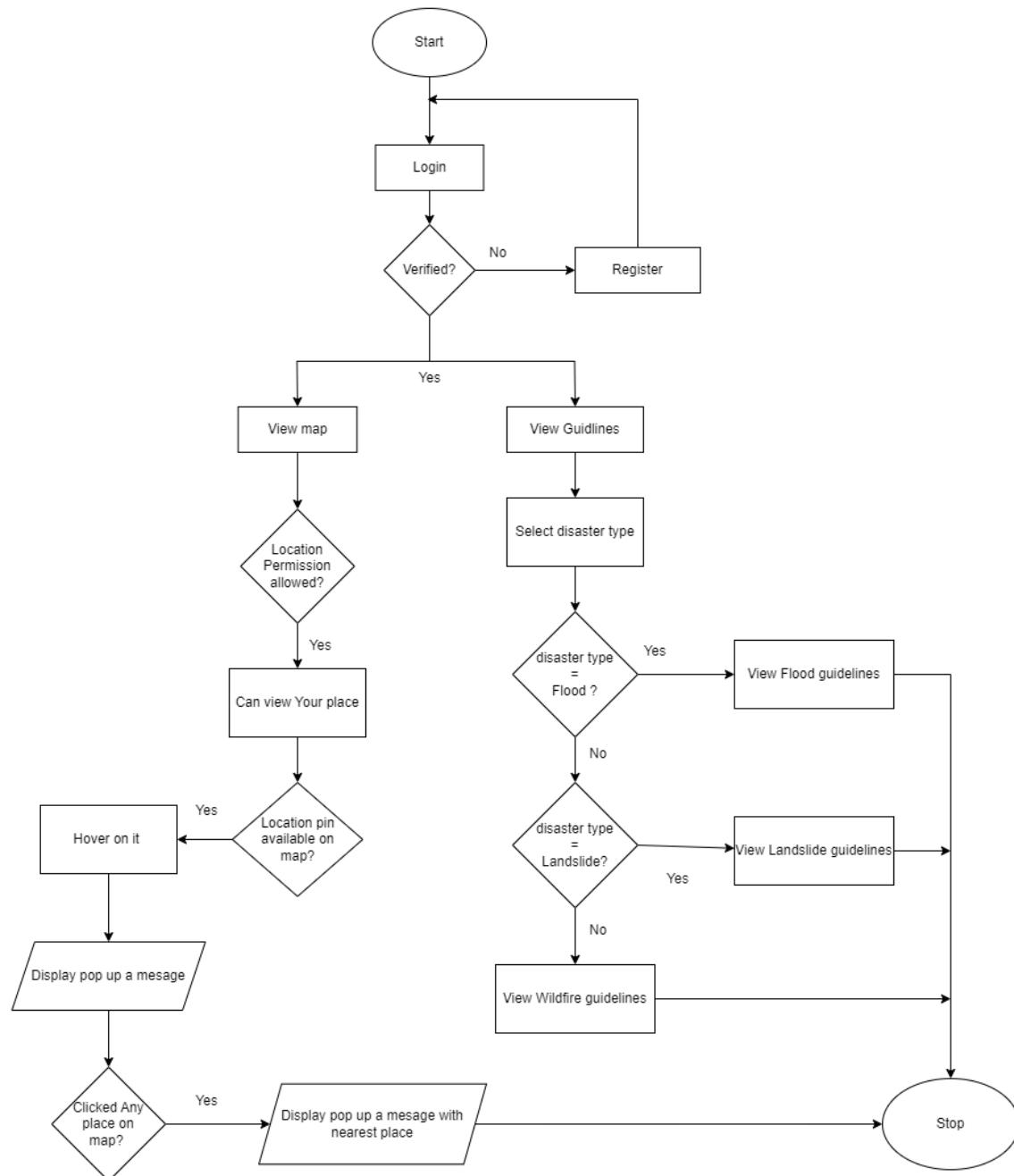


Figure 5.7-2 Flow Chart for HELP+US

The above diagram *Figure 5.7.2* shows the flow chart diagram for the HELP+US disaster management system which works with maps and guidelines specially.

Class Diagram for HELP+US

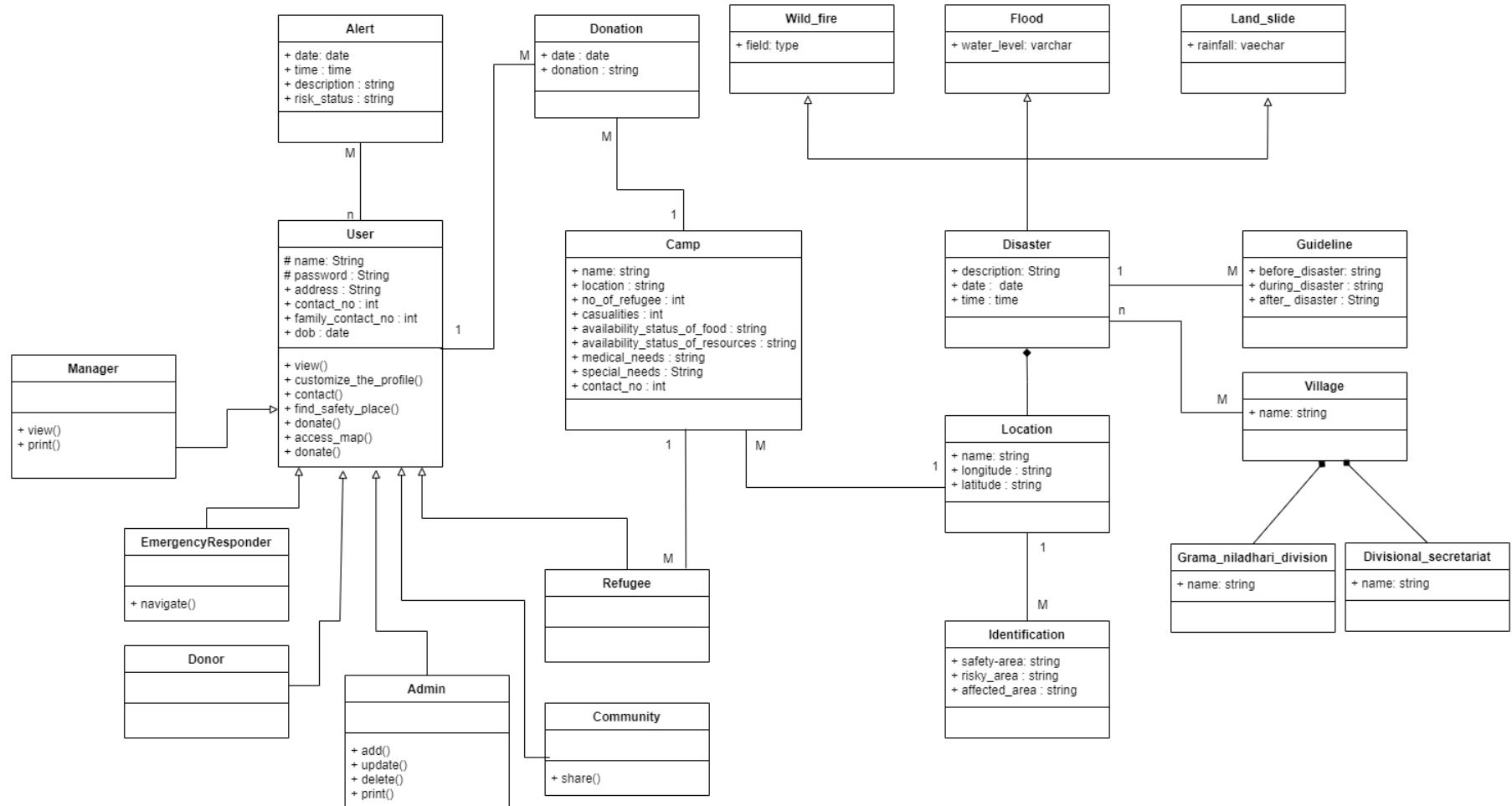


Figure 5.7-3 Class Diagram for HELP+US

The above diagram *Figure 5.7.3* shows a class diagram for a Disaster Management System that depicts the system's structure, including classes, attributes methods and relationships. It is important to understand how different system components interact with each other and share information, allowing for more effective development of a system.

Activity Diagram for HELP+US

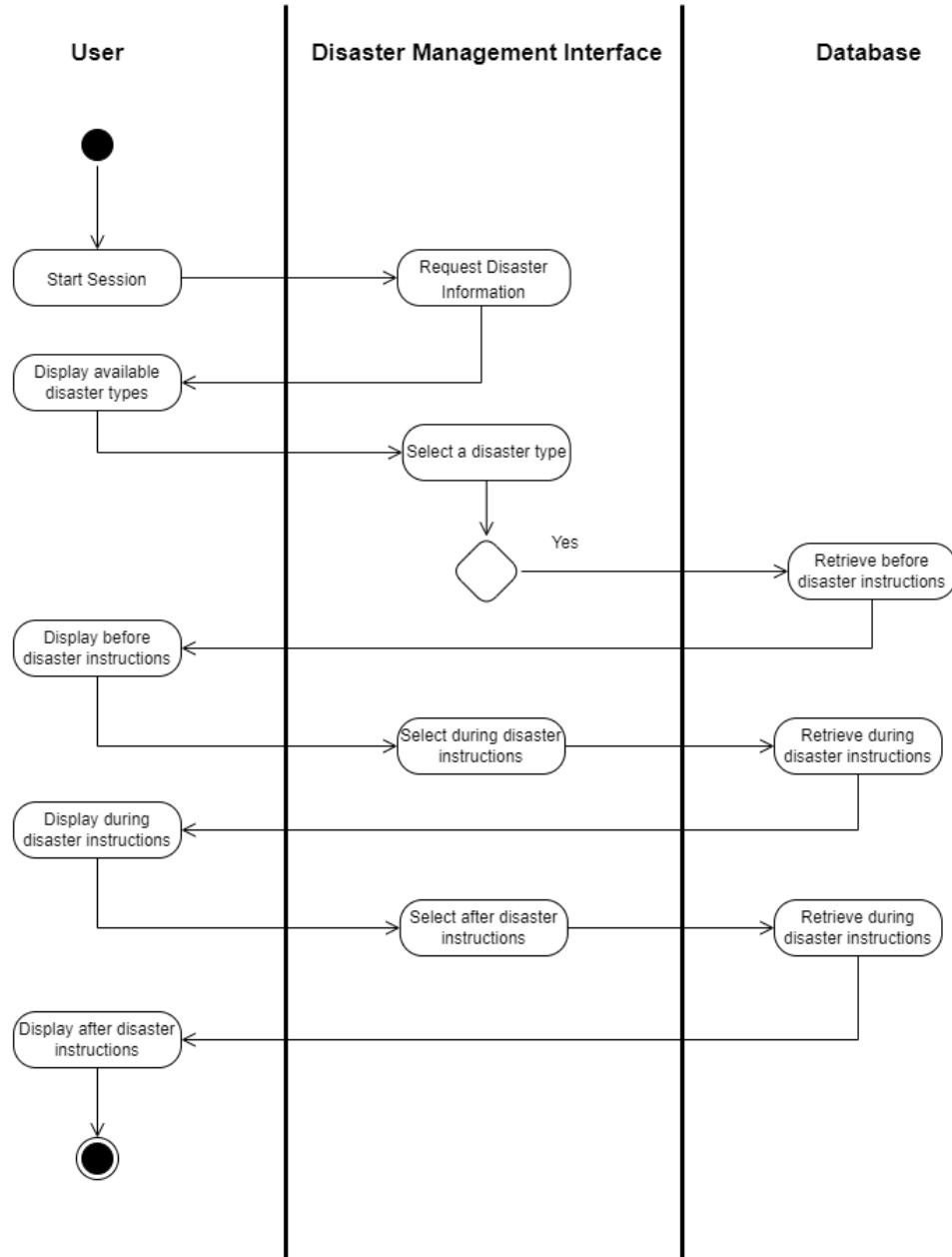


Figure 5.7-4 Activity Diagram for HELP+US - Guidelines Functionality

The above diagram *Figure 5.7.4* shows how the system works when providing the guidelines. Here the user should be able to get details or guidelines on what they should do before, during and after a disaster.

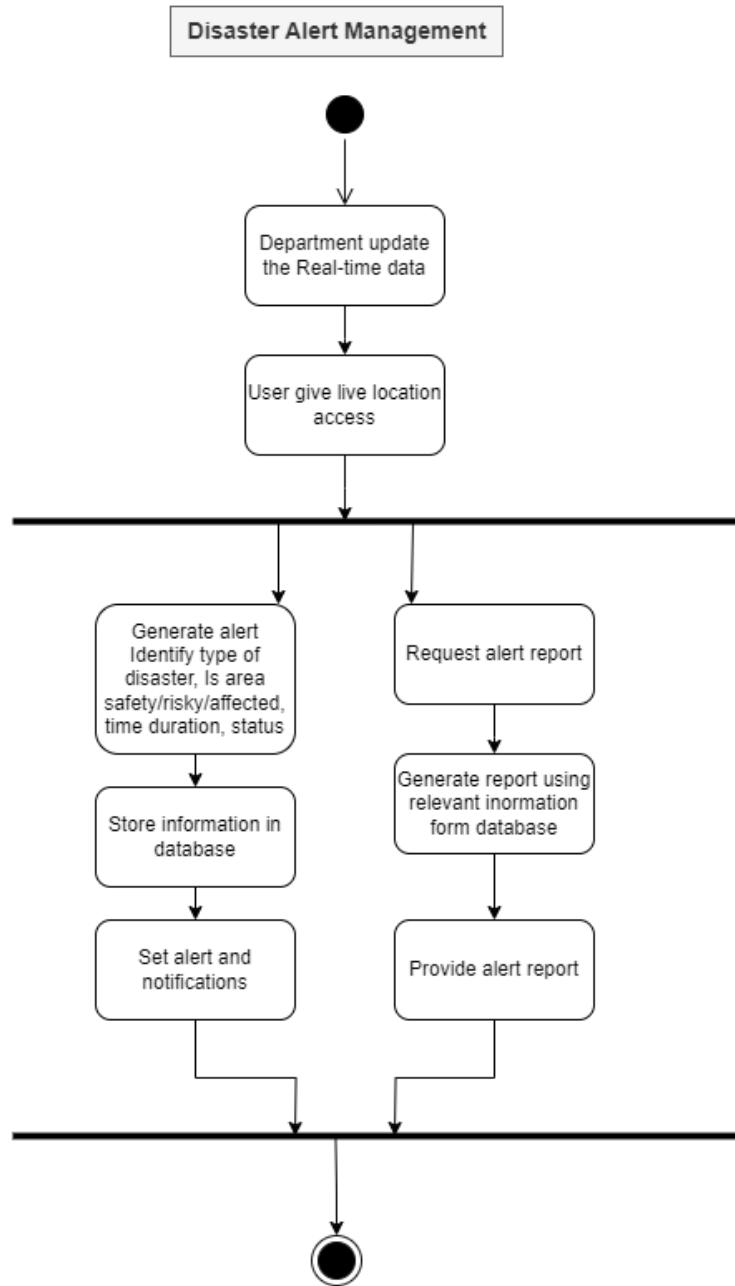


Figure 5.7-5 Activity Diagram for HELP+US - Disaster Alert Management

The above diagram *Figure 5.7.5* shows the disaster alert system. Here the user should be able to get an alert by checking whether the relevant area is safe or not.

Sequence Diagram for HELP+US

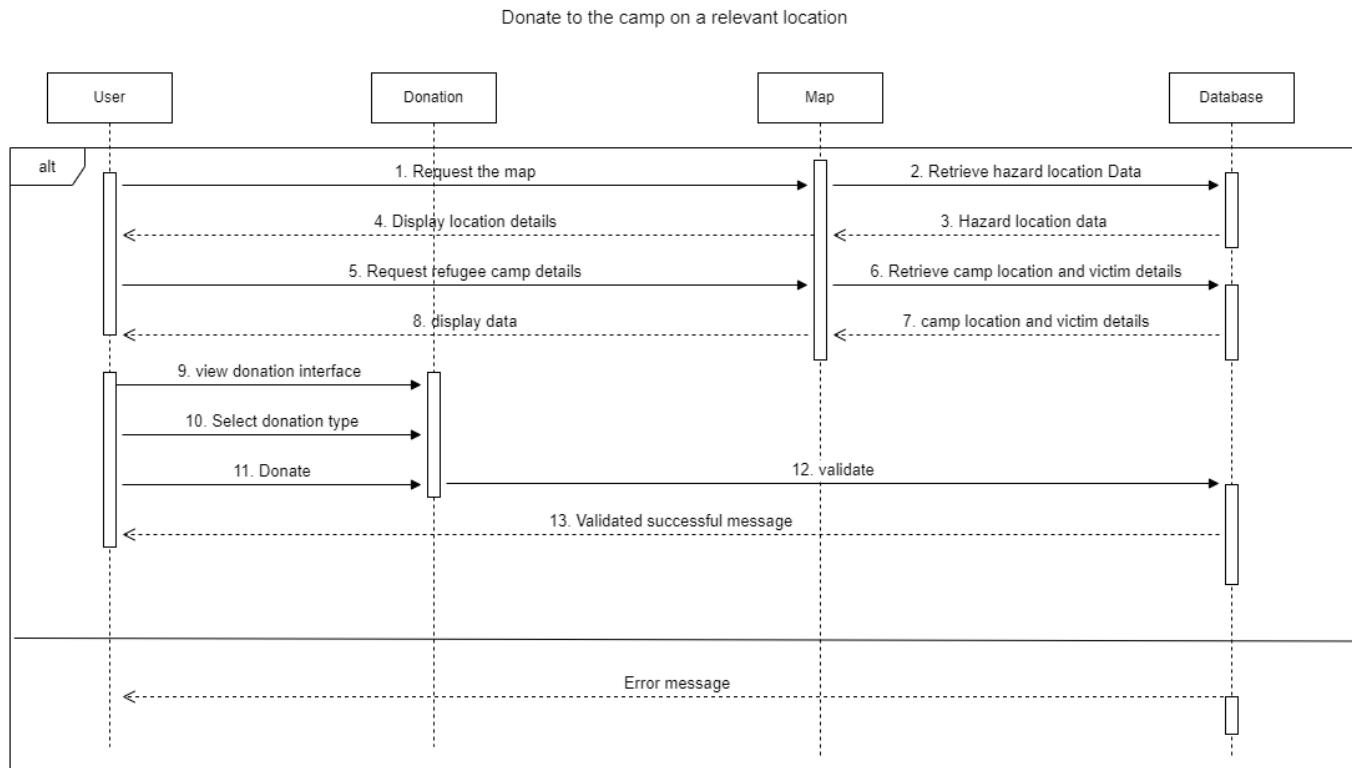


Figure 5.7-6 Sequence Diagram for HELP+US - Donate functionality

The above sequence diagram *Figure 5.7.6* shows the donation functionality in which any user can locate any camp using a map and will be able to donate to that relevant camp.

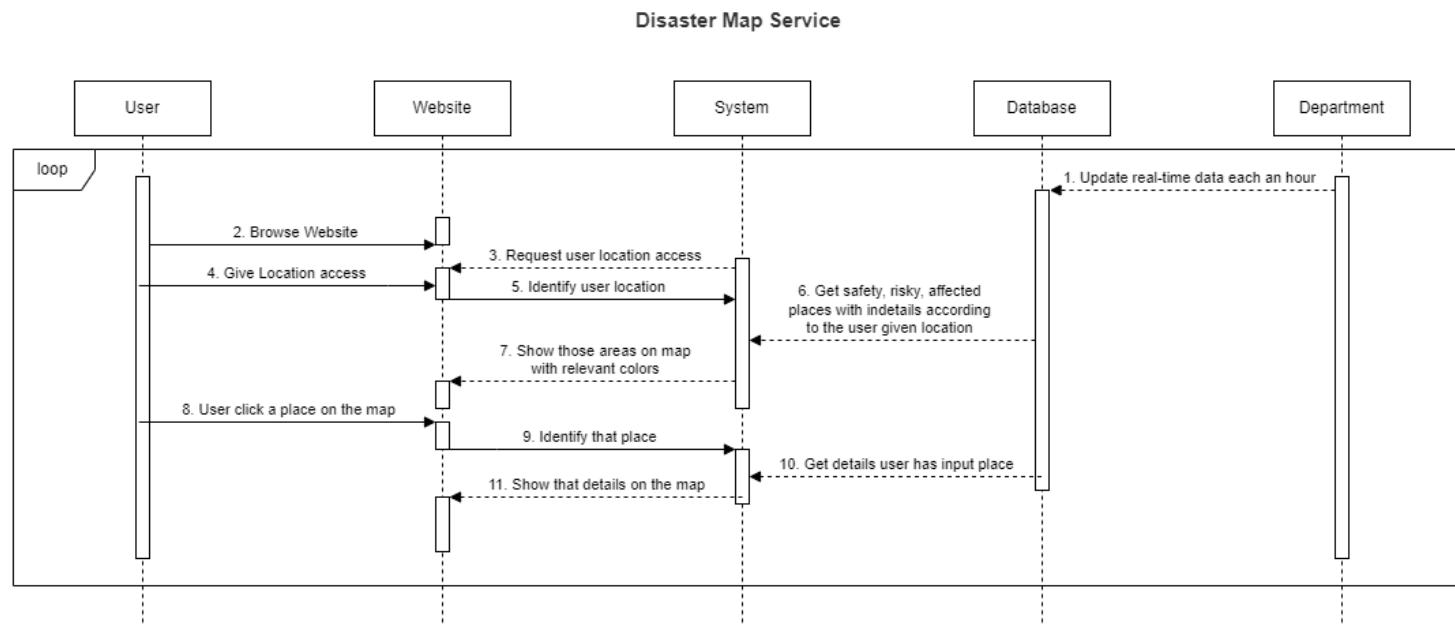


Figure 5.7-7 Sequence Diagram for HELP+US - Disaster Map service

Above *Figure 5.7.7* is a sequence diagram to show the disaster, safety and nearest location from the users' location which is visible to the user.

ER Diagram for HELP+US

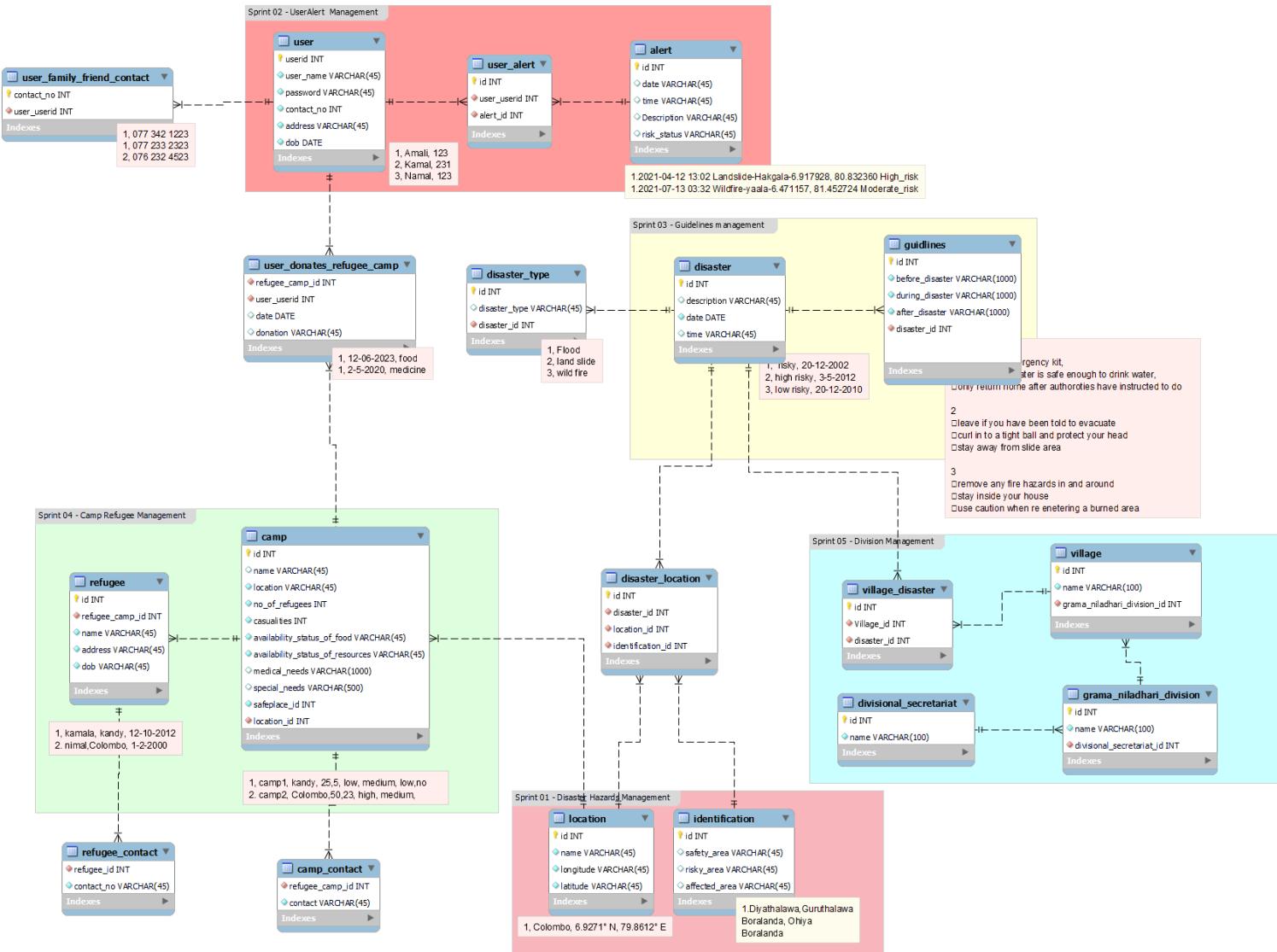


Figure 5.7-8 ER Diagram for HELP+US

User Interface Designs

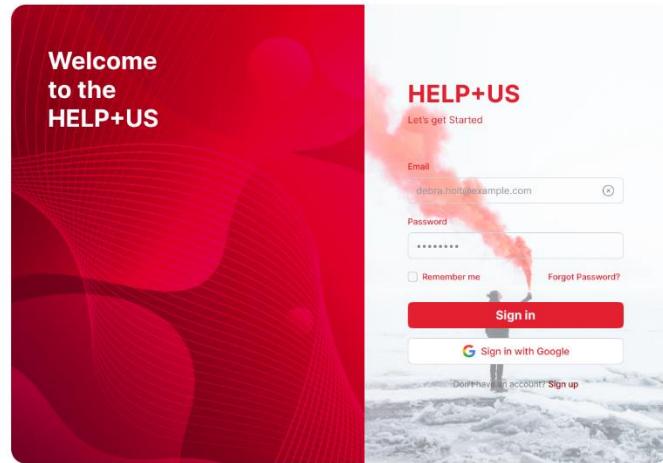


Figure 5.7-9 Sign in Interface

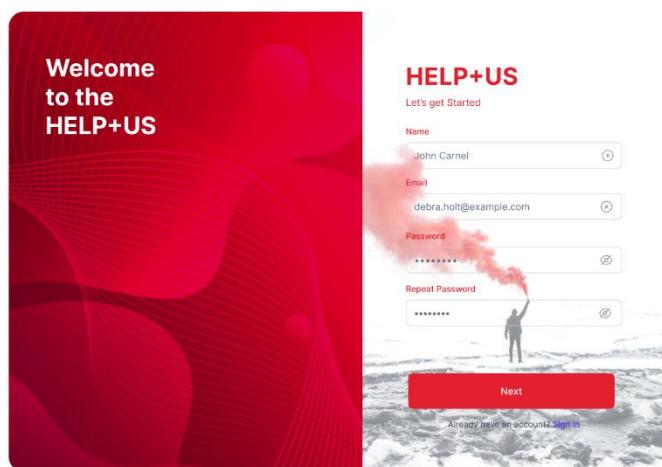


Figure 5.7-10 Sign up Interface



Figure 5.7-11 Sign up Interface 2

Figure 5.7-12 Donation Interface

Figure 5.7-13 Donation Interface

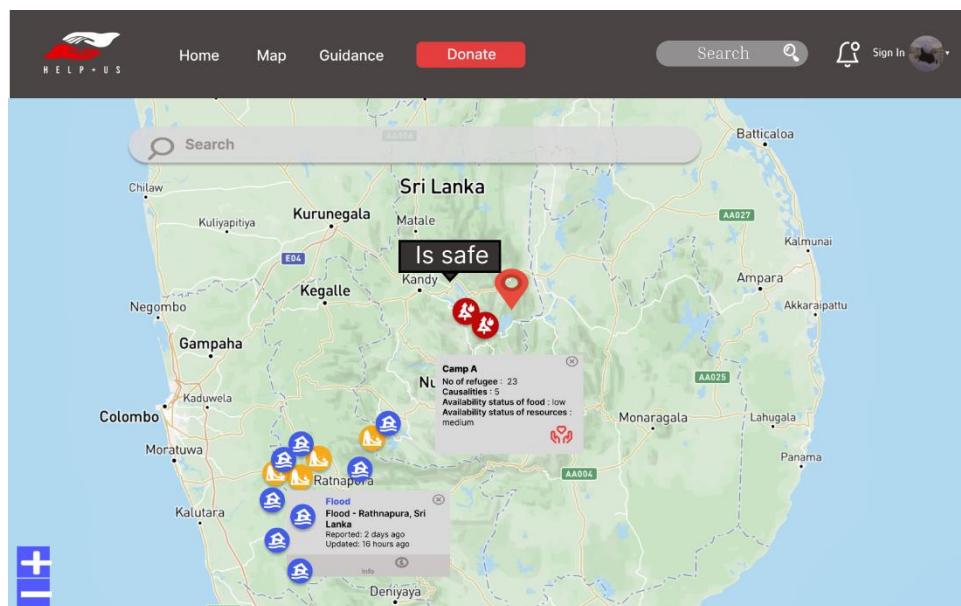


Figure 5.7-14 Map Interface

Camp	Location	Availability status of foods	Availability status of resources	Medical needs	Special needs
CAMP A	Ketawala, Rathnapura	Low	Low	<ul style="list-style-type: none"> • Aspirin • Atropine sulfate • Aminophylline • Amyl nitrite inhalation • hospital beds • nebulizers • glucose monitors 	<ul style="list-style-type: none"> • The scarcity or inadequate availability of essential supplies and services. • This can include items such as clean water, shelter, clothing, fuel, sanitation facilities, communication tools, and electricity. • Lack of emergency shelters, distribution of essential supplies, restoration of infrastructure, and ensuring access to basic services.

Figure 5.7-15 Donations Interface



Figure 5.7-16 Guidelines Interface

The screenshot shows the HELP+US website with a dark header. The logo is a red stylized hand holding a flame. The navigation bar includes links for Home, Map, Guidance, and a red 'Donate' button. To the right are search, sign-in, and language selection buttons. The main title 'Surviving From Wildfire - Guidelines' is centered above three red-outlined boxes. The first box, 'Before the Wildfire:', lists steps like creating a defensible space and having an evacuation plan. The second box, 'During the Wildfire:', lists actions like listening to broadcasts and seeking shelter. The third box, 'After the Wildfire:', lists steps like inspecting property and contacting insurance. Below these boxes is a 'FOLLOW US ON' section with social media icons and a 'QUICK LINKS' menu with links to Home, About us, News, Disaster, Contact Us, Donate, Search, Notifications, Sign In, Profile, Support, Privacy Policy, FAQs, Contact, and Events. On the right side, there is an email address 'info@helpus.lk' and contact information for Maharagama, Sri Lanka, including phone numbers '+xx xx xxx xxxx / +xx xx xxx xxxx'.

Figure 5.7-17 Guidelines - Wild Fire interface

This screenshot shows the same website layout for landslide guidelines. The main title 'Surviving From Landslide - Guidelines' is centered above three yellow-outlined boxes. The 'Before the Landslide:' box lists signs of an impending landslide and areas prone to landslides. The 'During the Landslide:' box lists actions like moving to higher ground. The 'After the Landslide:' box lists steps like staying away from the affected area and checking for damage. The footer follows the same structure as the wildfire page, including social media links, a quick links menu, and contact information for info@helpus.lk and Maharagama, Sri Lanka.

Figure 5.7-18 Guidelines - Landslides interface

The screenshot shows a dark-themed web page with a navigation bar at the top. The navigation bar includes a logo, links for Home, Map, Guidance, and a red 'Donate' button, along with a search bar and a sign-in link.

Surviving From Flood - Guidelines

Before the Flood:

- Stay informed about weather conditions and flood warnings in your area.
- Create an emergency kit with essential supplies, including food, water, medications, and first aid items.
- Secure your important documents and valuables in waterproof containers or bags.
- Develop an [emergency plan](#) with your family, including evacuation routes and meeting points.

During the Flood:

- Listen to local authorities and follow evacuation orders if issued.
- Avoid walking or driving through floodwaters; they can be deeper or faster-moving than they appear.
- Seek higher ground and move to a safe location away from rivers, streams, and low-lying areas.
- Keep emergency supplies and a portable radio with you.

After the Flood:

- Wait for authorities to declare it safe before returning to your home or affected area.
- Inspect your property for damage and report any issues to the [appropriate authorities](#).
- Be cautious of hazards such as debris, contaminated water, and electrical wires.
- Contact your [insurance company](#) to file a claim if your property has been damaged.

FOLLOW US ON

QUICK LINKS

Home	Donate	Support
About us	Search	Privacy Policy
News	Notifications	FAQs
Disaster	Sign In	Contact
Contact Us	Profile	Events

info@helpus.lk
Maharagama,Sri Lanka
+xx xx xxx xxxx / +xx xx xxx xxxx

Figure 5.7-19 Guidelines -Floods interface

The screenshot shows a red-themed profile editing interface. On the left, a sidebar lists options: Edit Profile, Notification, Security, Appearance, Help, and Settings. The main area is titled 'Edit Profile' and contains fields for First Name*, Last Name*, Contact Email address*, Contact Mobile Phone Number*, Emergency Contact Number 1*, Emergency Contact Number 2, Emergency Contact Number 3, and Emergency Contact Number 4. There is also a placeholder for a profile picture with a 'change' button. At the bottom are 'Cancel' and 'Save' buttons.

Figure 5.7-20 Edit Profile Interface

The screenshot shows the HELPUS website's main page. At the top, there is a navigation bar with links for Home, About Us, News, Contact Us, a red 'Donate' button, a search bar, and a sign-in link. Below the navigation is a large image of several white and red shipping containers stacked together. Underneath this image is a grid of nine circular icons, each representing a different management module:

- Refugee Management** (visit page)
- Camp Management** (visit page)
- Disaster Status Management** (visit page)
- Guidelines Management** (visit page)
- Divisional Secretariat Management** (visit page)
- Grana Niladhari Management** (visit page)
- Village Management** (visit page)
- Identification Management** (visit page)
- Location Secretariat Management** (visit page)
- Alert Management** (visit page)

The screenshot shows the 'About Us' page of the HELPUS website. The page features a large background image of a yellow diamond-shaped road sign with three traffic lights, partially submerged in floodwater. The title 'About Us' is centered above a detailed paragraph about the organization's mission and history. A small image of a person working at a desk is visible on the right side.

The screenshot shows the 'News' section of the website. It displays two news items in a grid format:

- March 16, 2013**: A man walks through floodwaters downstream from a levee break along the Pajaro River in Monterey County, California. Heavy rain from an atmospheric river caused the break on March 11, 2013. Image credit: California Department of Water Resources.
- WWS Helping Feed the Hungry in Chile after Weather Disasters**: A woman stands behind a table filled with food boxes, likely from the Project Rain Raps organization.

A 'More News' button is located at the bottom right of the news section.

The screenshot shows a contact form for getting in touch. It includes fields for Name, E-mail, and Message, along with a 'Send' button. To the left of the form, there is a section titled 'Get in touch today' with a brief message and a 'Contact Us' link.

The screenshot shows the footer of the website. It includes social media links for Facebook, Twitter, YouTube, and LinkedIn. There are also sections for 'CICK LINKS' with links to Home, About us, News, Disaster, and Contact Us; and for 'Support' with links to Donate, Search, Notifications, Sign In Profile, Privacy Policy, FAQs, Contact, and Events. On the right side, there is an email address (info@helpus.lk), a location (Maharagama, Sri Lanka), and a phone number (+XX XX XXX XXXX / +XX XX XXX XXXX).

Figure 5.7-21 Home Page

Camp Registration

Name:	CampA
Address:	Colombo
No of	Causaliti
12/02/2001	2
Availability Status of	Low
Availability Status of	Low
Medical	Aspirin
Special Needs	
Needs transportation service.	

CREATE

Wanna update details? visit [Dashboard](#)

Figure 5.7-22 Camp Registration

List of registered Camps for refugees

Camp	Location	No of Refugees	Casualties	Availability status of foods	Availability status of resources	Medical needs	Special needs
CAMP A	Ketawala, Rathnapura	34	Low	Low	Low	<ul style="list-style-type: none"> • Aspirin • Amphetamine sulfate • Aminophylline • Amyl nitrite inhalation • hospital beds • nebulizers • glucose monitors 	<ul style="list-style-type: none"> • The scarcity or inadequate availability of essential supplies and services. • This can include items such as clean water, shelter, clothing, fuel, sanitation facilities, communication tools, and electricity. • Lack of emergency shelters, distribution of essential supplies, restoration of infrastructure, and ensuring access to basic services.

Let's Add a New Registered Camps

Page 1 of 2 [Next](#) [Last >>](#)

Figure 5.7-23 Camp Detail View

Camp Update Details

Name: CampA

Address: Colombo

No of Causalities: 2

12/02/2001

Availability Status of: Low

Availability Status of: Low

Medical: Aspirin

Special Needs: Needs transportation service.

UPDATE

Figure 5.7-24 Camp Update View

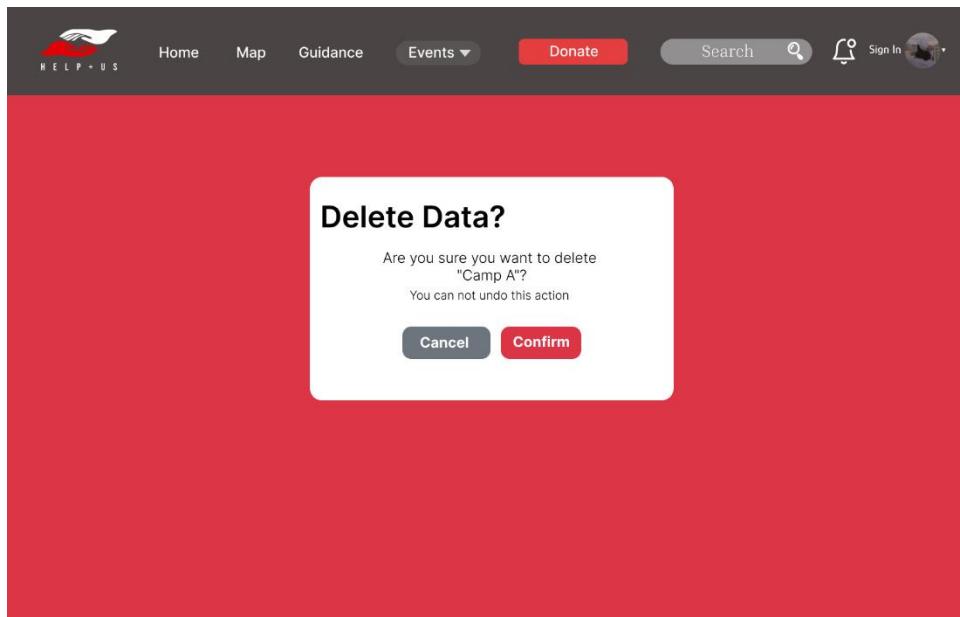


Figure 5.7-25 Camp Delete View

5.8 Evaluating of solutions

By gathering the requirements using research, the disaster management system for Sri Lanka is made. Most people do not know what they should follow before, during and after a disaster and most of the time they get hopeless when they face any disaster. People do not know where to shelter themselves. They become hopeless and even displacement.

In response to this situation, the HELP+US web application is implemented. This web application will not act as a complete solution but will cover up to some extent. For example, it will provide disaster places and nearest places and will provide guidelines to follow. Therefore, the system HELP+US is a timely valuable solution to the problem.

5.9 Summary

The first section *Section 5.1* was an introduction to the whole chapter which is about system analysis and design which is a structured process for developing and improving the systems. *Section 5.2* describes the process model I have chosen to develop this system. In that section, it mentioned the iterative and incremental models. *Section 5.3* shows the feasibility studies which consist of Time Feasibility, Cost Feasibility, Scope Feasibility, Technical Feasibility and Technology Adoption, and Economic Feasibility. The techniques used to gather the requirements are mentioned in the section *Section 5.4* Requirement Gathering for the Design Phase. In section *Section 5.5* Key features like login controllers, admin panels, user panels, disaster maps, donation panels, and guidelines panels were discussed. In Requirement Specification, it includes functional, non-functional and finally the HELP+US web application is evaluated.

Chapter 6

6 Implementation

6.1 Introduction

As previously stated, disaster management is a complicated challenge requiring a thorough and effective solution. The HELP+US disaster management system will help people whenever in a disaster or at a critical time to protect them and we expect to have a significant influence on disaster resiliency in our community and area. In this phase, the theoretical aspects will be shown using practical executions of a web application.

This chapter will discuss the best practices that followed during implementation, the implementation environment, tools and the significant code modules used during the implementation.

6.2 Best Practices adhered during Implementation

During the implementation,

- Added comments in necessary places, in order to increase the clarity of the codes and to make the reviewer understand the code within a short time.
- As a version controller git hub was used to collaborate with the team members to maintain previous and up-to-date implementations.
- Throughout the implementation of the disaster management system, rigorous testing was conducted including unit testing and integration testing.
- Ensures that the system can balance the load and can handle more requests and respond within a short time which is scalable.

6.3 Implementation Environment & Development tools

Initially, the implementation and the testing for the HELP+US disaster management web application were carried out in a Windows 10 environment and Microsoft Edge was used as the browser to get the output.

- **VSCode:** is a lightweight but powerful source code editor and development environment developed by Microsoft. With VSCode, can easily create code making your programming journey more enjoyable. [9].
- **Django:** The server-side development of the web application is done by using Django and Django is a high-level Python web framework that encourages to development of rapid programs with inbuilt libraries [10]. It uses the MVC architecture.
- **HTML:** is used as the front end to create the structure and the layout of the web page and is a canvas that is used to paint the user interface's blueprint.
- **CSS:** is an important tool for customizing the visual representation of a web page and is used for styling the overall appearance of the user Interfaces
 - **Bootstrap:** is a famous and pre-defined CSS framework that is used to build responsive web applications that ensure that web applications gracefully respond to any device screen size.
- **Leaflet JS:** is a framework that is flexible, lightweight and open source library for creating interactive maps that overlay different types of layers [11]. The use of leaflet js, it makes our application to add geograohical data.
- **SQLite:** is a lightweight, serverless, and self-contained database engine that is suitable for projects with low to moderate database traffic.
- **Figma:** Figma is a web tool for collaborative interface design that focuses on user interface and user experience design.

6.4 Significant Code Modules used during the Implementation

Sample code of models.py

```
DMSystem > app > models.py > Camp > Meta
 1  from django.db import models
 2
 3  # Model for Refugee
 4  class Refugee(models.Model):
 5      name = models.CharField(max_length=45)
 6      # def __str__(self):
 7      #     return self.name + ""
 8      address = models.CharField(max_length=45)
 9      dob = models.DateField('2002/09/01',null=False)
10      age = models.IntegerField(22,null=False)
11      class Meta:
12          permissions = [("print_refugee", "Can print refugee")]
13
14  class Camp(models.Model):
15      # Choices for availability status of food and resources
16      AVAILABILITY_IN_FOOD_CHOICES = [
17          ('Low', 'low'),
18          ('Moderate', 'moderate'),
19          ('High', 'high')
20      ]
21
22      # Choices for availability status of resources
23      AVAILABILITY_IN_RESOURCES_CHOICES = [
24          ('Low', 'low'),
25          ('Moderate', 'moderate'),
26          ('High', 'high')
27      ]
28      name = models.CharField(max_length=45)
29      location = models.CharField(max_length=45)
30      no_of_refugee = models.IntegerField(default=0)
31      casualties = models.IntegerField(default=0)
32      availability_status_of_food = models.CharField(max_length=10, choices=AVAILABILITY_IN_FOOD_CHOICES)
33      availability_status_of_resources= models.CharField(max_length=10, choices=AVAILABILITY_IN_RESOURCES_CHOICES)
34      medical_needs = models.CharField(max_length=1000, null=True, blank=True)
35      special_needs = models.CharField(max_length=1000, null=True, blank=True)
36      # def __str__(self):
37      #     return self.name + ""
38      class Meta:
39          permissions = [("print_camp", "Can print camp")]
```

Figure 6.4-1 Sample code of models.py

This code defines the several Django models that represent elements of a system, for managing disasters. These elements include refugees, camps, disasters, guidelines, identification, locations and villages which include several fields for each.

Sample Code of views.py

```
views.py 1 ×
DMSystem > app > views.py > registeruser
399     success_url = '.../app/villagelistview'
400
401 def camp_create(request):
402     return render(request, 'app/camp_create.html')
403
404 def refugee_create(request):
405     return render(request, 'app/refugee_create.html')
406
407 @login_required
408 def viewprofile(request):
409     return TemplateResponse(request, 'profile.html')
410
411 def homepage(request):
412     return TemplateResponse(request, 'home.html')
413
414
415 def activate(request, uidb64, token):
416     return redirect('login')
417
418 def activateEmail(request, user, to_email):
419     mail_subject = "Activate your user account."
420     message = render_to_string("template_activate_account.html",{
421         'user': user.username,
422         'domain': get_current_site(request).domain,
423         'uid': urlsafe_base64_encode(force_bytes(user.pk)),
424         'token': account_activation_token.make_token(user),
425         "protocol": 'http' if request.is_secure() else 'https'
426     })
427     email = EmailMessage(mail_subject, message, to=[to_email])
428     if email.send():
429         message = mark_safe(f'Dear {user}, please go to your email <b>{to_email}</b> inbox and click on<br>| | received activation link to confirm and complete the registration. <b>Note:</b> Check your spam folder.')
430         messages.success(request, message)
431     else:
432         messages.error(request, f'Problem sending email to {to_email}, check if you typed it correctly.')
433
434 @user_passes_test(lambda u: not u.is_authenticated)
435 def registeruser(request):
436     form=CreateUserForm
437     if request.method == 'POST':
438
```

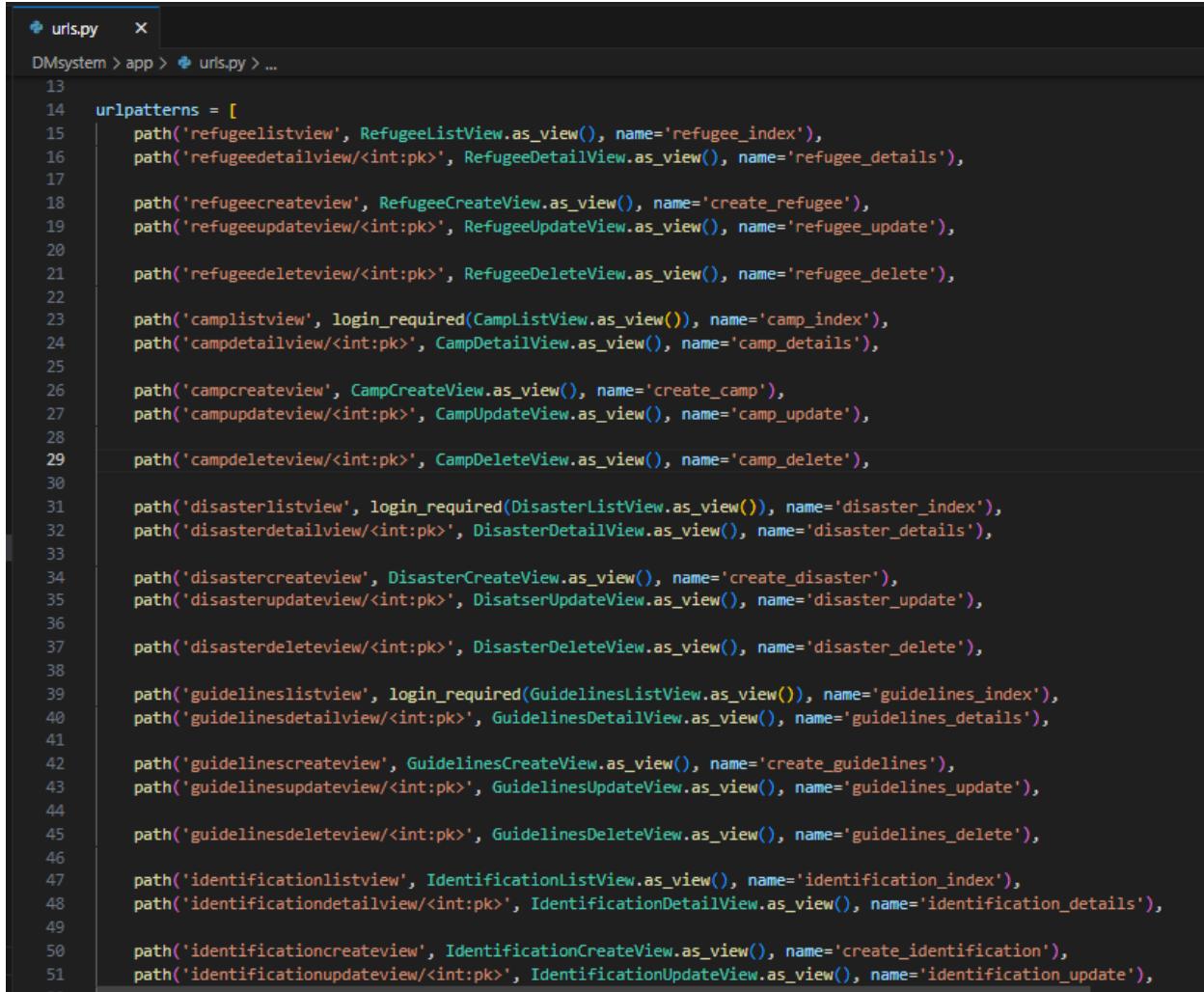
Figure 6.4-2 Sample Code of views.py -1

```
views.py 1 X
DMSystem > app > views.py > activateEmail
  66 |     success_url = '../..//app/refugeelistview'
  67 |
  68 class RefugeeDeleteView(PermissionRequiredMixin, DeleteView):
  69     permission_required = 'app.delete_refugee'
  70     model = Refugee
  71     fields = '__all__'
  72     template_name_suffix = "_delete"
  73     success_url = '...//app/refugeelistview'
  74
  75 class CampListView(ListView):
  76     permission_required = 'app.view_camp'
  77     template_name_suffix = "_index"
  78     model = Camp
  79     paginate_by = 8
  80
  81 class CampDetailView(PermissionRequiredMixin, DetailView):
  82     template_name_suffix = "_show"
  83     model = Camp
  84
  85 class CampCreateView(PermissionRequiredMixin, CreateView):
  86     permission_required = 'app.add_camp'
  87     model = Camp
  88     fields = '__all__'
  89     template_name_suffix = "_create"
  90     success_url = 'camplistview'
  91
  92 class CampUpdateView(PermissionRequiredMixin, UpdateView):
  93     permission_required = 'app.update_camp'
  94     model = Camp
  95     fields = '__all__'
  96     template_name_suffix = "_update"
  97     success_url = '...//app/camplistview'
  98
  99 class CampDeleteView(PermissionRequiredMixin, DeleteView):
100     permission_required = 'app.delete_camp'
101     model = Camp
102     fields = '__all__'
103     template_name_suffix = "_delete"
104     success_url = '...//app/camplistview'
105
```

Figure 6.4-3 Sample Code of views.py -2

The above code snippets will act as a server-side function which will render the HTML templates and will also handle the Django built-in functions as well.

Sample Code of ulrs.py



The screenshot shows a code editor window with the file 'urls.py' open. The file is part of a Django application named 'app'. The code defines a list of URL patterns for various views related to refugee, camp, disaster, guidelines, and identification management. Each pattern includes a view function, a name for reverse resolution, and optional parameters like pk and name.

```
13
14 urlpatterns = [
15     path('refugeelistview', RefugeeListView.as_view(), name='refugee_index'),
16     path('refugeedetailview<int:pk>', RefugeeDetailView.as_view(), name='refugee_details'),
17
18     path('refugeecreateView', RefugeeCreateView.as_view(), name='create_refugee'),
19     path('refugeeupdateview<int:pk>', RefugeeUpdateView.as_view(), name='refugee_update'),
20
21     path('refugeedeleteview<int:pk>', RefugeeDeleteView.as_view(), name='refugee_delete'),
22
23     path('camplistview', login_required(CampListView.as_view()), name='camp_index'),
24     path('campdetailview<int:pk>', CampDetailView.as_view(), name='camp_details'),
25
26     path('campcreateview', CampCreateView.as_view(), name='create_camp'),
27     path('campupdateview<int:pk>', CampUpdateView.as_view(), name='camp_update'),
28
29     path('campdeleteview<int:pk>', CampDeleteView.as_view(), name='camp_delete'),
30
31     path('disasterlistview', login_required(DisasterListView.as_view()), name='disaster_index'),
32     path('disasterdetailview<int:pk>', DisasterDetailView.as_view(), name='disaster_details'),
33
34     path('disastercreateview', DisasterCreateView.as_view(), name='create_disaster'),
35     path('disasterupdateview<int:pk>', DisasterUpdateView.as_view(), name='disaster_update'),
36
37     path('disasterdeleteview<int:pk>', DisasterDeleteView.as_view(), name='disaster_delete'),
38
39     path('guidelineslistview', login_required(GuidelinesListView.as_view()), name='guidelines_index'),
40     path('guidelinesdetailview<int:pk>', GuidelinesDetailView.as_view(), name='guidelines_details'),
41
42     path('guidelinescreateview', GuidelinesCreateView.as_view(), name='create_guidelines'),
43     path('guidelinesupdateview<int:pk>', GuidelinesUpdateView.as_view(), name='guidelines_update'),
44
45     path('guidelinesdeleteview<int:pk>', GuidelinesDeleteView.as_view(), name='guidelines_delete'),
46
47     path('identificationlistview', IdentificationListView.as_view(), name='identification_index'),
48     path('identificationdetailview<int:pk>', IdentificationDetailView.as_view(), name='identification_details'),
49
50     path('identificationcreateview', IdentificationCreateView.as_view(), name='create_identification'),
51     path('identificationupdateview<int:pk>', IdentificationUpdateView.as_view(), name='identification_update'),
```

Figure 6.4-4 Sample Code of ulrs.py

This code snippet set up the routing, for views and their corresponding URLs, in a Django web application. It enables users to access functionalities and pages based on the specified patterns.

Sample Code of HTML template

```
24  </div>
25
26 <div class="card w-50 mb-6 container" style="max-width: 30rem; background-color: #rgba(245, 245, 245, 0.164);>
27   <div class="container-fluid p-4">
28     <form method="POST">
29       {% csrf_token %}
30       <div>
31         <label class="form-label text-white fw-semibold">Name:</label>
32         <input value="{{camp.name}}" name="name" class="form-control" placeholder="CampA">
33       </div>
34       <div>
35         <label class="form-label text-white fw-semibold">Location:</label>
36         <input value="{{camp.location}}" name="location" class="form-control" placeholder="Colombo">
37       </div>
38       <div class="row">
39         <div class="col">
40           <label class="form-label text-white fw-semibold">No of Refugee:</label>
41           <input value="{{camp.no_of_refugee}}" name="no_of_refugee" class="form-control"
42             placeholder="12">
43         </div>
44         <div class="col">
45           <label class="form-label text-white fw-semibold">Casualties:</label>
46           <input value="{{camp.casualties}}" name="casualties" class="form-control" placeholder="2">
47         </div>
48       </div>
49     </div>
50
51     <div>
52       <label class="form-label text-white fw-semibold">Availability status of food:</label>
53       <select name="availability_status_of_food" value="{{camp.availability_status_of_food}}"
54         class="form-control">
55         <option value="Low">Low</option>
56         <option value="Moderate">Moderate</option>
57         <option value="High">High</option>
58       </select>
59     </div>
60
61     <div>
62       <label class="form-label text-white fw-semibold">Availability status of resources:</label>
```

Figure 6.4-5 Sample Code of HTML template

The above code snippet is an HTML form to appear on the web page which serves as a user interface.

Sample Code of Disaster Map

```
def index(request):
    data = Location.objects.all()
    data1 = Camp.objects.all()
    location_list = Location.objects.values_list('latitude', 'longitude')
    camp_list = Camp.objects.values_list('latitude', 'longitude')
    map = folium.Map(location=[6.927079, 79.861244], tiles='OpenStreetMap', zoom_start=9)
    # Add markers for locations
    for location in data:
        popup_content = f"<b>Flood Hazard at {location.name}</b><br>"
        iframe = folium.IFrame(html=popup_content, width=160, height=60)
        popup = folium.Popup(iframe, max_width=300)
        folium.Marker([location.latitude, location.longitude], popup=popup, icon=folium.Icon(icon="flash", color='red')).add_to(map)
    # Add markers for camps with a different icon
    for camp in data1:
        popup_content = f"<u><b>{camp.name}</b></u><br>"
        popup_content += f"No. of Refugees: {camp.no_of_refugee}<br>"
        popup_content += f"Casualties: {camp.casualties}<br>"
        popup_content += f"Food Availability: {camp.get_availability_status_of_food_display()}{br}"
        popup_content += f"Resource Availability: {camp.get_availability_status_of_resources_display()}{br}"
        popup_content += f"Medical Needs: {camp.medical_needs}<br>"
        popup_content += f"Special Needs: {camp.special_needs}<br>"
        iframe = folium.IFrame(html=popup_content, width=250, height=150)
        popup = folium.Popup(iframe, max_width=300)
        folium.Marker([camp.latitude, camp.longitude], popup=popup, icon=folium.Icon(icon="home", color='blue')).add_to(map)
    # Get user's location
    user_latitude = request.GET.get('user_latitude', None)
    user_longitude = request.GET.get('user_longitude', None)

    # Display user's location on the map if available
    if user_latitude is not None and user_longitude is not None:
        user_location = [float(user_latitude), float(user_longitude)]
        display_user_location_on_map(map, user_location)
        # Find the nearest camp and draw a line
        nearest_camp = find_nearest_camp(user_location, data1)
```

Figure 6.4-6 Sample Code of Disaster Map

The code snippet shows the extraction of data from CSV files to show disaster places on the map and also save it on the database.

6.5 Summary

In this chapter, Section 6.2 shows what we have followed during the system implementation to maintain the standard of the project. By providing relevant comments, using version controls to share the code, by testing the developing code were able to maintain the standard of the system. Section 6.3 has discussed the environment, tools and others like Django, VSCode, HTML, CSS, Bootstrap, and Leaflet js used throughout the project implementation. Section 6.4 shows the code modules of the disaster management system for Sri Lanka.

Chapter 7

7. Testing

7.1 Introduction

Testing is the process of evaluating any project or something in order to enhance the quality and performance of software. Testing is crucial in a system like the HELP+US disaster management system for Sri Lanka. During the development of the system, in each development, the testing was done with time limitations. This chapter will discuss the types and methods of testing, test plans, and test cases for the HELP+US disaster management system.

7.2 Types and Methods of Testing

There are various types and methods of testing suitable for specific projects. So for the HELP+US disaster management system for Sri Lanka, several types of testings applied will be discussed.

Unit testing: Test the individual components like buttons, links, and input in HELP+US to ensure that they work correctly.

Integration testing: Using the integrated testing, integrate the components like camp registration and camp views in HELP+US to manage refugees in a camp.

System testing: Evaluate the entire system to ensure that it meets the functional requirements of the HELP+US disaster management system and ensures that integrated parts are working together.

Usability testing: Check whether the system is user-friendly for the general users as well as for the technical people.

Communication Testing: Ensures that communication channels like emails are working with in the HELP+US disaster management system. For example, when a user registers to the system confirmation email is received.

Regression testing: checks and ensures whether the recently updated code changes do not affect the existing codes.

7.3 Test plan

Table 7.3.1 Test Plan

HELP+US Disaster Management System Sri Lanka	
Test plan ID	01
Brief introduction about the database system	The HELP+US disaster management system for Sri Lanka is mainly developed to maintain a disaster preparation and response system that users can access to view the disaster map and get disaster guidelines to protect themselves beforehand.
Introduction to the testing objectives	This document mainly describes the plan for testing the HELP+US disaster management system features.
Testing items	<ul style="list-style-type: none">○ Main functions to be tested.
Features to be tested	<ul style="list-style-type: none">○ Log in as a user○ Password validation○ Username validation○ Logout button○ Insertion of data○ Deletion of data○ Updating of data○ Search data○ Map Integration

	<ul style="list-style-type: none"> ○ Show Guidelines ○ Database Connection
Test environment	PC, Windows 10 operating system, Microsoft Edge, Visual Studio Code
Test approach	Black box testing
Testing tasks	Test planning, Test Design, Test Development, Test execution, Test evaluation.
Test deliverables	Test plan, Test Environment, Test summary, Test result, and Test Evaluation report.
Schedule	9 th August 2023 to 9 th September 2023

7.4 Test Cases

Table 7.4.1 Test Case 1

Test Case	
Test Unit : Login Window	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 1	Test Executed By : Vidushan, Keshari
Test Description : Login to the HELP+US system with valid username and Password.	Test Execution Date : 07/09/2023
Test Title : User Login	Test Execution Time : 8.00 pm to 8.15 p.m.

Table 7.4.2 Test Case 1 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Enter Username and Password				
2.	Perform Validation	Username: Sarah Password: User@123	Moving to the Home Page successfully.	Login Successful	Pass

Figure 7.4-1 Test Case 1 - Screenshot 1

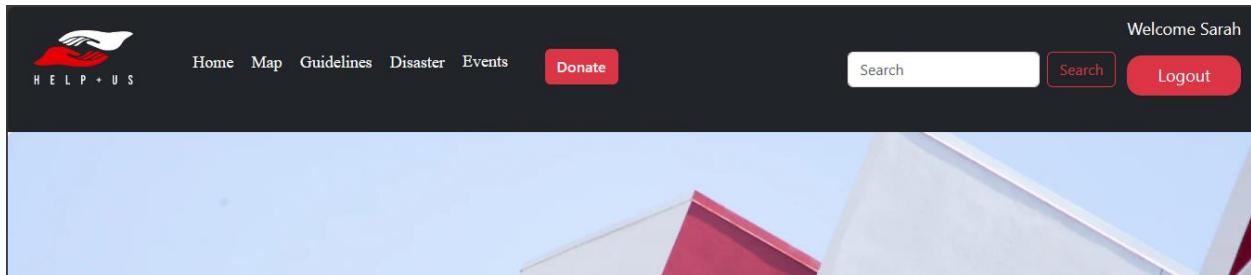


Figure 7.4-2 Test Case 1 - Screenshot 2

Table 7.4.3 Test Case 1 - Table 2

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Enter Username and Password				
2.	Perform Validation	Username: Sarah Password: 123	Moving to the Home Page successfully.	Login failure	Fail

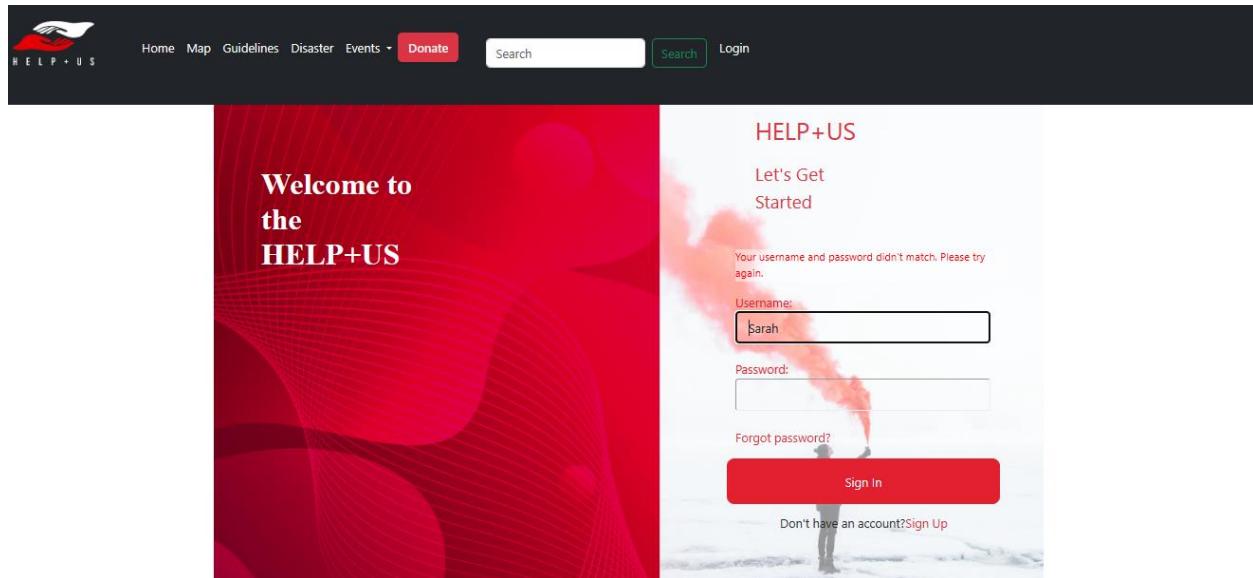


Figure 7.4-3 Test Case 1 - Screenshot 3

Table 7.4.4 Test case 2

Test Case	
Test Unit : Registration Window	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 2	Test Executed By : Vidushan, Keshari
Test Description : Register to the HELP+US system by providing user name, email and a password.	Test Execution Date : 07/09/2023
Test Title : User Registration	Test Execution Time : 7.30 pm to 8.00 p.m.

Table 7.4.5 Test Case 2 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Enter your Username, Email Address and Password and re-enter the password to confirm.				
2.	Perform Validation by receiving an email	Provide correct details	Moving to the login Page successfully.	Registration Successful	Pass

Hi ,

Please click on the link below to confirm your registration:

<http://127.0.0.1:8000/app/activate/MjU/bu6e9n-b438db9d5ccb81e3f53f21aab57aad57>

Figure 7.4-4 Test Case 2 - Screenshot 1

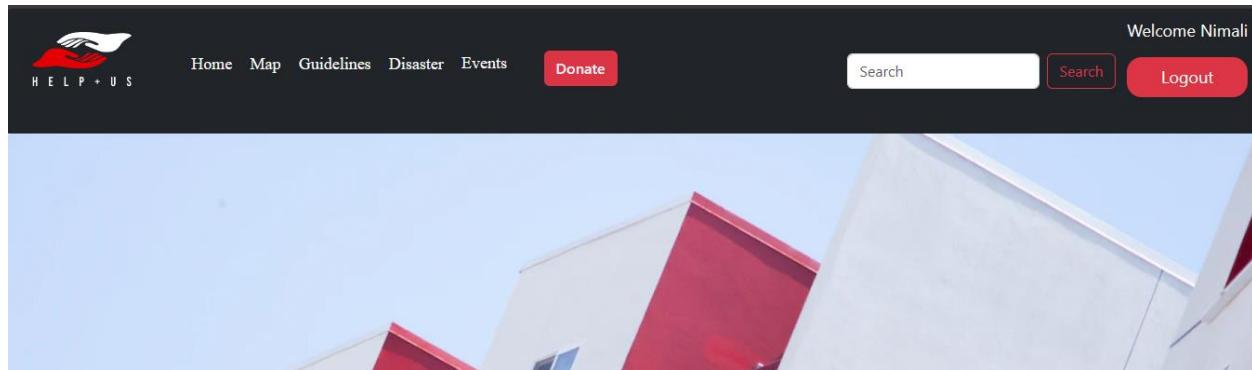


Figure 7.4-5 Test Case 2 - Screenshot 2

Table 7.4.6 Test Case 2 - Table 2

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Enter your Username, Email Address and Password and re-enter the password to confirm.				

2.	Perform Validation	Provide different passwords in the password and confirm password field.	Moving to the login Page successfully.	Registration failure	Pass
----	--------------------	---	--	----------------------	------

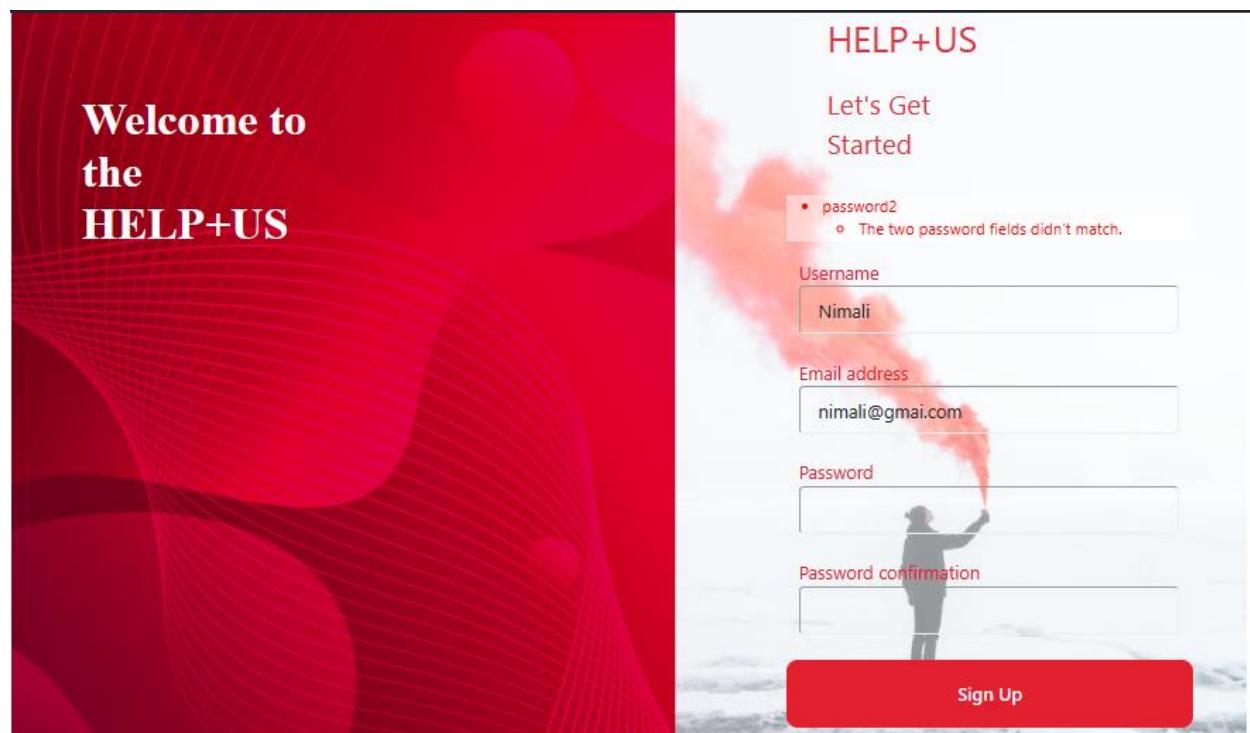


Figure 7.4-6 Test Case 2 - Screenshot 3

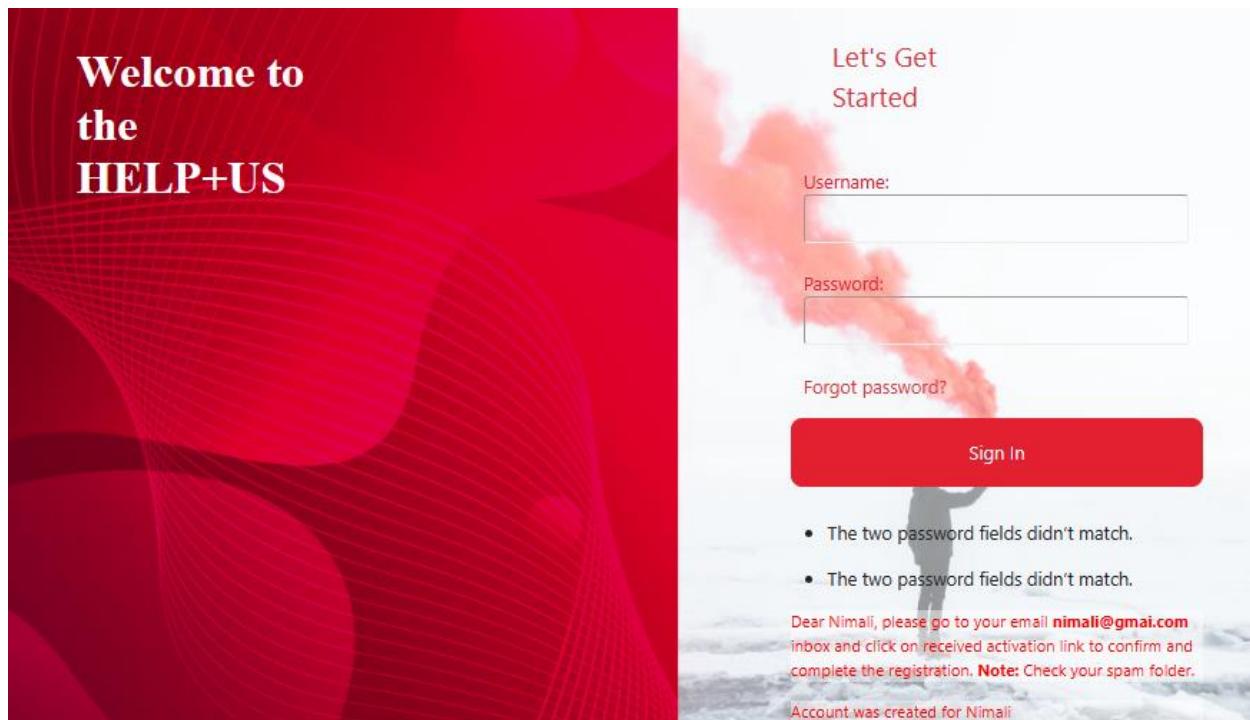


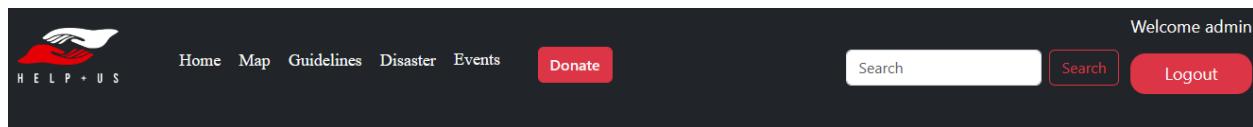
Figure 7.4-7 Test Case 2 - Screenshot 4

Table 7.4.7 Test Case 3

Test Case	
Test Unit : Camp Create form	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 3	Test Executed By : Vidushan, Keshari
Test Description : Register any camp to the HELP+US system through a form.	Test Execution Date : 07/09/2023
Test Title : Adding camp Details	Test Execution Time : 7.30 pm to 8.00 p.m.

Table 7.4.8 Test Case 3 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login as Admin				
2.	Enter Details in the provided text box in the correct Format				
3.	Perform Validation	Provide correct details	Moving to the Camp Detail view Page successfully.	Moving to the Camp Detail view Page and Created Successfully	Pass



List of registered Camps for refugees

Name	Location	No of Refugee	Casualties	Availability status of food	Availability status of resources	Medical needs	Special needs	
Camp2	Rathnapura	34	2	Low	Low	parasitamol	None	<button>Edit</button> <button>Delete</button>
CampA	Kandy	67	14	low	low	None	Transportation is needed	<button>Edit</button> <button>Delete</button>
Camp1	Colombo	23	23	Low	Low	None	None	<button>Edit</button> <button>Delete</button>

Figure 7.4-8 Test Case 3 - Screenshot 1

Table 7.4.9 Test Case 3 - Table 2

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login as a community user				
2.	Click on Camp Register on the Navigation bar				
3.	Perform Validation		Give an Error	Give an error	Pass



Figure 7.4-9 Test Case 3 - Screenshot 2

Table 7.4.10 Test Case 4

Test Case	
Test Unit : Camp Update form	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 4	Test Executed By : Vidushan, Keshari
Test Description : Update any camp details that feed from the HELP+US database.	Test Execution Date : 07/09/2023
Test Title : Update Camp Details	Test Execution Time : 7.30 pm to 8.00

Table 7.4.11 Test Case 4 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login as Admin				
2.	Click the Edit button				
3.	Enter Details in the provided text box in the correct Format				
4.	Perform Validation	Provide correct details	Moving to the Camp Detail view Page successfully.	Moving to the Camp Detail view Page and Updated Successfully	Pass

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Update Camp2 Details

Name:

Location:

No of Refugee: Casualties:

Availability status of food:

Availability status of resources:

Figure 7.4-10 Test Case 4 - Screenshot 1



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List of registered Camps for refugees

Name	Location	No of Refugee	Casualties	Availability status of food	Availability status of resources	Medical needs	Special needs	
Camp2	Rathnapura	87	12	Low	Low	parasitamol	None	Edit Delete

Figure 7.4-11 Test Case 4 - Screenshot 2

Table 7.4.12 Test Case 5

Test Case	
Test Unit : Camp Delete form	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 5	Test Executed By : Vidushan, Keshari
Test Description : Delete any camp from the HELP+US database.	Test Execution Date : 07/09/2023
Test Title : Delete Camp Details	Test Execution Time : 7.30 pm to 8.00 p.m.

Table 7.4.13 Test Case 5 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login as Admin				
2.	Click Delete Button to Delete				
3.	Perform Validation		Delete Camp	Deleted Successful	Pass

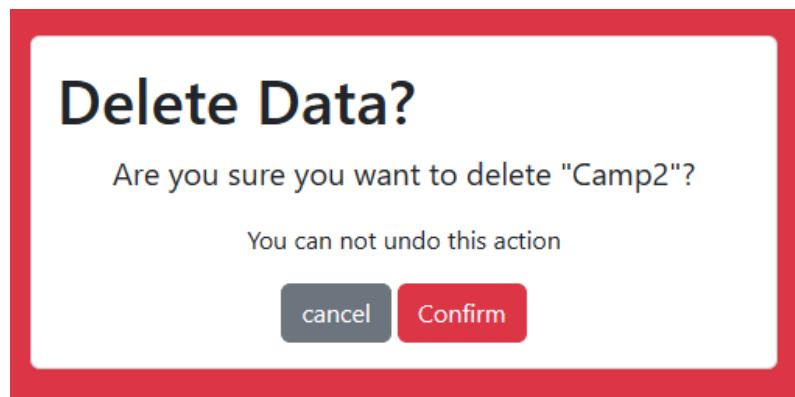


Figure 7.4-12 Test Case 5 - Screenshot 1

Name	Location	No of Refugee	Casualties	Availability status of food	Availability status of resources	Medical needs	Special needs	
CampA	Kandy	67	14	low	low	None	Transportation is needed	<button>Edit</button>
								<button>Delete</button>

Figure 7.4-13 Test Case 5 - Screenshot 2

Table 7.4.14 Test Case 6

Test Case	
Test Unit : Camp Detailed form	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 6	Test Executed By : Vidushan, Keshari
Test Description : Provide a list of details of all camps in a table.	Test Execution Date : 07/09/2023
Test Title : List Camp Details	Test Execution Time : 7.30 pm to 8.00 p.m.s

Table 7.4.15 Test Case 6 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
4.	Login as Admin or any registered user				
5.	Click on Camp Details on the Navigation bar				
6.	Perform Validation		View Camp	Viewed Successful	Pass



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List of registered Camps for refugees

Name	Location	No of Refugee	Casualties	Availability status of food	Availability status of resources	Medical needs	Special needs	
CampA	Kandy	67	14	low	low	None	Transportation is needed	Edit Delete

Figure 7.4-14 Test Case 6 - Screenshot 1

Table 7.4.16 Test Case 7

Test Case	
Test Unit : Map	Test Designed By : Vidushan, Keshari
Test Type : Black Box	Test Designed Date : 06/09/2023
Test Case ID : 7	Test Executed By : Vidushan, Keshari
Test Description : Showing the disaster locations on the map.	Test Execution Date : 07/09/2023
Test Title : Testing Map	Test Execution Time : 9.00 pm to 10.00 p.m.

Table 7.4.17 Test Case 7 - Table 1

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login (Optional)				
2.	Click on Map link on the Navigation bar				
3.	Perform Validation		View map	View map	Pass

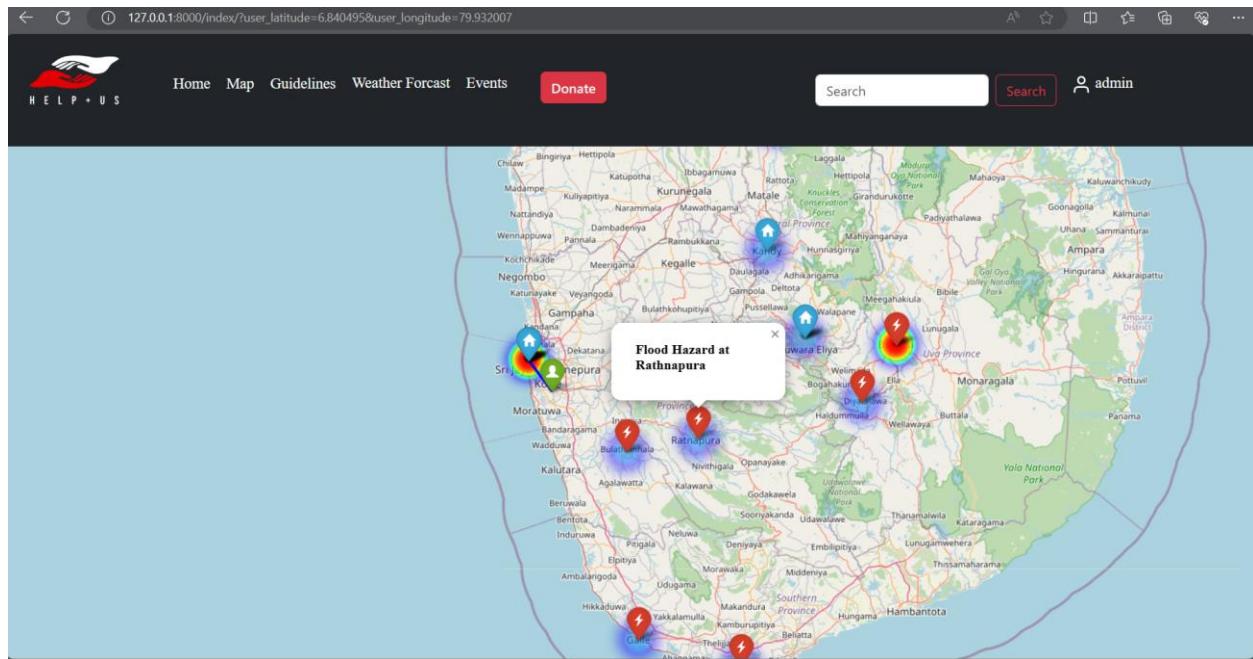


Figure 7.4-15 Test Case 7 - Screenshot 1

7.5 Summary

From the beginning of the development testing types like unit testing and integrated testing were done to ensure that those components were working together. Section 7.2 discussed the testing types and methods used in the HELP+US disaster management system for Sri Lanka. In Section 7.3 a test plan and in Section 7.4 the test cases were shown.

Chapter 8

8 Conclusion & Further Work

8.1 Introduction

In the journey of developing the HELP+US disaster management system, Our team successfully traversed all aspects of the project. As we complete our report, We've overcome obstacles, celebrated successes, and, most importantly, learned crucial lessons. The following sections will discuss the important takeaways from our experience gained by implementing the HELP+US disaster management system for Sri Lanka.

8.2 How the process was carried out?

The development was made for the HELLP+US disaster management system in Sri Lanka. During the development the process was mainly focused on SDLC phases which consisted of Data gathering, planning, analyzing, Designing, Developing, Testing and documentation processes. Throughout this journey have used different platforms and tools in order to implement the system.

By using Surveys, research papers and field researchers have gathered ideas which could enhance the quality of the system (*Refer - Appendix A and B*). Once the project ideas were gathered, have shortlisted the features to be implemented in the system and have finalized the features.

The finalized were designed using UML diagrams like Use case, Class Diagram, Flowchart, Sequence Diagram and Activity Diagrams and to have a brief understanding of the system to be implemented, the wireframe and a prototype were constructed.

By referring to the Design made during the designing phase, by using different programming languages and different platforms the implementation began. By learning new technologies the system implementation proceeded and the testing was carried out. Still, there are processes to be accomplished.

8.3Critical Appraisal

On the journey of implementing the HELP+US disaster management system for Sri Lanka, have engaged in many different types of discoveries and insights.

Lessons learnt

- When the project started with a proper plan to complete the phases. Following this plan, we began by gathering requirements, analyzing them, designing our approach, and finally implementing the HELP+US system.
- Sometimes the project may not work the way you want. There might be unexpected occurrences that have to face. So, being able to prepare for the unexpected and focus on the result is a must.
- When following the procedure, there was a lot to learn about the technologies and have got the experience from the tools we used to implement the HELP+US.
- Furthermore, when a project is in progress, should identify the capabilities of the project team. In order to make an efficient outcome it is better to divide the work according to the skills of the team members.
- Not only that always having better communication between the teammates will make the project progress look better and successful.

Problems and Challenges

- When the process implements a project, the team members' ideas are appreciated. Normally, we split up the work into different parts between the team members, assigning each part to one person. If the team members do not fully dedicate themselves to the project can lead to stress among the active team members. The stress comes from the fact that it's hard to finish everything on time when it's all on one person's plate.
- As mentioned above, having discussions, exchanging ideas and brainstorming is necessary to come up with productive ideas. Communication issues, on the other hand, can leave everyone feeling irritated when some team members are not dedicated to the project. It was a challenge to encourage the team to stay dedicated.

- Also, with the deadlines and the academic workload and external factors and most of the tasks get more time than expected when testing and fixing the errors. With the limited time constraint, it was a challenge to manage the project tasks.

Strengths

- Were able to output a working web application.
- Finish the project though there were challenges and problems.

Weaknesses

- The final plan is different from the initial plan.

8.4 Further work

Though the challenges and problems faced during the project, a considerable amount of implementation was done. But there are some areas in the HELP+US system to be improved for the future.

Limitations

- Using the HELP+US disaster management system from Sri Lanka does not display water level details relevant to different areas and sending error to the general public before a disaster.

Future Works

- Sending an alert before a disaster using an SMS.
- Implement the system for other areas in Sri Lanka
- Implement the system for other disasters.
- Further develop the map to view water level details.
- Implement the system to donate for safety camps.

8.5Summary

The HELP+US disaster management system for Sri Lanka aims to provide a disaster preparedness and response application for the general public of Sri Lanka which contains future work even though it is completed. This chapter has discussed how the project process was carried out during the time given. By following the SDLC phases including planning, analysing, designing, developing and testing was able to organise the project tasks efficiently. In *Section 8.3* it discusses the critical appraisal during the project procedures. Understanding the challenges and problems like new technologies, team capability matters, communication barriers and others, was able to implement a successful project by focusing on the project goal.

In conclusion, our goal to develop the HELP+US disaster management system for Sri Lanka has been an exciting journey of learning and development. We have met problems head-on, celebrated small successes, and hope to make the system even better in the future.

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Appendix A

Questionnaire for HELP+US Disaster Management System for Sri Lanka Survey



Sri Lanka Natural Disaster Management System

Preventing people from a disastrous moment is not a very easy task to do. If anyone can view whether a location is safe or unsafe using the application easily, it will be able to minimize the impact that occurs due to a disaster. Even they will be able to get an alert when in a disaster and also how they should act in a disastrous situation will be also given to them as instructions. We are undergraduate students at Lanka Nippon Biztech Institute, Maharagama, and we are excited to share an important initiative we are working on – the development of a Natural Disaster Management Web App name as HELP+US.

Purpose of this survey

The purpose of the survey to gather valuable feedback and insights from users and stakeholders to enhance the system's effectiveness, usability, and user satisfaction. This survey aims to improve disaster preparedness, response, and recovery efforts by leveraging user input.

Figure 8.5-1 Appendix A - Screenshot 1

HELP+US



What types of natural disasters are most prevalent in your area? *

Earthquakes
 Floods
 Wildfires
 Tsunamis
 Landslides
 Other: _____

What information and resources do you currently rely on during disasters? *

Television and Radio
 Government Alerts and Notifications
 Weather Apps
 Social Media
 Community Networks
 Emergency Hotlines
 Family and Friends
 Other: _____

Figure 8.5-2 Appendix A - Screenshot 2

How do you prefer receiving disaster related information? *

- Mobile Apps
- SMS/Text Alerts
- Email
- Website
- Voice Calls
- Social Media (e.g., Facebook, Twitter)
- Other: _____

What specific features or functionalities would you find valuable in a disaster management system? *

- Real-time Disaster Alerts
- Safety Instructions and Guidelines
- Finding Nearest Safety Places
- Donations and Support for Victims
- Educational Resources
- Reporting Hazardous Conditions
- Family Safety Status
- Other: _____

Figure 8.5-1 Appendix A - Screenshot 3

Are there any existing disaster management systems or resources available in your area? *

Yes

No

If yes, what are the strengths of these existing systems/resources?

- Timely Alerts
- Comprehensive Information
- User-Friendly Interface
- Accessibility
- Community Engagement
- Other: _____

If yes, what are the weaknesses or areas where improvements are needed?

- Lack of Timely Alerts
- Incomplete Information
- Complex Interface
- Limited Accessibility
- Low Community Engagement
- Other: _____

Figure 8.5-1 Appendix A - Screenshot 4

How knowledgeable are you about disaster preparedness and safety measures? *

- Not much
- Moderately know
- Good
- Other: _____

What measures do you typically take to prepare for a disaster in your area? *

- Create an Emergency Kit (food, water, first aid supplies).
- Develop a Family Disaster Plan (communication, evacuation).
- Stay Informed (monitor weather alerts, local news).
- Secure Important Documents (passports, IDs, insurance).
- Reinforce Home (secure heavy furniture, windows).
- Join a Community Emergency Response Team (CERT).
- Conduct Disaster Drills (practice evacuation).
- Have a Pet Emergency Plan (for pet owners).
- Know Evacuation Routes.
- Volunteer for Disaster Relief Organizations.
- Other: _____

Figure 8.5-2 Appendix A - Screenshot 5

How do you receive information or alerts about potential disasters in your area? *

- Mobile Apps (e.g., disaster management apps).
- SMS or Text Alerts.
- Sirens and Alarms.
- Television Broadcasts.
- Radio Announcements.
- Community Notifications.
- Weather Apps and Websites.
- Social Media Updates.
- Other: _____

What are your thoughts on the feature that displays the nearest safety places on the map during a disaster? Please share your feedback on its usefulness, ease of use, and any improvements you would suggest. *

- Very useful and easy to use
- More details about safe places would help
- Needs real-time status information
- Other: _____

Figure 8.5-3 Appendix A - Screenshot 6

The Following graphs will summarize the results got by 22 participants for each question.

What types of natural disasters are most prevalent in your area?

22 responses

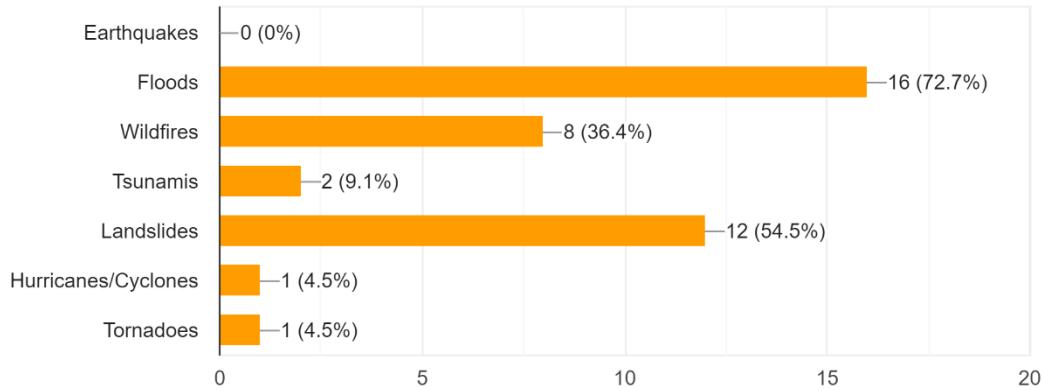


Figure 8.5-4 Appendix A - Screenshot 7

The above graph shows the type of disaster in the responders areas. Therefore most number of participants have mentioned it is floods.

What information and resources do you currently rely on during disasters?

22 responses

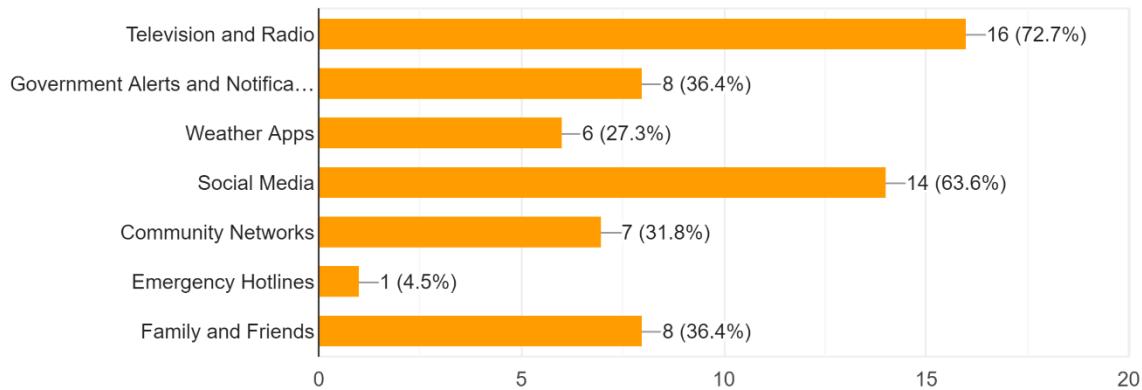


Figure 8.5-5 Appendix A - Screenshot 8

How do you prefer receiving disaster related information?

22 responses

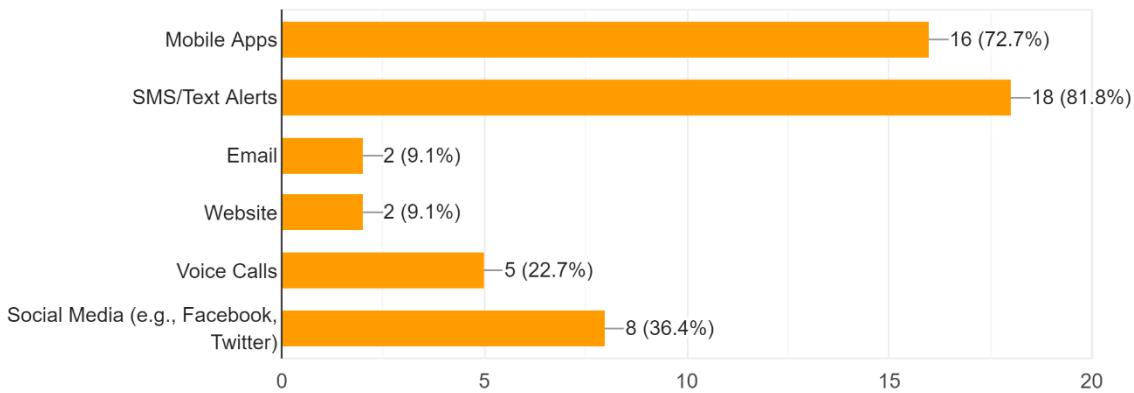


Figure 8.5-6 Appendix A - Screenshot 9

What specific features or functionalities would you find valuable in a disaster management system?

22 responses

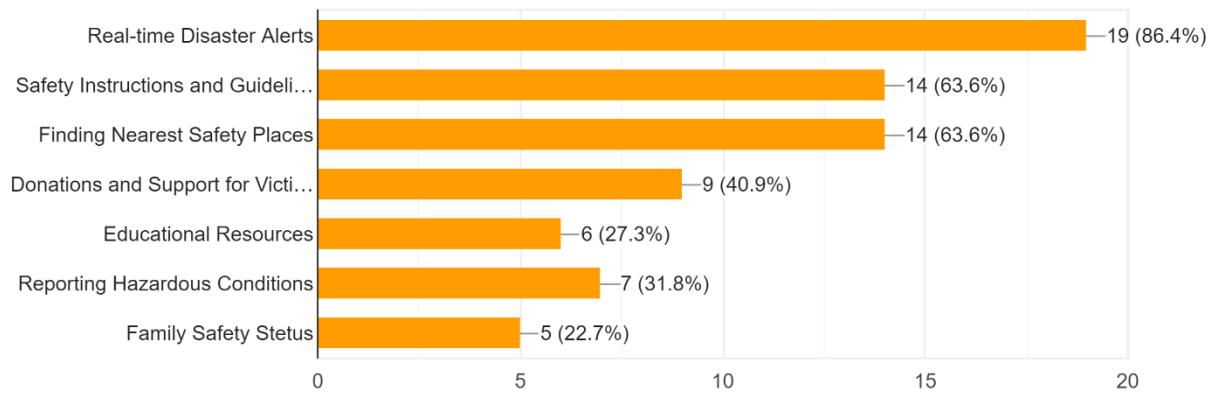


Figure 8.5-7 Appendix A - Screenshot 10

Are there any existing disaster management systems or resources available in the your area?
22 responses

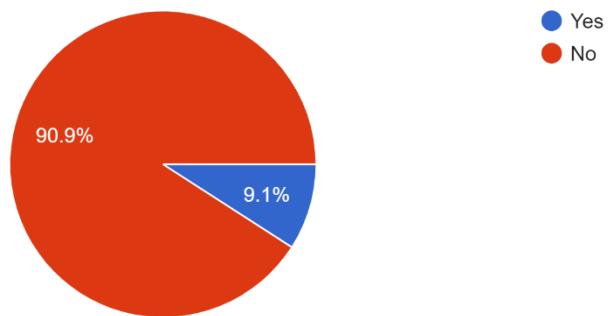


Figure 8.5-8 Appendix A - Screenshot 11

If yes, what are the strengths of these existing systems/resources?
7 responses

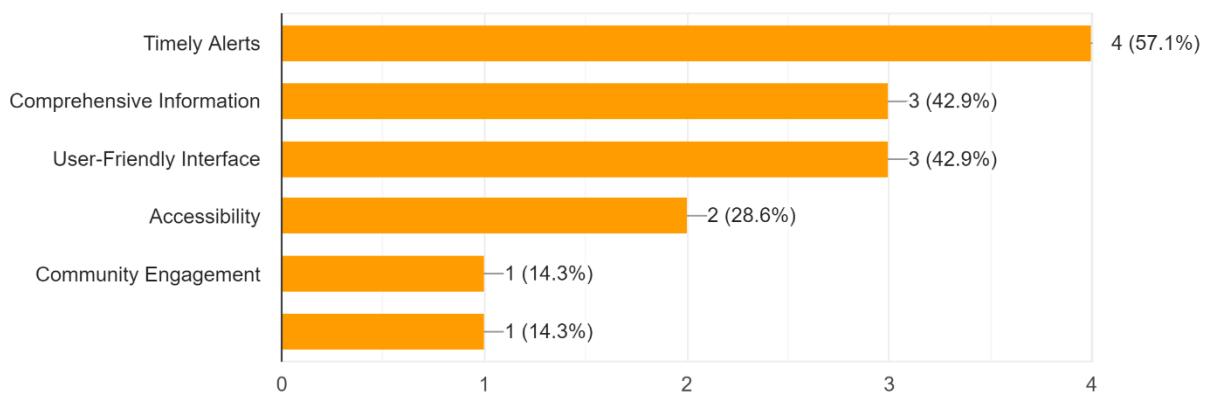


Figure 8.5-9 Appendix A - Screenshot 12

How knowledgeable are you about disaster preparedness and safety measures?
22 responses

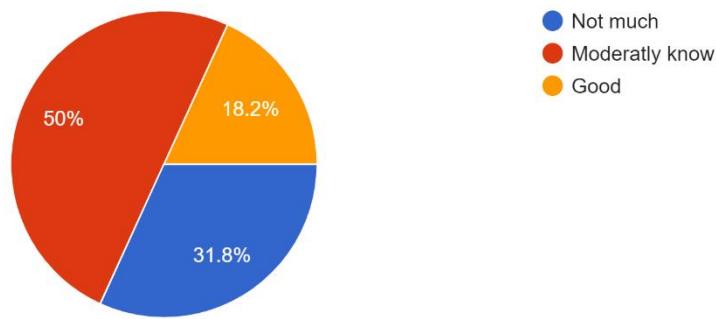


Figure 8.5-10 Appendix A - Screenshot 13

What measures do you typically take to prepare for a disaster in your area?
22 responses

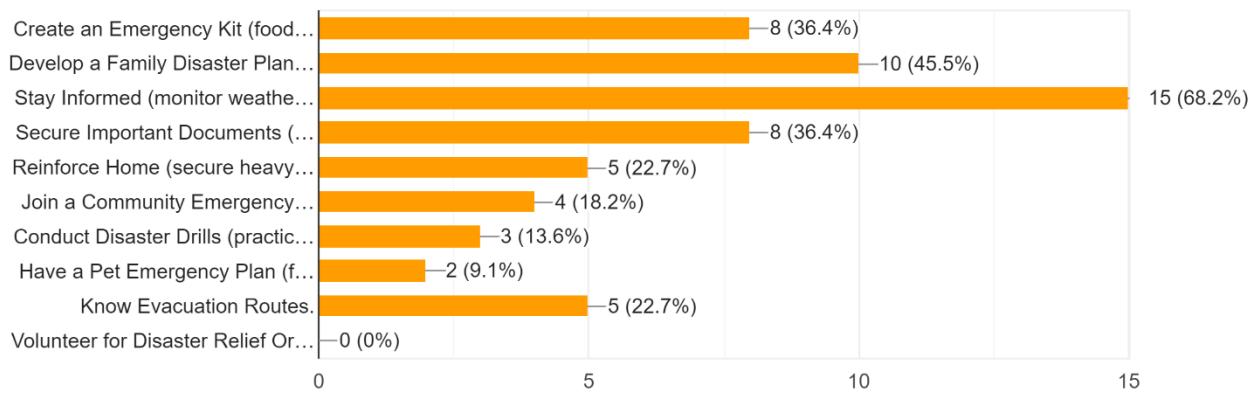


Figure 8.5-11 Appendix A - Screenshot 14

How do you receive information or alerts about potential disasters in your area?

22 responses

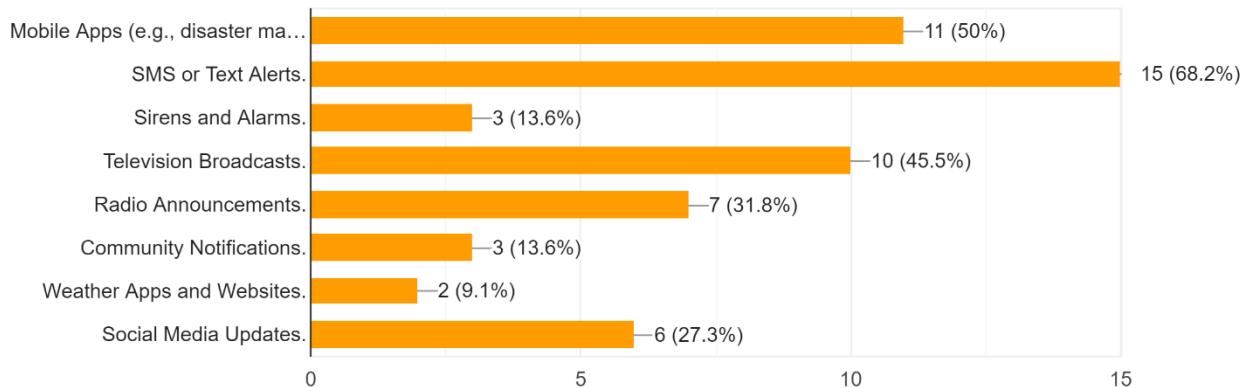


Figure 8.5-12 Appendix A - Screenshot 15

What are your thoughts on the feature that displays the nearest safety places on the map during a disaster? Please share your feedback on its useful... of use, and any improvements you would suggest.

22 responses

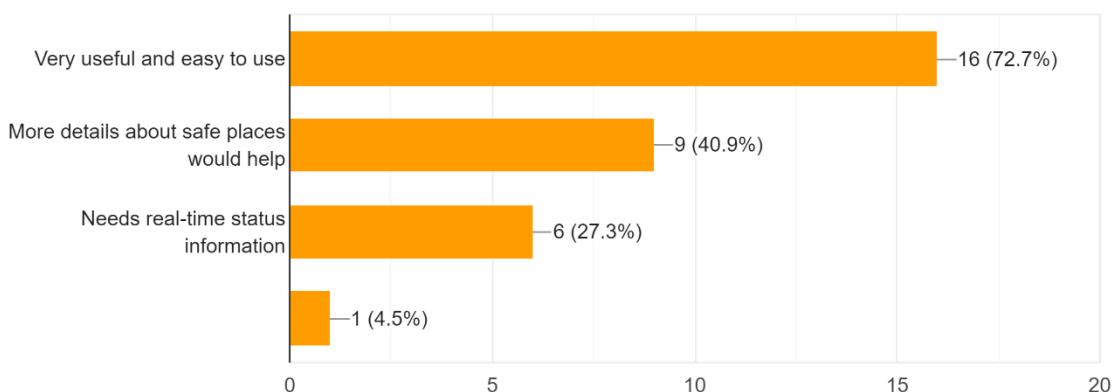


Figure 8.5-13 Appendix A - Screenshot 16

Appendix B



06 May 2023

The Director
Irrigation Department Sri Lanka
Bauddhaloka Mawatha
Colombo 07

Dear Sir/Madam,

Rathnayake Mudiyanselage Keshari Hasithangi Rathnayake

Student ID : UOG0121007
National ID Number : 200173002987
Date of Registration : 19.07.2021
Registered Course : BSc (Hons) Information Systems Degree programme (University of Greenwich) offered at Lanka Nippon BizTech Institute

Kuda Udage Vidushan Prabash

Student ID : HD0520018
National ID Number : 200123103522
Date of Registration : 30.05.2021
Registered Course : Higher Diploma In Software Engineering

This is to confirm that the students listed above are officially enrolled at the Lanka Nippon BizTech Institute, which has been approved by Sri Lanka's Tertiary and Vocational Education Commission (TVEC) and University Grants Commission (UGC).

Duration of this study programme is 4 years and the medium of instruction is English and Japanese.

We would be grateful if you could assist Ms Keshari and Mr Vidushan in providing information for their group project based on Disaster Management System for Sri Lanka.

This letter has been issued at the request of Ms. Rathnayake Mudiyanselage Keshari Hasithangi Rathnayake and Mr Kuda Udage Vidushan Prabash.

Yours Sincerely,

A handwritten signature in black ink.

Shyamika Wasala
Registrar

Lanka Nippon BizTech Institute
No. 278, High Level Road
Maharagama,
Sri Lanka

Lanka Nippon BizTech Institute (Pvt) Ltd

No 278, High Level Road, Maharagama, Sri Lanka

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Figure 8.5-1 Appendix B - Screenshot 1 - Permission Letter to collect data from Irrigation Department



13 May 2023

The Director
National Building research organisation.
99/1 Jawatta Rd, Colombo 05

Dear Sir/Madam,

Rathnayake Mudiyanselage Keshari Hasithangi Rathnayake

Student ID : UOG0121007
National ID Number : 200173002987
Date of Registration : 19.07.2021
Registerd Course : BSc (Hons) Information Systems Degree programme (University of Greenwich) offered at Lanka Nippon BizTech Institute

Kuda Udage Vidushan Prabash

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This letter has been issued at the request of Ms. Rathnayake Mudiyanselage Keshari Hasithangi Rathnayake and Mr Kuda Udage Vidushan Prabash.

Yours Sincerely,


for
Shyamika Wasala
Registrar

Lanka Nippon BizTech Institute
No. 278, High Level Road
Maharagama,
Sri Lanka

Lanka Nippon BizTech Institute (Pvt) Ltd

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Figure 8.5-2 Appendix B - Screenshot 2 – permission letter to collect data from MBRO