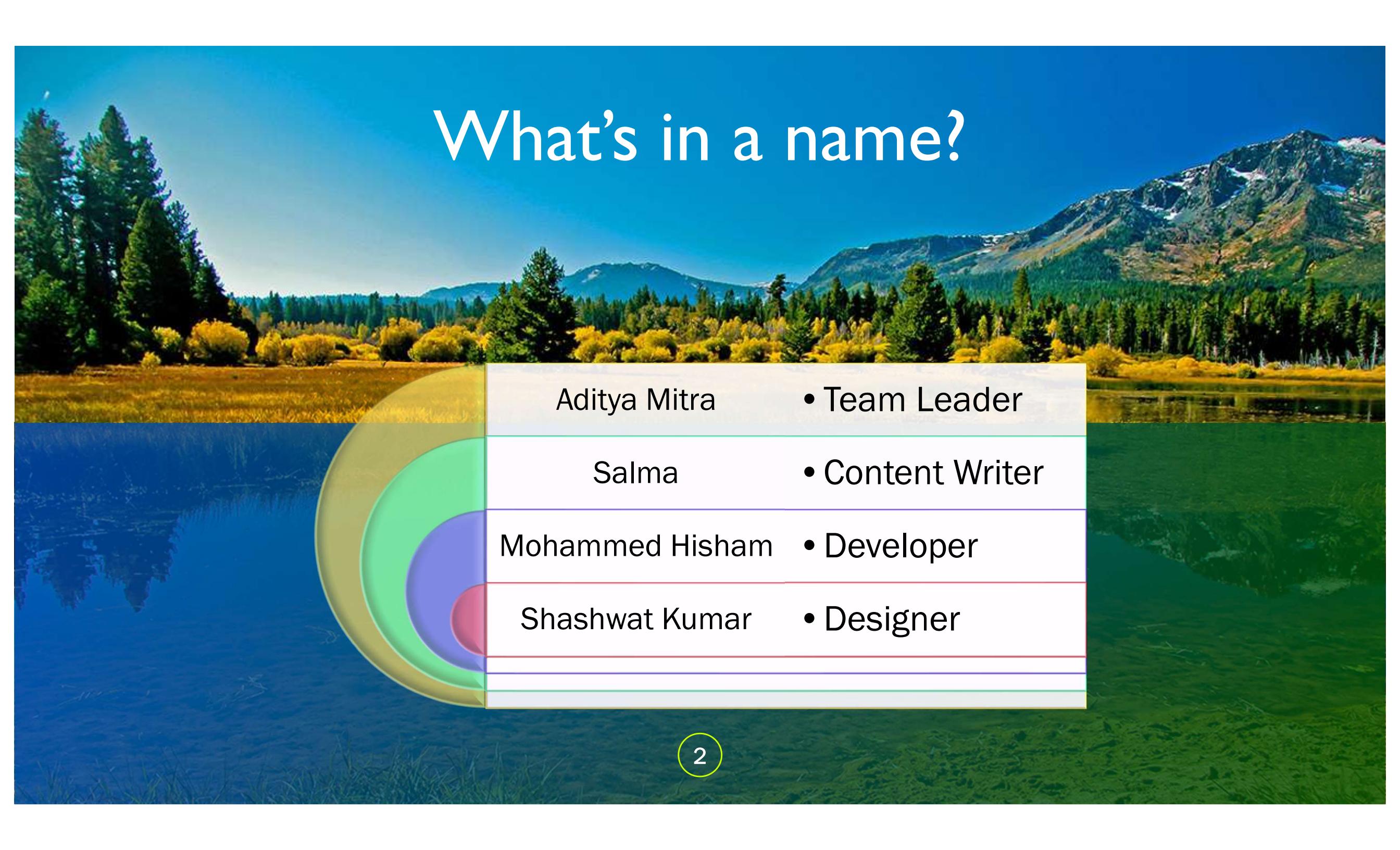


UN-SDG 6:
Clean Water & Sanitation

ADAM'S ALE

Pinpointing Potable Water



What's in a name?

Aditya Mitra	• Team Leader
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Introduction

Bringing safe water to people.

- Natural calamities can't be prevented. But, their impact on life can be mitigated to a certain extent by taking quick action. It is seen that the unavailability of potable water after a disaster is a cause of distress to many and consumption of water unfit for drinking leads to various water-borne diseases and in worst case scenarios, a pandemic.
- The Adam's Ale project, when implemented, would be highly beneficial to people in case of disasters and natural calamities.
- We hope to significantly reduce the post-disaster epidemics due to water-borne diseases.



Case Study

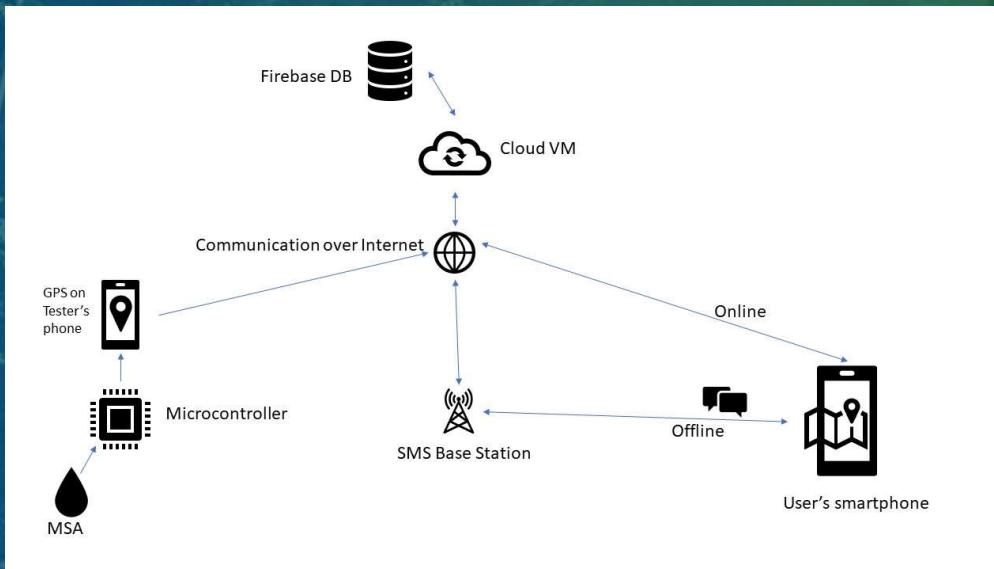
Some harmful effects of unavailability of potable water after calamities

- 1) Cholera epidemic in West Bengal (1998)
 - Attributed to preceding floods.
- 2) Hepatitis A and E
 - Association with lack of access to safe water & sanitation
 - In endemic areas, Hepatitis E outbreaks frequently following heavy rains & floods.
 - Generally mild, self – limited illness but in pregnant women, case-fatality rates can be up to 25%.
 - Noted in Aceh, Indonesia following December 2004 Tsunami.
- 3) And many other water-borne diseases.



Features

The personnel from the rescue team (referred to here as ‘Tester’) will be carrying ‘Testing Probes’ to check the quality of water in local water sources. If it is found fit for drinking, the location will be saved for the victims to consume water from that.



Tester's side

The testing probe will be able to identify water sources safe for drinking and tag its geolocation.

User's side

Victim's mobile application will be able to identify the nearest potable water source in online/offline modes and the guide to it.

Parts

The project is divided into 4 parts:

- Tester's side
- Cloud
- User/Victim's side
- SMS Base station

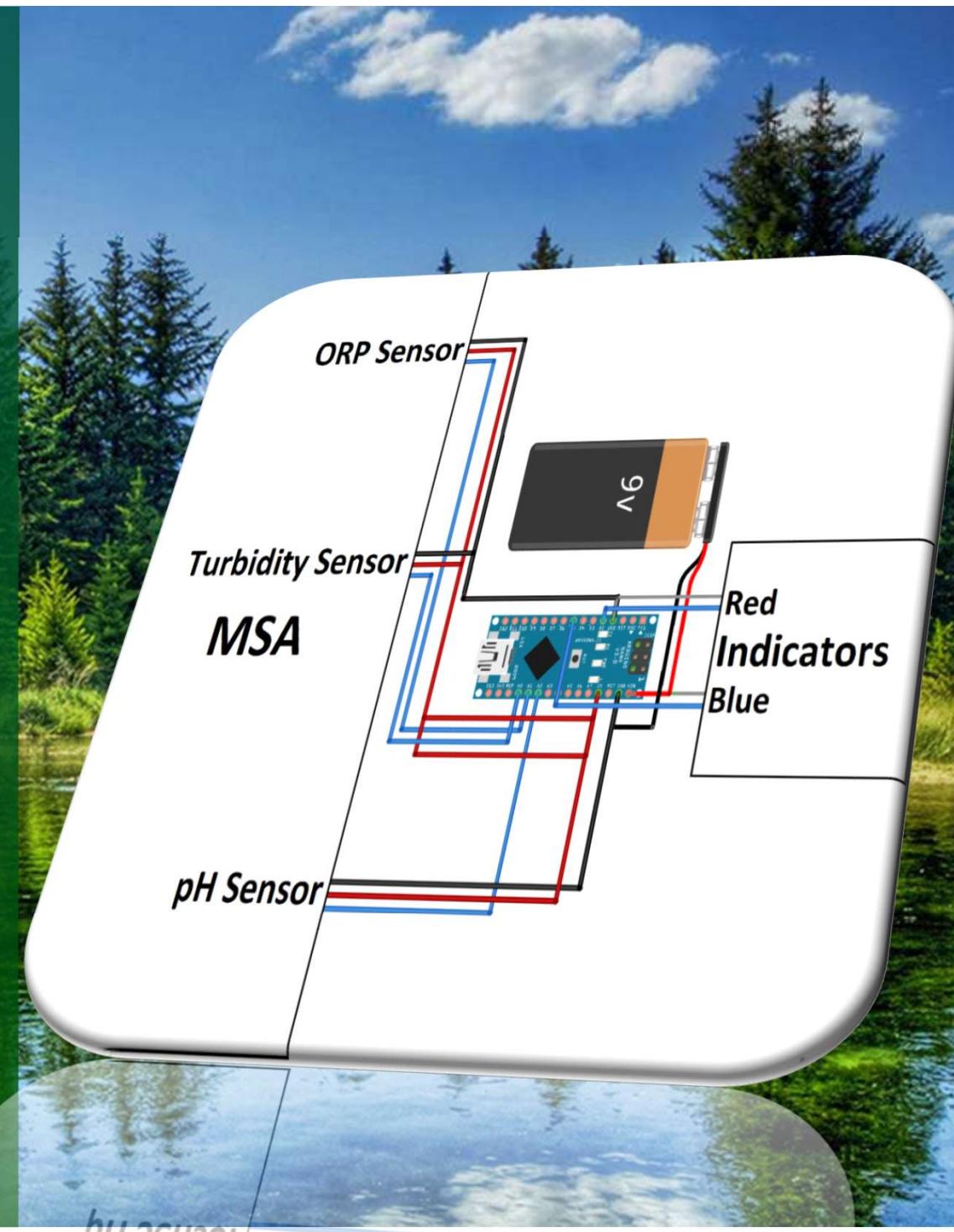


Tester's side

Let's see if the water is safe for drinking

The testing probe will be equipped with a Multi-Sensor Array (MSA) that will be able to measure the temperature, pH, turbidity and Oxidation Reduction Potential (ORP) of the water body and follow the parameters from WHO guidelines to determine whether the water is safe for drinking. If yes, it will be shown using the indicator LEDs. The tester will be able to use an application that will capture the geolocation and communicate the same to the cloud.

We have not connected the microcontroller to the application directly to leave a scope for the tester's discretion.



Is the water safe?

Let's see if the water is safe for drinking

According to WHO, the quality of water can be judged by its following characteristics:

Parameter	Measuring Principle	Unit	Quality Range
Turbidity	Infrared backscattering	NTU	0 – 5
ORP	Galvanic Cell, Pt Electrode	V	0.6 – 0.8
pH	Galvanic Cell, glass Electrode	pH	6.5 - 8.5
Temperature	Negative Temperature Coefficient (NTC) Resistance	°C	-



Cloud

Finding your nearest water source.

- The data (geolocations) of the water sources will be stored in a firebase database. A Microsoft Azure virtual machine will be able to read the requests from the user side and map them with their nearest potable water source.

This is done using the MapMyIndia maps API.



Cloud

Configuration

Virtual machine		
Computer name	AdityaVM	
Operating system	Linux	
Publisher	Canonical	
Offer	UbuntuServer	
Plan	18.04-LTS	
VM generation	V1	
Host group	None	
Host	-	
Proximity placement group	-	
Colocation status	N/A	
Availability + scaling		
Availability zone	-	
Scale Set	-	
Extensions		
-		
Networking		
Public IP address	52.172.129.174	
Public IP address (IPv6)	-	
Private IP address	10.0.0.4	
Private IP address (IPv6)	-	
Virtual network/subnet	AdityaVM_group-vnet/default	
DNS name	adams-ale.centralindia.cloudapp.azure.com	
Size		
Size	Standard B1s	
vCPUs	1	
RAM	1 GiB	
Disk		
OS disk	AdityaVM_disk1_4d690d0e2daa402fbafae17e9b3b57a0	
Azure disk encryption	Not enabled	
Ephemeral OS disk	N/A	
Data disks	0	
Azure Spot		
Azure Spot	-	
Azure Spot eviction policy	-	

Technical Difficulties

Obstacles or Hurdles?

- We are fully aware of the fact that we were supposed to use Google Technology for the project. However, due to some technical difficulties, we couldn't enable a billing account on GCP. Hence, we were forced to use Azure instead of GCP and MapMyIndia instead of Google Maps SDK.



SMS Base station

No Internet Connection? No worries.

- The SMS Base station receives the GPS coordinates of the user via SMS and sends it to the cloud. We know that the user is offline, and hence just sending the GPS coordinates of the water source to the user will not be of much help.
- Hence, we are fetching details route directions on how to reach the place and sending it back via another SMS.



User's side

I know I'll get safe water.

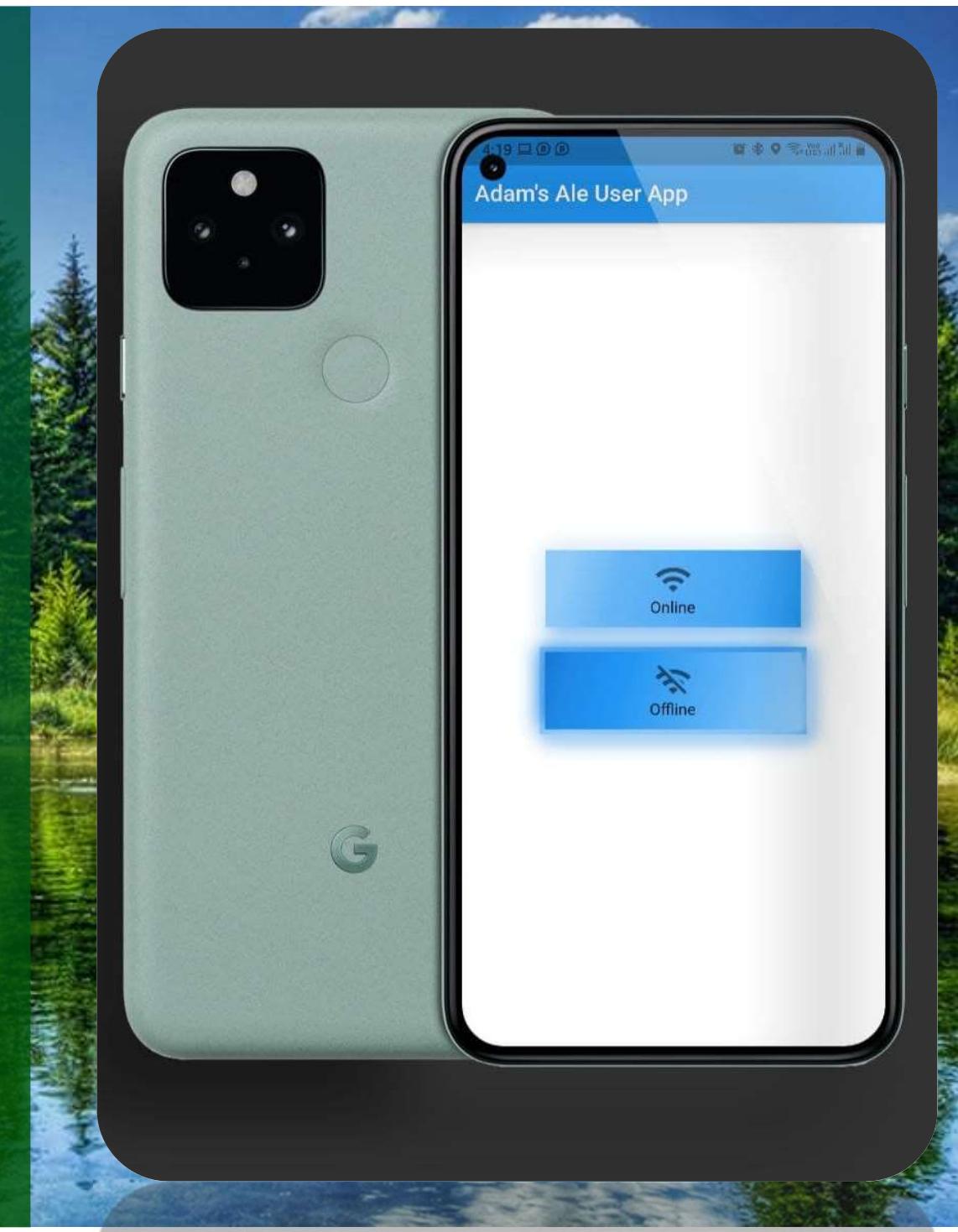
The user side application can be used in online as well as offline modes (Usually, there are connectivity issues after natural calamities).

Online Mode

The online mode captures the geolocation of the user and sends it to the cloud VM. It directs the user to the nearest water source using Google Maps after receiving the coordinates from the cloud.

Offline Mode

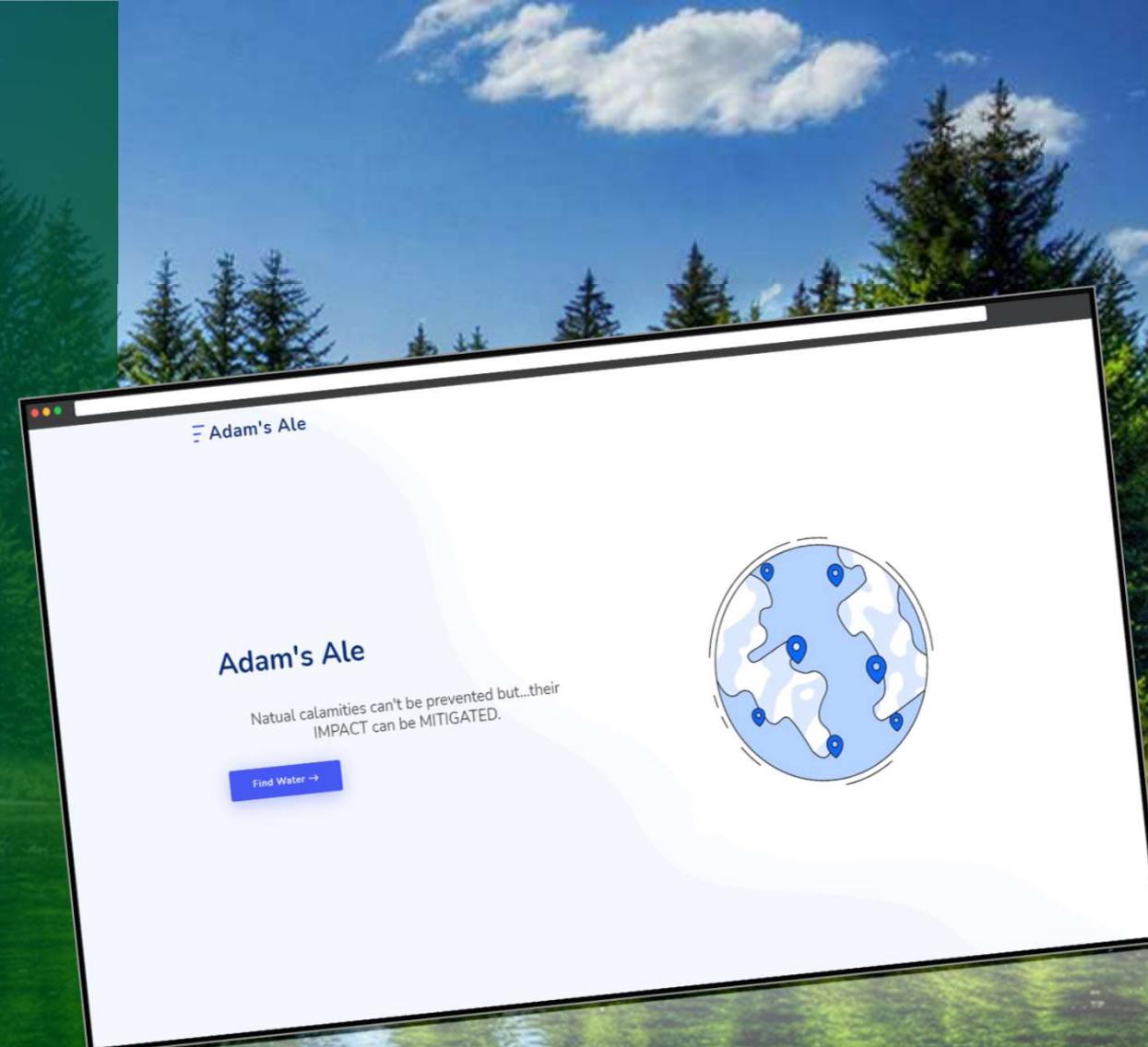
The offline mode sends the current GPS coordinates to the SMS base station via a SMS message and shows the route directions to the nearest water source.



Web App

Various users have various devices

The web application of Adam's Ale does the same work as the android application. However, as the name suggests, it is only an online version. The main motive of developing the Web App is so that the Kai OS users, the Symbian OS users and other users (even those using a laptop/PC device) can also access Adam's Ale.



Tech Stack



Arduino

Flutter



Firebase

Microsoft Azure



MapMyIndia API

Technologies used

Scope

Adam's Ale, when implemented in collaboration with the government or some NGO, can be of great help for people in distress after a calamity.



Future Scope

As cellular network might be disrupted in case of natural calamities, even the offline way of updating the database might not work. Hence, we have decided to add Lo-Ra WAN feature to the testing probe in later versions of the project.

The tester probe will be able to send the data to a base station (which will be having internet connectivity) in 10-kilometre range (The range can be increased upto 766 kilometres with 25mW power). Then, the base station would be able to communicate the same to the server.



Future Scope

Flutter allows us to develop applications for Android and iOS only. In further versions of the project, we aim to develop the application for Kai OS and other feature phones so that no one is deprived of the basic amenity, drinking water.



Future Scope

Modification in backend and implementation of load balancing to make Adam's Ale available to more number of users at a time.



Similar projects

After a rigorous search for similar projects on the internet, we failed. We could claim our project unique. However, the following project is to be taken into consideration:

- Drinking Water Mapping Application to Protect Source Waters (DWMAPS) by the US Govt. This aims at protecting water sources instead of making it available for use during calamities. Moreover, it mainly focuses on sources of contamination of water unlike Adam's Ale.



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THANK YOU!

Team What's in a name?

VIT-AP