Flood help web app using MERN stack

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I. BACKGROUND

A flood happens when too much water covers land that's usually dry. It's not just rainwater - floods can also come from rivers or even the ocean tide. Floods are a big worry for farmers, builders, and keeping people healthy. Sometimes, the things we do to nature can make floods worse. Like when we cut down forests or drain wetlands, it changes how water flows and can make flooding happen more often. And climate change is making things even trickier. It's making storms stronger and sea levels rise, which means floods are getting more intense and happening more often. So, we need to be careful about how we treat the environment to help prevent floods from causing too much damage.

Floods come in different forms. There's areal flooding, when large areas of land get covered in water. Riverine flooding happens when rivers overflow their banks. Coastal flooding is when the sea spills onto the land. And urban flooding occurs when cities get overwhelmed with water, often because of poor drainage systems. Sometimes, flooding is done on purpose. This can be for farming, like when fields are flooded to grow rice. It can also be for military reasons, or to manage rivers better. For instance, in some places, they intentionally flood land to help with farming, especially for growing rice, which needs water to grow.

In India, Bihar stands out as the most flood-prone state. A staggering 76% of North Bihar's population constantly faces the threat of devastating floods. This state alone contributes to 16.5% of India's flood-affected area and shelters 22.1% of the nation's flood-affected populace. Over 73.06% of Bihar's total area, approximately 68,800 square kilometers out of 94,160 square kilometers, suffers from the consequences of flooding.

Annually, floods in Bihar take a heavy toll, claiming numerous lives and causing significant damage to livestock and assets, amounting to millions of dollars. Since 1979, floods have tragically claimed the lives of 9,500 individuals, based on government records.

North Bihar bears the brunt of flood-causing rivers during the monsoon season. These rivers, including the Mahananda, Koshi, Bagmati, Burhi Gandak, and Gandak, originate in Nepal, making the region especially vulnerable. Additionally, some districts in South Bihar face flood threats from rivers like the Son, Punpun, and Phalgu.

The year 2013 saw widespread devastation when floods impacted over 5.9 million people across 3,768 villages in 20 districts of Bihar. Similarly, in 2017, 19 districts in North Bihar were affected by floods, resulting in the loss of 514 lives and affecting over 17 million people. Nepal is known for its towering mountains and rugged terrain. During heavy rains, especially in the central and eastern parts of the country, water rushes down from these mountains into the major river systems like the Narayani, Bagmati, and Koshi. When these rivers reach India, particularly Bihar, they overflow their banks, causing flooding in the flat plains and low-lying areas.

In 2008, Bihar faced one of its worst floods in history, causing devastation in this densely populated and economically challenged Indian state. The disaster unfolded when the Koshi embankment, situated near the border of India and Nepal, breached on August 18, 2008. The river's sudden change of course led to flooding in regions that hadn't experienced such inundation in many years. This calamity impacted more than 2.3 million individuals residing in the northern areas of Bihar. The flood in Bihar claimed the lives of 250 individuals and displaced nearly three million people from their homes. The devastation also extended to property, with over 300,000 houses destroyed. Additionally, the floodwaters damaged at least 340,000 hectares of crops, affecting the livelihoods of many. In the face of such adversity, villagers in Bihar resorted to desperate measures, consuming raw rice and flour mixed with contaminated water in order to survive.

The common problems faced by people during floods are:

- Emergency Shelter: When floods strike, people often find themselves without a safe place to stay as their homes may be flooded or completely destroyed. Providing temporary shelters in secure locations becomes paramount to ensure their safety and well-being during these challenging times.
- Clean Water: Floodwaters bring contamination and damage to water sources and infrastructure, making access to clean water extremely difficult. Ensuring access to safe drinking water is critical to prevent waterborne diseases and dehydration among flood-affected communities.
- Food Supplies: Floods disrupt food supply chains, leading to shortages and hunger among affected populations. Distributing food supplies, particularly non-perishable items, helps address the nutritional needs of individuals and families during these emergencies.
- Medical Assistance: Floods pose significant health risks, including injuries, infections, and the spread of water-borne diseases. Immediate access to medical assistance, such as first aid kits, essential medicines, and trained medical professionals, is essential to address health emergencies and prevent further harm to those affected.

The few solutions provided by the Bihar government to solve these problems are:

- To tackle the challenges posed by floods, the Bihar government has introduced Befiqr, an official flood man-

agement app. This innovative tool aims to empower communities by facilitating interaction and providing real-time notifications, thereby enhancing flood control measures.

- In addition to the Befiqr app, the government has established the "Hello WRD Call Centre" and the "Central Flood Control Cell Cum Help Desk" to monitor flood conditions closely and take prompt action when necessary.

- Furthermore, to improve disaster preparedness, the disaster management authority and the Indian Institute of Technology (IIT), Patna, have collaborated to develop a pendant-shaped device. This device serves as an early warning system, alerting people to potential heatwaves, coldwaves, lightning, and floods through voice messages, ensuring timely and effective response to emerging threats.

These apps and devices are designed with the primary goal of mitigating the impact of flooding by facilitating community engagement and delivering timely alerts. While they excel in providing early warnings for various climatic changes, such as floods, heatwaves, and lightning, they fall short in addressing individual needs and establishing a direct channel for communication and assistance from flood relief authorities during actual flood events. There's a clear gap in terms of providing a platform for individuals to communicate their specific needs and seek help during floods. Enhancing these apps to include features that enable direct communication with flood relief bodies and facilitate assistance requests could significantly improve their effectiveness in responding to the needs of affected individuals during emergencies.

II. METHODS

The solution to the above problem is a web app that creates a communication link between flood affected people and government official. Users can raise a request to get any help. Request status will be available to the users and all data will be stored in a database. As shown in the Fig. 1 to use the
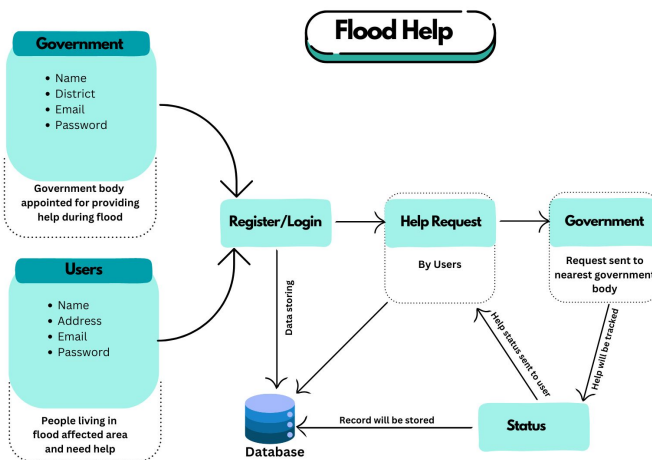

Fig. 1. Working flow chart.

web app user like normal user, officials from Panchayat and from District, first need to register on the website. They need to provide information like name, address, email and password. Once submitted successfully their data will be stored in the database. Once the user registered on the portal, they need to login. After login normal users can initiate a help request. That help request will be sent to the officials in the Panchayat, they visit the location and verify the details provided by the normal user. If they approve the request they need to enter the expected amount to be spent on the help or they can decline the help. This data then sent to the DDMA office to be monitor or verify. All status of the help will be provided to the normal user, Panchayat and DDMA in real time.
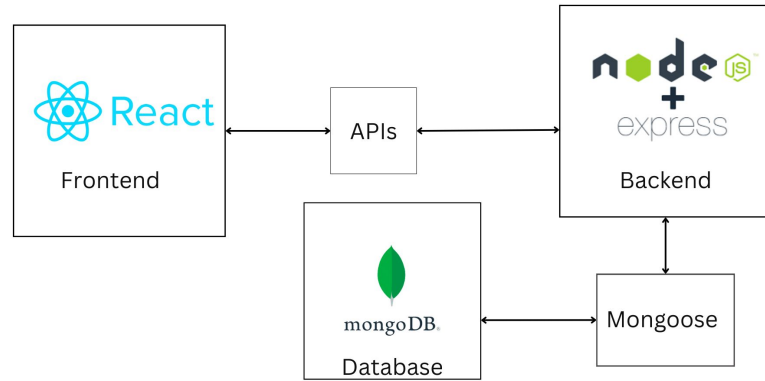

Fig. 2. Flow chart of different technologies used.

The tech stack used in this project is MERN. MERN stand for MongoDB used as database, Express for routing, React.js for frontend and Node.js for backend. As shown in Fig. 2, React.js has been used in frontend to develop the User Interface of the website, to create different components. The frontend is then connected to the backend using APIs. The backend is written in Node.js and all processing is done by it. Express.js is used to create and manage all APIs endpoints. The backend is then connected to the databse using mongoose library in Node.js.

Below in Fig. 3 is the sign up page, used for registering the different users. It has the input boxes for taking full name, email address, password and role. After proving all information, the user will press submit button. If the user has provided the correct information then the data will be stored in the MongoDB database. The dashboard also contains the button for logout from account, about page and home page.

Once the user has been registered successfully, as shown in the Fig. 4, the user need to provide email address and password to login to their account.

After login the normal user has the options to add a help, shown in Fig. 5. They need to provide the description of the help and address. The help then added to their dashboard along with the previous helps, shown at the same place. The help contains the status (Confirmed, Declined and Pending),

Fig. 3. Sign up page.

Fig. 4. Login page.

Fig. 5. User dashboard.

Fig. 6. Panchayat dashboard.

Fig. 7. DDMA dashboard.

description, address, button to delete and update a particular help.

After the user has added the the help it will be displayed on the Panchayat dashboard for confirmation, shown in Fig. 6. The dashboard contains status, description, address, input field to enter the expected cost and two buttons to confirm and decline the request. The officials has to provide the expected price for confirming and no need to enter price for declining. Once approved the buttons will be disappeared and cost will be shown on the individual help itself.

Once the helps are approved by the Panchayat, as shown in Fig. 7, it will be shown on the DDMA dash board. It contains the table which show the information of the users like id, description, address, status, price and total price. It will be used by the DDMA for monitoring and verification. It also contains logout functionality.

III. RESULTS

As we can see from the Fig. 5 that the website is successfully adding the help in user dashboard and showing all information as expected. Also in Panchayat dashboard in Fig. 6, all information and functions are displaying properly. Similarly in the DDMA dashboard. The MongoDB database stores the information correctly using two different collections for users and helps, user data in Fig. 9 and help data in Fig. 8.

Fig. 8. Helps data.

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_id: ObjectId('66315e5f3eb6b40e1c31f48d')
name: "Abhishek Kumar"
email: "abhi@gmail.com"
password: "$2a$10$MvFHEltIf5slHgNO/2F0tes71SfxfkhsP1RFA2W3VmUHnDZDTuORu"
role: "user"
date: 2024-04-30T21:10:55.724+00:00
__v: 0


_id: ObjectId('66315e883eb6b40e1c31f492')
name: "Mukesh Singh"
email: "singh@gmail.com"
password: "$2a$10$OICVZSSsPFeJvBeatOrpf.01ez0ksuAXzD5VQt1VAzGRhPGfAKNNK"
role: "panchayat"
date: 2024-04-30T21:11:36.861+00:00
  v: 0
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Fig. 9. Users data.

IV. Conclusion

Floods bring about significant challenges that affect both individuals and entire communities. They disrupt lives, destroy homes and livelihoods, and damage essential infrastructure. Climate change worsens these challenges by making storms stronger and sea levels rise, leading to more frequent and severe flooding events. Bihar, known as India's most flood-prone state, bears the brunt of these disasters, resulting in devastating consequences for its people and economy.

Despite efforts such as the Befiqr app and early warning systems aimed at improving flood management and response, there remains a crucial need to focus on addressing the specific needs of individuals during floods. Communication and assistance during these emergencies often fall short. This is where the proposed web app steps in, offering a promising solution by establishing a direct connection between flood-affected individuals and government authorities. By streamlining assistance requests and monitoring processes, the web app, developed with the MERN stack, shows promising functionality across different user interfaces. With continued refinement and implementation, technology-driven solutions like this have the potential to significantly improve flood response efforts and minimize the impacts of future disasters on communities.

Acknowledgment

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