Designing and Developing a Web Application Using The MERN Stack to Support Biodiversity Conservation and Sustainable Use of Natural Resources

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Abstract

In this research, we investigate social media Web applications to find a solution for life-on-land sustainability development objectives. This research focuses mainly on the advantages of having a web application to inform What is Land ?, Why do we need to protect it? Human-wildlife conflicts, help to understand the impact of human activities and sell Eco-friendly products to users, all around the globe as a method to help protect life on land. According to research, combining social media with a web application makes it more helpful for users and simplifies the buying and selling processes for both buyers and sellers. These days, we struggle with environmental issues like deforestation, wildlife killing, and droughts. So, we anticipate that our web application will be more helpful in providing solutions to those issues. The system was created using the MERN stack and underwent practical and browser compatibility testing, both of which yielded favorable outcomes. Our system can answer questions about land pollution and offer users a detailed explanation in the form of a blog. Users can post their ideas as posts and certain users can join established environmental projects. Anyone has access to create projects. Through our web application, users can market their eco friendly products and users can purchase eco-friendly products.

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*Abstrac*t – **In this research, we investigate social media Web applications to find a solution for life-on-land sustainability development objectives. This research focuses mainly on the advantages of having a web application to inform What is Land ?, Why do we need to protect it? Human-wildlife conflicts, help to understand the impact of human activities and sell Eco-friendly products to users, all around the globe as a method to help protect life on land. According to research, combining social media with a web application makes it more helpful for users and simplifies the buying and selling processes for both buyers and sellers. These days, we struggle with environmental issues like deforestation, wildlife killing, and droughts. So, we anticipate that our web application will be more helpful in providing solutions to those issues. The system was created using the MERN stack and underwent practical and browser compatibility testing, both of which yielded favorable outcomes. Our system can answer questions about land pollution and offer users a detailed explanation in the form of a blog. Users can post their ideas as posts and certain users can join established environmental projects. Anyone has access to create projects. Through our web application, users can market their eco friendly products and users can purchase eco-friendly products.**

Keywords—**Social-media, MERN Stack, React JS, Node JS, Express JS, Mongo DB, Blogs Management, Post management, Recycle management, and Projects handling.**

INTRODUCTION

This is a sentence with reference to a journal article [1]. The United Nations (UN) adopted the 2030 Agenda of Goals for Development that is Sustainable in the month of September 2015. The Sustainable Development Goals, or SDGs, are a set of global objectives comprising 17 goals, 169 targets, and more than 230 indicators that are meant to serve as a "blueprint to achieve a more equal and sustainable future for all".

Life on land (SDG 15) emphasizes improved management of forests, preventing and reversing the degradation of land, fighting desertification, and halting biodiversity loss. Land degradation, droughts, untamed animal killing, and deforestation are all influenced by natural and anthropogenic processes. Urbanization, population migration, inadequate planning for land use, and various wastes or pollution brought on by economic growth are examples of anthropogenic factors. Droughts, wild animal hunting, and deforestation are all long-term processes that need to be monitored using authorized and standardized techniques and a lot of data. The investigation of terrestrial environments, populations of wildlife, soil quality, and protection initiatives are all included in the broad and intricate field of study known as "Life on Land." Human well-being depends on life on land because it gives necessary resources like meals, safe water, and fresh air. The biodiversity that supports life on land is threatened by human actions like urbanization, deforestation, and climate change, which have had major effects on agricultural ecosystems and wildlife populations. In order to create efficient methods of conservation and manage natural resources responsibly, it is essential to understand the intricate connections that exist within life forms, ecological systems, and the environment.

The goal of "**Help Nature** " is to provide information on deforestation, droughts, land pollution, hunting of wild animals, pollution in the air, unsafe building practices, and other issues. The system's primary consumers are bloggers, poster creators, project managers, product sellers, and buyers. As a "**Help Nature** " a web application was created so that users could contribute their thoughts and experiences. With our web application, users can sell eco-friendly goods, join current projects, and start new ones.

This is a sentence with reference to a journal article [2]. A user-friendly system with excellent user interfaces and user experiences reportedly draws customers. In order to make it simpler for users to engage with the system, the user interface was created using best practices. Unlike most other systems, it is simple and lacks any irrelevant information or words that are system-oriented or complex. An online system was asked by "**Help Nature** " to facilitate user interaction, idea exchange, and the sale and purchase of environmentally friendly goods. As a result, it was determined to create a web-based application using the MERN stack,

with React being used for the front end, NodeJS for the back end, and MongoDB for the database.

We will first contrast the functionality of our system with those of other systems in this study paper. Second, we'll talk about the technologies and tools used to create the system. Using diagrams, we'll clarify the techniques used to create the system and describe the backend operations associated with its major features. The primary operations of the system will then be described using diagrams. The important conclusions or results will then be discussed, along with the testing techniques that were employed to test the system's primary functions. Finally, we will summarize the key points of the paper's results and draw conclusions. We will also note a few issues with our work that would be helpful to other researchers.

LITERATURE REVIEW

The majority of the systems in use today don't provide any knowledge or insight into the land or life here. It is either not particularly user-friendly or lacks key features that allow users to seek new things or sell their goods on a reliable platform from anywhere in the world.

These systems are typically offline, making them inaccessible to software from anywhere in the world. that is why we developed this MERN stack online application to collaborate with global citizens, villages, and regular people.

Although additionally in developing nations, issues like biodiversity loss, climate change, and deteriorating living and health conditions are caused by the industrialization process. This is a sentence with reference to a journal article [3]. To make expansion more sustainable, there is a growing need to look for integrated solutions. The "2030 Agenda for Sustainable Development" has been endorsed by the UN, which has recognized the issue. The seventeen Sustainable Development Goals, or SDGs, included in the Plan entered into force on January 1st, 2016. These objectives address the three pillars of sustainable development: environmental protection, social inclusion, and economic growth.

This is a sentence with reference to a journal article [4]. In the past, people have altered the land to get the resources they needed to survive, but at a slower rate than it is now. At local, regional, and global levels, the recent elevated level of extraction has resulted in previously unheard-of alterations in habitats and ecological processes.

We investigated this issue thoroughly and discovered numerous solutions to it. Too many Web applications have been produced by too many developers as a solution to the Life on Land (SDG 15) problem. However, the premise is the same as that of other web applications, and some web applications are unable to offer a solution in these circumstances. So, in order to interact with people and share ideas and information about pertinent issues, we created a social media web application. These days, humans are responsible for land pollution, droughts, and the hunting of wild animals. Therefore, we are hoping that by using the "**Help Nature** " Web Application, we may provide answers to the SDG 15 problem.

Using lengthy descriptions and pertinent themes, bloggers can lend their knowledge and ideas to blogs. Let's say someone goes around Sri Lanka and other countries and notices droughts in some places, deforestation in some places, the hunting of wild animals, etc. They can take a picture of these things and upload it to our web application as a Post. Our system contains recycling facilities, and certain people can manage initiatives to help save the land from harmful structures and other things. Users can search for available trash can locations, which will help to preserve the lives of those who live on land. (SDG 15).

METHODOLOGY

For the requirements-gathering phase, we observed a simple questionnaire with some of the stakeholders. To develop the UML designs we used Draw.io and Star UML because we are already familiar with this software. To develop the application prototypes, we used Figma and Adobe XD.

Because in terms of functionality and features, Figma is a cloud-based design application similar to Sketch, but with significant variations that make Figma superior for team collaboration. Figma makes the design process simpler and facilitates team collaboration more effectively than other tools.

MERN is an acronym for MongoDB, Express, React, and Node. These four technologies are what enable us to create or develop this web application. It is a cross-platform open-source program. It falls under the NoSQL database category. It was a database that was focused on documents. It employs JSON documents with optional Schemas. Which includes React.js for developing the front end, and Express.js. It is a well-known Library in node. For routing, js is utilized. It contains certain router-like methods that aid in performing common operations such as put, get, post, and delete requests. and A runtime JavaScript environment called NodeJS operates outside of a web page. The majority of its applications are server-side ones and MongoDB's NoSQL database for data storage and retrieval. We decided to use this technology because it suits our client's requirements. There are some tutorials for this technology, and it was easy to learn.

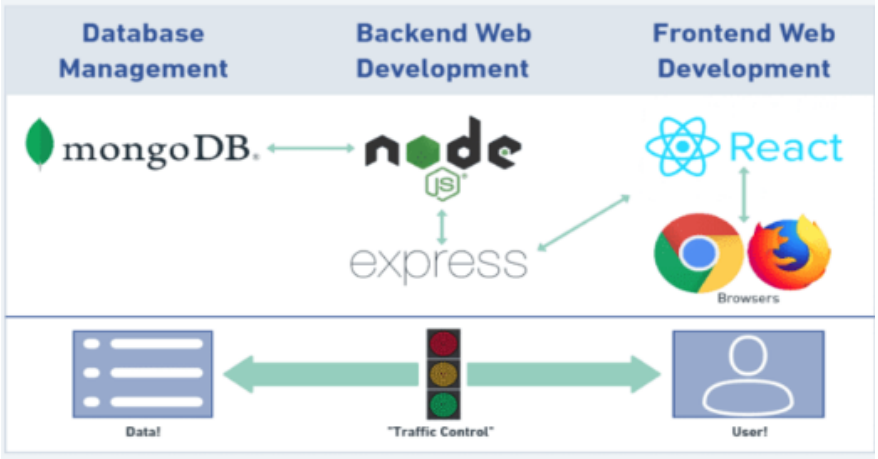


Figure 1: Overview of Technology

For example, assume that we can discuss blog administration to have a fundamental grasp of our web application. You can see how our web application's blog administration overview diagram was created in this situation. The blogs that are now accessible through our web application can first be seen by users. If the person wants to make a blog on our online web application and wants to become a blogger there, they can do so by entering their login information. nonetheless, users must first register in our online application if they do not already have one in order to start a blog.

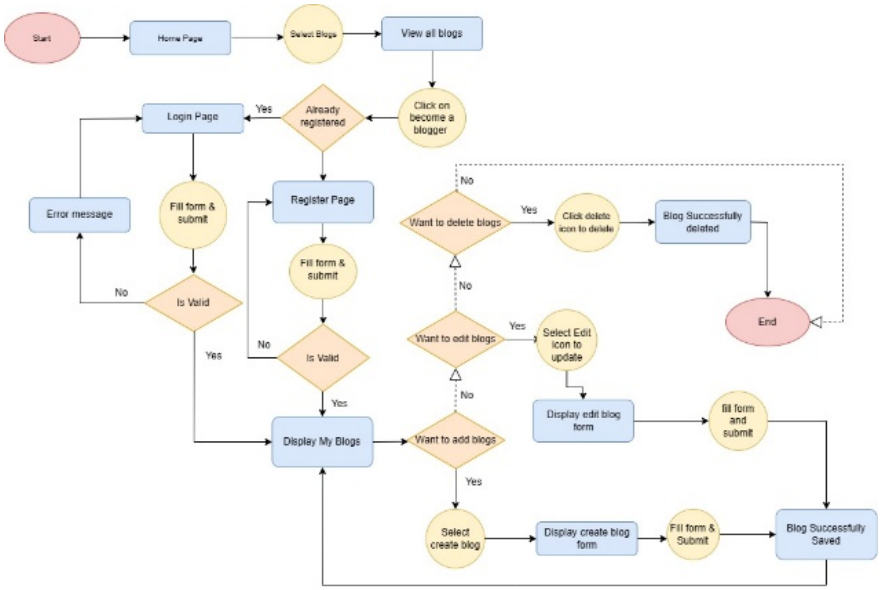


Figure 2: Blog Management Overview

Visual Studio Code IDE is a free source code editor. It includes built-in support for the programming languages JavaScript and TypeScript, as well as support for other extension languages. it is free and lightweight. It is also a tool used by many people in the field as it has the advantages of being able to reuse the code, increase its attractiveness, and get a better understanding of the code. Therefore, For the development of the application, we used VS Code IDE. To test the backend routes, we used the Postman software which is a popular software used for this purpose. Utilizing Postman, create and send API requests. Send a call to an endpoint, request data from a data source, or test the functionality of an API. No codes or instructions need to be entered into a terminal. When we start a new request and select Send, Postman shows the API response right away.

HTTP Methods and Their Meaning

Method	Meaning
GET	Read data
POST	Insert data
PUT or PATCH	Update data, or insert if a new id
DELETE	Delete data

Figure 3: HTTP Methods

Here are a few of the most popular techniques:

- Data is retrieved from an API through GET.

- New data is sent to an API via POST.
- Existing data is updated through PATCH and PUT.
- Existing data is removed using DELETE.

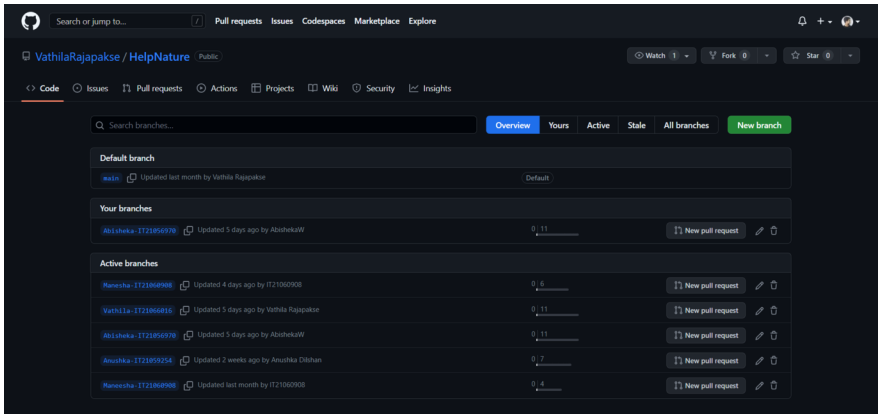
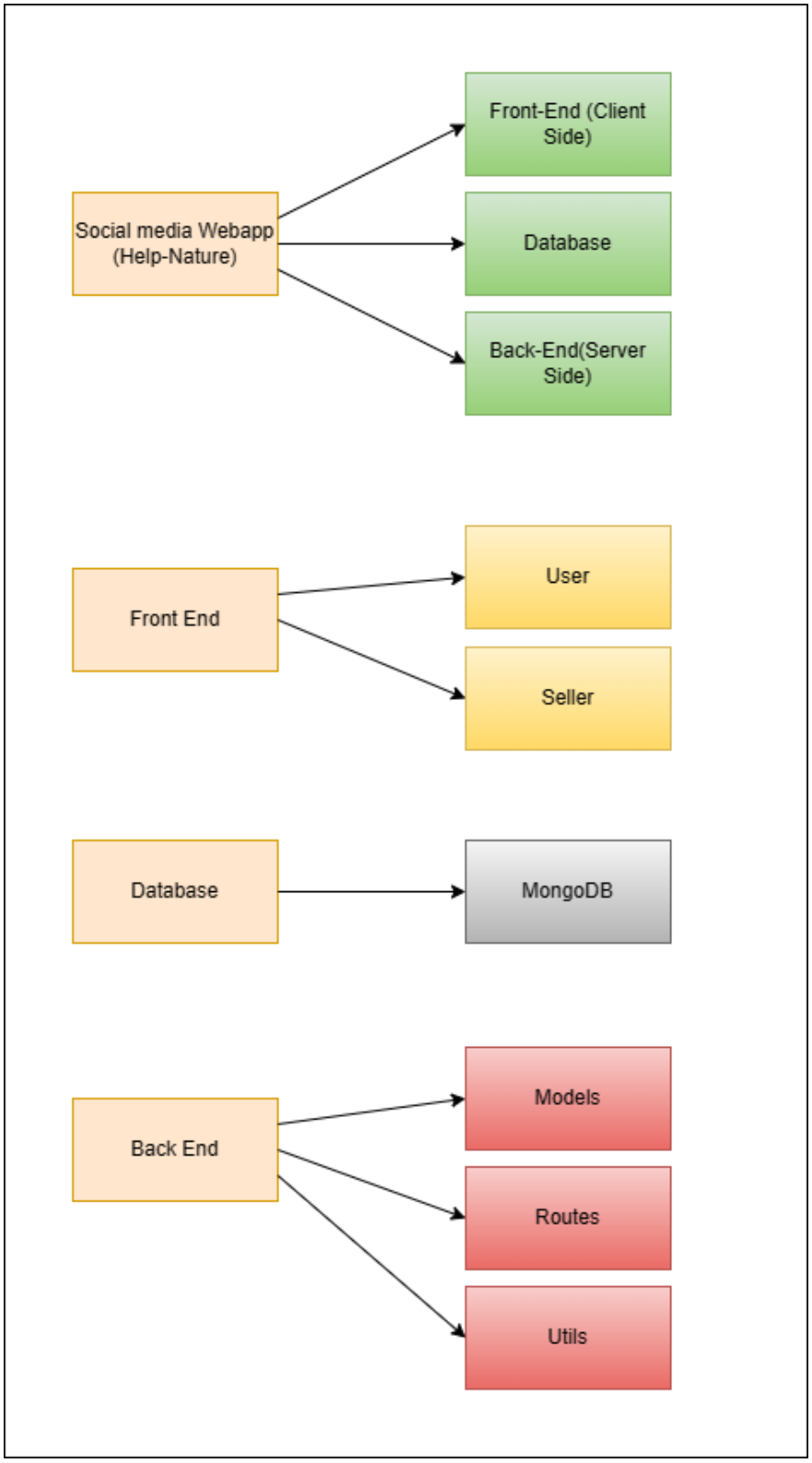


Figure 4: GitHub Repositories

We used GitHub to integrate the system because Strong versioning tools are built into GitHub, making branching and merging simple. In addition, the majority of programmers are already familiar with using GitHub, and it's simple to direct people to a GitHub page if they want to contribute. GitHub has also taken steps to increase security, and it's fantastic for distance collaboration.

IV. PROPOSED SYSTEM



The MERN stack of technologies is used in the work on our platform that is suggested in this article. MongoDB, Express, ReactJS, and NodeJS are all abbreviated as M, E, R, and N, respectively. The project comprises numerous parts that are arranged in a specific order for ease of access.

The goal of this website is to bring together all environmental enthusiasts. Visitors to the website can view the entries under a few environmental-related topics. Additionally, site users can browse various blogs. They can also participate in the projects as volunteers. These projects aim to safeguard the environment. The location has recyclable goods. Visitors can purchase these items if they desire them. Let's say that a visitor would like to add a post, create a blog, offer their products, or start a project and find people for it. Then they can quickly join this site by clicking the register button or by using a special button that is already present in each function. (Blog page's "Become a Blogger" button). After logging into the system, users can contribute posts, blogs, products to sell (which should be environmentally friendly), or projects to advertise in order to recruit volunteers. They simply need to log in to the system if they have already registered.

Users can add, search for, update, and delete functionality related to their function.

Blog management

The suggested system includes a capability for managing blogs. After entering in, users may read the most recent and popular blogs and find out more about individual blogs. It is seen in Figure 5.

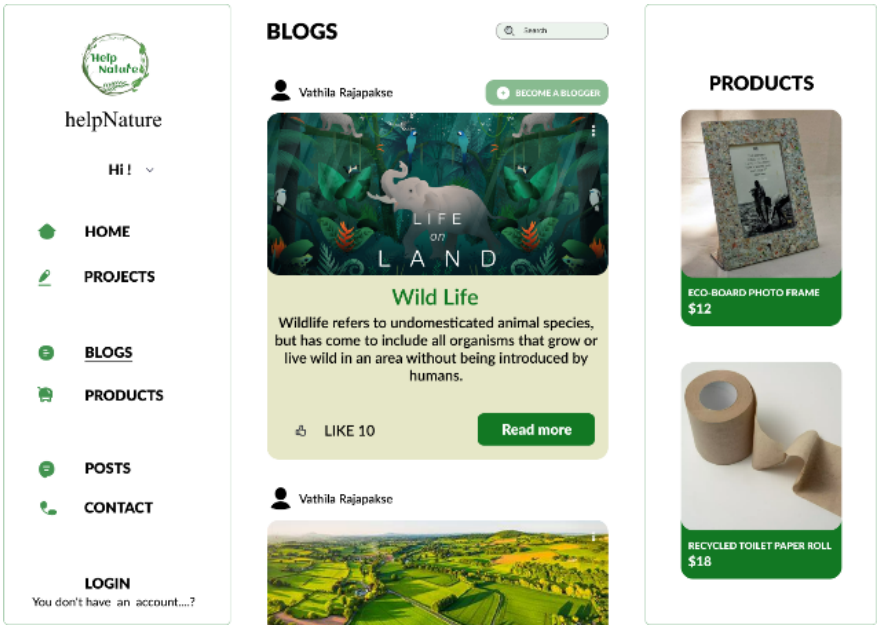


Figure 5: Blog Home

The user will utilize the interface below to view the detailed information about each blog. The "Read more" button allows the user to view the specifics.

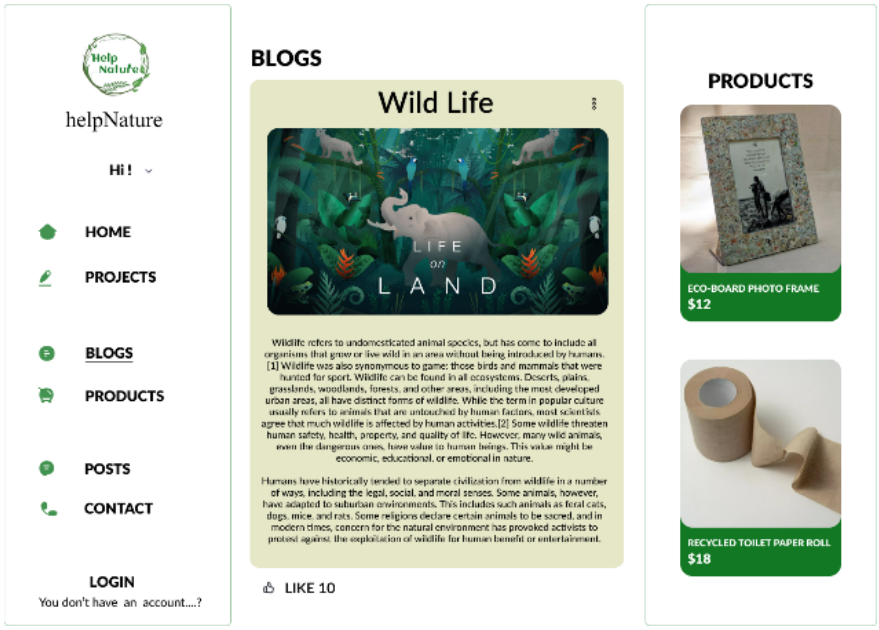


Figure 6: Specific Blogs

After entering in, users can create blogs on our web application. However, every user decides to actively log in to the system. Figure 7 illustrates it.

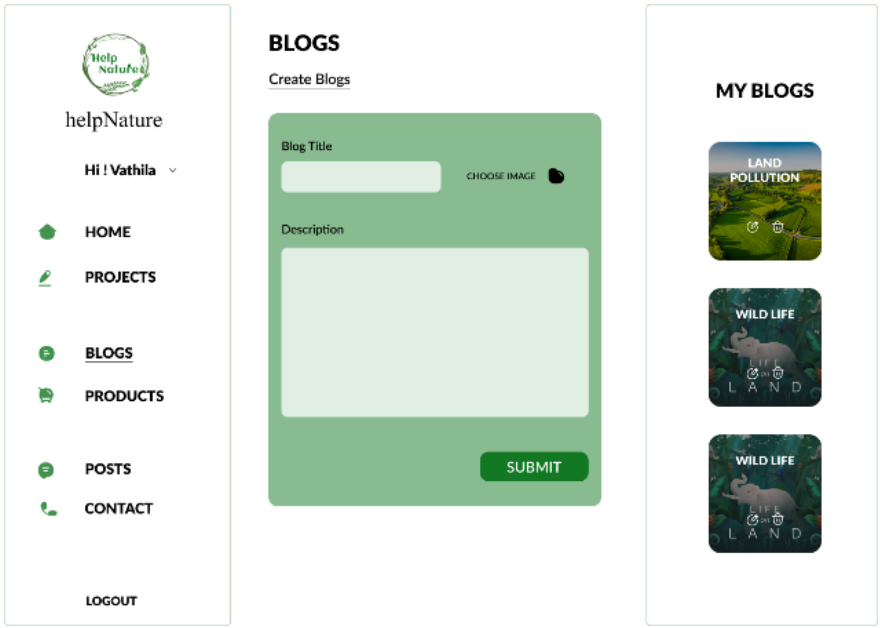


Figure 7: Create a Blog page

Users can view their newly created blogs in our web app's blog page after providing their details. The user can go to the "my blogs" page and make their own changes if they choose. Figure 8 illustrates it.

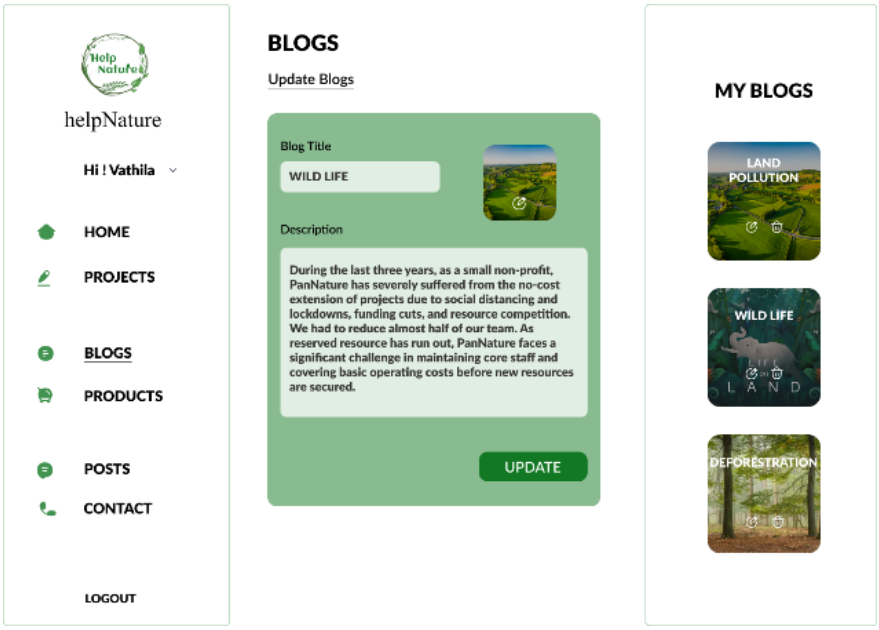


Figure 8: Update Blog

If a user requests it, remove blogs from our online application. He or she has the option to delete it from our web application by clicking the "Delete" button. A confirmation window with the words "Are you sure, you want to delete this blog" appears. If the user selects "Ok," the blog will be instantly deleted from the system. Figure 9 provides an example.

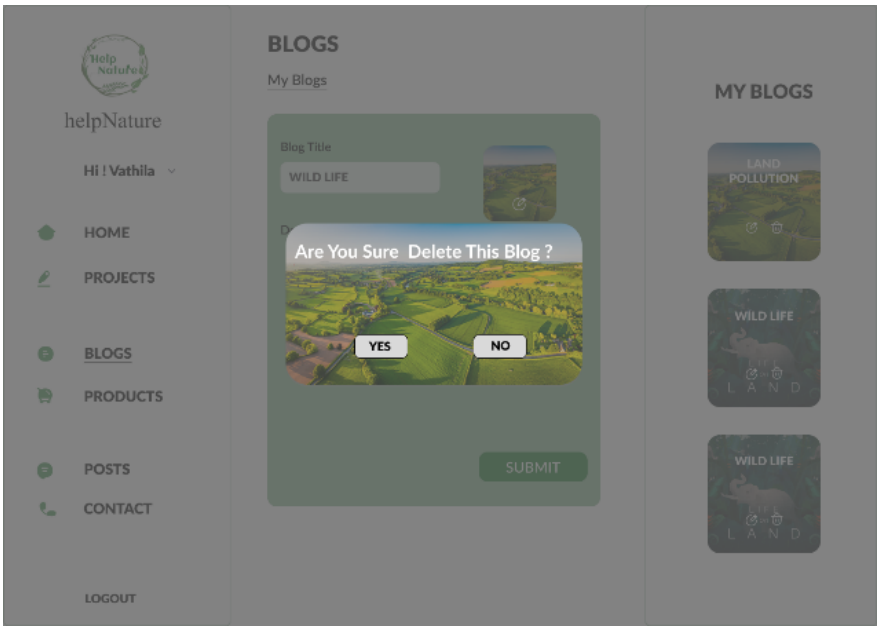


Figure 9: Delete Blog

Users can only edit and delete their blogs using the "My Activity" tab, which is where they can be found.

They must log in to the system if they want to edit or delete their blogs. They are unable to change or delete anything if they are not logged in to our system.

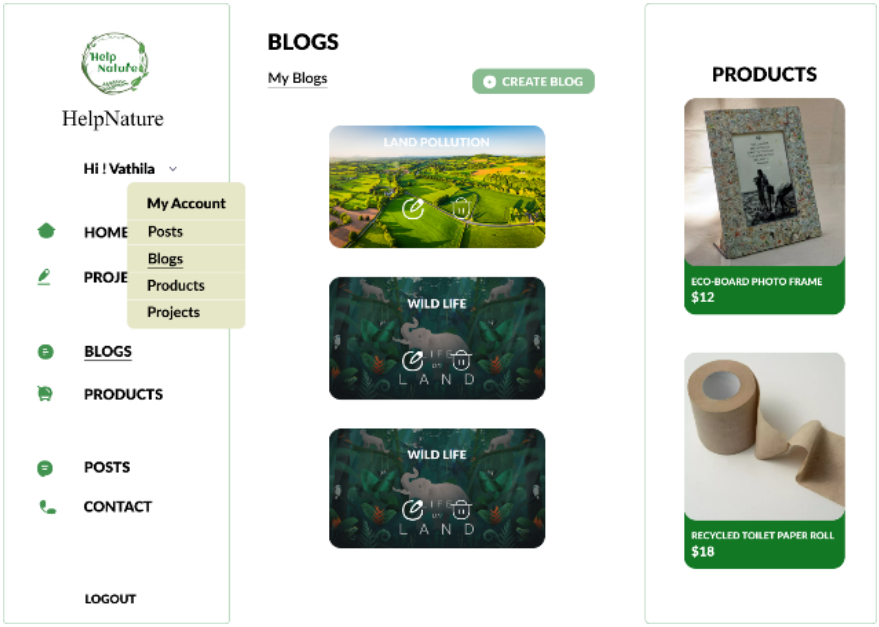


Figure 10: My Activity Blog Page

Post management

Through this function, we look into solutions for problems faced by wildlife animals, environmental problems, and environmental and animal needs. Anyone can access information and articles published by people by entering the help nature web application and they can also post reactions to articles uploaded by other people. The search bar is used to search and filter out the posts posted by the user. so through posting these problems we can provide these issues to environmental authorities and societies. It is seen in Figure 11.

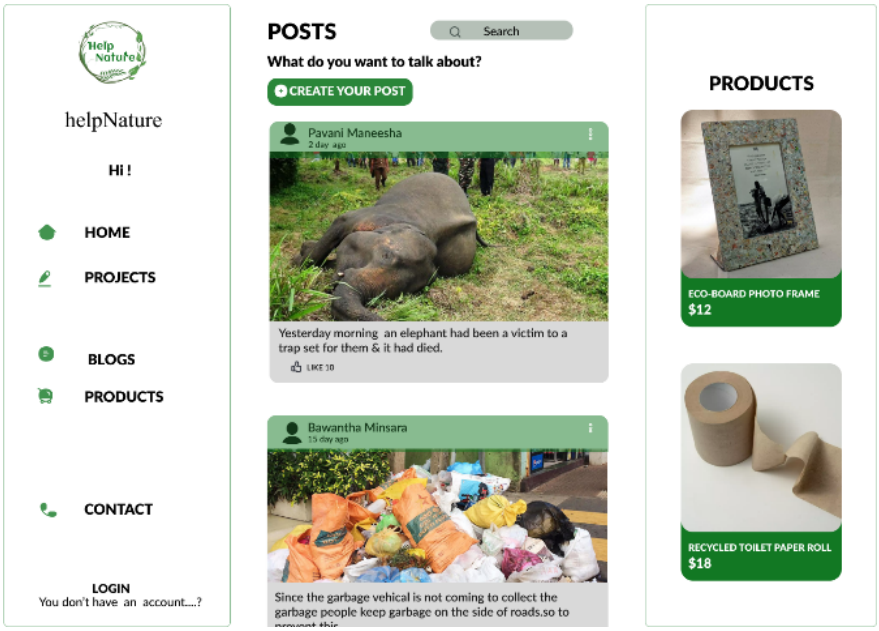


Figure 11: Home Page

If someone wants to create a new post, then they can select the "create your post". This will direct them to a login page, after successful login they will get directed to the page that contains their related posts. From this user interface if they select the create post button they will be navigated to this page. the user can easily post new post here. Figure 12 illustrates it.

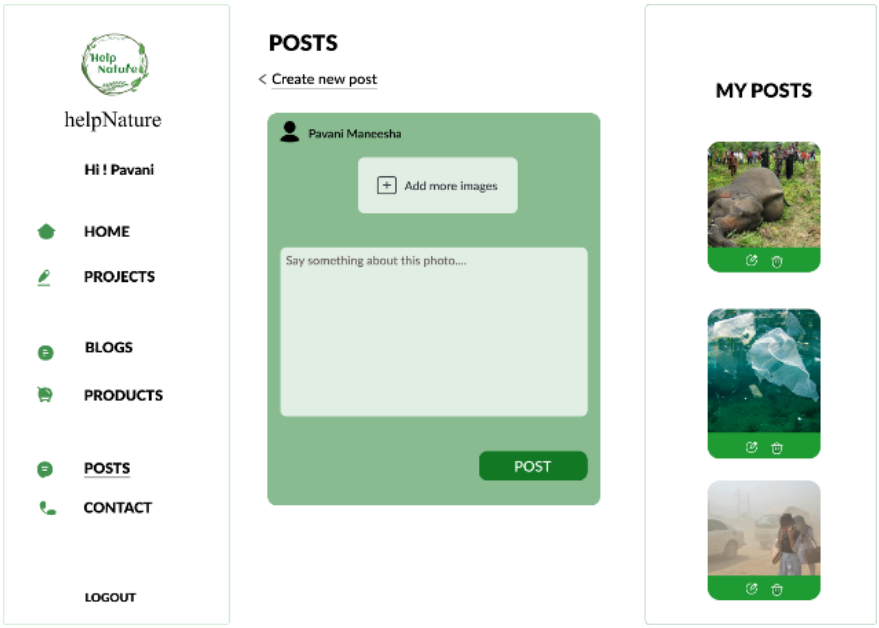


Figure 12: Create Post page

From this right side the user can view all the previous posts he/she had put and when a new post is created

it will be shown in this too. And a user who has already logged in to the account can go to my post page by clicking on posts from this my post page a user can see all the previous posts he or she uploaded.

Furthermore, the user can edit or delete from the icons above the posts. It is seen in Figure 13.

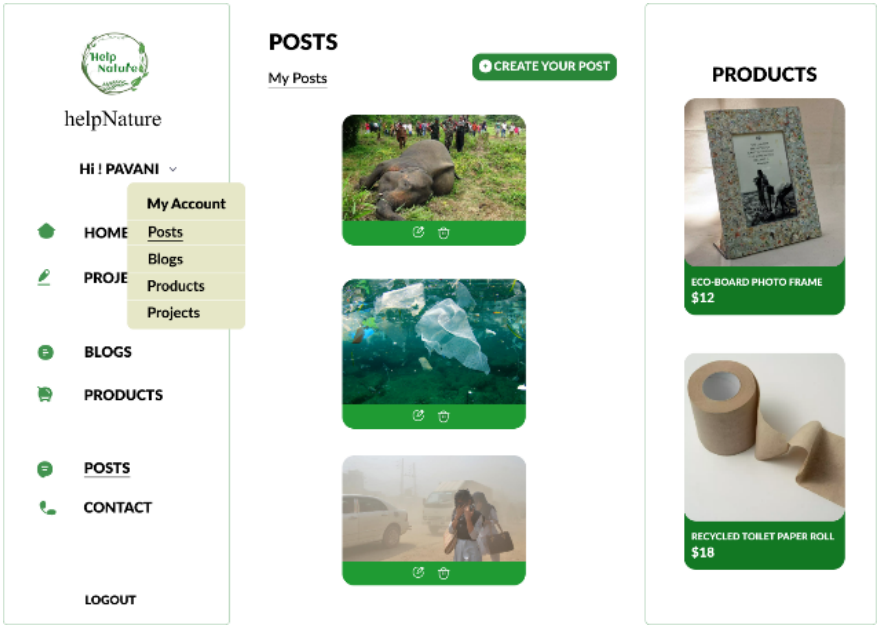


Figure 13: My Activity Post Page

By clicking the edit icon shown in the post the users can update any of the details of their posts. Figure 14 illustrates it

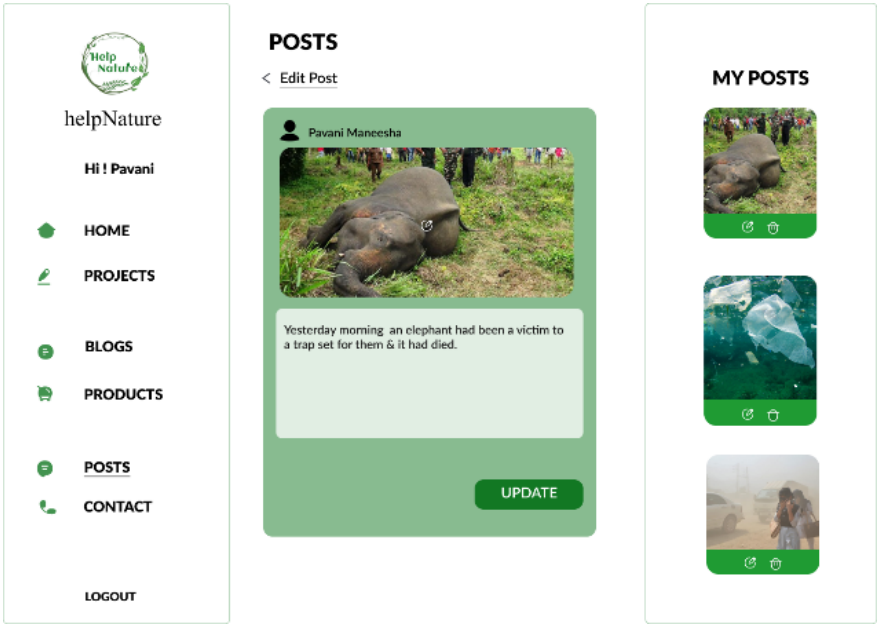


Figure 14: Update Post Page

From the delete icon, they can delete their posts or choose not to delete the post so if they select no by chance then they will be navigated to the home page. Figure 15 illustrates it

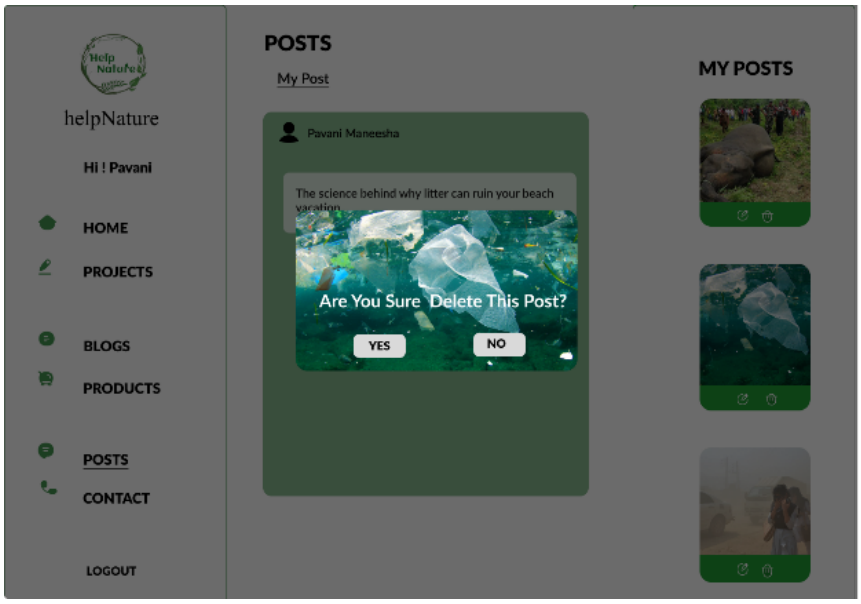


Figure 15: Delete Post Page

Community Project Handling

The suggested system includes a capability for community Projects Handling. The user can choose a project that they are interested in. When a user clicks the "Join" button, they can participate in projects that are open. The interface was designed by focusing on one specific task, which is the addition of the project. It is seen in Figure 16.

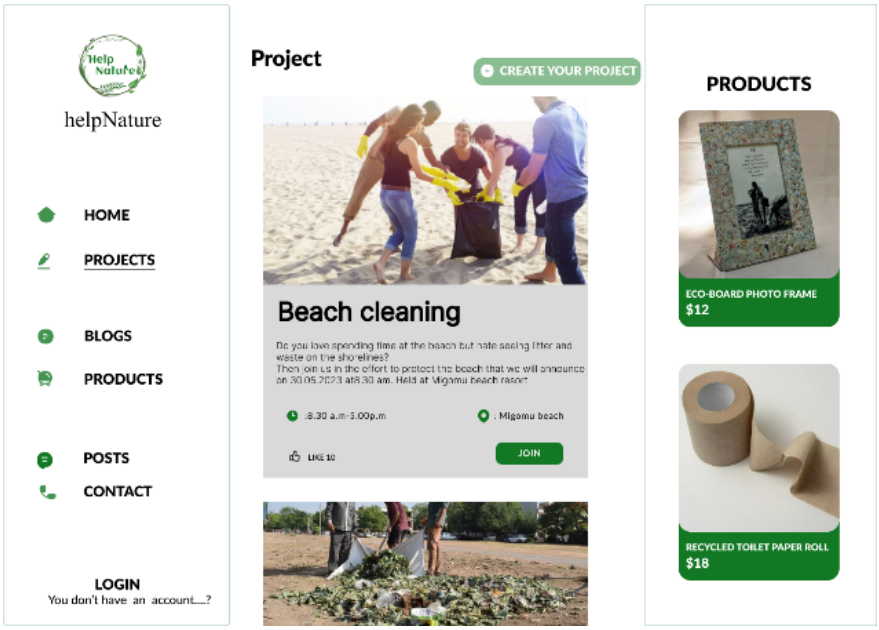


Figure 16: All Project page

After Clicking the "join" button User is directed to the below interface. With this interface, the users provide the details and submit. The interface is designed with the aim of bringing members together in a project team. It is seen in Figure 17.

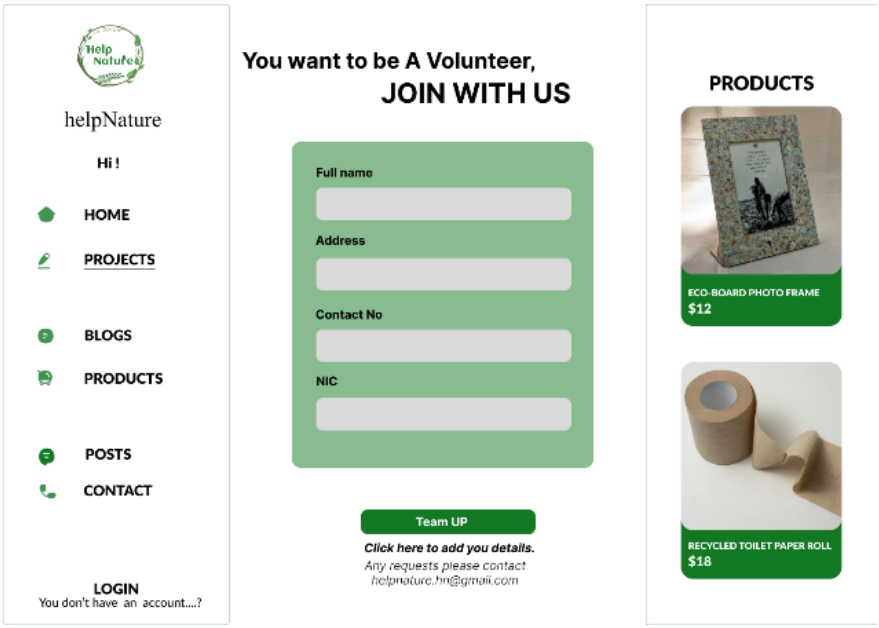


Figure 17: Project Join Form

Users can use the feature in this web application to look up existing projects and ongoing projects by clicking the search button. Users may change and remove their projects with a single click by using the update and delete icons. It is seen in Figure 18.

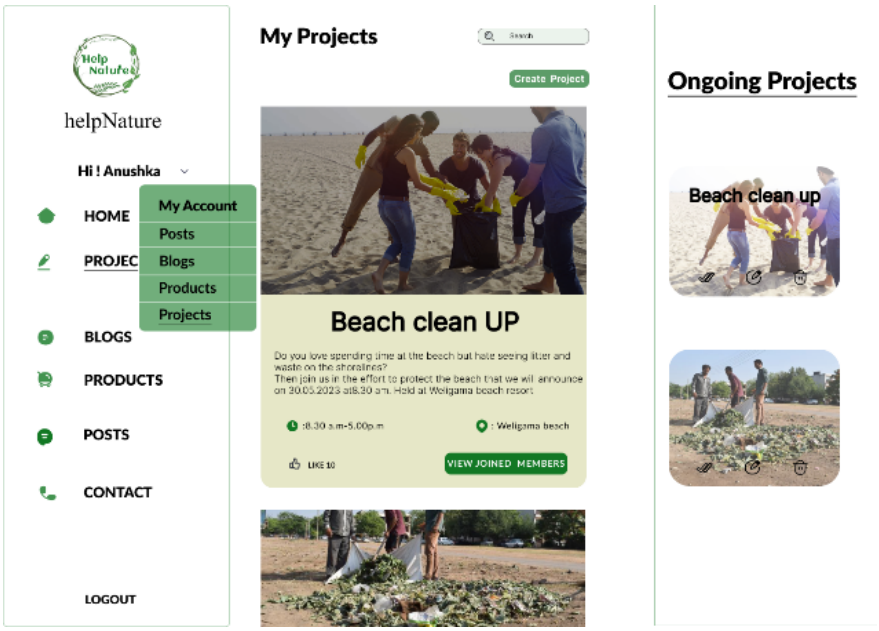


Figure 18: My Project Page

After Clicking the "VIEW JOINED MEMBERS" button User is directed to the below interface. Project owners can view the members of pertinent projects. The delete button, Project owner may easily Remove the members. It is seen in Figure 19.

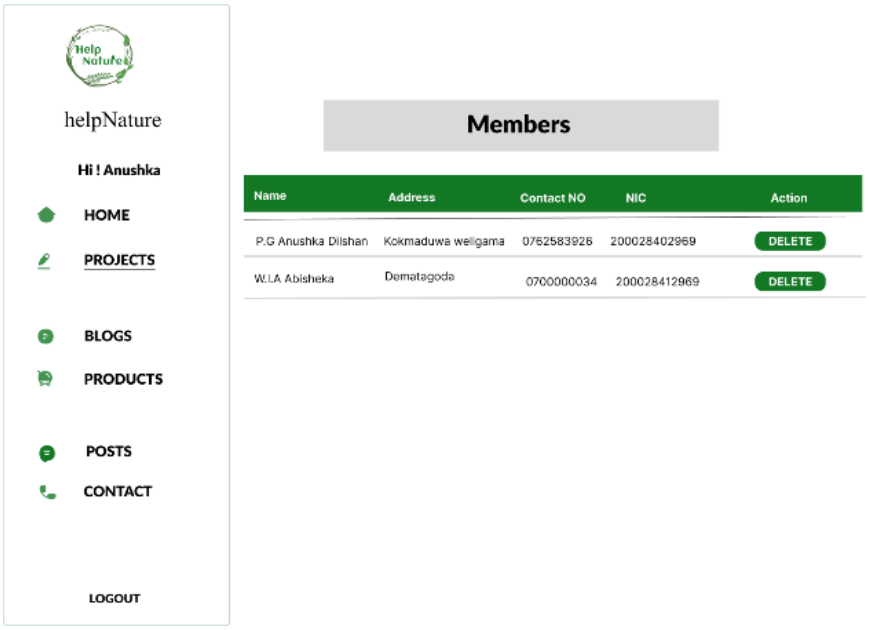


Figure 19: View Members Page

New Projects will be created using the below interface for this web application. A Project Owner may create a new project. Figure 20 illustrates it.

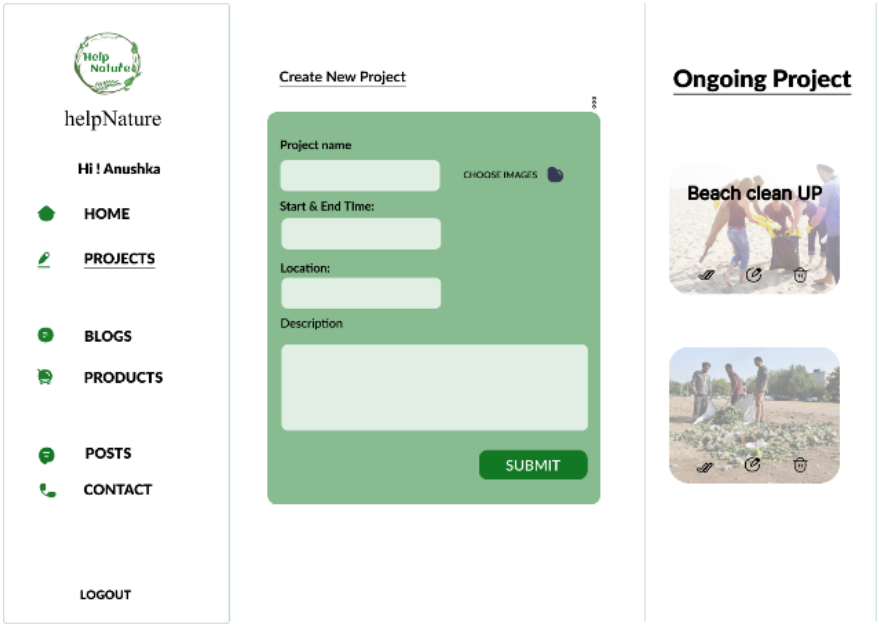


Figure 20: Create New Project Page

The interface below interface uses to update the current activated project. Figure 21 illustrates it.

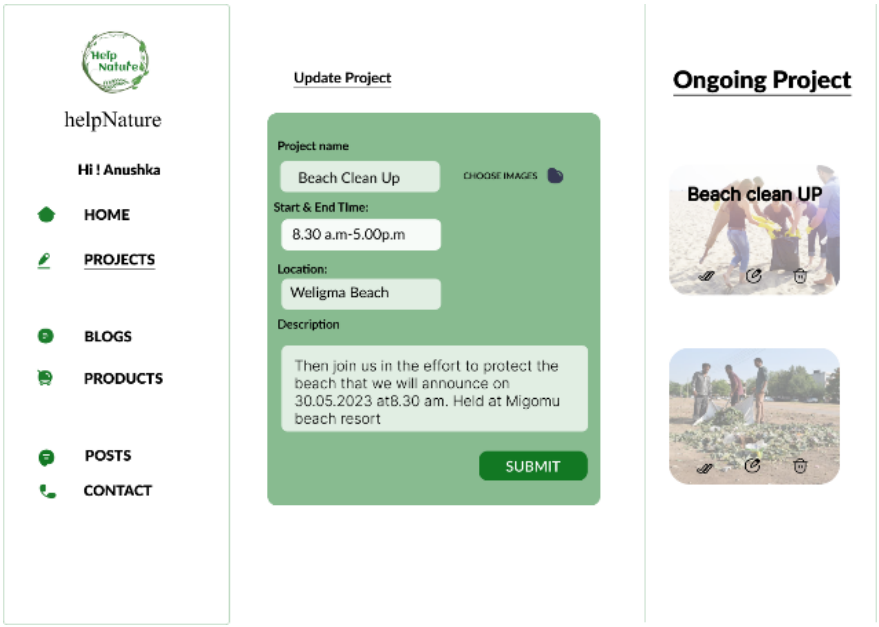


Figure 21: Update Project Page

The below interface is used to delete the projects. Click the delete button to continue. If the user clicks the delete button, a pop-up message will immediately display asking "Are you sure you want to delete this Project?" (icon). The project will be deleted from our website if the project owner chooses yes. It is seen in Figure 22.

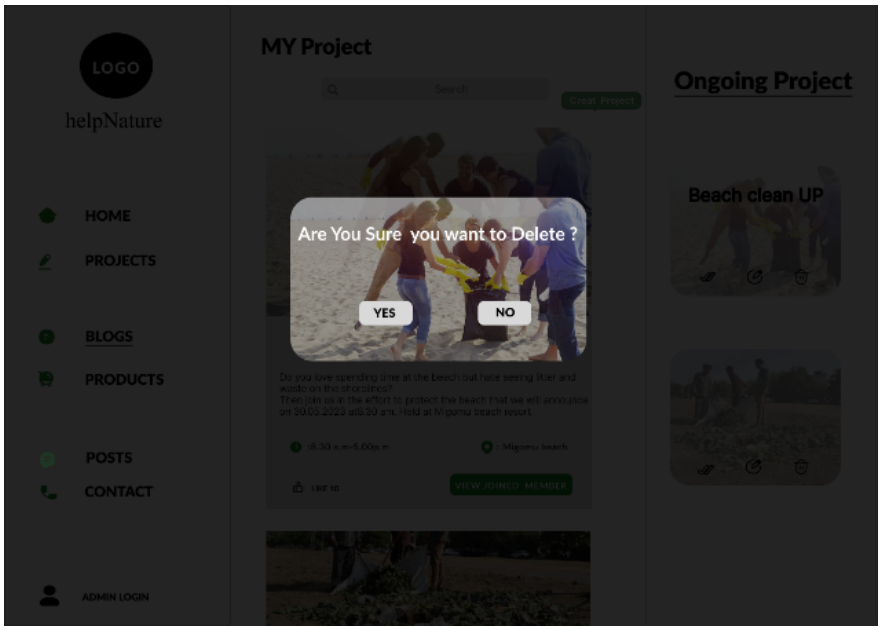


Figure 22: Delete Project Page

Product Management

A function for product selling is included in the proposed arrangement. Customers can view every item that is currently listed for sale on the website. And they can buy those things. Customers can browse every item that is offered on the website, as shown in figure 23.

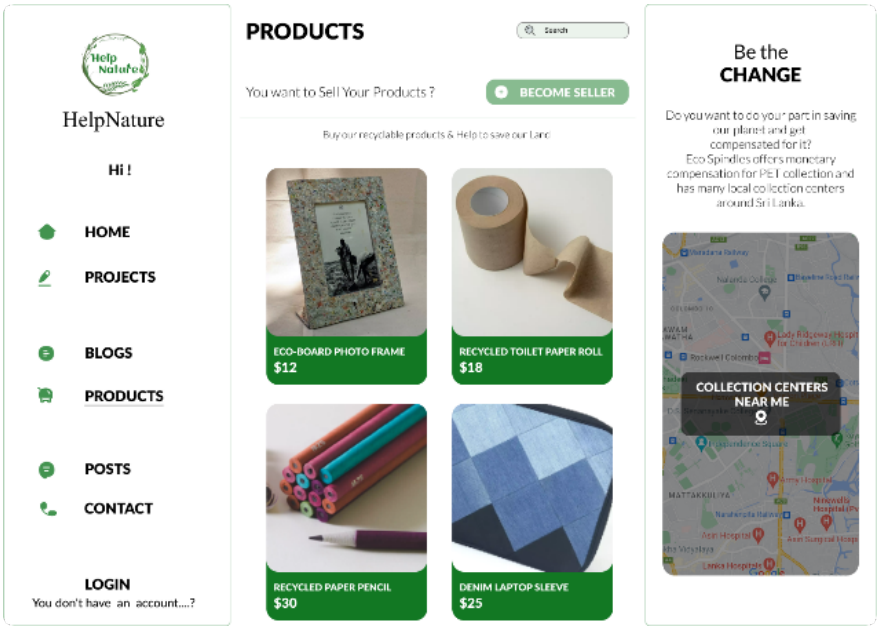


Figure 23: Products Home Page

Clicking on the product card will bring up more information and allow you to purchase the item. The product information page is reached after clicking the product card. It shows the item description. The product information is displayed in the interface below.

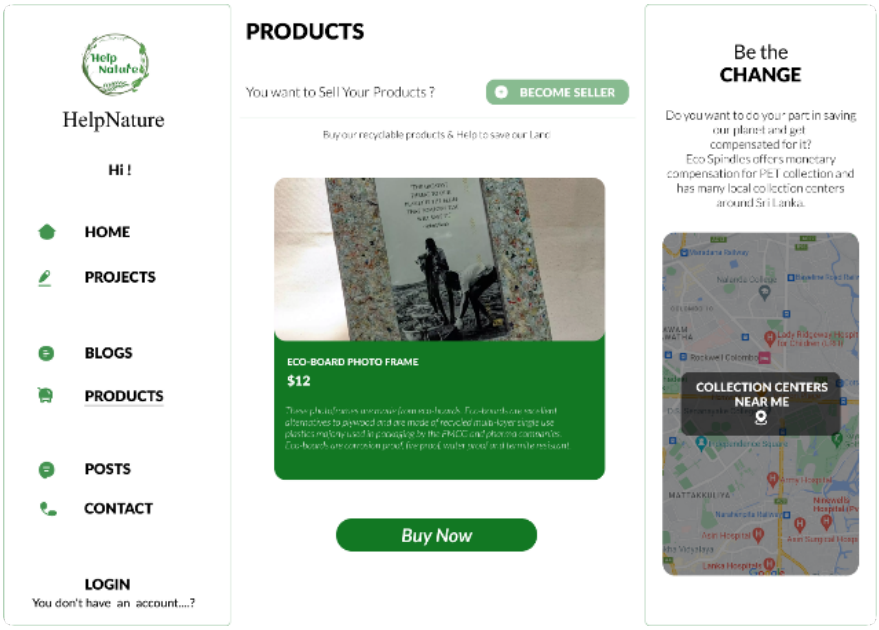


Figure 24: View Product Details Page

Customers can purchase the merchandise using the figures below 25. They need only complete the payment form. Customers can use their MasterCard or visa to make payments. Buyers need only click the confirm button after entering the necessary payment information. Following that, payment will start.

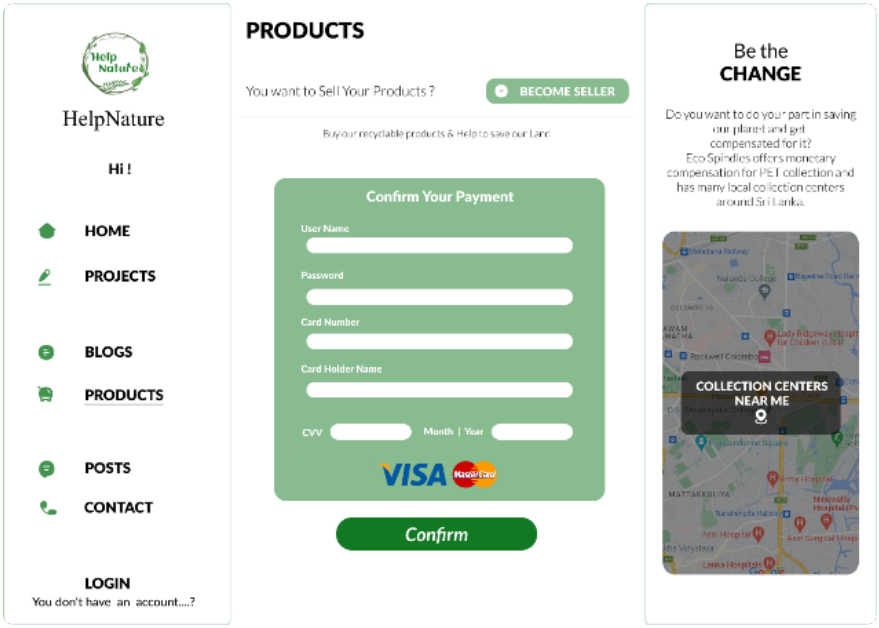


Figure 25: Purchase Product Page

Let's say a user wants to sell their own products on this website (products should be related to eco-friendly concept), they need to click on 'Become Seller' button. They will then be directed to the login page. They must register for an account if they don't already have one.

They can view the products they have already added to the website after logging into their account.

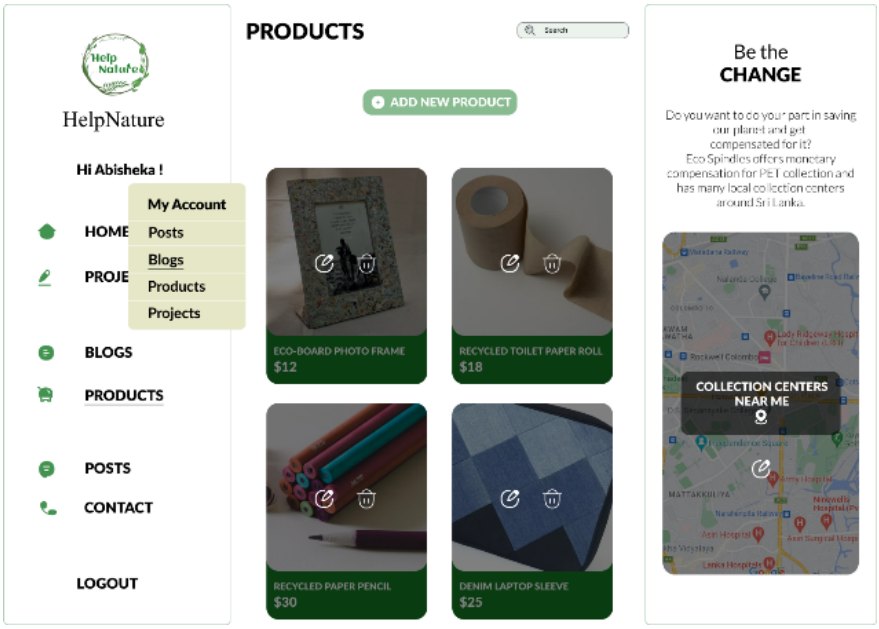


Figure 26: My Activity Product Page

An 'Add Product' button can be found in figure 27. The user has the option to add products to the website by clicking this button. The add product user interface is shown in the following figure. Sellers must fill out a few sections before uploading a product image. They can effectively add products to the system after that.

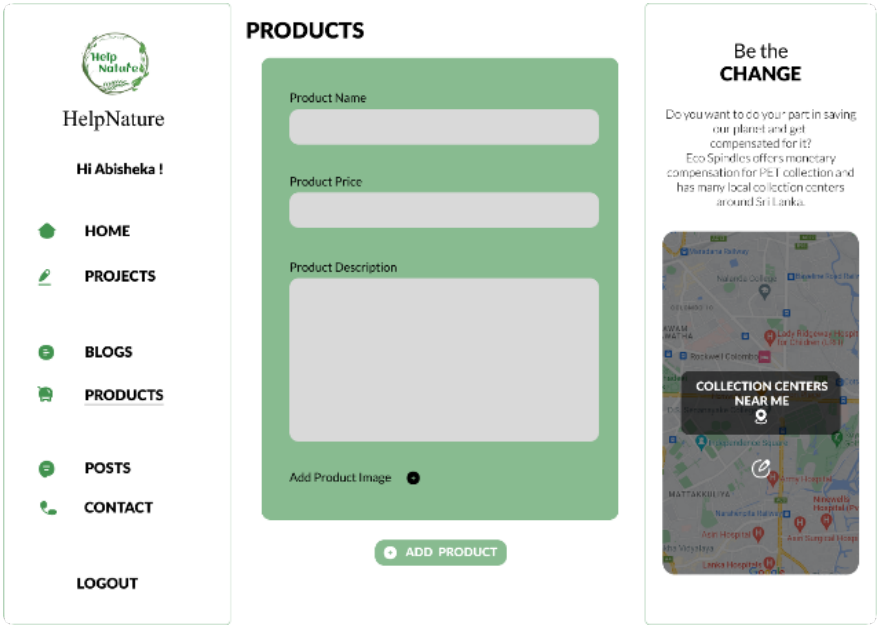


Figure 27: Add Products Page

'Edit' and 'Delete' icons can be found in the seller products interface on the product card. The interface that the seller sees when clicking the edit icon is depicted below in figure 28.

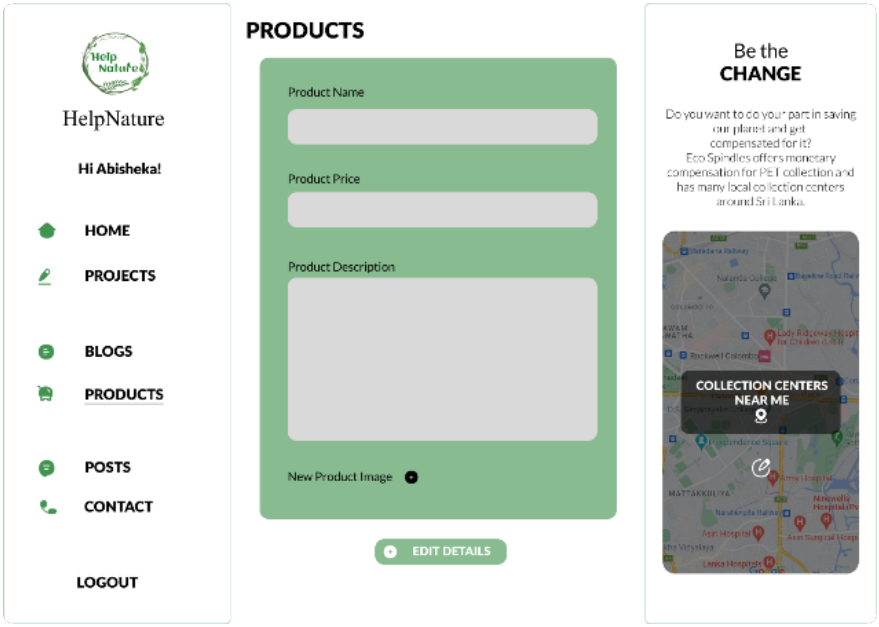


Figure 28: Edit Product Details Page

The interface that appears when a seller clicks the delete button is shown in figure 29 below.

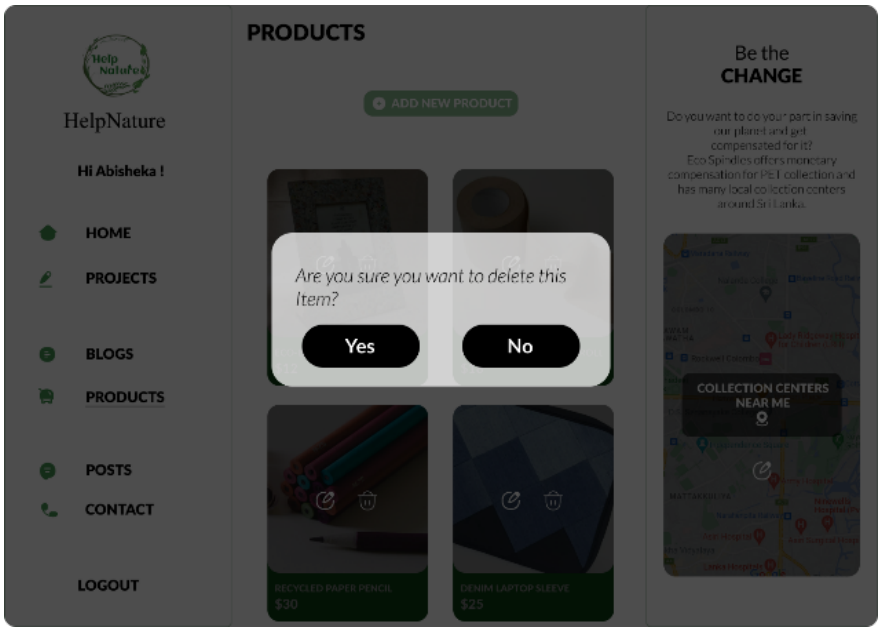


Figure 29: Delete Product Page

DISCUSSION

This chapter displays the web application's findings for the "**Help-Nature** " application. To improve the application in the future, ideas for potential updates are also investigated

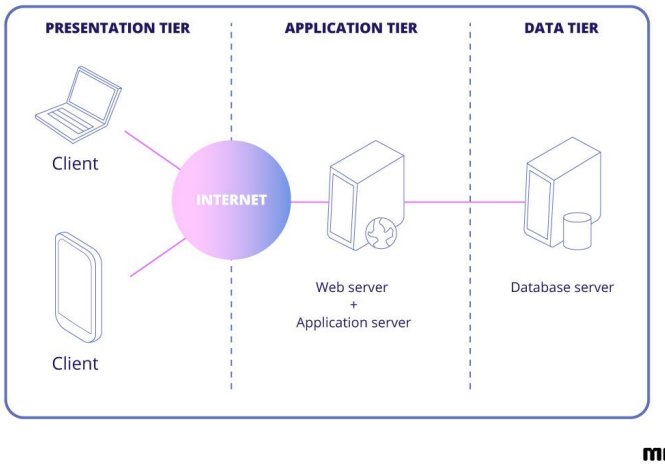


Figure 30: Architecture of Web-Application

V.1 Results

The MERN stack ultimately functioned as the primary full-stack technology for the creation of the social media web application, demonstrating its capacity to build sophisticated full-stack applications. MongoDB, Express, React, and NodeJS were integrated with other tools and technologies to produce the finished application. The thesis went into great detail on the technology and procedures used. The completed application, therefore, satisfies each need stated in the project specs. Users can access the system to learn more about Life on Land SDG and to sell or purchase things through our web application. Users are able to log in, search for blogs, create their own, update them, and delete them, as well as make posts, update them, and delete them in our web application. Users are also able to join as volunteers in our web application and sell or buy environmentally friendly goods. The program is easy to use, welcoming, and practical because it only takes a few steps for each visitor to complete on the platform from being an anonymous user.

V.2 Testing

Since testing verifies that the application is functional and compatible with the majority of current browsers, such as Chrome, Microsoft Edge, Safari, and Firefox, it is essential for quality control. Thus, the test of browser compatibility that was performed on the following browsers was successful. The online content is also grammar-checked before publication to enhance user experience. The functionality test is taken into account, which involves looking at all the links, blogs, articles, and photo-rich items. Our website application has a search tool for improved usability. it will be more beneficial to have knowledge about the idea of "Life on Land". Users who are signed in may create articles, blogs, and projects, and anybody else can participate as a volunteer in ongoing initiatives. Every user has the ability to sell and acquire environmentally friendly goods. Our online application also includes a Map. What recycling facilities in Sri Lanka have been listed on the map? The user may use the website application to find out where they can recycle their trash currently. Our online application will list all the recycling locations, which is incredibly beneficial for users.

V.3 Additional advancements

Although our research paper application satisfies all requirements as planned, there are still a few places where performance might be enhanced. Since the web application now only works on desktop computers,

responsive design for tablets and smartphones might be developed in the future to enhance user experience. On the other hand, more sophisticated ideas and strategies may be applied to enhance other parts of the program. Server-side rendering (SSR), which improves search engines' access to the content on the web, is added to search engine optimization (SEO) in order to raise a web page's exposure in search engines like Bing and Google. Automated testing may be developed using a range of well-liked tools, like react-testing library, Jest, and Cypress, in order to execute various testing approaches, including unit testing, integration testing, and end-to-end (E2E) testing. This lowers the application's mistakes and defects.

VI. CONCLUSION

Through our analysis of social media web apps, we discovered that accessibility, user-friendliness, security, efficiency, and the web application's design are crucial factors to take into account while designing a web application. All of the aforementioned requirements are met by our web application. We discovered that the web application created should benefit users who are already familiar with it and that this kind of system addresses many issues that other offline social media apps and online social media systems encounter. Because there are just a few steps involved in utilizing the program, the system is simple to use. This system was intended to attract as many users as possible so that they may learn about the SGD 15 living on a land dilemma and receive a solution from the system. The creation of this system used the MERN stack, which turned out to be a reliable complete stack technology. In order to address development goals for **living on land**sustainability, the research looks into social media online applications. The website application educates visitors about the value of **land, conflicts between people and wildlife, and environmentally friendly goods** . The system underwent practical and browser compatibility testing after being built using the **MERN stack** . Users may join existing environmental projects, publish their own ideas as postings, and advertise their eco-friendly goods. The functionality of the system, tools and technologies employed, and back-end processes related to its key features are all covered in the paper. Diagrams and images used to illustrate the system's core operations are also used to show the testing methods used to verify those functions. The report comes to a close by summarizing the important findings and offering inferences. We do, however, desire researchers to carry out more studies and attempt to develop a program that can operate on a variety of platforms in order to enhance user experience, as well as make use of third-party services like Google, Outlook, and Facebook to sign in or register more quickly. Additionally, more study has to be done on email notifications and different testing methods. and making judgments.

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