# SEON 6222

## POE Part 3

Jamie Parker
ST10257863@vcconnect.edu.za

# Table of Contents

# Part 1

## Introduction

### Purpose

This document defines the goals, scope, and functionality of the website being developed for the **GreenFuture Foundation** (GFF) a non-profit organisation dedicated to reforestation. The website will include tools for managing donations, coordinating volunteer activities, and measuring the effectiveness of **GFF** initiatives. It is intended to increase operational efficiency and stakeholder engagement (Burak, 2023).

The platform will include a secure donation system, a volunteer management section, and an administrative dashboard for tracking key metrics like tree planting progress and environmental impact. Users will have access to real-time progress updates, and **GFF** staff will benefit from more efficient resource management and organisation (Burak, 2023; Sommerville, 2016).

This document describes the platform's features, technical requirements, and constraints and serves as a resource for the development team and stakeholders. It ensures that business requirements and technical implementation are in sync, while also considering security, scalability, and compliance. The goal is to provide a robust, scalable solution that will support **GFF's** mission and future growth (Sommerville, 2016; Burak, 2023).

### Product scope

The scope of this project is to develop an intuitive and user-friendly platform for the **GreenFuture Foundation (GFF)** that facilitates effective communication and management of tree-planting efforts, donations, and volunteer engagement. The platform will allow GFF to manage its resources more efficiently, enabling them to communicate seamlessly with volunteers, track donations, and provide valuable insights into the environmental impact of their work (Burak, 2023; Sommerville, 2016).

Specifically, the platform will offer a secure donation system that not only accepts contributions but also provides donors with feedback on how their donations are used, fostering transparency and trust. Volunteers and supporters will benefit from a dedicated communication system designed to enhance engagement, making it easier for them to participate in tree-planting events and stay informed about the foundation’s progress (Sommerville, 2016).

Additionally, the platform will include features for tracking tree-planting milestones, offering progress updates to both GFF staff and users. To further motivate contributions, the website will provide users with detailed calculations of the environmental impact of their donations. This will be in the form of data on oxygen production generated by the trees and the reduction of CO2 emissions achieved through their efforts (Burak, 2023).

# General Description

## Business requirements

The **GreenFuture Foundation (GFF)** needs an online platform to better organise its efforts, communicate with volunteers and supporters and provide clear and organised results in their tree planting efforts. The main business objectives include an efficient donation and secure donation process

## Product limitations and constraints

Below are some of the limitations and constraints for the project (Burak, 2023; Sommerville, 2016).

**Budget limitations:** Because the platform is funded through donations, the project's initial scope and scale may be limited. Future funding may be required for any feature expansions.

**Security:** Because the platform handles sensitive user data (donations, personal information), there are strict security requirements, such as encryption and secure payment gateways.

**Third-party services:** Integration with external payment processing services may result in dependencies and limitations based on their capabilities and fees.

**Technical constraints:** The platform must be scalable to accommodate increasing traffic from donors and volunteers, but server and hosting resources may be limited by budget.

**Time constraints:** The project must be completed within a specific timeframe, which limits the scope of the initial features. Certain features may have to be deferred to later versions.

## Assumptions and dependencies

**User accessibility:** Most users are assumed to have reliable access to the internet and a basic understanding of how to navigate websites.

**Platform scalability:** The platform is expected to handle an increasing number of users over time, and sufficient resources for server infrastructure and bandwidth will be allocated as required (Sommerville, 2016).

**Third-party service availability:** The project assumes that third-party services like payment gateways, email communication services, and mapping APIs for tree-planting visualisations will continue to be available and reliable (Burak, 2023).

**Volunteer engagement:** It is expected that volunteers are going to continue to use the platform on a regular basis, with GFF providing updates on upcoming events.

**Staff competency:** It is assumed that GFF employees will be adequately trained to manage and use the administrative tools provided.

# Features and Requirements

## Features

The platform will include the following features (Sommerville, 2016).

**Secure donation system:** A system to allow users to securely and easily donate.

**Impact visualization:** Milestones and visual feedback on the efforts made by volunteers and donations.

**Progress tracking:** Feedback on goals and milestones allowing user to see the efforts being made.

**Volunteer management system:** Allows communication with volunteers in the form of event planning and schedules.

**Resource management:** Tools to allows GFF staff to manage donations and organise events and schedules.

**Public awareness features:** Providing information on successful impacts and calculations showing the effects made by volunteers and donations.

## Functional

Below are the functional requirements for the platform (Burak, 2023).

**User Registration and Login:** The platform must allow users to register with their personal information, create a secure password, and log in to access personalised features.

**Donation System:** A secure payment system must enable users to make financial contributions that are logged and tracked for both the user and GFF.

**Volunteer Event Sign-Up:** Volunteers must be able to browse upcoming events, register for them, and receive confirmation via email.

**Progress Reporting:** GFF staff must be able to create and view reports that summarise donations, volunteer efforts, and tree-planting milestones.

**Environmental Impact Visualisation:** The system must display visual representations of environmental impact, such as a map of planted trees and data on CO2 offset.

**Administrative Dashboard:** GFF employees must have access to a dashboard that allows them to manage volunteers, contributions, and events.

**Automated Notifications:** Users should receive automatic notifications such as email confirmations and event reminders.

**Content Update:** GFF employees must be able to update the website with new content (such as articles, statistics, and success stories).

**Volunteer Communication:** A means of communication must be available so that staff can send emails or notifications to volunteers about events or project updates.

**User Profile Management:** Users must be able to edit their profiles, view their donation history, and track what they have contributed to tree planting campaigns.

## External interface

**User Interfaces:** The website of the **GreenFuture Foundation** (GFF) will have a simple, easy-to-use interface that complements its mission and branding. For consistency and user-friendliness, all pages will adhere to a single style guide with standard navigation layouts. This consists of a footer that shows important contact details, a fixed header with navigation links, and a responsive design that fluidly adjusts to different screen sizes. Interactive buttons will be prominently displayed on pertinent pages to facilitate key actions, like registering as a volunteer, donating, or subscribing to newsletters. Real-time alerts will also help users with tasks like updating their profiles or finishing donations (Burak, 2023; Sommerville, 2016).

**Hardware Interfaces:** To ensure accessibility for all users, the platform will work with a wide variety of devices, such as desktop computers, laptops, tablets, and smartphones. To serve users with poor connectivity, the website will function well on fast broadband connections and continue to function on slower mobile networks. The system will use WebSocket for real-time updates and standard communication protocols like HTTPS for secure data transfer. By making these decisions, the platform will continue to operate dependably on all supported devices and network conditions (Sommerville, 2016).

**Communications Interfaces:** The operation of the GFF website depends on smooth data exchange. Third-party services like RocketMailer, a multi-channel digital messaging platform, will use SMTP to send automated email and/or SMS notifications, including registration confirmations, donation receipts, and event reminders. RESTful APIs will be used for integration with external services, such as payment gateways and mapping APIs, guaranteeing safe and effective data transfer. Secure protocols like SFTP will be used to transfer sensitive files, giving administrators and users an extra degree of protection (Ciampa, 2022; Sommerville, 2016).

**Software Interfaces:** To provide a stable and dynamic user experience, the platform will integrate several software components. The backend will be built with ASP.NET Core for scalable and dependable server-side operations, while the frontend will make use of contemporary frameworks like React.js or Angular to create interactive, responsive interfaces. A relational database, like Microsoft SQL Server, will handle data management, guaranteeing security and consistency for information about volunteers, donors, and events. Functionality will also be improved by third-party libraries like Chart.js for data visualization and APIs like Google Maps for location services. In line with GFF's long-term objectives, these integrations have been carefully selected to satisfy the platform's performance, scalability, and usability requirements (Burak, 2023; Microsoft, 2024; Sommerville, 2016).

## Nonfunctional

Below are the nonfunctional requirements for the platform (Sommerville, 2016).

**Performance:** The platform should load all pages within 3 seconds during normal traffic conditions. The system must be able to support at least 10,000 concurrent users without compromising performance (Burak, 2023; Sommerville, 2016).

**Reliability:** The platform should have an uptime of 99.9% with minimal interruptions. Backup and recovery procedures must be in place to ensure that data is safe and recoverable in the event of a system failure.

**Scalability:** The system should scale effectively as the user base grows, allowing for future expansion of features and capacity.

**Compliance:** The platform must follow data protection regulations, such as the POPI Act, to guarantee user privacy and legal adherence when handling personal information.

**Maintainability:** The codebase should be well-documented and adhere to best practices to guarantee that future changes and updates can be completed efficiently. The design of the system should be modular, allowing for easy debugging and improvement without affecting existing functionality. As a non-profit organisation, maintenance should be as efficient as possible to reduce costs (Sommerville, 2016).

# Part 2

## Architecture Pattern:

The most suitable architecture for the **GreenFuture Foundation** (GFF) website is the Model View Controller (MVC) architecture. MVC is specifically designed to break down large, complex programs by separating them into smaller, manageable components facilitating easier development, updating, and maintenance. This separation of duties allows for the application to be better maintained , modified and understood by other developers (GeeksforGeeks, 2024).

The MVC architecture breaks down the application into three main parts. These parts are **Model**, **View** and **controller**. This division ensures that different program functions are handled by separate components, which improves modularity and simplifies management (GeeksforGeeks, 2024).

**Model:**

The Model is responsible for controlling the data-related logic. It handles communication with the database or other forms of data storage. This also includes managing data within the website, such as user preferences or inputted information (GeeksforGeeks, 2024).

**View:**

The View is tasked with managing the user interface (UI) logic. It displays the UI elements, updates data, and renders it in specific formats. Essentially, the View represents everything the user can see and interact with on the website (GeeksforGeeks, 2024).

**Controller:**

The Controller functions as the communication link between the View and the Model. It manages the application's business logic, which includes processing user requests and routing them to the appropriate components. The View cannot retrieve or display data on its own; instead, it must send a request to the Controller, which then communicates with the Model to obtain the required information (GeeksforGeeks, 2024).

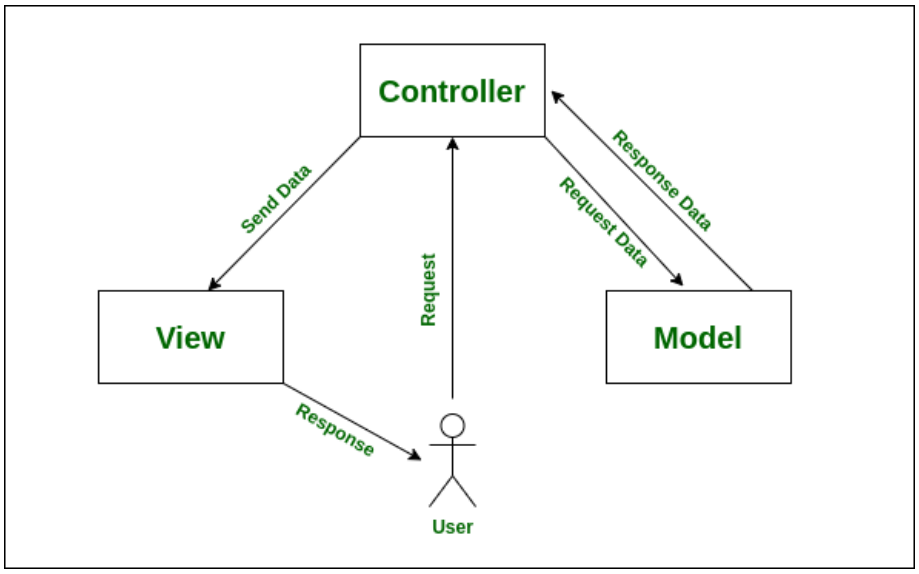


*Figure 1. MVC Example Diagram (GeeksforGeeks, 2023).*

Adopting the MVC architecture for the **GreenFuture Foundation** (GFF) website offers key advantages that work with the organization's technical and operational objectives. By taking advantage of the clear separation of concerns provided by MVC, GFF can maintain a scalable and modular system capable of managing critical functions like donations, volunteer coordination, and impact tracking. This ensures that the system remains efficient and adaptable as the organization grows (GeeksforGeeks, 2023; GeeksforGeeks, 2024)

One of MVC's standout features is its support for Asynchronous Method Invocation (AMI), which significantly enhances website performance by reducing load times and enabling real-time data updates. This directly benefits GFF by providing users with a seamless experience, assisting in achieving better engagement from donors and volunteers. The modular structure of MVC also allows for rapid development and deployment of new features, such as adding better reporting tools or improved event management systems, without disrupting existing functionality (GeeksforGeeks, 2023).

Additionally, MVC enables parallel development, allowing different teams to work on unique components simultaneously. For instance, one team could optimize the donation workflow, while another focuses on improving the volunteer dashboard. This division of labour not only shortens development but also reduces costs, which is critical for GFF's resource management (GeeksforGeeks, 2024).

From a long-term perspective, MVC promotes clean and organized code, which assists in maintenance and ensures the website can scale efficiently as GFF expands its reach and operations. The reduction in code redundancy improves system reliability and minimizes future technical debt, enabling GFF to focus more on its mission of environmental restoration rather than technical challenges (Microsoft, 2024).

In conclusion, the MVC architecture offers GFF a robust, cost-effective, and future-ready solution, perfectly suited to its current and evolving needs in supporting environmental initiatives (GeeksforGeeks, 2023; GeeksforGeeks, 2024).

## UML Diagram.

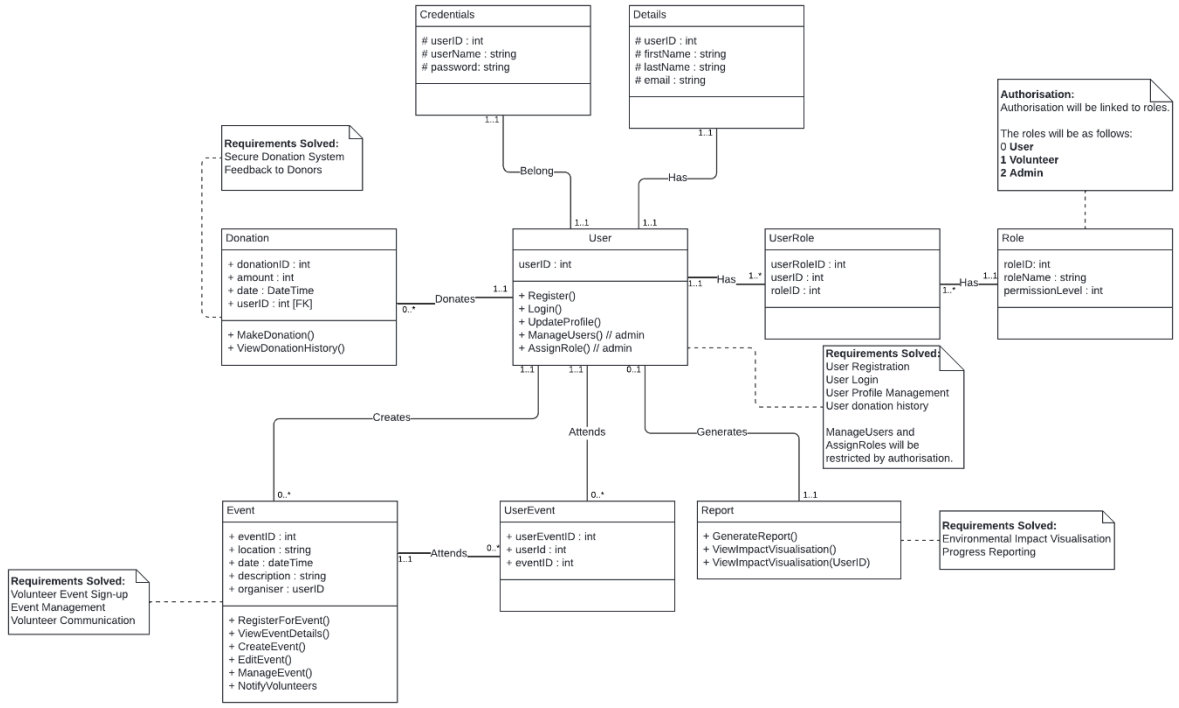


*Figure 2. UML Diagram of the Web Application Classes (GeeksforGeeks, 2024) (Visual Paradigm, 2024) (Sommerville, 2016).*

The User class is central to the system, representing all users who interact with the site. It includes features for registering, logging in, updating profiles, and performing administrative tasks such as managing users and assigning roles (Sommerville, 2016).

The Credentials class stores user login information, such as userName and password. The Details class contains personal information such as firstName, lastName, and email address. Both classes are linked to the User class, which separating authentication and personal data (Microsoft, 2024).

The Role class defines various levels of authorisation (User, Volunteer, and Administrator), each identified by a roleID and assigned a specific permissionLevel. The UserRole class manages the many-to-many relationship between users and roles, allowing for customisable role assignment for each user (Microsoft, 2024).

The Donation class handles financial contributions made by users. Each donation is associated with a specific user via userID (foreign key) and includes details such as amount and date. This class provides methods for making donations and viewing donation history, fulfilling GFF's requirement for a secure donation system (Sommerville, 2016).

The Event class controls event management, such as event creation, modification, and user participation. Key information such as location, description, and organiser are stored. The UserEvent class connects users with the events they attend, facilitating volunteer coordination and communication (Sommerville, 2016).

The Report class allows for the creation of reports, which include visualisations of environmental impact and participation metrics. It supports both system-wide and user-

specific reporting, allowing GFF to track progress and assess success in its reforestation efforts (Sommerville, 2016).

# Part 3

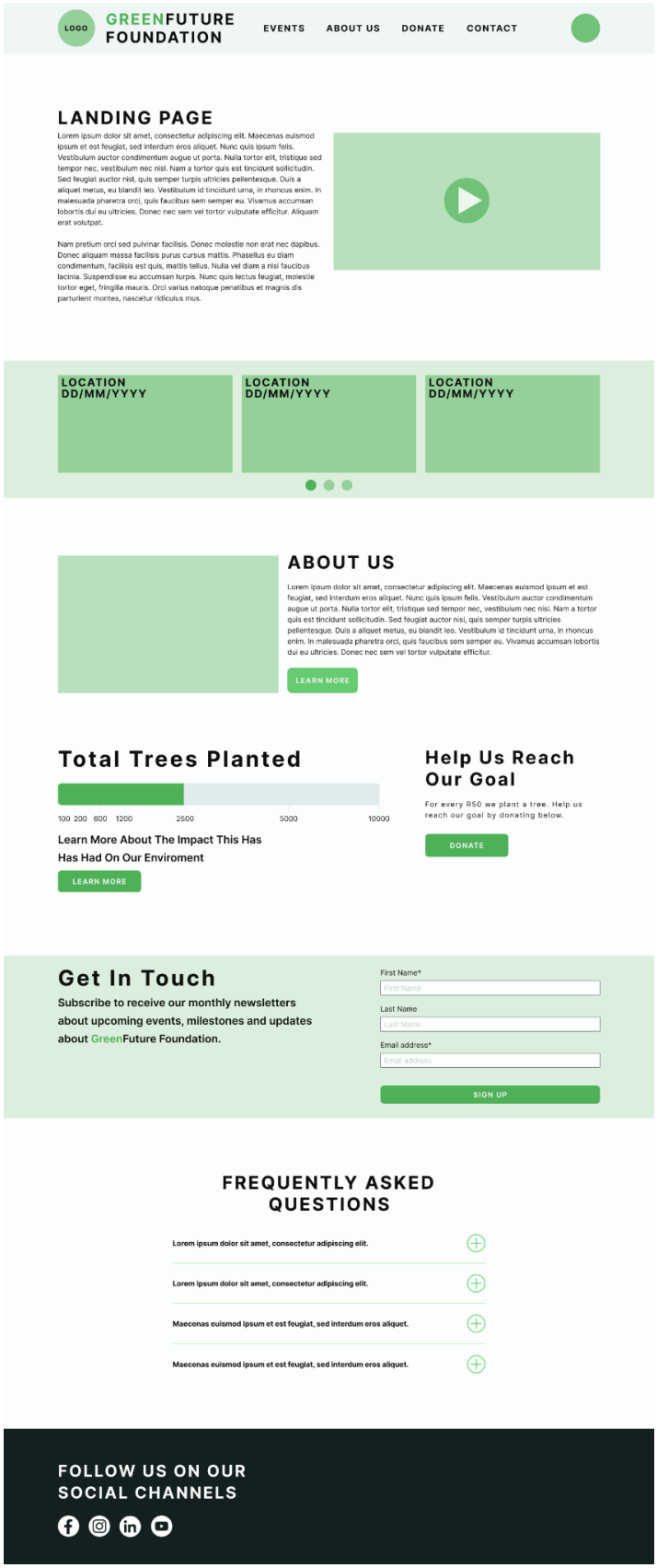


*Figure 3. Screenshot of GreenFuture Foundation Website mock up: Landing Page.*

The following screenshots are mock ups of the design and implementation features for the **GreenFuture Foundation** website.

The landing page includes multiple elements relating to the required functionality for the website. For example, the carousel displays upcoming events, ordered by closest date. The user can select an event to redirected to the event page as seen in Figure 8. The event page will display all relevant.

The total trees planted progress bar displays GFF's current efforts and their progress to reaching their goal. The "Learn More" will redirect the user to the Objectives page as seen in Figure 6.

Next to the Total trees planted graph is a button to redirect the user to the donation page. These have been placed next to each other to boost moral and incentivise users to donate if the are able. The donation page can be seen in Figure 10.

Below is the mailer signup section. This allows users to sign up to receive communications on upcoming events and milestones reached. This achieves the functional requirements of Automated Communications and Volunteer Communication.

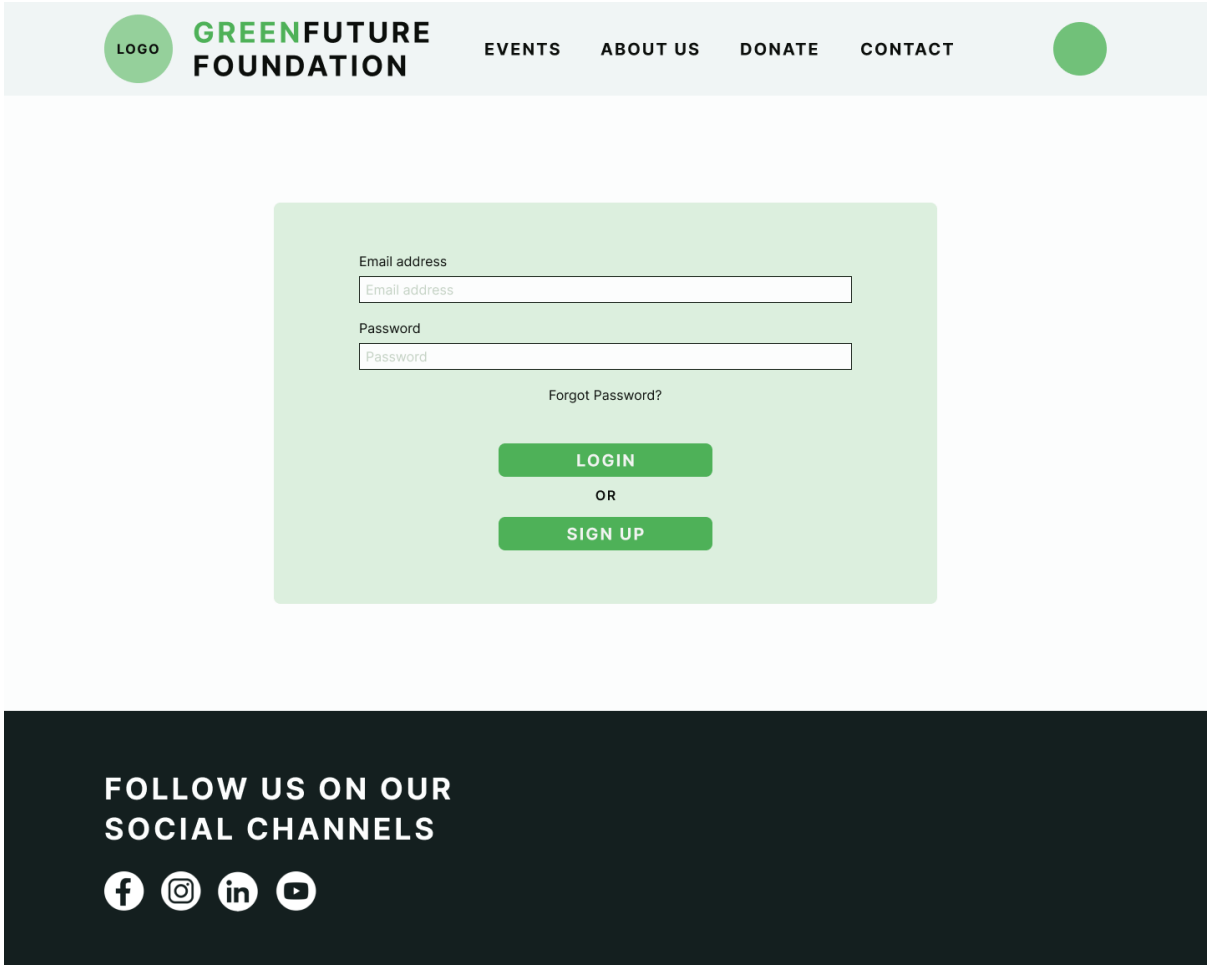


*Figure 4. Screenshot of GreenFuture Foundation Website mock up: Login page.*

Figure 4 Shows the login page which allows users to securely access their accounts. It includes fields for entering their credentials (username and password). Upon successful login, users are directed to their profile. Unauthorized users will be denied access, ensuring data security.

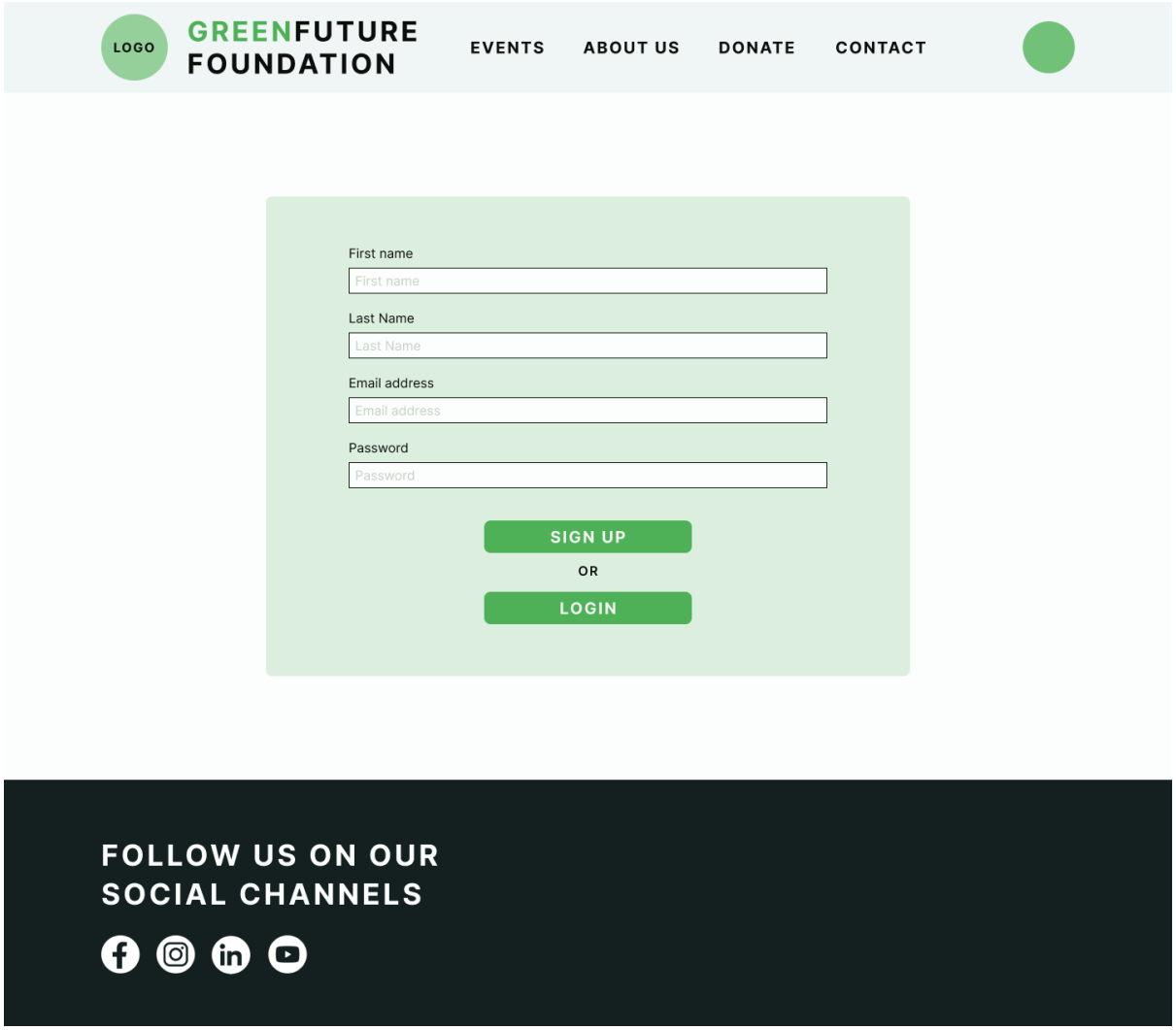


*Figure 5. Screenshot of GreenFuture Foundation Website mock up: Registration page.*

Figure 5 shows the registration page which is designed for new users to create an account. It collects basic information such as their name, email, and password. Successful registration assigns a default role and grants limited access until further permissions are authorized, preventing them from being able to see the Create Event and Edit Event buttons under the dropdown menu accessed by clicking on the profile icon in the top right of the page.

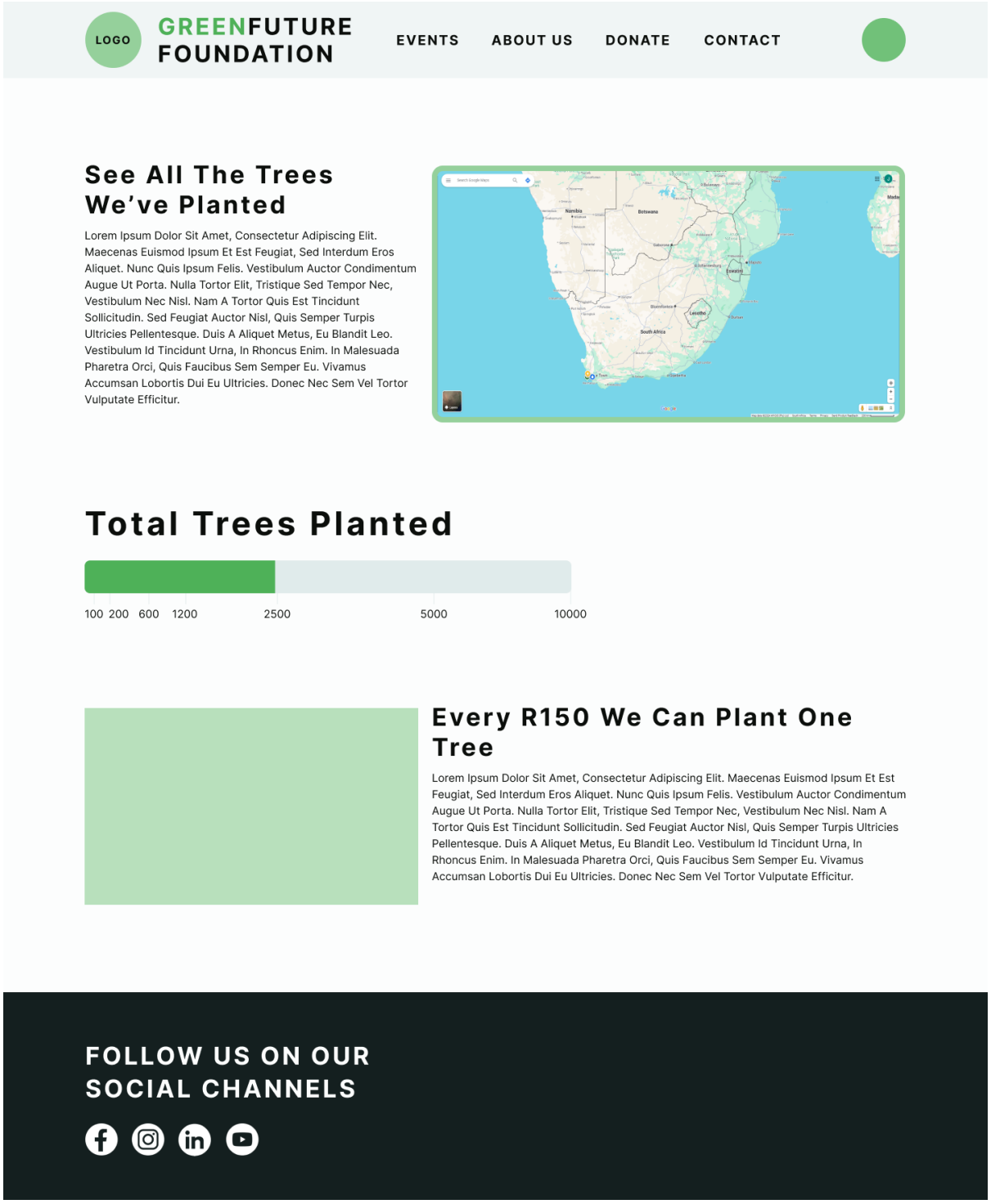


*Figure 6. Screenshot of GreenFuture Foundation Website mock up: Objective page.*

The Objectives Page outlines GFF's progress in tree-planting efforts. It includes a map of planting locations and a progress bar with milestones to meet the environmental impact visualisation and progress tracking requirements. This page engages users by highlighting the foundation's achievements and encouraging ongoing support.

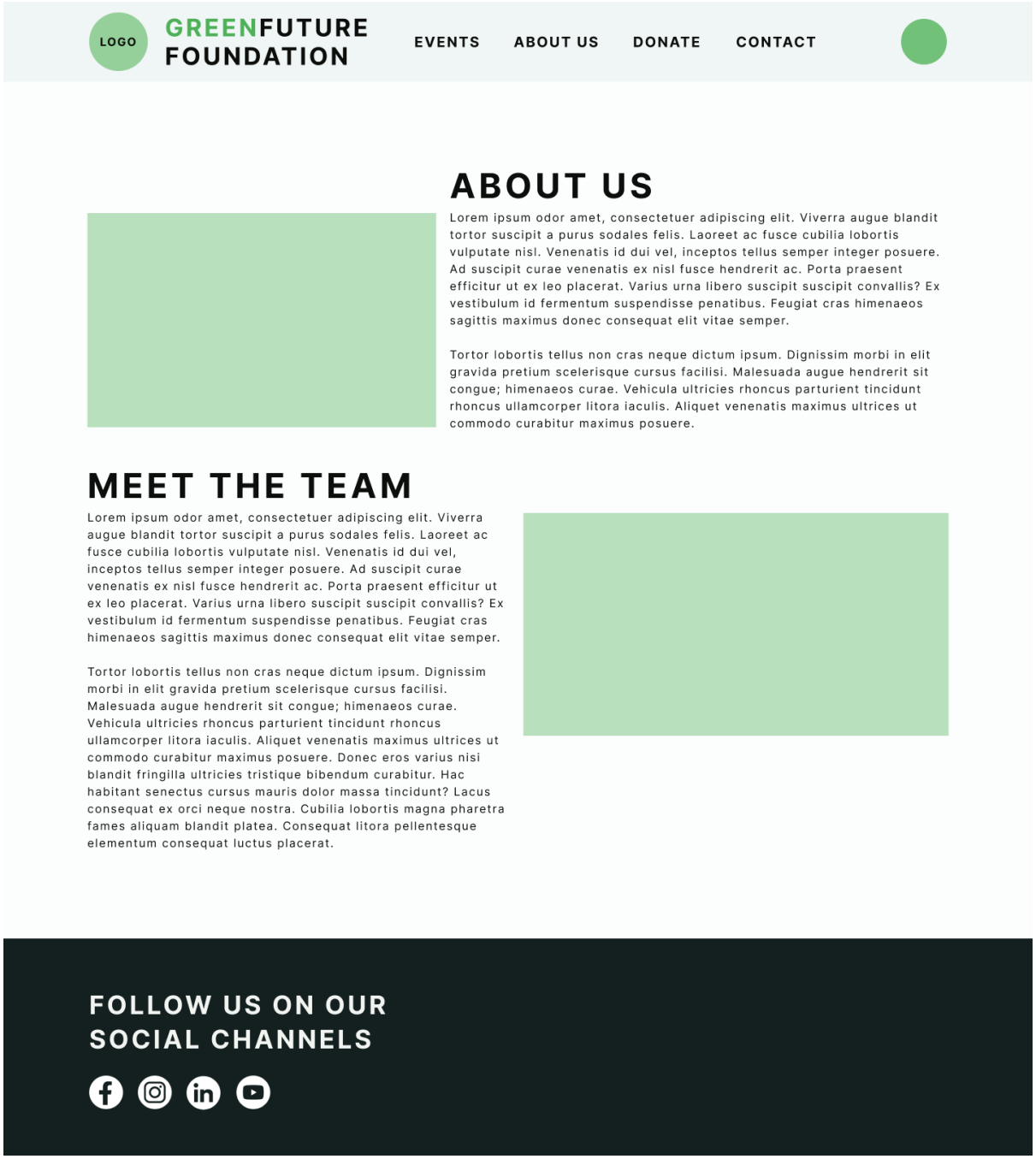


*Figure 7. Screenshot of GreenFuture Foundation Website mock up: About us page.*

The About Us Page, while not strictly necessary, provides insight into GFF's mission, vision, and history. It introduces the foundation's team and emphasises its dedication to environmental sustainability. This page promotes trust and transparency, resulting in a stronger connection with users who want to learn more about the organization's purpose and values.

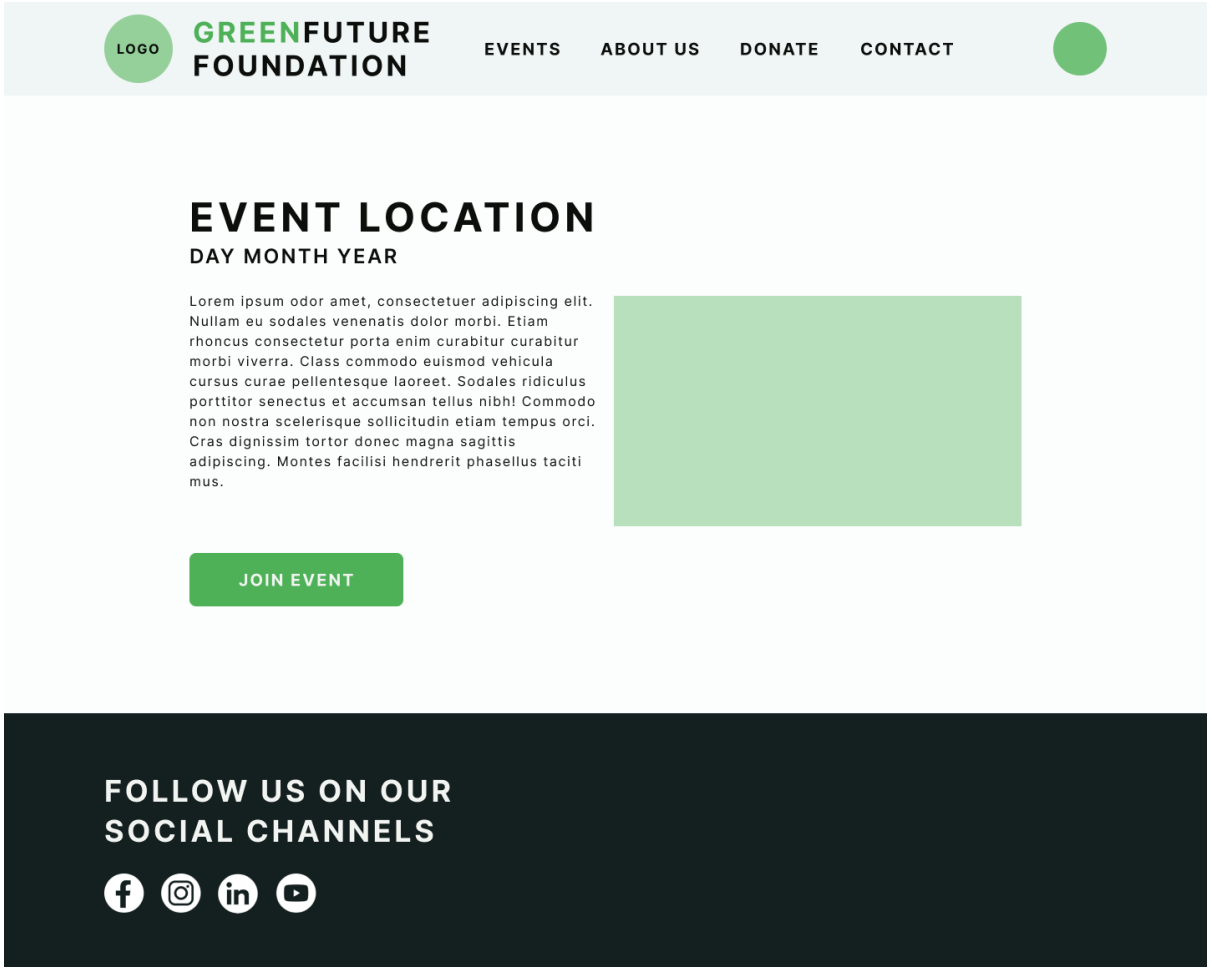


*Figure 8. Screenshot of GreenFuture Foundation Website mock up: Event page.*

The Event Details Page displays an upcoming event's details and allows users to register to participate. Meeting the volunteer event sign-up requirement. The page helps GFF organise events more efficiently. Users receive confirmation after registering, ensuring transparency and accountability in event participation.

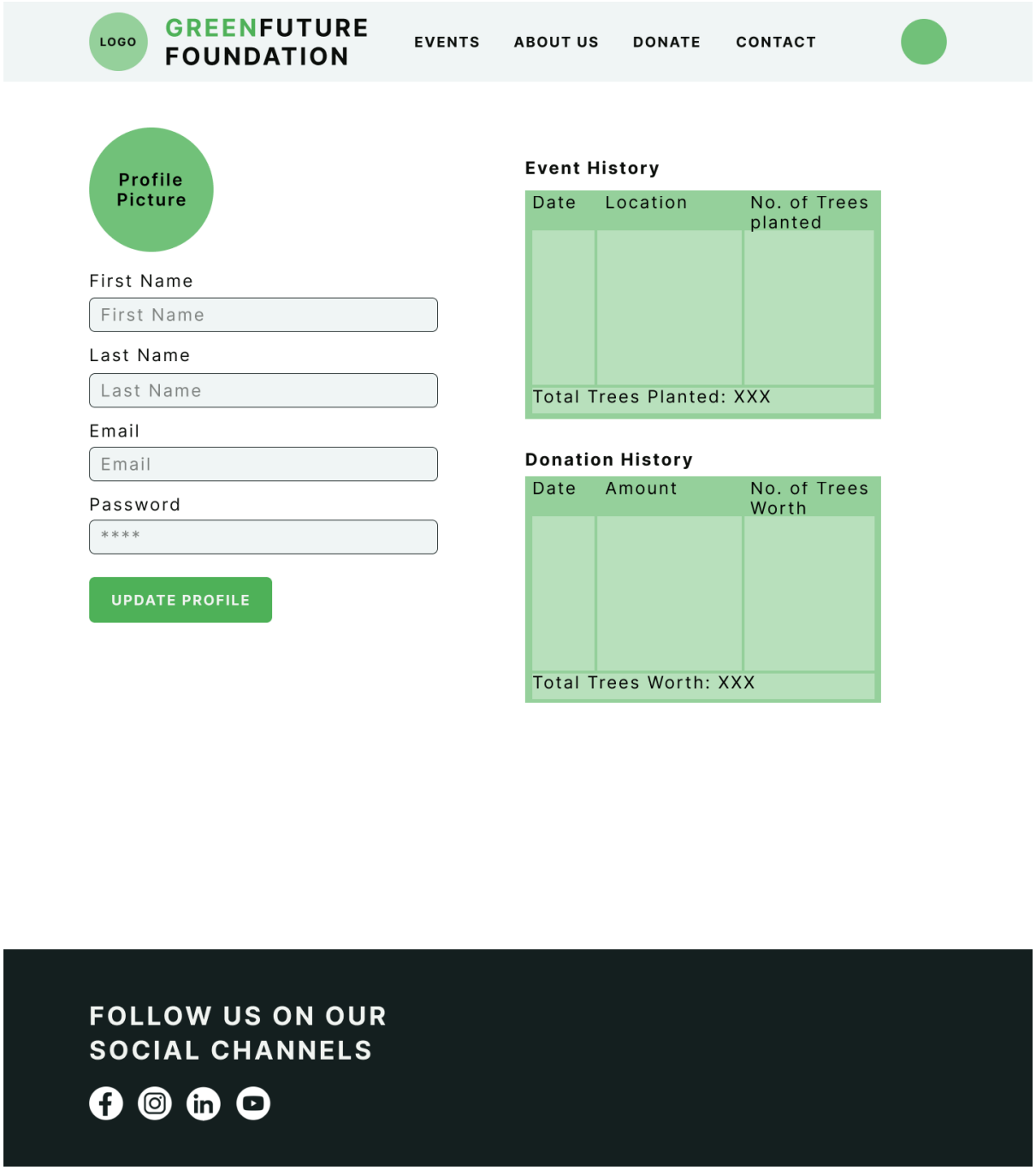


*Figure 9. Screenshot of GreenFuture Foundation Website mock up: Profile page.*

The Profile Page allows users to update their personal information as well as view their donation and event history. This page fulfils the user profile management requirement by providing users with a personalised experience. It also helps GFF achieve its goal of encouraging long-term engagement by providing a comprehensive overview of individual contributions and involvement.

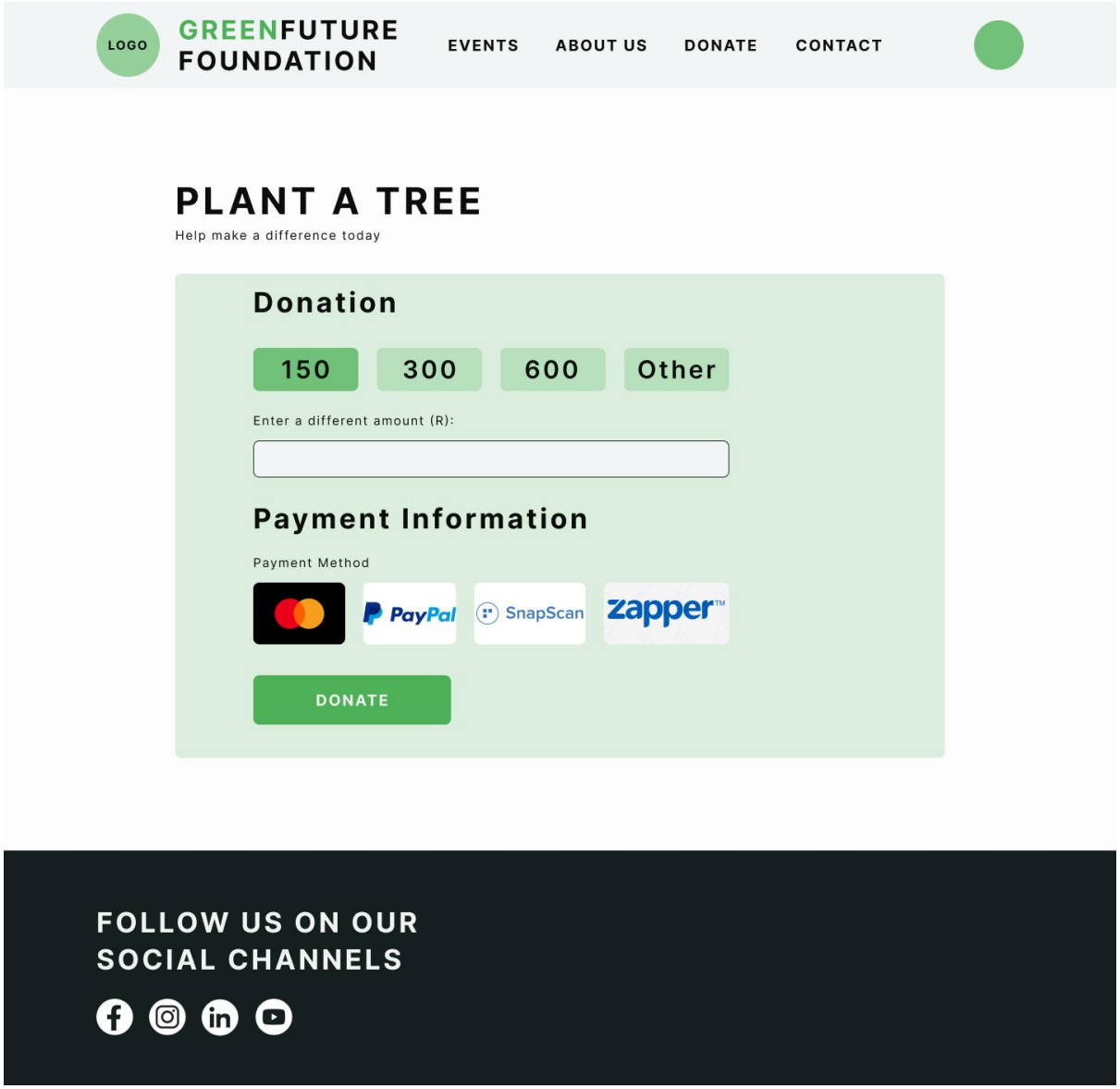


*Figure 10. Screenshot of GreenFuture Foundation Website mock up: Donation page.*

The Donation Page offers a simple and secure way for users to make donations. It integrates with a third-party payment gateway to meet the secure donation system requirement, ensuring that transactions are carried out securely. This page is central to GFF's fundraising efforts, allowing users to view their donation history while also fostering trust through transparency.

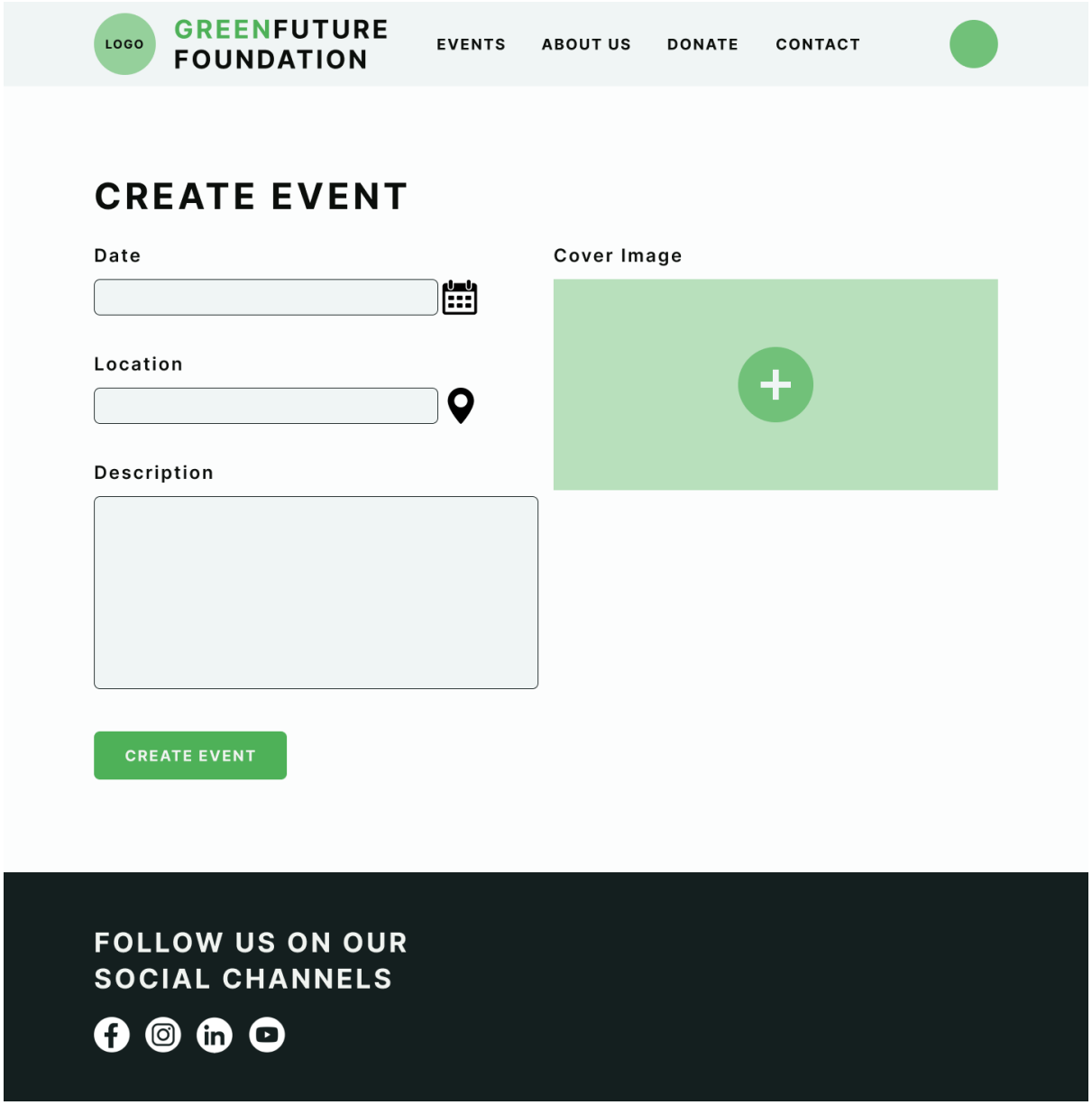


*Figure 11. Screenshot of GreenFuture Foundation Website mock up: Event Creation page.*

The Create Event Page, accessible only to authorized users, enables staff and volunteers to organize new events. This page fulfils the resource management requirement by allowing event details such as location, date, and description to be added efficiently. It directly supports GFF's mission to plan and execute impactful initiatives.

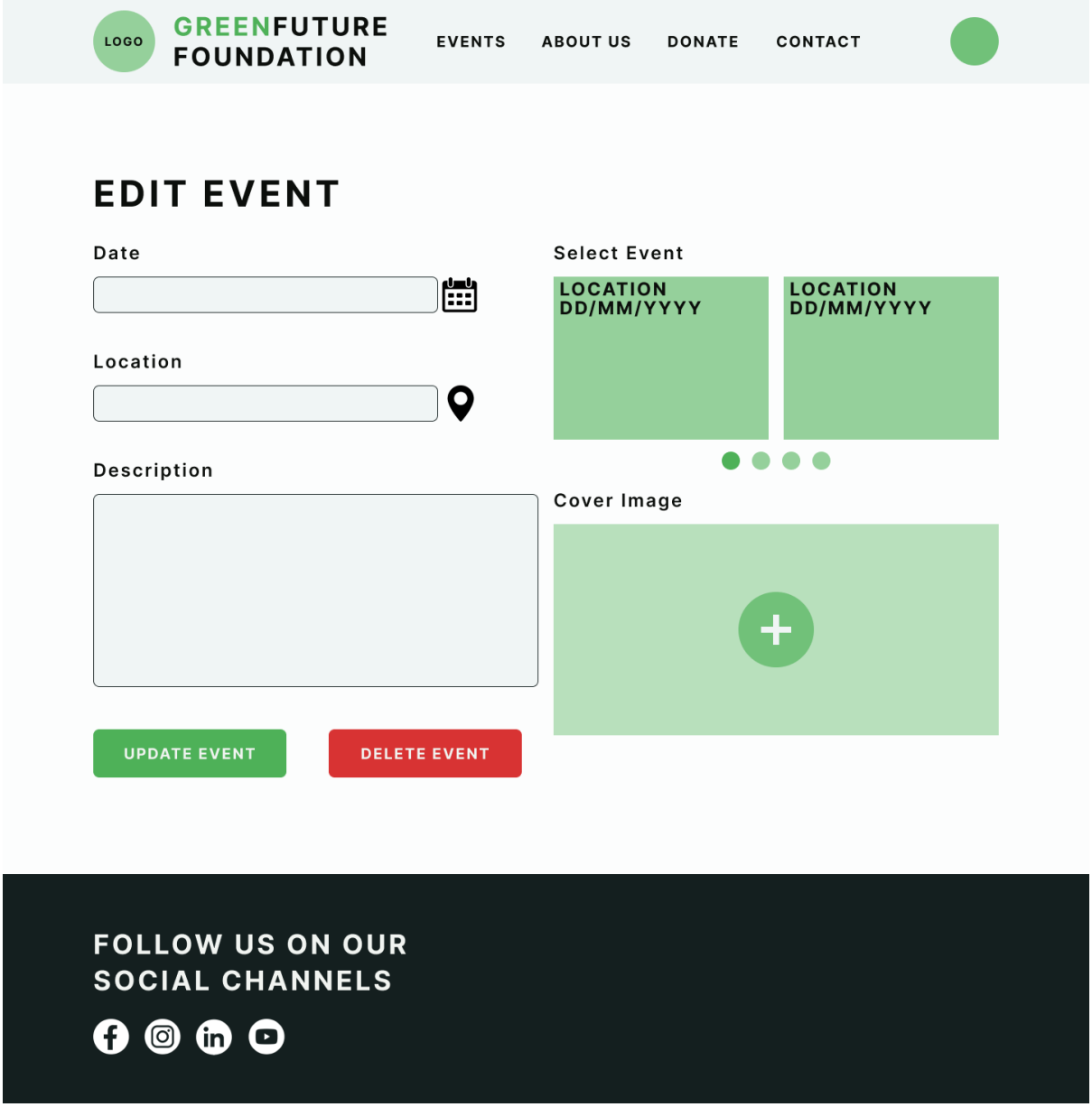


*Figure 12. Screenshot of GreenFuture Foundation Website mock up: Edit event page.*

The Edit Event Page, also restricted to authorized users, allows GFF staff to update existing events. This page supports efficient resource management by providing tools to modify event details as needed. It ensures flexibility and accuracy in GFF's event planning process, aligning with the administrative dashboard requirement.

# References

Burak, A., 2023. *Your 2024 Guide to Writing a Software Requirements Specification – SRS Document*. [Online]
Available at: https://relevant.software/blog/software-requirements-specification-srs-document/
[Accessed 26 September 2024].

Ciampa, M., 2022. *CompTIA Security+ Guide to Network Security Fundamentals*. 7th ed. Boston: Cengage.

GeeksforGeeks, 2023. *Benefit of Using MVC*. [Online]
Available at: https://www.geeksforgeeks.org/benefit-of-using-mvc/
[Accessed 23 October 2024].

GeeksforGeeks, 2023. *mvc.png*. [Online]
Available at: https://media.geeksforgeeks.org/wp-content/uploads/20210629165722/mvc.png
[Accessed 23 October 2024].

GeeksforGeeks, 2024. *MVC Framework - Introduction*. [Online]
Available at: https://www.geeksforgeeks.org/mvc-framework-introduction/
[Accessed 23 October 2024].

GeeksforGeeks, 2024. *Unified Modeling Language (UML) Class Diagrams*. [Online]
Available at: https://www.geeksforgeeks.org/unified-modeling-language-uml-class-diagrams/
[Accessed 23 October 2024].

Microsoft, 2024. *Entity Framework Documentation*. [Online]
Available at: https://learn.microsoft.com/en-us/aspnet/entity-framework
[Accessed 25 October 2024].

Microsoft, 2024. *Overview of ASP.NET Core*. [Online]
Available at: https://learn.microsoft.com/en-us/aspnet/core/introduction-to-aspnet-core?view=aspnetcore-9.0
[Accessed 19 November 2024].

Microsoft, 2024. *Role-based authorization in ASP.NET Core*. [Online]
Available at: https://learn.microsoft.com/en-us/aspnet/core/security/authorization/roles?view=aspnetcore-8.0
[Accessed 25 October 2024].

Sommerville, I., 2016. *Software Engineering*. 10th ed. Harlow: Pearson Education Limited.

Visual Paradigm, 2024. *UML Class Diagram Tutorial*. [Online]
Available at: https://www.visual-paradigm.com/guide/uml-unified-modeling-language/uml-class-diagram-tutorial/
[Accessed 23 October 2024].