Development Documentation for ROLSA Technologies

This digital solution aims to provide sustainable living solutions through a web platform. It includes features like carbon footprint and energy usage tracking, consultation booking, and an EV charger locator, along with user authentication, personalized profiles, and a dashboard. This solution follows an Agile methodology with 3 sprints to ensure continuous progress and improvements.

Agile Development Split

Sprint 1:

Duration: 24th March 2025 - 25th March 2025  
Main Focus: Backend setup, Authentication, Database, Frontend setup

1. User Authentication (Register/Login):
   * Implemented JWT Middleware to ensure secure access to the user profile.
   * Created the routes and controllers for Signup and Login.
   * Developed the necessary models for storing user data.
   * Configured Google OAuth for social login integration using Google Sign-In and added it to the frontend.

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AI-generated content may be incorrect. A computer screen shot of text

AI-generated content may be incorrect.

1. Database Setup:
   * Set up the SQLite database to store user data, carbon footprint data, energy data, and more.
   * Implemented the models for data storage (e.g., EnergyModel.js).
2. Frontend Development:
   * Developed core frontend pages: Landing Page, Login, Signup.
   * Designed reusable components for Navbar, Theme Toggle, and Language Selector.
   * Implemented folder structure to manage all backend, frontend, and testing files.
3. Challenges Encountered:
   * Version conflicts with i18next (for translations and theme toggle) and axios led to delays in implementing the theme toggle and language selector in this sprint.

ERROR: export 'useState' (imported as 'useState') was not found in 'react' (module has no exports)

npm ERR! While resolving: i18next@24.2.3

npm ERR! peerOptional typescript@"^5" from i18next@24.2.3

* + File naming inconsistency (uppercase vs. lowercase) caused minor bugs.

1. Testing:
   * Basic functional testing of Login/Signup functionality and Google OAuth.
   * Early tests were conducted on user profile creation, JWT token generation, and database updates.

Sprint 2: Core Functional Pages

Duration: 27th March 2025 – 31st March 2025  
Main Focus: Energy and Carbon Tracking, EV Locator, Booking Feature

1. Energy & Carbon Tracking:
   * Developed the Carbon Calculator page: A step-form with a progress bar to track and calculate a user’s carbon footprint.
   * Implemented Energy Usage Tracker, integrated smart home devices like Google Home.
   * Ensured that energy usage and carbon footprint data are stored in the backend and displayed as graphs using Recharts.
2. Booking System:
   * Developed a React Calendar for consultation bookings.
   * Added the ability to select available slots and save bookings in the database.
   * Added a booking page to allow users to schedule consultations for energy-saving advice.
3. EV Locator:
   * Integrated Google Maps for location-based EV charging stations.
   * Implemented filters (e.g., connector types, network operators) for station selection.
4. Challenges Encountered:
   * Google Maps API integration caused some initial bugs with station markers and map styling.
   * Encountered API rate limit issues with Google Geolocation API during station searches.
5. Testing:
   * Iterative testing of form submissions, calculator functionality, and map to ensure correct station locations.
   * Unit tests for API requests were implemented, and mock data was used during initial testing.

Final Sprint:

Duration: 1st April 2025 – 2nd April 2025.  
Main Focus: Dashboard, Account Settings, UI Enhancements, Language Selector & Theme Toggle

1. Dashboard:
   * Developed a dashboard to show carbon footprint and energy usage trends.
   * Incorporated Line and Pie charts for visualizing user data.
   * Displayed recent bookings and allowed users to navigate back to calculators.
2. Account Settings:
   * Added user profile management (change name, email, password).
   * Integrated JWT middleware to secure this page.
   * Ensured responsive design for the settings page.
3. UI Enhancements & Accessibility:
   * Applied CSS for responsive and accessible layouts (mobile-first approach).
   * Completed styling for all pages.
   * Added accessibility features such as keyboard navigation and colour contrast adjustments.
4. Language Selector & Theme Toggle:
   * Completed theme toggle functionality to switch between light and dark mode.
   * Implemented language switcher (English, Spanish, French, German, etc.).
   * Addressed integration issues between language selector and theme toggle.
5. Challenges Encountered:
   * Version conflicts between i18next and React, which caused delays in language and theme integration.
   * Cross-browser compatibility issues with some UI elements (e.g., dropdowns, date picker).
6. Testing:
   * Tested UI responsiveness on various screen sizes.
   * Used manual testing to ensure that language and theme toggle functionalities work as expected.

Testing Documentation:

Iterative Testing:

1. First Iteration: Focused on backend API tests for authentication and user profile management.
2. Second Iteration: Verified carbon and energy calculators using mock data.
3. Third Iteration: Tested UI components for responsiveness and compatibility (mobile support, theme toggle, and language switcher).

Development Challenges:

* Version Conflicts: Encountered versioning issues with axios, i18next, and other libraries. These were resolved by updating dependencies and sometimes downgrading to compatible versions.
* API Integration Issues: Had difficulty with Google OAuth API as it worked only with my account. Spent time debugging and testing different solutions.
* File Naming Consistency: Inconsistent naming conventions caused bugs in the development process. Ensured consistent lowercase file naming for API routes and model files.

Conclusion:

This agile-based development process allowed for continuous improvements and iterative testing. By dividing the project into three manageable sprints, I was able to focus on critical components first (e.g., user authentication, carbon footprint calculation), ensuring that essential features were working before moving to advanced functionalities like booking and dashboard. Despite some challenges with versioning and third-party API integration, the development process has led to a fully functional prototype with key features implemented. The project meets the client’s requirements and ensures security, responsiveness, and accessibility.