Conception Phase – Project: EcoRoute Planner

Student: Manoj Marakala

Matriculation: 4251374

Course: DLMCSPSE01 – Project: Software Engineering

This software engineering project will strive to create EcoRoute Planner, a new web-based application that will enable eco-conscious city commuters (the target audience will be the 25-40-year-old professionals of the European cities) to learn about the most eco-friendly travel paths and select the one they prefer. In contrast to current navigation applications that are concerned with speed or distance, EcoRoute Planner compares and visually depicts the real-time carbon footprint of multimodal paths (public transport, a bicycle, walking, sharing e-scooters) and rewards users with an eco-badge as a reminder of long-term behavioral change. The application brings definite customer value as sustainable value and sustainable rewards, as well as monthly reports of the CO2-saving, and this can be utilized as a green-tax incentive or green-employer sustainability programmes.

Some of the early design concepts are a route search interface with intuitive design, open APIs (OpenStreetMap, local transit feeds, weather, etc.), and a custom carbon-emission calculator, using the EU/EPA factors, to compare routes and activities, user accounts with badge levels, and optional email summaries. Advantages: engaging user activity, based on gamification, scalable on the cloud with free-tier services, and cheap to use services (free). Disadvantages: Reliance on third-party APIs after the availability and accuracy of emission models. Initial Figma wireframes and responses of five prospective users proved that the aspect of eco-gamification had high demand, whereas superior mobile responsiveness was also expected.

Its architecture is a typical three-tier architecture (React on the frontend, Node.js/Express on the back end, MongoDB in the database), and these maps are lightweight maps with Leaflet.js. Non-functional requirements involve < 3-second page loads, GDPR-compliant handling of data, offline-able routes caching, and being entirely responsive.

The reason I will use the Agile/Scrum methodology and three two-week sprints is that it can help to achieve refinement through iterations, risks can be identified in the initial stages, and tutor feedback can be integrated without any difficulty, which is perfect when one works on a creative solo project. The tools were carefully selected as part of the JavaScript ecosystem (React, Node.js, Express, MongoDB, Leaflet, and Chart.js) to minimize context switching and facilitate speedy development without compromising on modern and maintainable code.

Success in the project profile is characterized by≥ 85 percent route calculation accuracy, supplying five main MVP features, and a GitHub repository containing adequate documentation. Some of the most significant threats (API downtimes, scope creep) will be addressed with the help of daily stand-ups (self-logged issues), fallback data, and prioritization of the backlog.

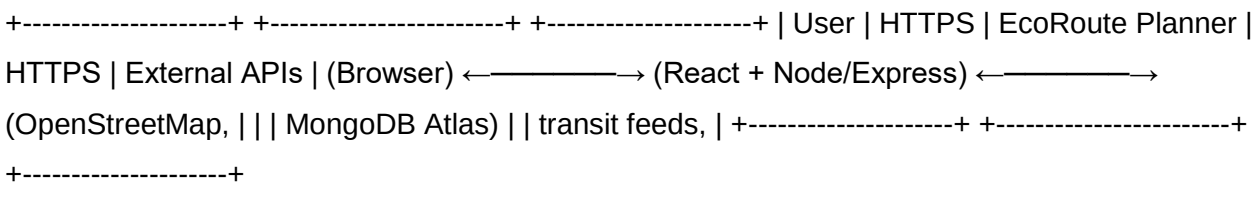
Project Profile - EcoRoute planned.

Item	Description
1. Project objective	A web application that decreases CO2 emissions in the city through optimal route planning and gamerification.
2. Target group	Premium commuters in European cities, living between the ages of 25 and 40, who are environmentally minded.
3. Core MVP services	Auth, route search, carbon calculator, comparison charts, badge system, and monthly report.
4. Success criteria	Accuracy of routes of ≥ 85 percent, performing an intuitive UI, live deployment, and complete GitHub documentation.
5. Primary risks	Distribution of API, accuracy of emission data, and scope creep.
6. Risk aversion	Fallback to mock data, hard backlog, and weekly commits.
7. Methodology	Agile/Scrum- 3 two-week sprints.
8. About Rough timeline	Week 1-2 Conception, Week 3-5 Development, Week 6 Finalization and deployment

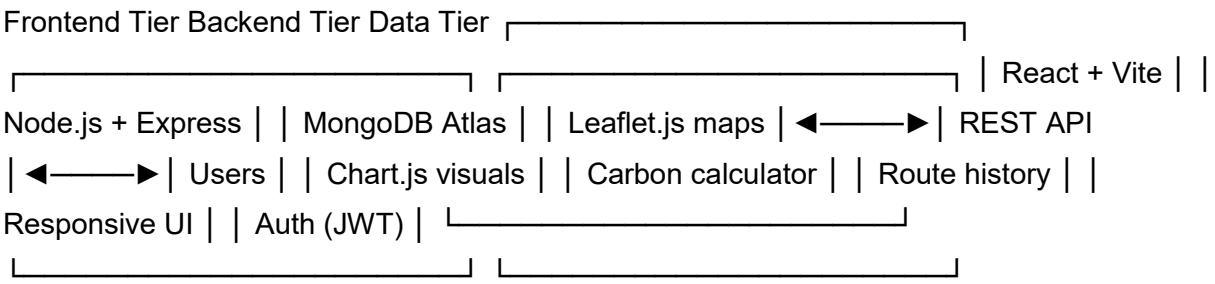
Glossary

Term	Definition
1. Multimodal route	Route involving the use of multiple modes of transport (train + bike + running).
2. Carbon footprint	Summative CO2e emissions by a route (kg CO2e)
3. Eco-Badge	A graphic reward is given for the selection of low-carbon routes.
4. Nominatim	OpenStreetMap geocoding (address - coordinates) service.
5. GTFS	General Transit Feed Specification - a standard for schedules of public transport.
6. Leaflet.js	Open is an open-source JavaScript framework for interactive maps.
7. JWT	Web Secure in a user authentication access token- JSON Web Token
8. CORS	Cross-Origin Resource Sharing - a security mechanism.
9. MVP	Minimum viable product is the tiniest practical embarrassment of the application.
10. Technical debt	Strongly identified minor cuts of corners, or the absence of features that will be addressed.
11. Render / Railway	Backend/frontend hosting, free-tier cloud services.
12. Atlas (MongoDB)	Cloud database service to store the user and route history.

UML Context Diagram



Building Block



Three Wireframes