enigmaX

GREENCART

by BBD

COS 301 Capstone Project

Contact Email:
enigmax.cos@gmail.com

Contents

enigmax.cos@gmail.com

GREENCART OVERVIEW

GreenCart is a purpose-driven e-commerce platform designed to promote sustainable and ethical consumerism by connecting users with a curated selection of eco-conscious products. As environmental awareness continues to grow, many consumers are actively seeking ways to align their purchasing habits with their values—but finding truly sustainable products and transparent information can be difficult. GreenCart aims to solve that problem.

The platform serves as a centralized marketplace that features products from verified ethical brands, making it easier for users to shop responsibly. It empowers consumers to filter and browse items based on key sustainability metrics, such as carbon footprint, certifications (e.g. organic, Fair Trade, carbon-neutral), and production practices. By offering clear environmental impact insights on each product, users can make informed choices that reflect their personal commitment to sustainability.

Beyond basic shopping functionality, GreenCart integrates carbon tracking tools that allow users to monitor the cumulative footprint of their purchases over time. This feature not only raises awareness but also encourages more mindful decision-making. Additionally, the platform can offer users options to offset their carbon impact, creating a closed loop of accountability and positive action.

GreenCart isn't just an online store—it's a digital ecosystem that supports a community of conscious consumers. With potential features such as reviews, discussions, and personalized recommendations, the platform aims to foster a culture of transparency, environmental responsibility, and smarter shopping. Whether a user is new to sustainability or already deeply invested, GreenCart meets them where they are and helps them take the next step toward ethical living.

APPLICATION FUNCTIONALITY

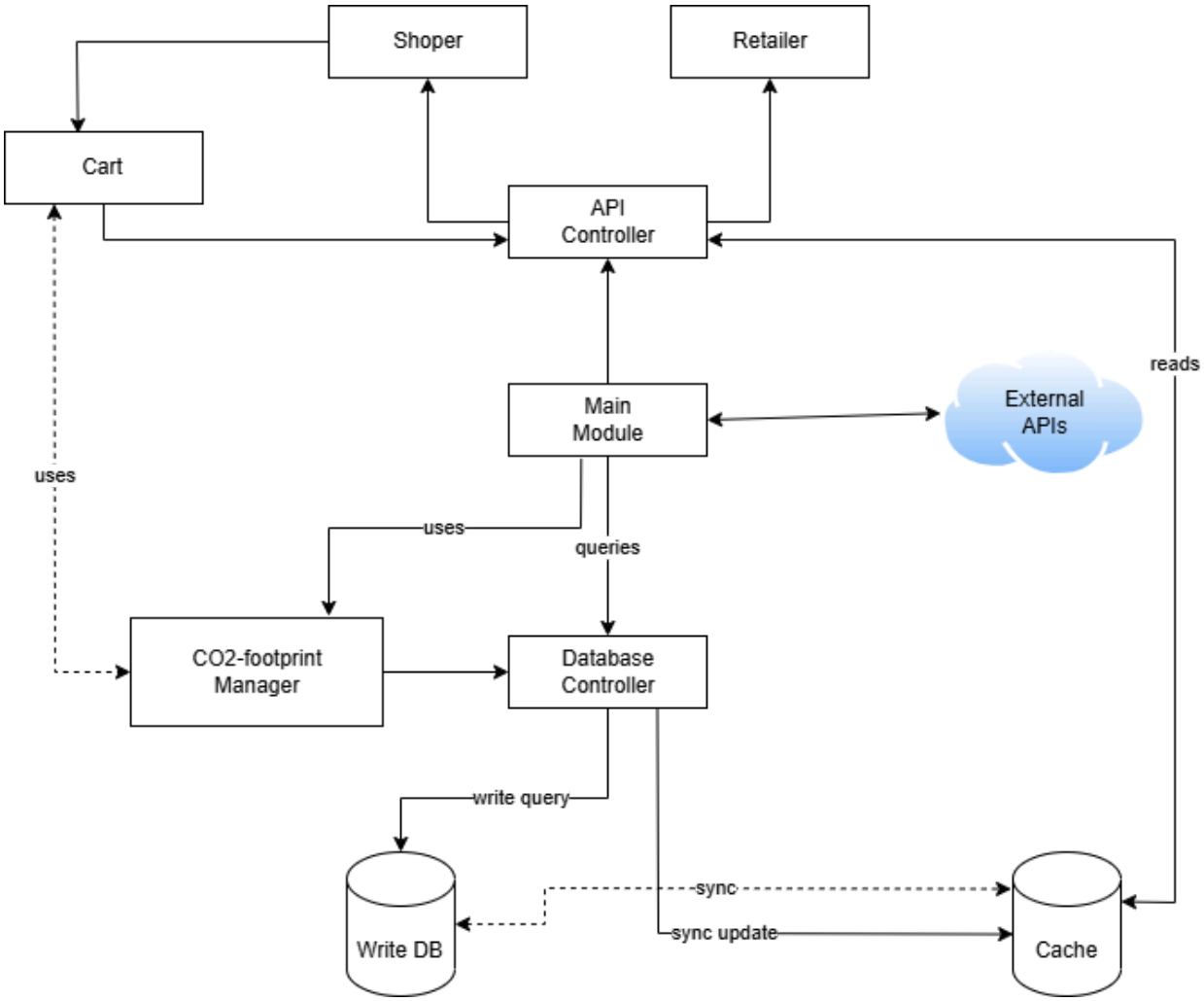
CORE REQUIREMENTS

- The platform should allow shoppers to browse and purchase eco-friendly and sustainable products.
- The platform should allow retailers to manage their products available on the platform and require them to disclose the necessary data to allow shoppers to make informed decisions.
- Product listings should include detailed sustainability ratings and transparency regarding sourcing and manufacturing practices.
- Shoppers should be able to track the carbon footprint of their purchases and monitor their overall environmental impact.
- The platform must encourage retailers to offer eco-friendly alternatives for popular products, guiding shoppers toward more sustainable choices.
- Shoppers and retailers should have the option to offset the carbon emissions of their sales/purchases through donations or other environmental initiatives.
- The platform should allow users to filter and search for products based on certifications such as organic, Fair Trade, or carbon-neutral.

OPTIONAL REQUIREMENTS

- The platform should allow shoppers to browse and purchase eco-friendly and sustainable products.
- The platform should allow retailers to manage their products available on the platform and require them to disclose the necessary data to allow shoppers to make informed decisions.
- Product listings should include detailed sustainability ratings and transparency regarding sourcing and manufacturing practices.
- Shoppers should be able to track the carbon footprint of their purchases and monitor their overall environmental impact.
- The platform must encourage retailers to offer eco-friendly alternatives for popular products, guiding shoppers toward more sustainable choices.
- Shoppers and retailers should have the option to offset the carbon emissions of their sales/purchases through donations or other environmental initiatives.
- The platform should allow users to filter and search for products based on certifications such as organic, Fair Trade, or carbon-neutral.

PROPOSED DOMAIN MODEL



PROPOSED TECHNOLOGIES

Use Case	Proposed Technology (or Framework) Options
Frontend Development	React or Vuejs
Backend Development	Rust, Python and Java
Database	Redis (cache), PostgreSQL
Authentication	Supabase Auth and JWT or CRSF tokens etc.
API	REST, Nodejs, Typescript and Nestjs
Hosting	Supabase, Upstash, AWS S3 and AWS beanstalk
Version Control	Git and GitHub
Testing	Jest, Postman and Cypress
CI-CD	GitHub Actions

PROPOSED TECHNOLOGY DEEP DIVE

FRONTEND DEVELOPMENT: REACT OR VUEJS

React or Vuejs will serve as our frontend framework, providing component-based architecture ideal for building consistent product displays and filtering interfaces. Both support Progressive Web App (PWA) capabilities, ensuring GreenCart remains responsive across all devices while enabling offline browsing of sustainable products.

BACKEND DEVELOPMENT: RUST, PYTHON AND JAVA

Our backend combines Rust for performance-critical operations, Python for sustainability data processing, and Java for enterprise-grade e-commerce functionality. This polyglot approach allows us to leverage each language's strengths while maintaining cohesive architecture through RESTful services.

DATABASE: REDIS (CACHE), POSTGRESQL

Redis serves as our caching layer for fast access to frequently queried sustainability data, while PostgreSQL handles structured storage of product information, user profiles, and certification details. This combination delivers both speed and reliability, ensuring responsive filtering of eco-friendly products while maintaining data integrity.

AUTHENTICATION: SUPABASE AUTH, JWT, CSRF TOKENS ETC.

Supabase Auth handles user management with features like email verification and social logins, complemented by JWT for secure service authentication and CSRF protection. This multilayered approach ensures POPIA/GDPR compliance while providing seamless login experiences for eco-conscious shoppers.

API: REST, NODEJS, TYPESCRIPT AND NESTJS

Our RESTful API uses Nodejs with Typescript and Nestjs, creating a structured and maintainable backend. This combination provides strong typing to reduce errors and dependency injection for better testing, with endpoints designed around resources like products and sustainability certifications.

HOSTING: SUPABASE, UPSTASH, AWS S3, AWS ELASTIC BEANSTALK

Our hosting leverages Supabase for backend services, Upstash for serverless Redis, AWS S3 for media storage, and AWS Elastic Beanstalk for scalable application deployment. This serverless architecture minimizes operational overhead while allowing flexible scaling to meet demand within Azure student account free tier constraints.

VERSION CONTROL: GIT AND GITHUB

Development relies on Git and GitHub with branch protection rules requiring code reviews before merging. Feature branches allow parallel development of different sustainability features while GitHub's project management tools track progress and maintain stakeholder transparency.

TESTING: JEST, POSTMAN AND CYPRESS

Our testing strategy uses Jest for unit testing React components and sustainability calculations, Postman for API testing and documentation, and Cypress for end-to-end verification of user journeys like eco-friendly checkout processes.

CI-CD: GITHUB ACTIONS

GitHub Actions automates our testing and deployment pipeline, running code quality checks and deploying to staging environments when code is pushed. This automation ensures consistent quality control while supporting rapid iteration of sustainability features.

DEVELOPMENT METHODOLOGY

As a team, we've decided to follow the Agile methodology for this project. Agile works really well for a project like GreenCart because it focuses on iterative development, collaboration, and adaptability—all of which are key when building a complex system with changing requirements. We'll be working in Scrum-style sprints, with Weekly Sprint Planning, regular in-person coding sessions, daily stand-ups, and Sprint Reviews and Retrospectives at the end of each week.

We strongly believe that communication is key, and that every team member's voice should be heard. That's why we're putting a lot of emphasis on staying connected—not just within the team, but with our lecturer, mentor, and client as well. We'll be meeting with our assigned mentor weekly for check-ins, feedback, and guidance. To make sure we fully understand what the client wants and that we're building the right solution, we'll also be scheduling monthly client meetings so that we stay aligned throughout the project.

We'll also be incorporating Feature-Driven Development (FDD) into our process. This is because it allows us to focus on delivering small, meaningful features that bring real value to the client. Since this project also involves learning and working with new technologies, we'll be applying the Personal Software Process (PSP) as well. PSP will help us track how we learn and improve over time, making sure that the knowledge we gain actually benefits the team and the project as a whole.

WHY YOU SHOULD CHOOSE ENIGMAX

Team EnigmaX consists of five final-year Computer Science students with strong technical foundations and complementary skills. We are committed to delivering a high-quality, reliable solution for GreenCart. What distinguishes us is our methodical approach, attention to detail, and ability to work effectively as a team under structured development practices.

Our team brings practical experience in full-stack development, web technologies, and database management. Through academic projects and collaborative work, we have developed and deployed applications using technologies such as React, Node.js, and PostgreSQL. This ensures we can implement GreenCart's technical requirements effectively and efficiently.

Each member contributes specific strengths in areas such as front-end development, backend integration, API design, and database optimization. Our experience with modern frameworks and deployment practices allows us to approach GreenCart with confidence and minimal learning curve.

While we are early in our professional careers, we have a solid understanding of software engineering principles, secure coding practices, and userfocused development. We are committed to ensuring that GreenCart's platform meets data protection standards such as POPIA and GDPR, providing a secure and trustworthy environment for users.

We follow Agile development methodologies, emphasizing iterative development, regular communication, and responsiveness to feedback. Our proven ability to deliver structured, collaborative project work under Agile practices means we can adapt quickly and maintain consistent progress. EnigmaX is a team driven by professionalism, technical excellence, and a commitment to delivering effective, user-friendly solutions. We are focused on helping GreenCart succeed by building a robust and scalable platform that meets its goals.

Choose EnigmaX for a team that combines technical skill, strong collaboration, and a results-driven approach.

THE TEAM

NIKHIL GOVENDER

I am a final-year Computer Science student with over six years of programming experience, having started with Java in high school. Over the years, I've grown into a versatile developer with a strong focus on web development, backend engineering, and system design. My experience spans multiple languages and frameworks, and I always strive to write clean, efficient, and scalable code.

I am meticulous and driven, with a perfectionist mindset that ensures every aspect of a system is well thought out—from architectural decisions to final implementation. As a leader, I focus on collaboration, consistency, and helping every team member deliver their best work. I take pride in building reliable systems from the ground up and making sure each component works seamlessly within the bigger picture.

Programming Languages and Frameworks:

- Java
- JavaScript (React, Node.js)
- Python
- HTML & CSS
- C++
- RESTful APIs

SHAYDEN NAIDOO

I am a final year Computer Science student who is always striving to grow and improve. I'm hard-working, curious, and enjoy learning new technologies —especially in the areas of web development and cybersecurity. I began programming five years ago with Delphi and have since developed projects across both front-end and back-end stacks. I enjoy solving logical problems and diving deep into how things work under the hood.
My strengths lie in adaptability, learning quickly, and always aiming to improve on every iteration of a task.

Programming Languages and Frameworks:

- JavaScript (React, Next.js)
- Python
- Java
- HTML & CSS
- Delphi
- PHP

CORNÉ DE LANGE

I am a final year Information and Knowledge Systems student with a solid foundation in both front-end and back-end development. I'm a dependable and forward-thinking individual who enjoys breaking down complex systems and building maintainable software solutions. I work well in structured environments and enjoy taking ownership of components or tasks that require long-term focus and clean integration with team efforts. I am comfortable working across the stack and thrive in situations that require logical thinking and problem solving.

Programming Languages and Frameworks:

- JavaScript (React, Angular, Express.js)
- Java
- HTML & CSS
- C++
- C# (ASP .NET MVC)
- SQL, MongoDB

TSHEGOFATSO MAHLASE

I am a final year Information and Knowledge Systems student specializing in systems architecture. I excel at analyzing complex systems, creating robust architectural designs, and ensuring seamless component integration. My expertise includes developing system blueprints that balance performance, scalability, and security while emphasizing clean separation of concerns and well-defined interfaces.

I implement architectural patterns like microservices and event-driven architectures to solve complex challenges, and create detailed technical documentation to guide implementation. With experience in both front-end and back-end development, I bring a full-stack perspective to designing cohesive solutions. My strength lies in translating business requirements into structured technical designs that teams can efficiently implement.

Programming Languages and Frameworks:

- JavaScript, TypeScript (React, Vue.js)
- Docker
- Java
- Python
- SQL, noSQL
- C# (ASP .NET MVC)
- Figma

SAMVIT PRAKASH

I am a hard-working Computer Science student with a strong focus on back-end development and system logic. Over the years, I've participated in various software internships which have given me practical industry experience and exposed me to best practices in clean coding and scalable architecture. I started programming with Delphi and have since gained confidence in multiple modern languages and frameworks. My strengths include attention to detail, structured problem solving, and a deep understanding of server-side logic.

Programming Languages and Frameworks:

- Java
- Python
- JavaScript (Node.js, Express)
- C++
- Delphi
- SQL

OUR CHALLENGES AND SOLUTIONS

As a team, we're excited to bring the GreenCart platform to life—not just as an e-commerce site, but as a tool that helps users shop more sustainably and make a positive impact on the environment. At the same time, we recognize that a project of this nature comes with its own set of challenges. From building a responsive interface to ensuring regulatory compliance, we've thought through each of these obstacles and developed a plan to address them head-on.

One of the key challenges is designing a platform that is fully responsive and performs well across all major browsers and screen sizes. Since our users may access GreenCart from desktops, tablets, or mobile devices, a consistent and intuitive experience is non-negotiable. To tackle this, we'll implement responsive design principles from the start, using flexible grid layouts, scalable UI components, and mobile-first testing practices to ensure that the platform looks and functions smoothly across all devices.

Another major challenge is maintaining strict data privacy and regulatory compliance, especially in light of POPIA and GDPR. Because the platform collects user data—such as personal profiles, transaction history, and possibly sustainability preferences—it's essential that we handle this information responsibly. To address this, we'll implement robust data encryption, secure user authentication via Supabase Auth, and clear user consent flows. Additionally, we'll ensure that users can easily manage or delete their data in line with privacy regulations.

We also recognize the importance of delivering a user-friendly interface that's easy to navigate, even for users with limited technical expertise. Sustainability can already feel like a complex topic—our job is to simplify it. That's why we'll prioritize clean design, intuitive navigation, and tooltips or onboarding prompts to guide users through the platform. We also plan to conduct usability testing with real users to ensure that everything—from browsing products to understanding impact scores—is clear and accessible.

In summary, while GreenCart presents technical and regulatory challenges, we're not just prepared to handle them—we're eager to solve them. With a thoughtful, user-centered design approach and a strong focus on security and compliance, we're confident that we can build a platform that's both impactful and easy to use.