Software Requirements Specification (SRS) Document

Project Number: 4

Project Name: Quantifying carbon footprinting for logistic hubs

Team Number: 38

Team Members:

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Brief problem statement

Quantifying carbon footprint using geospatial data

Global climate change is adversely affected by the increasing amounts of greenhouse gases being released. Carbon footprint is a measure of the amount of greenhouse gases produced which can be in different sectors such as Agriculture, Industrial, Transportation etc. In this project our goal is to make a person handling a logistics hub to quantitatively understand the carbon footprint due to the truck movement in the hub. Using this information then suggest an alternative routes using a pgRouting server to minimize this emission.

System requirements

Users require a browser capable of running JavaScript, handling HTML5 and CSS and an internet connection.

Developers require:

1. Javascript and openlayers(For front end)
2. Django (for backend development)
3. PostgreSQL (maintaining databases)
4. Pgrouting (for routing and other network analysis functionality)

Users profile

Many organizations and governments are looking for strategies to reduce emissions from greenhouse gases which are responsible for global warming. The quantitative assessment of the emissions in the form of carbon footprint will be helpful to all such organisations and governments for example the State Pollution Control board.

Users mostly will be equipped with basic knowledge on the subject and related software, hence can comfortably use our service.

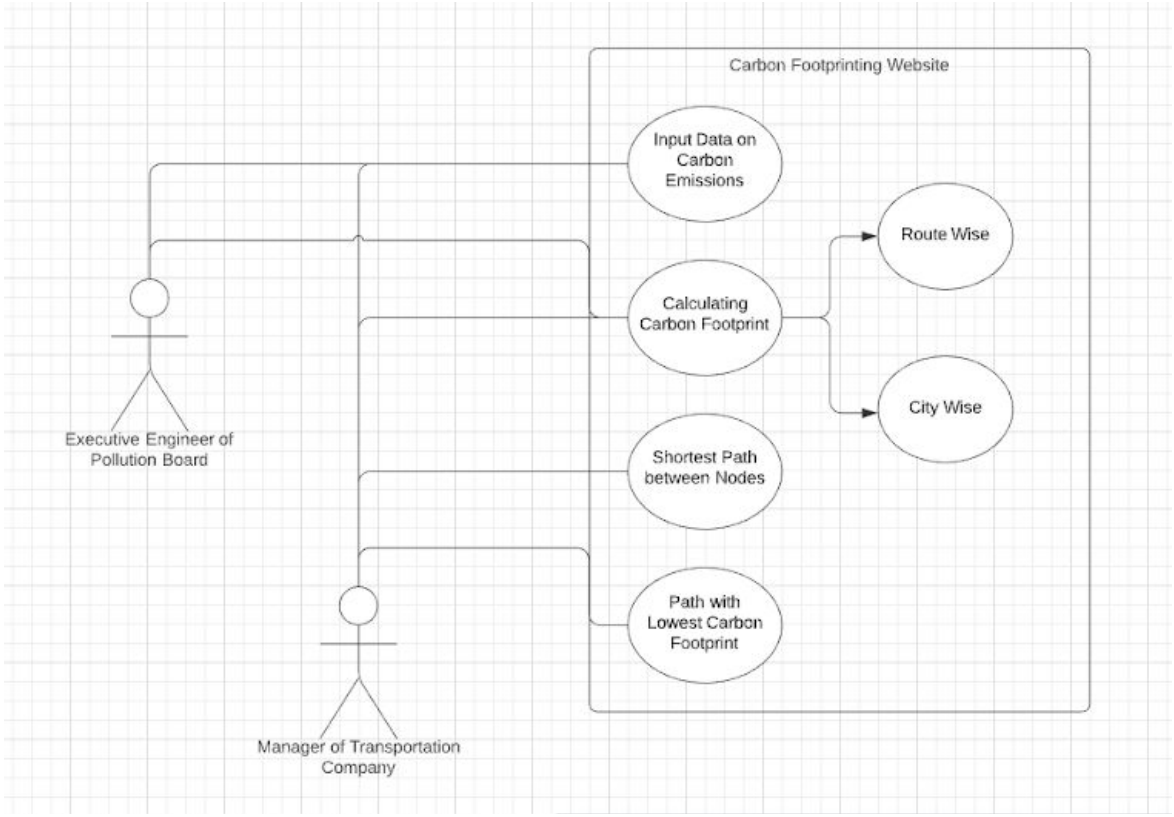
Feature requirements (described using use cases)

No.	Use Case Name	Description	Release
1	Registration	Users can register through their gmail	R1

2	Login	Users can login through their own accounts	R1
3	Upload Data	The two types of users; manager of an organisation / company and executive officer upload the details of vehicles travelling between the routes	R1
4	Route-wise Carbon Footprint	From already defined metrics, calculate carbon footprint for individual routes.	R1
5	City-wise Carbon footprint	From already defined metrics, calculate the carbon footprint of the city.	R2
6	Shortest path between nodes	GIven source and destination as input,output the shortest path between these two	R1
7	Company's Carbon Footprint	Based on input provided by the company's manager statistical analysis of data	R1

8	Pre-Emptive Carbon Emission Calculation	Given the number of trucks , source and destination as input,output the calculated carbon footprint emission	R1
9	Map Generation	Generating the map which displays the route with least carbon footprint with corresponding routes nodes	R2
10	Identifying hotspots with high carbon emission	Based on the input data calculate the carbon footprint for all possible data and displaying the regions/routes with highest carbon footprint.	R2

Use case diagram



Managers of transportation companies are exposed to all the routes from the hub along with the carbon footprint data along each of them. The optimum route with the minimum carbon emission is suggested, and the route with the shortest path is also suggested.

The Pollution Control and related authorities are shown the city wise overview of the carbon footprints.

Use case description

Use Case Number:	UC-1
Use Case Name:	Registration
Overview:	Users can register through their gmail
Actors:	Anyone
Precondition:	None
Flow:	Main Flow: 1. Enter the details of the user 2. Validation of the gmail

	3. Maintain a database and push the details
	Alternate Flow: 1. Proper error message when required
Post Condition:	Using the User ID and password the user can login

Use Case Number:	UC-2
Use Case Name:	Login
Overview:	Users can login to their own accounts
Actors:	Users with valid login IDs

Precondition:	The user should already be registered
Flow:	Main Flow: 1) Front end support for accepting details and beginning session. *2)* Validation of user's id and password with the help of data base
	Alternate Flows: 1. Proper error messages where ever required
Post conditions:	User's session is now active and can be used to make changes in the user's stead.

Use Case Number:	UC-3
Use Case Name:	Upload data
Overview:	The two types of users(manager of an organisation / company and executive officer)upload the details of vehicles travelling between the routes

Actors:	Managers and Executive officers
Precondition:	The uploaded files should be in specified format
Flow:	Main Flow: 1) Front end support for uploading the files 2) Commit the data into databases
	Alternate Flows: 1. Proper error message when the format doesn't match
Post conditions:	The data gets pushed into database and can be used for further computations

Use Case Number:	UC-4
Use Case Name:	Route-wise Carbon Footprint
Overview:	From already defined metrics for calculating carbon footprint for individual routes

Actors:	Managers
Precondition:	Check If details of the route are present in the Database
Flow:	Main Flow: 1) Extract details from databases regarding the nodes. 2) Find out the shortest the shortest path using any algorithm (in Pgrouting)
	Alternate Flows: 1. Proper error message when required
Post Conditions:	Can be for further statistical analysis of carbon emission across different routes within the city

Use Case Number:	UC-5
Use Case Name:	City-wise Carbon footprint

Overview:	From already defined metrics for carbon footprint apply these to calculate for each city
Actors:	Executive officers
Precondition:	Check If details of all the routes are present in the Database
Flow:	Main Flow: 1) Extract details from databases regarding carbon footprint emissions of all the routes in the city 2) Use formula to calculate total carbon footprint
	Alternate Flows: 1. Proper error message when required
Post conditions:	This can be further used for statistical analysis of carbon emission across different cities.

Use Case Number:	UC-6

Use Case Name:	Shortest path between nodes
Overview:	Given input as source and destination output the shortest path between these two.
Actors:	Managers
Precondition:	Check if the necessary details are present in the Database
Flow:	Main Flow: 1) Extract details from databases regarding carbon footprint emissions in this route 2) Use formulae to calculate total carbon footprint
	Alternate Flow: Proper error message when required.
Post conditions:	This can be used to reduce the expenditure and also to analyse if the shortest path and the path with least carbon footprint are the same.

Use Case Number:	UC-7
Use Case Name:	Company's Carbon Footprint
Overview:	Based on input provided by the company's manager statistical analysis of data
Actors:	Managers
Precondition:	Check If details of the company details are present in the Database
Flow:	Main Flow: 1) Check the authentication of the manager(whether he belongs to the same company or not) 2)Compute the carbon footprint using metrics Alternate flows: When the company's manager tries to cross check the other company's carbon footprint pop up an error.

Post conditions:	Can be further used by the companies for managing their carbon credits.

Use Case Number:	UC-8
Use Case Name:	Pre-Emptive Carbon Emission Calculation
Overview:	Given the number of trucks , source and destination as input,output the calculated carbon footprint emission
Actors:	Managers
Precondition:	Check if the necessary details are present in the Database
Flow:	Main Flow: 1)Extract details from databases regarding the number of trucks and the route. 2)Use formulae to calculate total carbon footprint.

	Alternate Flow: Proper error message when required.
Post conditions:	This can be used to reduce the expenditure and also to analyse if the shortest path and the path with least carbon footprint are the same.

Use Case Number:	UC-9
Use Case Name:	Map Generation
Overview:	Generating the map which displays the route with least carbon footprint with corresponding routes nodes.
Actors:	Managers
Precondition:	None
Flow:	Main Flow: 1) Take the input as source and destination

	2) Run the algorithm with displays the path with least carbon emission 3) Display the map containing the nodes which the truck has to travel
	Alternate Flow: On existing no path between the source and the destination inform the user that path doesn't exist between these two points
Post conditions:	User can take this path to minimize his carbon footprint

Use Case Number:	UC-10
Use Case Name:	Identifying hotspots with high carbon emission
Overview:	Based on the input data calculate the carbon footprint for all possible data and displaying the regions/routes with highest carbon footprint.
Actors:	Executive officer

Precondition:	Check if the necessary details are present in the Database
Flow:	Main Flow: 1)Use formulae to calculate total carbon footprint fro different routes in the city 2) generate a map by highlighting thr routes with most carbon footprint
	Alternate Flow: If the city doesn't exist in database pop an error message to the user
Post conditions:	Necessary measures can be taken to decrease the carbon footprint in hotspot areas.