## Acknowledgment

We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. We would like to extend our sincere thanks to all of them.

We are highly indebted to Professor Dr. Moussa Ibrahim and Dr. Nasser Ayoub, the supervisors of the project, for their guidance and constant supervision, as well as for providing necessary information regarding the project and their support in completing it.

We highly indebted to Prof. Dr. Nabila Mohamed Hassan the Dean of the College and the supervisor of the project for his guidance and constant

Supervision as well as for providing necessary information regarding the

Project & also for their support in completing the project.

We highly indebted to, and Eng. Reem for their guidance and constant supervision as well as for providing necessary information regarding the project and also for their support in completing the project.

We would like to express our gratitude towards our parents and member of October 6 university and faculty of Information System and Computer Science for their kind co-operation and encouragement which help us in completion of this project.

Finally, we would like to express my special gratitude and thanks to industry persons for giving us such attention and time. Our thanks and appreciations also go to my colleague in developing the project and people who have willingly helped us out with their abilities.

## Abstract

Carbon footprint refers to the total amount of greenhouse gas emissions generated by an individual, organization, or event, which contribute to climate change. It is calculated by considering all sources of carbon dioxide (CO2) emissions, including the burning of fossil fuels for energy and transportation, industrial processes, and deforestation. In the context of a university, the carbon footprint can result from a variety of activities, including heating and cooling buildings, electricity use, transportation of students and staff, and the sourcing and disposal of food and supplies. Understanding and reducing a university's carbon footprint is important for promoting sustainability and mitigating the negative impacts of climate change. There are various ways to reduce a university's carbon footprint, including energy efficiency measures, the adoption of renewable energy sources, and the promotion of sustainable transportation options for students and staff. Additionally, universities can engage in educational and research initiatives that raise awareness about the importance of reducing carbon emissions and promoting sustainability. In conclusion, reducing the carbon footprint of a university is a critical step towards creating a more sustainable and environmentally-friendly future, and universities play a crucial role in promoting sustainability and mitigating the impacts of climate change.

# Glossary

| Term | Definition |
|---|---|
| Greenhouse gases (GHGs) | A group of gases in the Earth's atmosphere that trap heat, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases. |
| Direct emissions | Refers to GHG emissions that are directly released into the atmosphere from sources such as transportation, industrial processes, and energy production. |
| Indirect emissions | Refers to GHG emissions that are the result of indirect activities, such as electricity consumption, deforestation, or production and disposal of goods. |
| Scope 1 emissions | Direct emissions from sources that are owned or controlled by an organization or individual. |
| Scope 2 emissions | Indirect emissions from the consumption of purchased electricity, heat, or steam. |
| Scope 3 emissions | All other indirect emissions that are not included in Scope 2, such as the production and disposal of goods and services. |
| Carbon footprint calculation | The process of determining the carbon footprint of an individual, organization, or country by quantifying their GHG emissions and assessing their impact on the environment. |
| Carbon offset | A reduction in GHG emissions made in one place to compensate for emissions made elsewhere. |
| Renewable energy | Energy sources that are replenished naturally and are not depleted, such as wind, solar, hydro, and geothermal energy. |
| Energy efficiency | The use of less energy to perform the same tasks, for example, by using more energy-efficient appliances or transportation. |
| Sustainable transportation | Transportation that has a lower impact on the environment, such as using public transportation, walking, or biking, or using low-emission vehicles |

## Table of Content

## Table of Figure

## Table of Figure

# CHAPTER 1: INTRODUCTION

## 1.1 Summary

A university's carbon footprint is a measure of its impact on the environment in terms of the amount of greenhouse gases it emits. Universities have a significant responsibility to reduce their carbon footprint and lead by example in promoting sustainable practices, as they are educational institutions that play a key role in shaping the attitudes and behavior of future generations. To reduce their carbon footprint, universities can adopt various measures such as investing in renewable energy sources like solar and wind power, promoting energy-efficient buildings, and encouraging sustainable transportation options such as biking and public transit.

Sustainable food production and consumption practices, including reducing waste and sourcing locally, can also help reduce carbon emissions. In addition, universities can reduce their carbon footprint through the adoption of green procurement policies and the reduction of water usage. Education and awareness-raising are essential in reducing a university's carbon footprint.

By offering courses, workshops, and events that promote sustainability and environmental responsibility, universities can raise awareness about the importance of reducing carbon emissions and encourage students, faculty, and staff to take action. Sustainability education can also be incorporated into various academic disciplines, such as engineering, architecture, and environmental studies.

Overall, reducing a university's carbon footprint requires a coordinated effort between individuals and institutions. Universities can engage the community in promoting sustainability and reducing their carbon footprint through partnerships with local governments, businesses, and organizations. Additionally, universities can leverage their position as research institutions to develop and promote new technologies and solutions that can help reduce carbon emissions on a broader scale.

## 1.2 Problem Definition

1. Limited resources: Reducing an organization's carbon footprint requires significant investment in renewable energy sources, energy-efficient buildings, sustainable transportation, and sustainable production and consumption practices. Many organizations face financial constraints and may not have sufficient resources to invest in these initiatives, limiting their ability to reduce their carbon footprint.

2. Resistance to change: Implementing sustainable practices often requires changes in behavior, which can be challenging for some individuals and organizations. Resistance to change and a lack of awareness or understanding of the importance of reducing carbon emissions can hinder progress in reducing an organization's carbon footprint.

3. Lack of infrastructure: Many organizations lack the infrastructure required to support sustainable practices, such as bike lanes, charging stations for electric vehicles, or composting facilities. Without the necessary infrastructure, it can be challenging for organizations to reduce their carbon footprint.

4. Limited data: Measuring and tracking carbon emissions is essential in reducing an organization's carbon footprint, but many organizations lack the necessary data and tools to measure and track their emissions accurately. Limited data can make it challenging to set targets, track progress, and identify areas for improvement.

5. Complex supply chains: Organizations source goods and services from a range of suppliers, which can make it challenging to trace the carbon footprint of their operations fully. Understanding and reducing the carbon footprint of the organization's supply chain can be a complex task that requires collaboration with suppliers and other stakeholders.

Overall, reducing an organization's carbon footprint requires overcoming these challenges and barriers. By addressing these challenges and promoting sustainability, organizations can contribute to a more sustainable future and inspire action towards a more sustainable world.

## 1.3 Objectives

Measurement: The primary objective of a carbon footprint system is to accurately measure and track the university's carbon emissions from all sources, including energy consumption, transportation, waste, and other activities.

1. Reduction: Another objective is to support the university's efforts to reduce its carbon footprint by identifying areas for improvement, monitoring progress over time, and setting reduction targets.

2. Transparency: A carbon footprint system can also help to increase transparency and accountability, by making the university's carbon emissions data and analysis accessible and understandable to all stakeholders.

3. Compliance: In some cases, a carbon footprint system may be required to meet legal or regulatory requirements, such as reporting requirements or emissions reduction targets.

4. Sustainability: A carbon footprint system can also support the university's broader sustainability efforts, by providing a comprehensive view of its carbon emissions and identifying areas for improvement across all aspects of its operations.

5. Education: A carbon footprint system can also serve as a tool for educating students, faculty, and staff about the import.

6. Enhance of reducing carbon emissions and the role of universities in sustainability efforts.

7. Reputation: By implementing a carbon footprint system and making progress in reducing emissions, a university can improve its reputation as a responsible and sustainable institution.

In summary, the objectives of a carbon footprint system for a university can include accurately measuring and tracking carbon emissions, reducing the university's carbon footprint, increasing transparency and accountability, meeting legal or regulatory requirements, supporting sustainability efforts, educating the university community, and improving the university's reputation.

## 1.4 Purpose

Is to understand and manage the university's impact on the environment. The system aims to measure the amount of carbon emissions generated by the university's operations and to develop strategies to reduce these emissions. The ultimate goal is to minimize the university's environmental impact and contribute to a more sustainable future.

A carbon footprint system can serve several important purposes, including:

- Awareness: The system helps the university to become aware of its carbon emissions and the impact of its operations on the environment.
- Planning: By measuring its carbon footprint, the university can plan and set goals for reducing its emissions.
- Responsibility: The university can demonstrate its commitment to sustainability and take responsibility for its impact on the environment.
- Education: The carbon footprint system can serve as a tool for educating the university community about the impact of their actions on the environment and encourage them to make changes that support sustainability.
- Transparency: The system can provide transparency and accountability in the university's carbon footprint measurement and reduction efforts.

Overall, the purpose of a carbon footprint system for a university is to help the institution minimize its environmental impact and become a leader in sustainability.

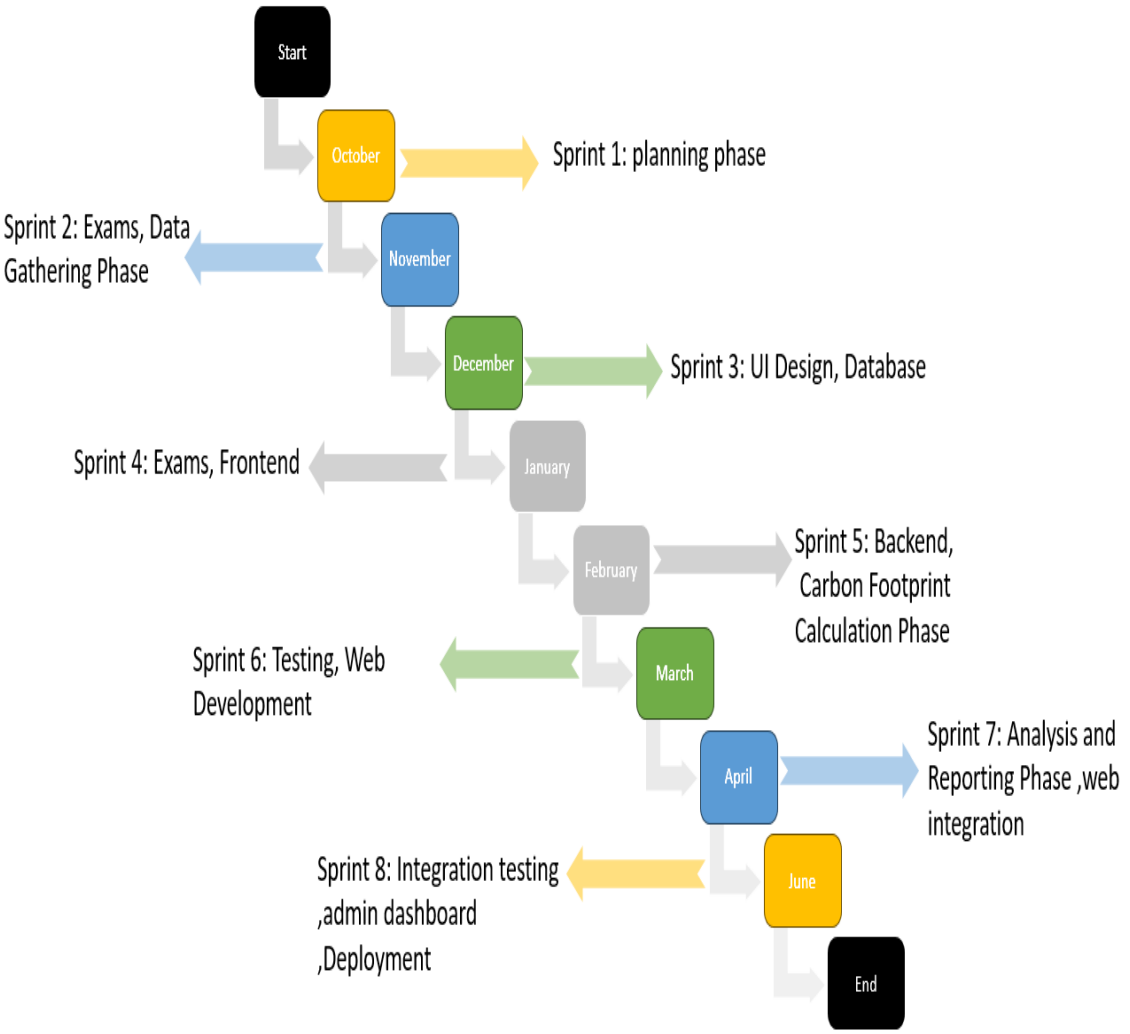
## 1.5 Scope

The scope of reducing a university's carbon footprint is broad and encompasses various aspects of its operations and activities. Some of the areas where a university can focus on reducing its carbon footprint include:

1. Energy consumption: Universities consume significant amounts of energy in their operations, including heating, cooling, and lighting of buildings, as well as powering research equipment and computer systems. Reducing energy consumption through energy-efficient buildings, equipment, and systems can help reduce a university's carbon footprint.
2. Transportation: Universities also generate carbon emissions through transportation, including commuting by faculty, staff, and students, as well as transportation for research and other activities. Encouraging sustainable transportation options, such as biking, walking, or public transit, and promoting carpooling or electric vehicles can help reduce carbon emissions.
3. Food production and consumption: Universities also generate carbon emissions through their food production and consumption practices, including food waste, transportation of food, and energy consumption in food preparation. Promoting sustainable food production and consumption practices, such as reducing waste, sourcing locally, and promoting plant-based diets, can help reduce carbon emissions.
4. Procurement: The procurement of goods and services by universities also generates carbon emissions, including the production, transportation, and disposal of products. By promoting sustainable procurement practices, such as sourcing products with low carbon footprints and reducing waste, universities can help reduce carbon emissions.
5. Education and awareness-raising: Education and awareness-raising are essential in reducing a university's carbon footprint. By offering courses and workshops on sustainability and promoting environmentally responsible behavior, universities can inspire their community to take action towards a more sustainable future.

Overall, the scope of reducing a university's carbon footprint is vast, and requires a coordinated effort across all aspects of the university's operations and activities. By promoting sustainability and reducing carbon emissions, universities can contribute to a more sustainable future and inspire action towards a more sustainable world.

## 1.6 Time Plan




Time Plan (Figure 1)

# CHAPTER 2: LITERATURE REVIEW

## 2.1 O6U Carbon Footprint System

### What is “CFP”?

Carbon footprint refers to the total amount of greenhouse gas emissions produced by the organization's activities, including energy consumption, transportation, waste disposal, and production and consumption of goods and services. It represents the impact that an organization has on the environment in terms of greenhouse gas emissions, which contribute to climate change.

Calculating an organization's carbon footprint involves measuring and tracking the emissions associated with its operations, including direct emissions from sources such as on-site fuel combustion and indirect emissions from purchased electricity and goods and services. Once the emissions are quantified, the organization can identify areas of high emissions and develop strategies to reduce its carbon footprint.

Reducing an organization's carbon footprint is crucial in mitigating climate change, and organizations have a responsibility to lead by example in promoting sustainable practices. By implementing energy-efficient measures, adopting renewable energy sources, reducing waste, and promoting sustainable transportation and production and consumption practices, organizations can reduce their carbon footprint and contribute to a more sustainable future.

### Who uses an “CFP”?

Carbon footprint is used by various individuals and organizations, including governments, businesses, and individuals, to measure their impact on the environment in terms of greenhouse gas emissions.

Governments use carbon footprint to develop policies and regulations to reduce greenhouse gas emissions and mitigate climate change. Businesses use carbon footprint to measure their environmental impact and identify areas where they can reduce their carbon emissions and operate more sustainably. Individuals can also use carbon footprint calculators to assess their personal carbon footprint and identify ways to reduce their carbon emissions.

In the context of universities, carbon footprint is used by university administrators and sustainability officers to measure the university's impact on the environment and identify areas where they can reduce their carbon

emissions. Students and faculty can also use carbon footprint as a tool to raise awareness about sustainability and advocate for more sustainable practices on campus.

**What are they using an "CFP" for?**

1. Measuring environmental impact: Carbon footprint is used to measure the impact that an individual or organization has on the environment in terms of greenhouse gas emissions. It provides a quantitative measure of the amount of carbon dioxide and other greenhouse gases that are released into the atmosphere as a result of various activities.

2. Identifying areas for improvement: Once an individual or organization's carbon footprint is calculated, it can be used to identify areas where emissions are high and develop strategies to reduce them. For example, an organization may identify that a significant portion of its carbon footprint comes from transportation and implement a carpooling program to reduce emissions.

3. Setting targets and tracking progress: Carbon footprint can be used to set emissions reduction targets and track progress towards meeting those targets. This can help motivate individuals and organizations to take action to reduce their emissions and contribute to a more sustainable future.

4. Compliance: Some jurisdictions may require organizations to report their carbon emissions or participate in emissions reduction programs. Carbon footprint can be used to ensure compliance with regulations and demonstrate environmental responsibility.

Overall, carbon footprint is a valuable tool for individuals and organizations looking to measure their impact on the environment, identify areas for improvement, set targets, and track progress towards reducing greenhouse gas emissions.

**So, what does an "CFP" do exactly?**

A carbon footprint measures the total amount of greenhouse gas emissions caused directly and indirectly by an individual, organization, product, or activity. It takes into account emissions from activities such as energy consumption, transportation, waste production, and food consumption.

The carbon footprint calculation provides a quantitative estimate of the amount of carbon dioxide and other greenhouse gases that are released into the atmosphere as a result of the activities being measured. The calculation typically uses a standardized methodology to convert the emissions of various greenhouse gases into equivalent units of carbon dioxide, known as carbon dioxide equivalents (CO2e).

The purpose of calculating a carbon footprint is to help individuals and organizations understand their environmental impact and identify opportunities to reduce their emissions. By measuring their carbon footprint, individuals and organizations can identify which activities are causing the most emissions and develop strategies to reduce them. This may involve implementing energy efficiency measures, reducing waste, or changing consumption patterns.

Overall, the goal of calculating a carbon footprint is to promote awareness and encourage action towards reducing greenhouse gas emissions and mitigating climate change. By taking steps to reduce their carbon footprint, individuals and organizations can contribute to a more sustainable future for themselves and the planet.

**Creating an "CFP"**

Creating a carbon footprint involves calculating the total amount of greenhouse gas emissions produced by an individual, organization, product, or activity. Here are some general steps involved in creating a carbon footprint:

1. Identify the scope: Determine the scope of the carbon footprint by identifying the activities, products, and services that will be included in the calculation.

2. Collect data: Collect data on energy consumption, transportation, waste production, and food consumption, as well as any other relevant activities or factors. This data may be obtained from utility bills, travel logs, and other records.

3. Calculate emissions: Use a standardized methodology to calculate greenhouse gas emissions for each activity or factor. This typically involves converting emissions of various greenhouse gases into equivalent units of carbon dioxide (CO2e).

4. Sum the emissions: Add up the emissions from all activities and factors to obtain the total carbon footprint.

5. Analyze and interpret the results: Interpret the results of the carbon footprint calculation and identify opportunities to reduce emissions. This may involve setting reduction targets, developing strategies to reduce emissions, and monitoring progress towards reducing the carbon footprint.

Overall, creating a carbon footprint can help individuals and organizations understand their environmental impact and identify opportunities to reduce greenhouse gas emissions. By taking steps to reduce their carbon footprint, individuals and organizations can contribute to a more sustainable future.

**Organizing your "CFP"**

1. Assess your current emissions: Calculate your current carbon footprint to determine which activities are causing the most emissions. This will help you identify areas where you can make changes to reduce your impact on the environment.

2. Set reduction targets: Set targets for reducing your carbon footprint over time. This will help you stay motivated and focused on achieving your goals.

3. Identify opportunities for reduction: Identify opportunities to reduce your emissions by using energy-efficient appliances and light bulbs, reducing your use of single-use plastics, using public transportation or biking instead of driving, and reducing your meat consumption.

4. Implement changes: Implement changes to reduce your carbon footprint, such as installing solar panels, reducing water consumption, and using reusable bags and containers.

5. Monitor progress: Monitor your progress towards reducing your carbon footprint and adjust your strategy as needed. This will help you stay on track towards achieving your goals.

Overall, organizing your carbon footprint involves taking a proactive approach to reducing your environmental impact. By making changes to reduce your emissions, you can contribute to a more sustainable future for yourself and the planet.

## Effective Strategies for Delivering a Carbon Footprint Project to Stakeholders

When it comes to a carbon footprint project, delivering it to your stakeholders requires careful planning and execution. One of the key elements of delivering a carbon footprint project is to educate and engage stakeholders on the impact of their activities on the environment and ways to reduce their carbon footprint.

One way to deliver a carbon footprint project is through a carbon footprint calculator. This tool can help individuals and organizations measure their carbon footprint by tracking their energy use, transportation, waste management, and other activities that contribute to carbon emissions.

Another effective way to deliver a carbon footprint project is through public outreach campaigns. This can include educational programs, workshops, and events that engage and educate the public on ways to reduce their carbon footprint.

Additionally, businesses and organizations can implement internal carbon footprint reduction programs, which can include initiatives such as reducing energy use, implementing sustainable transportation practices, and reducing waste.

To ensure the success of a carbon footprint project, it's important to engage with stakeholders, including employees, customers, and the wider community, and provide ongoing communication and feedback. This can help to build support and momentum for the project, as well as foster a culture of sustainability.

In summary, delivering a carbon footprint project requires a multi-faceted approach that includes education, outreach, and internal programs to reduce carbon emissions. By engaging stakeholders and utilizing effective communication strategies, the project can have a positive impact on the environment and contribute to a more sustainable future.

**Managing your users**

In a university setting, managing users is crucial for utilizing a carbon footprint calculator to measure and reduce carbon emissions. The calculator typically has three types of users: students, faculty and staff, and departments.

Students can use the calculator to measure their personal carbon footprint, while faculty and staff can use it to track their carbon emissions and identify areas for improvement. Managing users involves registering them in the calculator, allowing them to enter data on their energy use, transportation, waste management, and other activities that contribute to carbon emissions, and analyzing the results.

To manage users effectively, a carbon footprint calculator should be user-friendly and accessible to a wide range of users. It should provide clear instructions on how to use the calculator and offer support for users who need assistance. In addition, the calculator should be able to handle multiple users simultaneously and provide accurate calculations based on the data entered.

An effective carbon footprint calculator should also be customizable, allowing departments to tailor it to their specific needs and requirements. This could include adding custom fields for data entry, integrating with existing data systems, and generating custom reports and analyses.

To encourage user engagement and participation, a carbon footprint calculator can offer features such as gamification, social sharing, and community engagement. For example, users could be rewarded for reducing their carbon emissions or encouraged to share their progress on social media.

In summary, managing users is an essential component of a successful carbon footprint calculator project at a university. By providing a user-friendly and customizable calculator, the university can encourage engagement and participation, track their carbon emissions, and identify opportunities for improvement.

**Monitoring and assessing student progress**

When it comes to using a carbon footprint calculator, monitoring and assessing progress is a critical component of achieving success in reducing carbon emissions. A carbon footprint calculator should provide real-time tracking and reporting features to enable businesses and organizations to monitor their progress and adjust their strategies accordingly.

One essential feature of a carbon footprint calculator is the ability to track carbon emissions data over time. By regularly inputting data on energy use, transportation, waste management, and other activities, businesses and organizations can monitor their carbon footprint and identify trends and patterns. This data can be used to set reduction goals and measure progress towards achieving them.

In addition, a carbon footprint calculator should allow users to set targets and track progress towards achieving them. For example, a business might set a goal to reduce its carbon emissions by 20% within a year. The calculator would track progress towards this goal and provide alerts and notifications when the target is nearing or has been achieved.

Another important feature of a carbon footprint calculator is the ability to generate reports and analyses. These reports should provide an overview of carbon emissions data, including trends, comparisons to industry benchmarks, and potential areas for improvement. Users should be able to filter and sort data in various ways to gain deeper insights into their carbon footprint.

Finally, a carbon footprint calculator should provide users with real-time alerts and notifications to keep them informed about their progress. These alerts could include reminders to input data, notifications when targets are met, and updates on progress towards reduction goals.

**Advanced “CFP” features**

An advanced carbon footprint can be a comprehensive assessment of the organization's greenhouse gas emissions across all activities, including direct emissions from facilities, vehicles, and equipment, as well as indirect emissions from purchased electricity, heating, and cooling.

1. Scope: The carbon footprint assessment should cover all relevant activities of the organization, including but not limited to operational emissions, supply chain emissions, and employee commute.

2. Data collection: Data on the organization's energy consumption and activities should be collected from various sources, including utility bills, fuel receipts, employee travel records, and supplier invoices.

3. Emission calculation: The carbon footprint should be calculated using appropriate emission factors for each activity and energy source. The emissions can be calculated using standard methods such as the Greenhouse Gas Protocol or other internationally recognized standards.

4. Reporting: The results of the carbon footprint assessment should be reported in a clear and concise manner, highlighting the most significant sources of emissions, and identifying opportunities for emissions reductions.

5. Benchmarking: The carbon footprint assessment should compare the organization's emissions to industry benchmarks or other relevant standards to evaluate the organization's performance.

6. Goal setting: Based on the results of the carbon footprint assessment, the organization should set ambitious and achievable emission reduction goals.

7. Tracking and monitoring: The organization should regularly track and monitor its emissions to evaluate progress towards its emission reduction goals and identify areas for further improvement.

8. Verification: The carbon footprint assessment should be independently verified by a third-party to ensure accuracy and credibility.

Overall, an advanced carbon footprint for an organization can provide valuable insights into the organization's environmental impact and help identify opportunities for emissions reductions.

## Deploying a Carbon Footprint Assessment in an Organization

Deploying a carbon footprint assessment in an organization requires a systematic approach to gather, analyze and report data on the organization's greenhouse gas emissions. The following method outlines the steps an organization can take to deploy a carbon footprint assessment effectively.

Method:

1. Goal setting and scope definition: The first step is to establish clear goals and objectives for the carbon footprint assessment. The goals should include the activities that will be included and the emissions sources that will be considered. This will guide the assessment process and ensure its comprehensiveness.

2. Identification of data sources: Once the scope has been defined, the next step is to identify data sources required for the assessment. These may include utility bills, fuel receipts, transportation records, and supplier invoices.

3. Data collection and analysis: The necessary data should be collected and analyzed using appropriate methods to calculate the carbon footprint of the organization, considering both direct and indirect emissions. Standard protocols such as the Greenhouse Gas Protocol may be used to ensure consistency and accuracy.

4. Results reporting: Based on the data analysis, a report should be created that presents the results of the carbon footprint assessment, including a breakdown of emissions by source and recommendations for reducing emissions.

5. Target setting and progress tracking: Based on the results of the carbon footprint assessment, the organization should establish emission reduction targets and a system for tracking progress towards achieving those targets. This may involve implementing new processes or technologies to reduce emissions.

6. Results verification: To ensure the credibility of the assessment, it may be advisable to have it independently verified by a third-party.

7. Results communication: The results of the carbon footprint assessment should be communicated to stakeholders, including employees, customers, and investors. This can help build support for emissions reduction efforts and demonstrate the organization's commitment to sustainability.

## 2.2 Competitive Research

Competitive research for a carbon footprint system for universities involves analyzing existing systems and solutions implemented by other universities or organizations. It aims to identify their features, strengths, and weaknesses to gain insights and inspiration for designing a competitive system. Here are some steps to conduct competitive research:

1. Identify Competitors: Identify universities or organizations that have implemented carbon footprint systems or have sustainability initiatives in place. Look for institutions with similar goals, size, or geographical location.

2. Review Existing Systems: Study the features and functionality of the carbon footprint systems used by these institutions. Explore their websites, documentation, and any publicly available information related to their carbon footprint initiatives.

3. Analyze Methodologies: Understand the methodologies used by competitors to calculate and track their carbon footprint. Look for innovative approaches or unique metrics they employ to measure emissions from different sources.

4. Assess Data Collection and Reporting: Evaluate how competitors collect, manage, and report carbon footprint data. Look for automation, integration with existing systems, data visualization capabilities, and transparency in reporting.

5. Explore User Experience: Examine the user experience of competitors' carbon footprint systems. Evaluate the ease of data entry, accessibility of information, and any interactive features provided for users to engage with the system.

6. Identify Strengths and Weaknesses: Identify the strengths and weaknesses of each competitor's system. This could include areas such as data accuracy, user engagement, reporting capabilities, integration with sustainability initiatives, or scalability.

7. Identify Gaps and Opportunities: Analyze the gaps in existing systems or areas where improvements can be made. Consider opportunities to differentiate your system, such as incorporating innovative features, addressing specific challenges faced by universities, or offering enhanced user experience.

8. Learn from Best Practices: Identify best practices employed by competitors and explore how they align with your college's goals and

requirements. Consider adapting successful features or approaches while maintaining uniqueness and customization for your institution.

By conducting competitive research, you can gain valuable insights into existing carbon footprint systems, understand industry standards, and identify opportunities to design a competitive and effective system for your college. Remember to respect intellectual property and copyright laws while conducting your research.

## 2.3 Project Features List

| FEATURE | DESCRIPTION | PERIORITY |
|---|---|---|
| Emissions calculation | The system should have the capability to calculate the university's carbon emissions based on data collected from various sources, such as energy consumption, transportation, waste management, procurement, and campus activities. | Must |
| Emissions tracking | The system should track the university's carbon emissions over time, allowing for easy comparison of emissions from one year to the next. | Must |
| Goal setting | The system should provide a platform for setting goals for reducing carbon emissions and tracking progress towards these goals. | Must |
| Sustainable behavior promotion | The system should include tools and incentives to encourage sustainable behavior among students, staff, and faculty, such as educational resources, rewards, and gamification. | Must |
| Supplier tracking | The system should have the capability to track the carbon emissions generated by the university's suppliers and the supply chain. | Must |
| Stakeholder engagement | The system should provide a platform for engaging with stakeholders, such as students, staff, and the wider community, to educate them about the university's sustainability efforts and encourage their support. | Must |
| Integration with other systems | The system should be able to integrate with other systems used by the university, such as energy management systems, transportation systems, and procurement systems, to ensure that data is collected and used efficiently. | Must |
| Automation | The system should automate as many manual processes as possible, improving efficiency and reducing the workload involved in tracking and reducing carbon emissions. | Should |
| User-friendly interface | The system should have a user-friendly interface that makes it easy for users to access data, set goals, and track progress towards reducing carbon emissions. | Should |

# CHAPTER 3: METHODOLOGY

## 3.1 System Analysis

System analysis for carbon footprint for organizations involves the evaluation of an organization's carbon emissions and the development of a plan to reduce their carbon footprint. The analysis typically involves several steps:

1. Identifying and measuring carbon emissions: The first step is to identify all sources of carbon emissions within the organization, such as energy consumption, transportation, and waste management. The emissions are then measured using carbon accounting tools and methodologies.

2. Analyzing carbon emissions: The next step is to analyze the carbon emissions data to identify areas of high emissions and potential areas for improvement. This analysis can help identify opportunities to reduce emissions, such as by improving energy efficiency or adopting renewable energy sources.

3. Developing a carbon reduction plan: Based on the analysis, a carbon reduction plan is developed that outlines specific actions and targets for reducing carbon emissions. The plan may include initiatives such as implementing energy-efficient technology, reducing travel emissions, and promoting sustainable procurement practices.

4. Implementing the plan: Once the carbon reduction plan is developed, it is implemented through a series of initiatives and actions. This may involve working with suppliers, engaging employees, and investing in renewable energy sources.

5. Monitoring and reporting: Ongoing monitoring and reporting of carbon emissions is critical to ensuring the success of the carbon reduction plan. This involves regular tracking and reporting of emissions data and progress towards carbon reduction targets.

Overall, system analysis for carbon footprint for organizations involves a holistic approach to understanding and reducing an organization's carbon emissions. The process involves a combination of data analysis, stakeholder engagement, and ongoing monitoring and reporting to ensure that the organization is continually improving its sustainability performance.

**Performance Requirements:**

- The system and each functionality implemented in way which has the shortest time to perform tasks.
- The power of sending and receiving requests through the server is the important perspective, as the system design to serve thousands of people.
- Mobile application designed in way to enhance memory performance.
- Both mobile app and website designed with caching the data in order to benefit from the previous loaded data.

**Usability Requirements:**

- The system designed using high levels of user experiences which help actors to easily use the system.
- The way of sending and reading message designed in effective UX method to serve the usability of the system.

**Interface Requirements:**

- The user interface design of mobile application is suitable for the colors of branding of the company which help serving the identity of the co.
- Website front-end developers choose the colors of dashboard which suitable for the eyes and will be comfortable for all of the users.

**Operational Requirements:**

- Easy way in data entering, querying and filtering the data.
- Admin can perform the tasks in dashboard without any knowledge.
- Each part of the system designed to be easily operational and both participants and the admins can use the system as the use the applications they are usually use.

**Adaptability Requirements:**

- The mobile application is designed to work adaptability on all screen sizes.
- Admin dashboard or sponsor dashboard can be used in any device.

**System Security:**

- Back-end server(s), including data encryption and transmission.
- Administrator controlled user name and password access.
- Information Security Industry Standard encryption and SSL certifications (currently 128-bit).
- Automatic timeout/log-off.
- Privileges check system for both admin and sponsor.
- Integrated technical safeguards to ensure a high level of privacy and security.

**System Validation:**

- In data entering phase the system ensures the validation of data such as email and password constrains.
- Input masks.
- Drop down lists with standard responses.
- Automatic timeout/log-off.
- Record data completeness requirements.
- Basic data logic warnings (i.e., Gender: Male).

**System Integration:**

- An additional desired functionality of the system is systems integration. The system will be required to have the capacity to import and export data without ongoing support by the software vendor. The ability to customize and automate import and export utilities, with date specification and transaction receipts is highly prioritized. The import/export programming language must either be open or a reliable and flexible data transfer tool must be integrated with the software to facilitate the secure and reliable transfer of data between multiple and diverse external systems.

**Customization and Flexibility:**

- The desirability for the software vendor to continually update and improve the general software is a given. However, the system will also require that the software be flexible and customizable to suit their needs. It is highly preferable that this flexibility and customization be an administrative ability at the system level.

**Communications Requirements:**

- Communication between the User and the system will be through the worldwide web.

The next step after system introduction phase is system analysis, which include analysis the system which help in system design phase
So, in this chapter we will discuss each diagram in the systems such as:

**Sequence Diagram:**
The sequence diagram captures the time sequence of the message flow from one object to another.

**Use Case Diagram:**
To model a system, the most important aspect is to capture the dynamic behavior. Dynamic behavior means the behavior of the system when it is running/operating.

**Data Flow Diagram (DFD)**

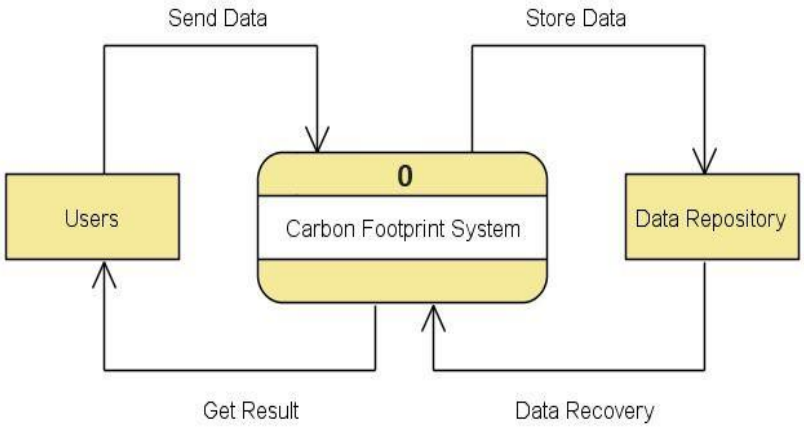
DFD describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation. Data flow diagrams can be divided into logical and physical

**Activity Diagram**

Activity Diagrams describe how activities are coordinated to provide a service which can be at different levels of abstraction. Typically, an event needs to be achieved by some operations, particularly where the operation is intended to achieve a number of different things that require coordination, or how the events in a single use case relate to one another, in particular, use cases where activities may overlap and require coordination. It is also suitable for modeling how a collection of use cases coordinates to represent business workflows

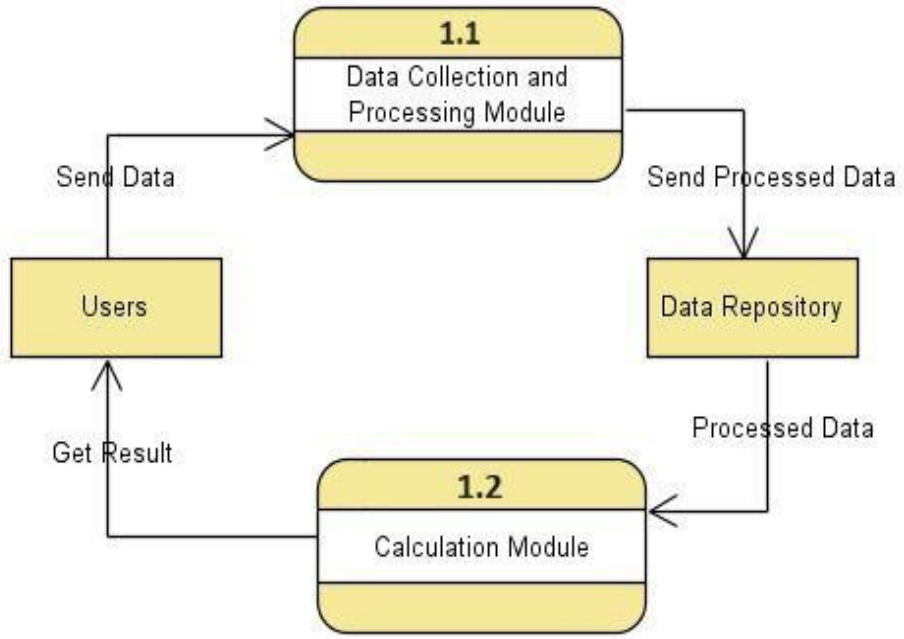
**1. DFD Diagram:**

Level 0:



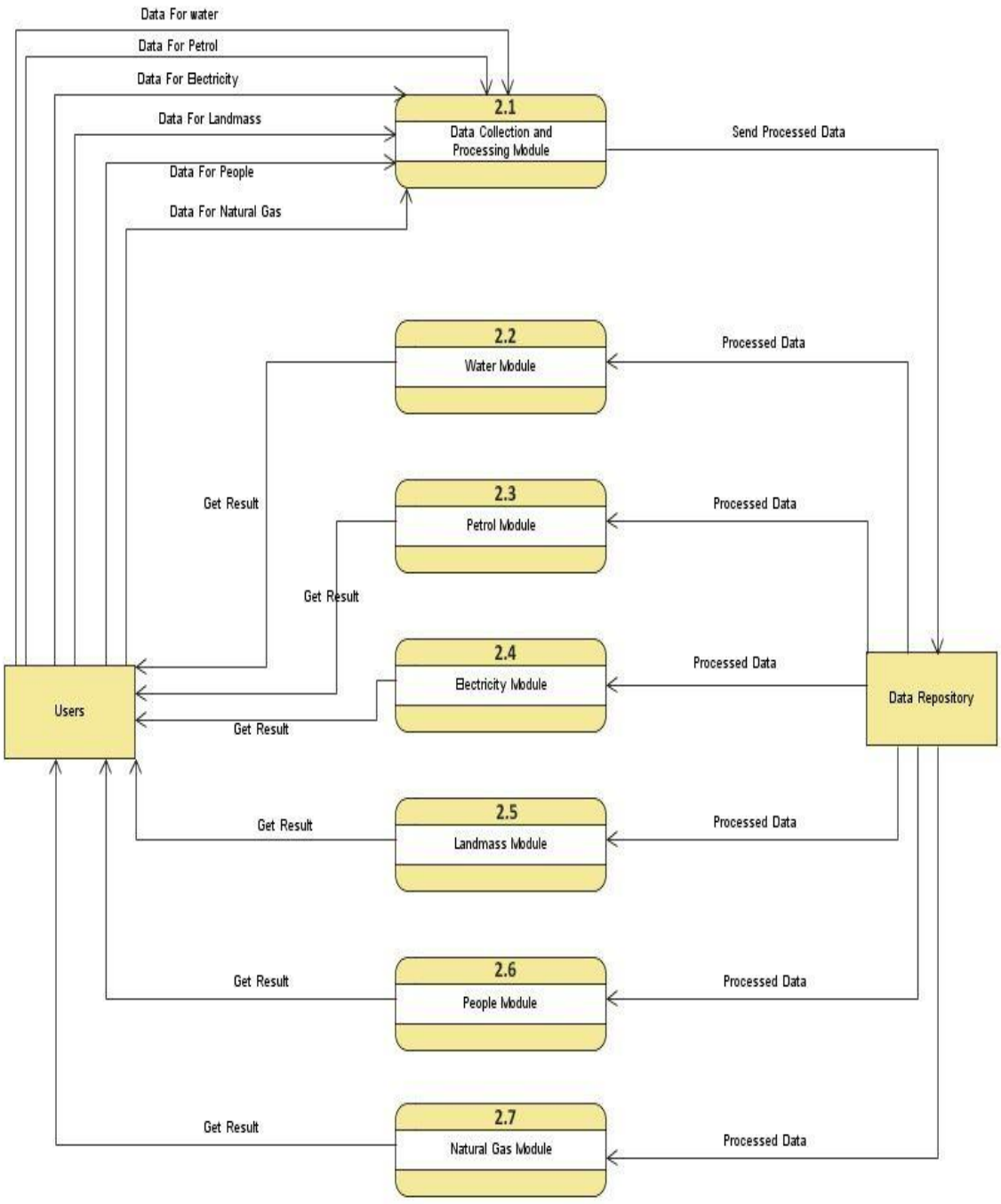

(Figure 2.1.1)

Level 1:




(Figure 2.1.2)

# Level 2:



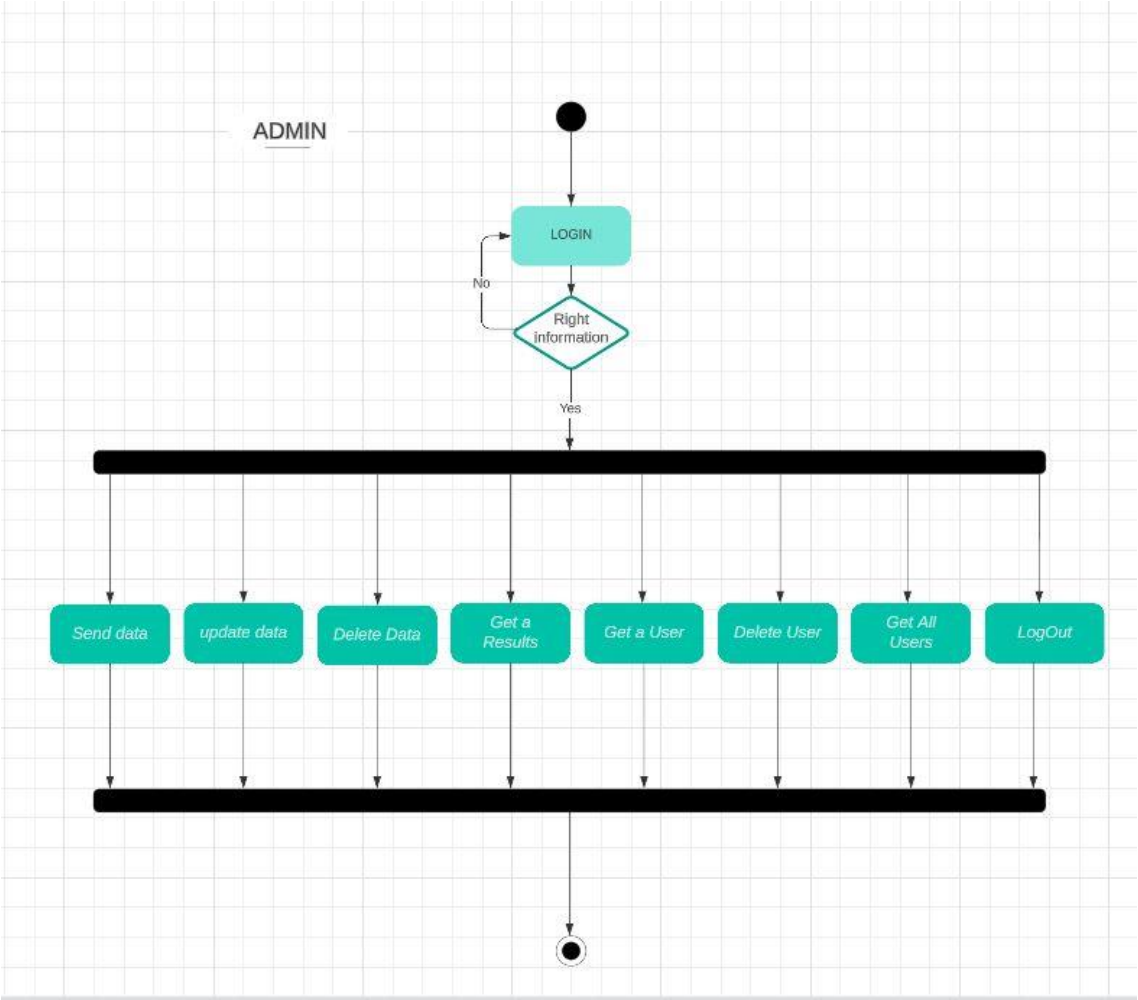

(Figure 2.1.3)

## 2. Use Case Diagram:


(Figure 2.2)

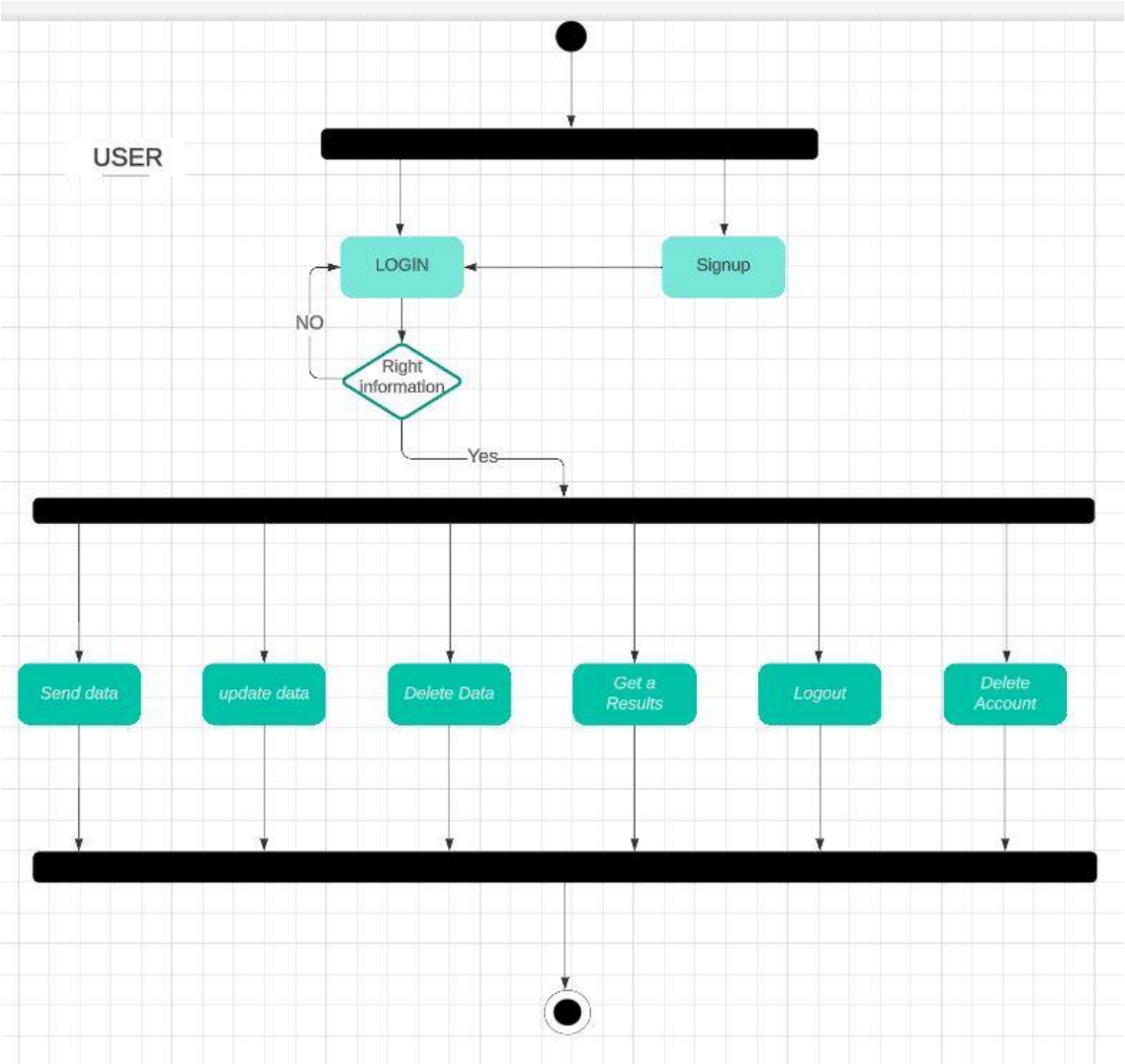
**3. Activity Diagram:**

# 1- For admin :



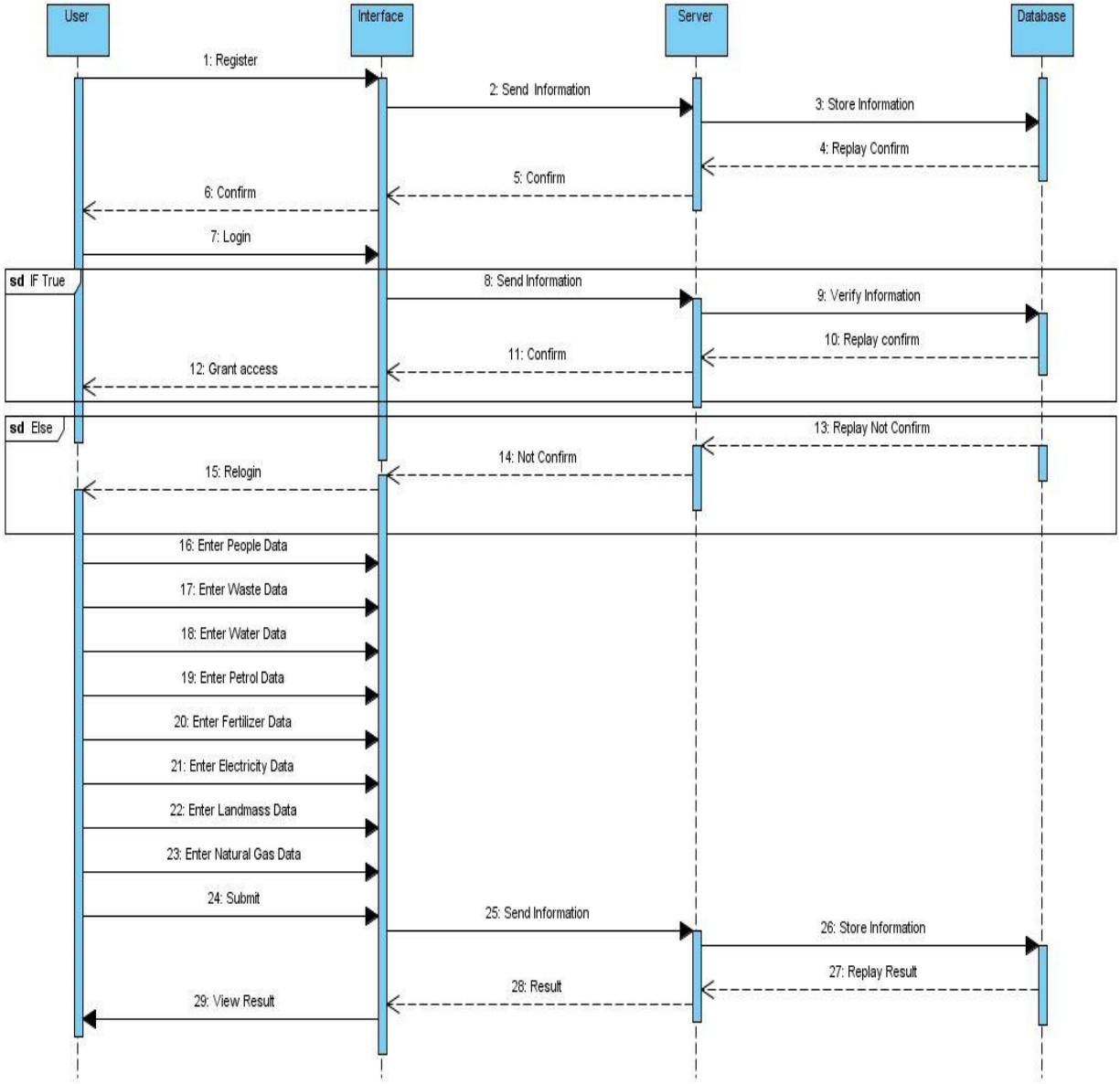

(Figure 2.3.1)

## 2- For User :




(Figure 2.3.2)

## 4. Sequence Diagram:




(Figure 2.4)

## 3.2 System Design

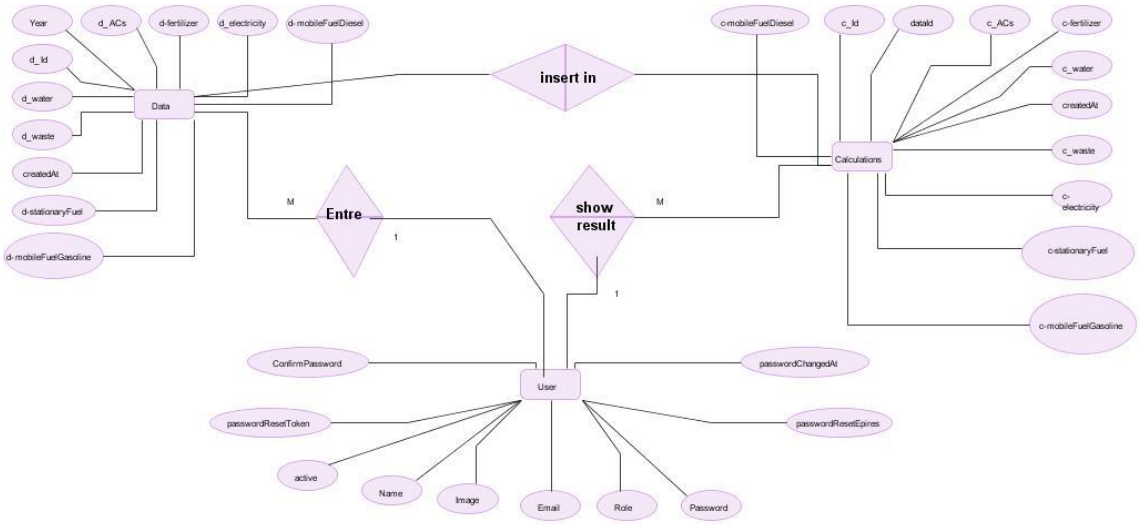
The next step after system analysis phase is system design, which include designing the diagrams of the system which help the developers in implementation of the system.

So, in this chapter we will discuss each diagram in the systems such as:

**Entity Relationship Diagram:**
The ER model defines the conceptual view of a database. It works around real-world entities and the associations among them. At view level, the ER model is considered a good option for designing databases.

**Database Scheme:**
A database schema is the skeleton structure that represents the logical view of the entire database. It defines how the data is organized and how the relations among them are associated. It formulates all the constraints that are to be applied on the data.

## 5. Entity Relationship Diagram (ERD):




ERD (Figure 2.5)

## 3.3 Tools

CFs is an enterprise system support many platforms and runs on browsers as web application and on smart phones, so that, we used a verity of tools to support Back-End, Web.

1. **Back-End Development**
   - Node.JS
   - JavaScript
   - Express.JS
   - MongoDB

2. **Front-End Development**
   - HTML
   - CSS
   - JavaScript
   - Tailwind
   - React
   - Next.JS
   - Three.JS
   - Framer Motion

### 3.3.1 Back-End Development Tools

**Node.JS:**

Node.js is an open-source JavaScript runtime environment that executes code outside the browser. It uses an event-driven, non-blocking I/O model, allowing for efficient handling of concurrent connections. With a single-threaded event loop, it's lightweight and scalable, making it ideal for real-time web applications. Node.js has a vast ecosystem of modules available through npm, enabling easy integration of functionalities. It's commonly used for building web applications, especially those requiring high concurrency. Additionally, Node.js can be used for developing command-line tools and scripts. Overall, Node.js provides a versatile and efficient platform for server-side JavaScript development.


Node.JS (Figure 3.1)

Express.JS:

Express.js is a fast and minimalist web application framework for Node.js. It provides a set of robust features for building web applications and APIs. With a simple and intuitive API, Express.js allows developers to create routes, handle requests and responses, manage middleware, and handle errors efficiently. It offers a modular architecture, allowing developers to add additional functionality using middleware and extensions. Express.js is widely adopted in the Node.js ecosystem and is known for its performance, flexibility, and ease of use. It is suitable for both small and large-scale applications, making it a popular choice among developers.


Express.JS (Figure 3.2)

MongoDB:

MongoDB is a popular open-source NoSQL database that provides a flexible and scalable solution for managing data. It uses a document-oriented model, where data is stored in flexible JSON-like documents called BSON. MongoDB offers high performance and horizontal scalability, allowing seamless distribution of data across multiple servers or clusters. It supports a rich set of features including document validation, indexing, aggregation, and replication. MongoDB's flexible schema enables easy data modeling and handling of evolving data structures. It is widely used in modern web and mobile applications, providing developers with a powerful and efficient database solution for their projects.


MongoDB (Figure 3.3)

### 3.3.2 Web Development Tools

**HTML:**

Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript, it forms a triad of cornerstone technologies for the World Wide Web.

Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.


HTML (Figure 3.4)

## CSS:

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language like HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.


CSS (Figure 3.5)

## JavaScript:

JavaScript often abbreviated as JS, is a high-level, interpreted programming language that conforms to the ECMAScript specification. JavaScript has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions.


JavaScript (Figure 3.6)

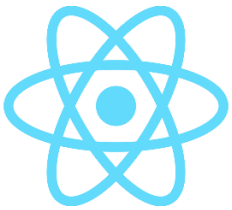
**Tailwind:**

Tailwind CSS is a utility-first CSS framework that allows developers to rapidly build user interfaces. It focuses on providing a comprehensive set of pre-defined utility classes that can be combined to create custom designs. With Tailwind CSS, you can easily style your components without writing custom CSS. It promotes a modular and scalable approach to styling, making it efficient for large projects. Tailwind CSS provides a wide range of utility classes for spacing, typography, colors, and more, giving developers flexibility and speed in styling their applications. It also supports responsive design out of the box, allowing for seamless adaptation to different screen sizes. Overall, Tailwind CSS simplifies the development process by providing a robust and intuitive CSS framework.

Tailwind (Figure 3.7)

React:

React is a popular JavaScript library for building user interfaces. It allows developers to create reusable UI components and efficiently manage the state of an application. With React, you can build dynamic and interactive web applications that update efficiently as data changes. It uses a virtual DOM (Document Object Model) to optimize rendering performance. React follows a component-based architecture, where each component encapsulates its own logic and rendering. It also supports JSX, a syntax extension that allows you to write HTML-like code within JavaScript. React is widely adopted and has a large ecosystem of libraries and tools that enhance development productivity. It is an efficient and flexible solution for creating modern, scalable, and maintainable web applications.



React (Figure 3.8)

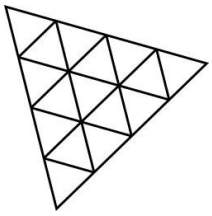
Next.js:

Next.js is a React framework for building server-rendered and static websites. It offers features like automatic code splitting, server-side rendering, and efficient caching. With simplified setup and seamless deployment, Next.js enables developers to create modern and performant web applications. It supports static site generation, dynamic routes, and API routes. Next.js also provides built-in support for CSS modules and Sass. Overall, Next.js enhances React development with essential tools and optimizations.

Next.js (Figure 3.9)

Three.js:

Three.js is a popular JavaScript library used for creating 3D graphics and animations in web browsers. It provides a powerful set of tools and features for building immersive and interactive 3D experiences. With Three.js, developers can easily render 3D objects, apply materials and textures, create lighting effects, and manipulate camera perspectives. It supports various 3D geometries, such as spheres, cubes, and meshes, and offers functionality for controlling animations, physics simulations, and user interactions. Three.js is compatible with different web technologies, including WebGL, allowing for hardware-accelerated rendering. It has a large community and extensive documentation, making it accessible for beginners and offering advanced capabilities for experienced developers. Overall, Three.js is a versatile and robust framework for creating captivating 3D web applications.



Three.js (Figure 3.10)

Framer Motion:

Framer Motion is a popular animation library for React that allows developers to create fluid and interactive user interfaces. It provides a simple and declarative syntax for defining animations and transitions, enabling developers to bring their designs to life with ease. With Framer Motion, you can animate elements, apply complex transitions, and create interactive gestures and scroll effects. It offers a wide range of animation properties and controls, allowing for precise control over timing, easing, and orchestration. Framer Motion also supports responsive animations, making it easy to create dynamic and adaptive interfaces. Whether you're building a small component or a complex UI, Framer Motion empowers developers to create visually stunning and engaging experiences in React applications.

Framer Motion (Figure 3.11)

# CHAPTER 4: IMPLEMENTATION

## Implementation

Implementing a carbon footprint system for a university involves several steps. Here are some key considerations to keep in mind:

1. Identify data sources: The first step is to identify the data sources that will be used to calculate the university's carbon footprint. These may include energy bills, transportation data, waste management data, and other relevant sources of information.

2. Gather data: Once the data sources have been identified, the next step is to gather the necessary data. This may involve contacting various departments within the university to collect data or using automated tools to collect data from various sources.

3. Calculate carbon footprint: With the data in hand, the next step is to calculate the university's carbon footprint. This involves using established methodologies to calculate the emissions associated with each data source and aggregating these emissions to obtain a total carbon footprint for the university.

4. Create a database: To manage the data, it is essential to create a database that can store and manage the various data points that make up the university's carbon footprint. The database should be designed to enable data entry, retrieval, and analysis.

5. Implement data entry and retrieval: Once the database is in place, the next step is to implement data entry and retrieval systems. This may involve creating forms for data entry and using queries to retrieve data for analysis.

6. Analyze and report: With the data in the database, the next step is to analyze the data and generate reports. This may involve using software tools to generate graphs and charts that visualize the data or creating dashboards that provide stakeholders with up-to-date information on the university's carbon footprint.

7. Set targets and monitor progress: Finally, it is essential to set targets for reducing the university's carbon footprint and monitor progress towards these targets over time. This may involve creating action plans to reduce

emissions and conducting regular reviews of progress to ensure that the university is on track to meet its goals.

Overall, implementing a carbon footprint system for a university involves identifying data sources, gathering data, calculating the carbon footprint, creating a database, implementing data entry and retrieval, analyzing the data, setting targets, and monitoring progress. This process requires collaboration between various stakeholders within the university, including administrators, faculty, staff, and students, to ensure that everyone is working towards a common goal of reducing the university's carbon footprint.

## 4. Data Base Table

---

# Database Tables:

### Fields : Data type

**Data**

| | |
|---|---|
| Year : Number | Fertilizer : Number |
| Mobile Diesel : Number | Electricity : Number |
| Mobile Gasoline : Number | ID : string |
| Stationary : Number | Water : Number |
| ACs : Number | Waste : Number |
| Created At : Date | |

**Result**

| | | |
|---|---|---|
| Mobile Diesel Results : Number | Stationary Results : Number | Waste Results : Number |
| Mobile Gasoline Results : Number | Electricity Results : Number | ID : String |
| Mobile Results : Number | Fertilizer Results : Number | Data : String<br>(ID : Reference to Data table ) |
| ACs Results : Number | Water Results : Number | |

**Users**

| |
|---|
| Name : String |
| Email : String |
| Photo :  String |
| Role : String |
| Password : String |
| Password Confirm : String |
| Password Change AT : Date |
| Password Reset Token : String |
| Password Reset Expires : Date |
| Active : Boolean |
| ID : String |

## 4.1 - Introduction to Database Implementation:

This section provides an overview of the implementation process for a carbon footprint system designed for a university. It outlines the purpose of the system, the intended audience, and the scope of the document. It also provides an overview of the database design, including the data modeling techniques used, and the general approach to implementing the database.

The purpose of the carbon footprint system is to track the university's carbon emissions and provide insights into the university's sustainability efforts. The system is designed to collect data from various sources, including energy bills, transportation logs, and waste management records. The data is stored in the database and processed to provide insights into the university's carbon emissions.

The intended audience for this document includes developers, database administrators, and any other personnel involved in the implementation process. The document serves as a comprehensive guide to the implementation of the carbon footprint system and provides valuable information for those involved in the development, implementation, and maintenance of the system.

The scope of this document covers the entire implementation process, including the design, creation, and management of the database. The document also outlines the testing process and provides guidance on how to troubleshoot any issues that may arise during the implementation process.

The database design is a crucial component of the implementation process. It involves the creation of a database schema, which outlines the structure of the database, including the tables, columns, and relationships between them. The data modeling techniques used in the design process are also discussed in this document.

In summary, this section of the document provides an introduction to the implementation process for a carbon footprint system designed for a university. It outlines the purpose, scope, and audience of the document, as well as the key components of the database design. The document serves as a comprehensive guide to the implementation of the system and provides valuable information for developers, database administrators, and other personnel involved in the implementation process.

## 4.2 - Database Implementation:

Implementing a carbon footprint system for a university involves creating the database designed in the previous step and then populating it with actual data. Here are some steps to consider when implementing the database:

1. To create a Mongoose database

1. Define a schema for the data using Mongoose.

2. Connect to the MongoDB server using Mongoose.

3. Create, read, update, and delete data using Mongoose schema methods.

However, for a more detailed documentation, it is recommended to include additional steps such as installation of Mongoose, defining schema types and options, creating Mongoose models, and implementing CRUD operations using Mongoose methods. Additionally, instructions on how to use the system, how to troubleshoot issues, and how to update the documentation should also be included.

2. Populate the database: Once the database is created, the next step is to populate it with actual data. You can do this by entering data manually or by importing data from spreadsheets or other sources. The data should be accurate, complete, and consistent.

3. Create forms for data entry: To facilitate data entry, you can create forms that allow users to input data into the database easily. You can use tools like Microsoft Access or web-based form builders to create these forms.

4. Create queries for data retrieval: To retrieve data from the database, you can create queries that filter and sort data based on specific criteria. You can use SQL queries or graphical query builders to create these queries.

5. Implement data analysis and reporting: Once the database is populated with data, you can use data analysis and reporting tools to generate insights about the university's carbon footprint. You can create reports, charts, and graphs that summarize the data and highlight key trends.

6. Test the system: After implementing the database, it is essential to test the system thoroughly to ensure that it works as intended. You can conduct user acceptance testing to ensure that the system meets the requirements of the stakeholders.

Overall, implementing a carbon footprint system for a university involves creating a database, populating it with data, creating forms for data entry, creating queries for data retrieval, implementing data analysis and reporting, and testing the system to ensure its effectiveness.

## 4.3 - Database Design:

Designing a carbon footprint system for a university involves creating a database that can store relevant data about the university's carbon emissions. Here are some steps to consider when designing the database:

1. Identify the entities: The first step is to identify the entities that will be part of the database. In this case, the entities could include the university, buildings, energy consumption, transportation, waste management, and other factors that contribute to the carbon footprint.

2. Determine the relationships: Once you have identified the entities, you need to determine the relationships between them. For example, buildings will be associated with energy consumption, and transportation will be associated with emissions. You will need to establish relationships between entities to create a cohesive system.

3. Establish data tables: Once you have identified entities and relationships, the next step is to create data tables. Each entity should have a corresponding table, and each table should have columns for relevant data points. For example, the buildings table could have columns for the building name, location, square footage, and energy consumption data.

4. Consider data integrity and normalization: It is essential to ensure data integrity and normalization to prevent data inconsistencies and errors. One way to achieve this is by enforcing referential integrity and establishing primary and foreign keys in the tables.

5. Implement data entry and retrieval: Once you have designed the database, you can start building the interface for data entry and retrieval. You can create forms for data entry and use queries to retrieve the data.

6. Implement data analysis and reporting: The final step is to implement data analysis and reporting tools that can help users understand the university's carbon footprint better. You can create dashboards that visualize data trends and provide insights to stakeholders.

Overall, designing a carbon footprint system for a university involves creating a comprehensive database that can store, manage, and analyze relevant data about the university's carbon emissions.

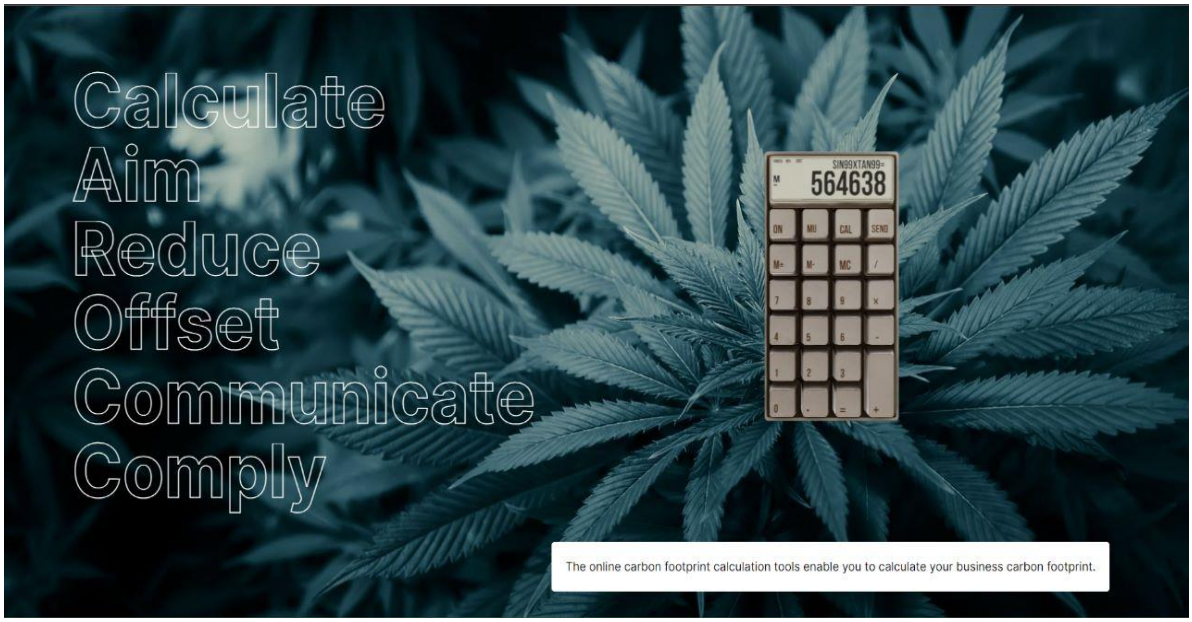
# Chapter 5: System Architecture

## 5.1 Overview:

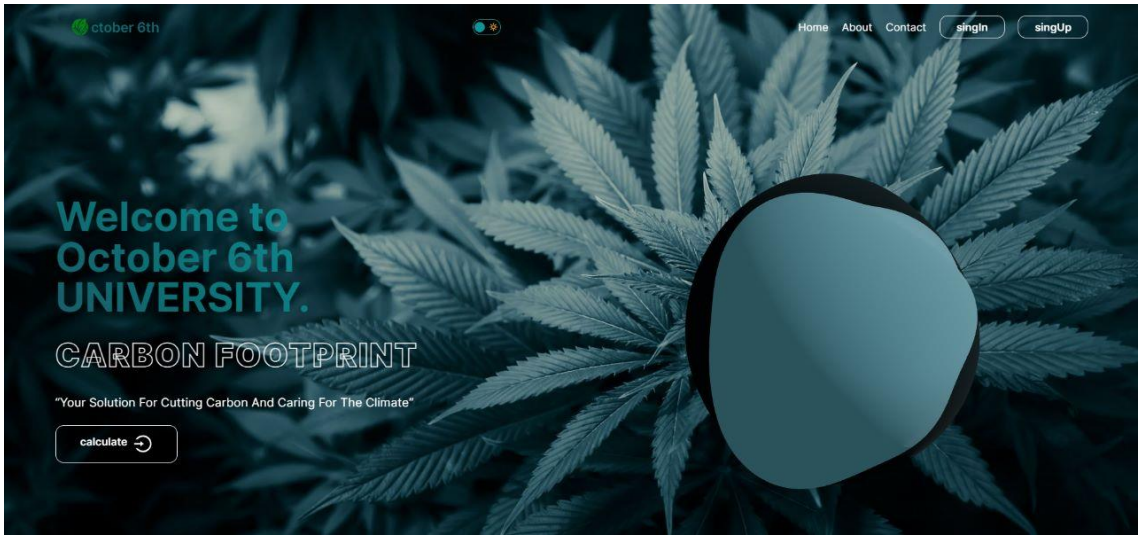
This chapter includes the system architecture and how it works. Discuss the relationship between each component user can sign in/up u can calculate in which data entry per month for a duration 1 year for each scope and we have 3 scopes each scope calculates the data entry and the result looking out in CO2e for each scope and we collect them, you can contact us,

## 5.2 System Screenshots:

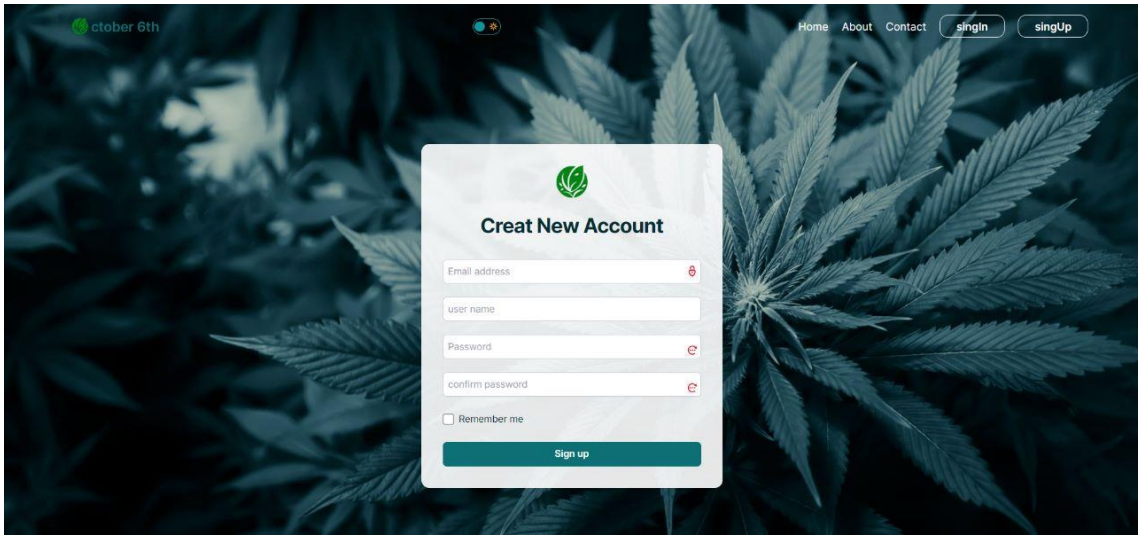
Website Interface



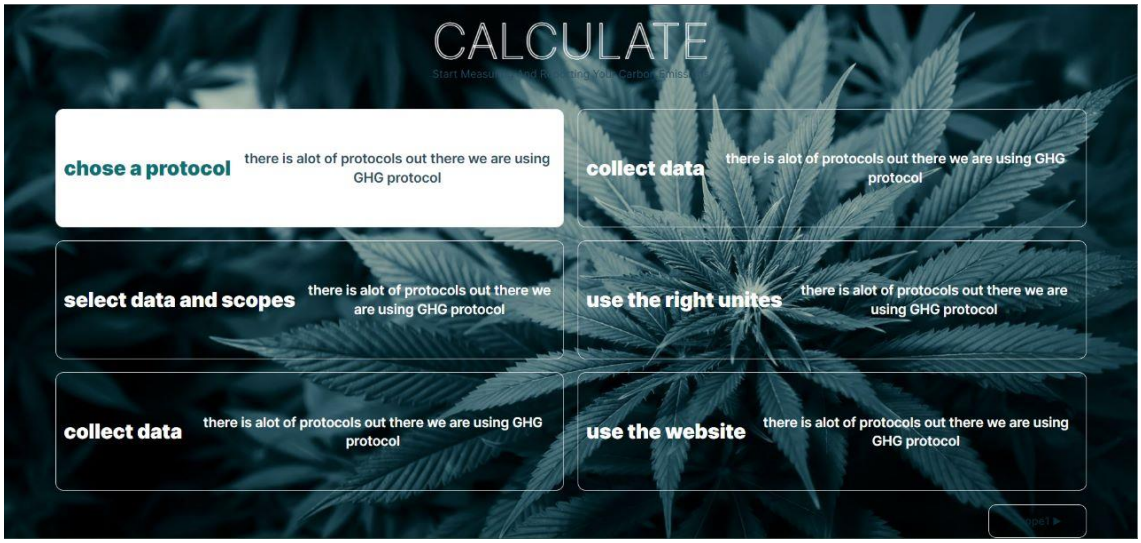

Calculation (Figure 4.1)




Home Page (Figure 4.2)

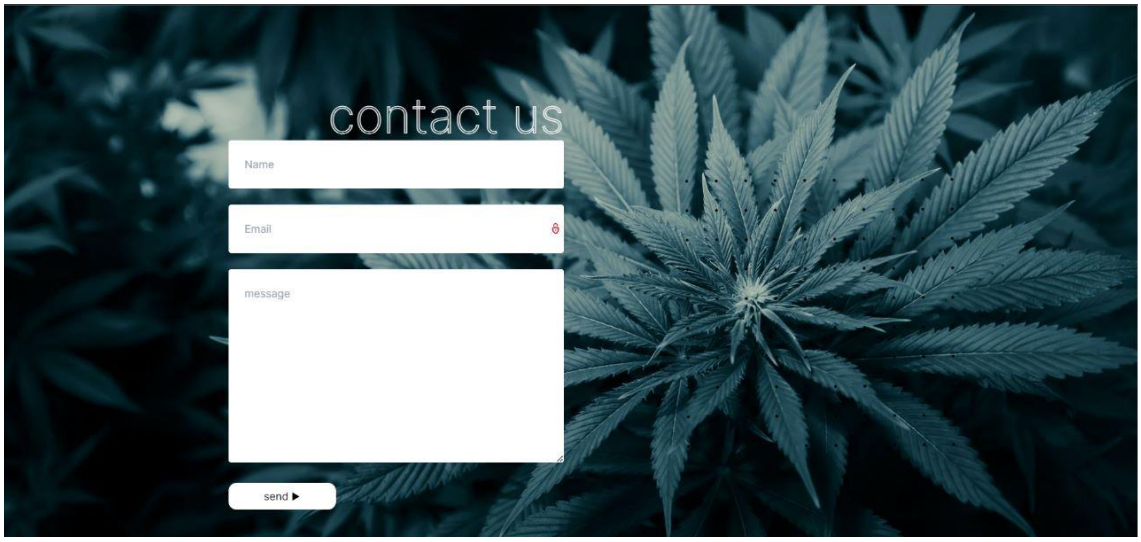



Sign up (Figure 4.3)

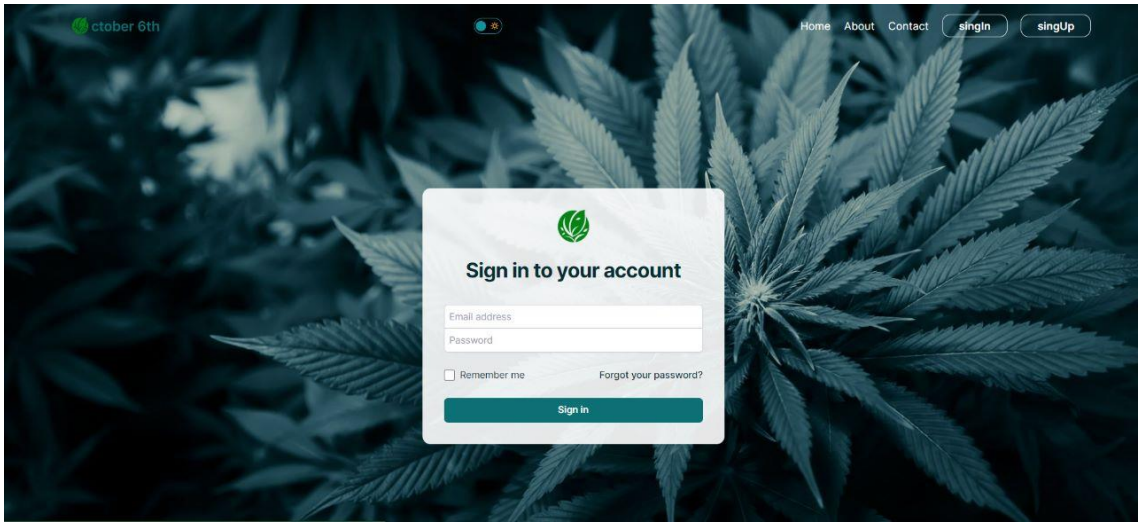



Calculate (Figure 4.4)

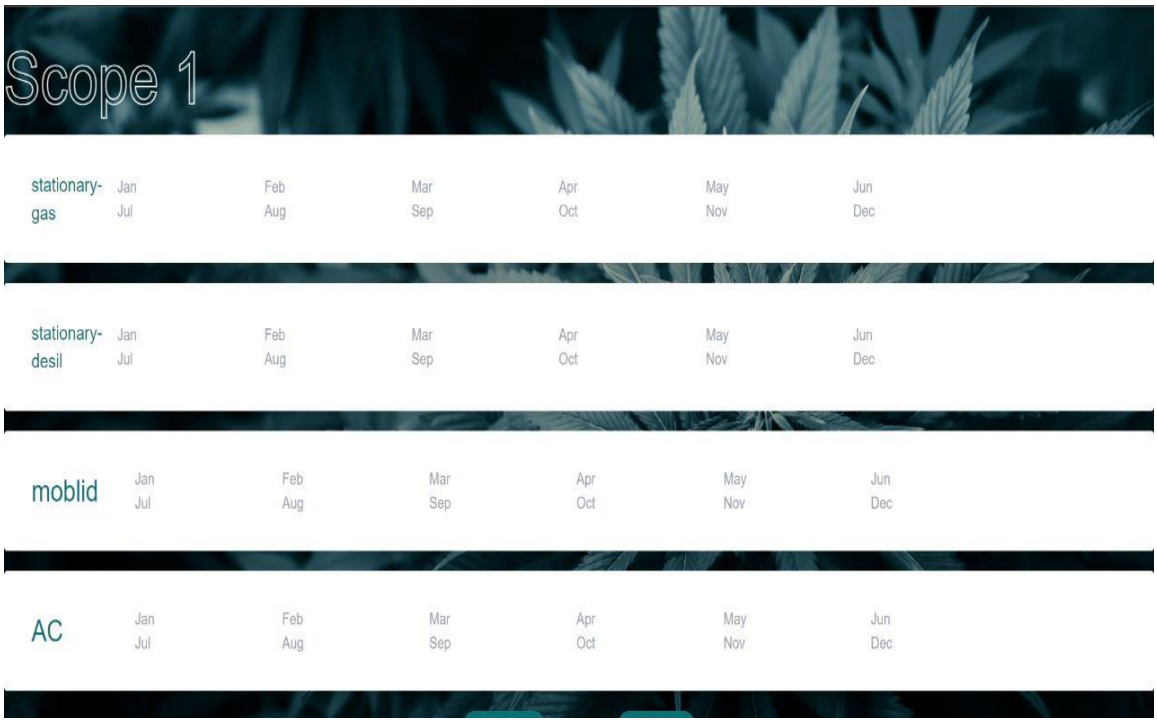

About (Figure 4.5)



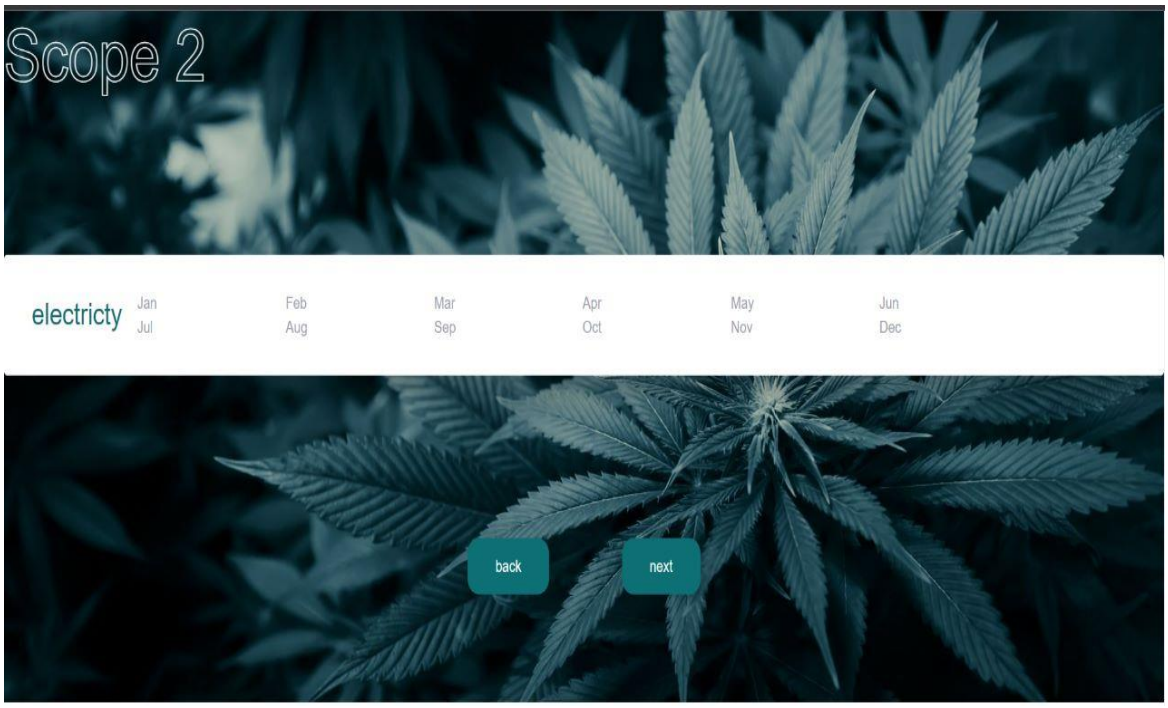

Contact Us (Figure 4.6)



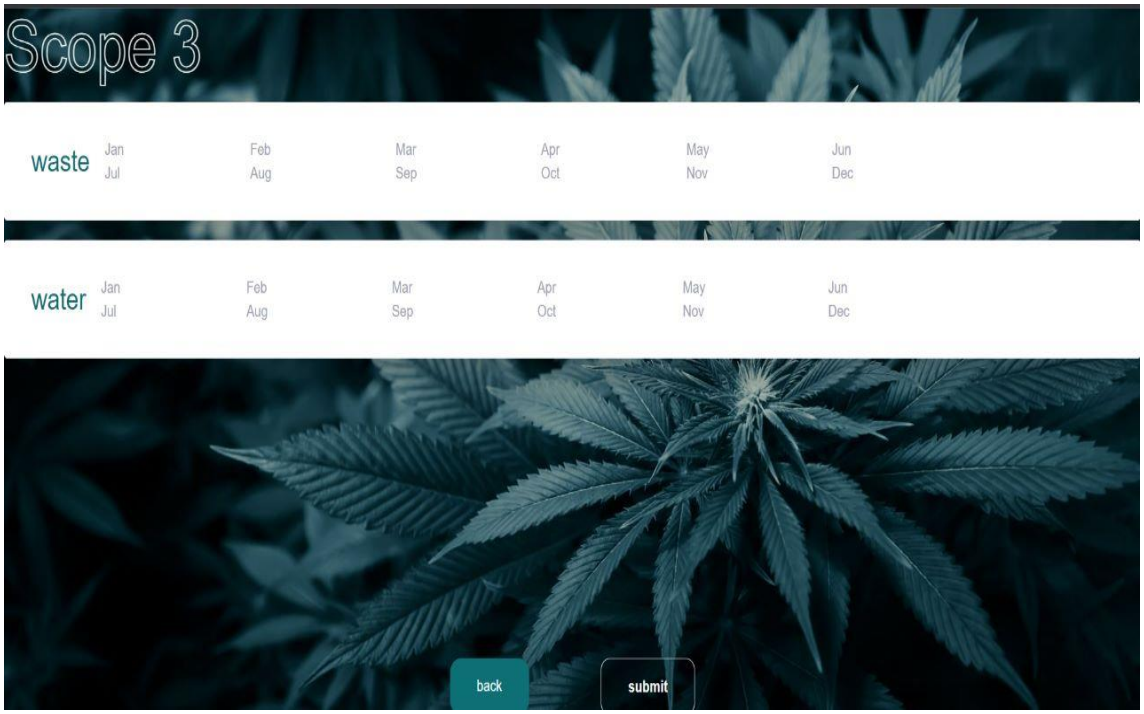

Sign in (Figure 4.7)




Scope 1(Figure 4.8)




Scope 2(Figure 4.9)




Scope 3 (Figure 4.10)

# Chapter 6: Conclusion

## Conclusion

Reducing carbon footprint in universities is critical to addressing the global challenge of climate change. Universities play a vital role in addressing this challenge by educating students, conducting research, and leading by example through sustainable practices. By implementing initiatives to measure and reduce energy consumption and GHG emissions, universities can make a significant impact on the environment and promote long-term behavior change.

In order to effectively reduce carbon footprint in universities, a comprehensive approach is needed that includes initiatives such as energy efficiency upgrades, renewable energy projects, sustainable transportation options, and waste reduction programs. Additionally, the use of technology and software, such as energy management systems, carbon footprint calculators, sustainable transportation tracking systems, and waste management systems, can help universities to track and monitor energy consumption, GHG emissions, and sustainability initiatives in real-time.

By working together to reduce carbon footprint in universities, students, staff, and faculty can create a more sustainable future and set an example for the rest of society to follow. By educating students and engaging the entire university community in sustainability efforts, universities can make a lasting impact on the environment and help to build a more sustainable future for generations to come.

# Chapter 7: Future Work

## Future Work

There is a growing need for continued research and action in reducing the carbon footprint of universities. Here are some areas for future work in this field:

1. Technology advancements: The continued development of new technologies and software will provide universities with new and innovative ways to measure and reduce their carbon footprint. For example, advancements in smart building technology, renewable energy, and energy storage systems will provide universities with new tools to reduce energy consumption and GHG emissions.

2. Collaboration: Universities should continue to collaborate with external organizations, such as governmental agencies and industry partners, to increase the impact of sustainability initiatives and share best practices.

3. Education and outreach: Universities should continue to educate students and engage the entire university community in sustainability efforts, promoting long-term behavior change and encouraging students to take action to reduce their own carbon footprint.

4. Carbon offset initiatives: Universities should explore carbon offset initiatives, such as purchasing carbon credits or investing in reforestation projects, to offset their GHG emissions and promote sustainable development.

5. Long-term planning: Universities should develop and implement long-term sustainability plans to ensure continued progress towards reducing carbon footprint and promoting sustainable practices.

By continuing to work towards reducing their carbon footprint, universities can play a crucial role in addressing the global challenge of climate change and lead by example in promoting sustainable development. By investing in new technologies, collaborating with external organizations, and engaging the university community, universities can make a lasting impact on the environment and help to build a more sustainable future for generations to come.

6. In the future, it is essential for administrators and responsible individuals to record data with utmost clarity and transparency to accurately calculate the carbon footprint.

## References


1- https://nodejs.org/en/docs

2- https://www.w3schools.com

3- https://tailwindcss.com

4- https://www.npmjs.com

5- https://www.mongodb.com

6- https://nextjs.org/docs

7- https://ghgprotocol.org/corporate-standard

8- https://www.carbonfootprint.com/calculator.aspx

# Appendices

## Appendix A (Frontend Implementation)

### 1- Home Page:

```
return (
  <section className="p-5 flex flex-col">
    <main className="container   w-full min-h-screen  flex flex-col mx-auto   text-center md:text-left">
      <div className=" h-full  flex-1 flex justify-between flex-col items-center  w-full lg:flex-row">
        <motion.div
          initial={{ opacity: 0, x: -100 }}
          whileInView={{ opacity: 1, x: 0 }}
          transition={{ delay: 0.3 }}
          className="left flex-1  h-full  flex flex-col justify-center items-center gap-5  md:items-start "
        >
          <h1 className="gradient text-4xl sm:text-5xl md:text-6xl font-bold ■text-white ">
            Welcome to <br />
            October 6th
            <br /> UNIVERSITY.
          </h1>
          <h2 className="my-3 text-3xl text-transparent stroke md:text-5xl sm:text-4xl font-black tracking-wider  ">
            CARBON FOOTPRINT
          </h2>
          <q className=" text-lg ■text-white ">
            Your Solution For Cutting Carbon And Caring For The Climate
          </q>
          <Link
            href="/calc"
            className=" px-9 py-3 flex gap-2 border-[1px] font-semibold  rounded-xl □hover:text-black ■text-white ■hover:bg-mainco
          >
            calculate <AiOutlineLogin className="text-3xl" />
          </Link>
        </motion.div>
        <div className=" flex-1 container h-screen z-[-1] ">
          <Canvas camera={{ fov: 25, position: [0, 0, 9] }}>
            <OrbitControls enableZoom={false} />
            <ambientLight intensity={0.2} />
            <directionalLight position={[0, 0, 0]} />
            <Sphere args={[1, 200, 100]} scale={1.5} position={[0, 0, -3]}>
              <MeshDistortMaterial
                color="#05161a"
                attach="material"
```

(Figure 5.1)

2- Results:

```
"use client";
import Link from "next/link";
import React, { useState, useEffect } from "react";
import axios from "axios";
import { motion, spring } from "framer-motion";

export const metadata = {
  title: "Result",
  description: "your carbon footprint Result",
};

function page() {
  const [data, setData] = useState([]);

  useEffect(() => {
    axios
      .get("/result.json")
      .then((response) => {
        setData(response.data.items);
      })
      .catch((error) => {
        console.error(error);
      });
  }, []);

  // Calculate the total emission by summing up the result values of each item
  const totalEmission = data.reduce((total, item) => total + item.result, 0);

  return (
    <section className="container min-h-screen mx-auto w-full text-white ">
      <h1 className="text-4xl my-5 text-center font-extrabold gradient">
        Your Carbon Footprint:
      </h1>
      <div className="flex justify-between flex-col md:flex-row gap-5">
        <motion.div
          whileHover={{ scale: 1.1 }}
          animate={{ x: 0, opacity: 1 }}
```

(Figure5.2 )

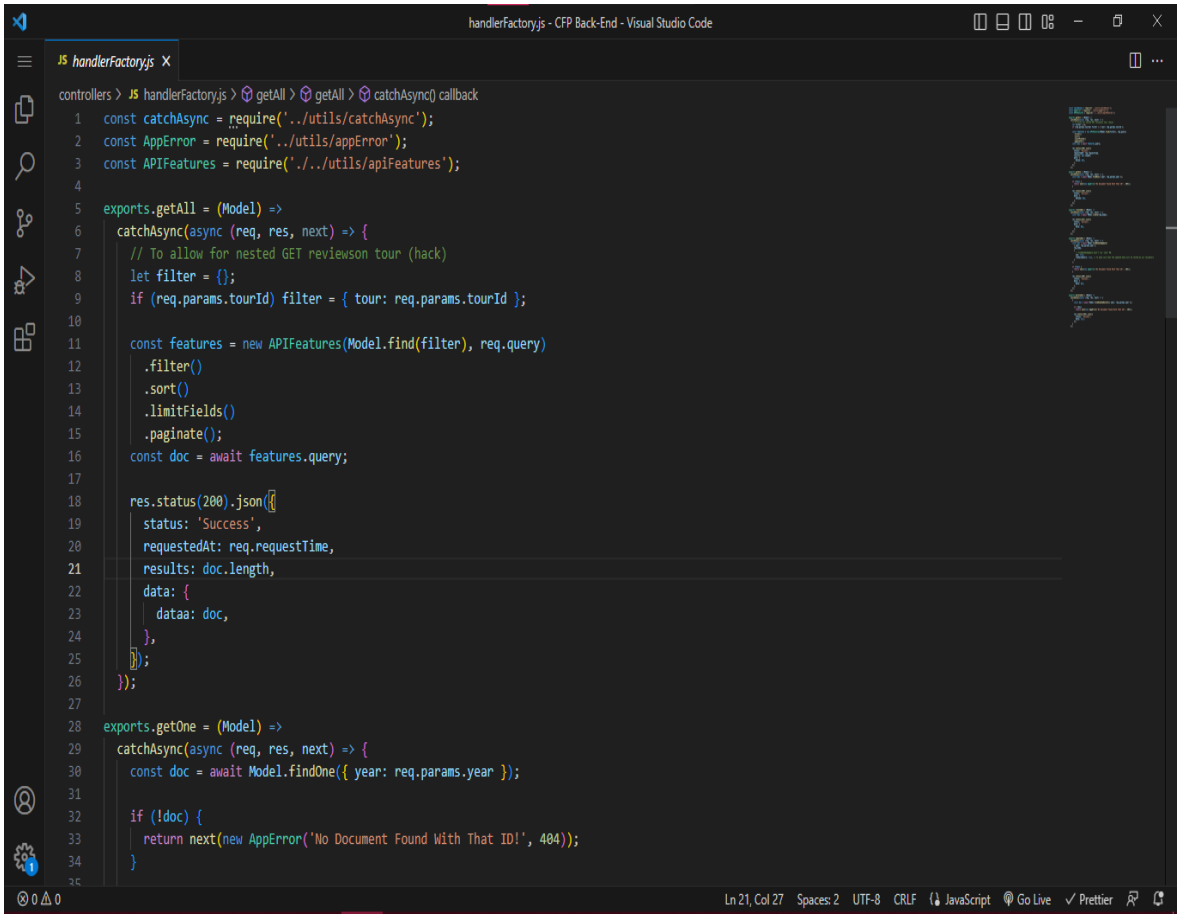
3- 3D Component:

```jsx
/*
Auto-generated by: https://github.com/pmndrs/gltfjsx
Command: npx gltfjsx@6.1.4 Arrow.gltf --transform
Author: aidanp (https://sketchfab.com/bionic_leaf)
License: CC-BY-4.0 (http://creativecommons.org/licenses/by/4.0/)
Source: https://sketchfab.com/3d-models/jumpboost-arrow-fad95c37aaa240e49377edcfe2552ee7
Title: Jump/Boost Arrow
*/

import React, { useRef } from "react";
import { useGLTF } from "@react-three/drei";

export default function Model(props) {
  const { nodes, materials } = useGLTF("/Arrow-transformed.glb");
  return (
    <group {...props} dispose={null} scale={0.015}>
      <mesh
        geometry={nodes.Cube__0.geometry}
        material={materials["Scene_-_Root"]}
        rotation={[-Math.PI / -2, 0, 0]}
        scale={100}
      />
    </group>
  );
}

useGLTF.preload("/Arrow-transformed.glb");
```

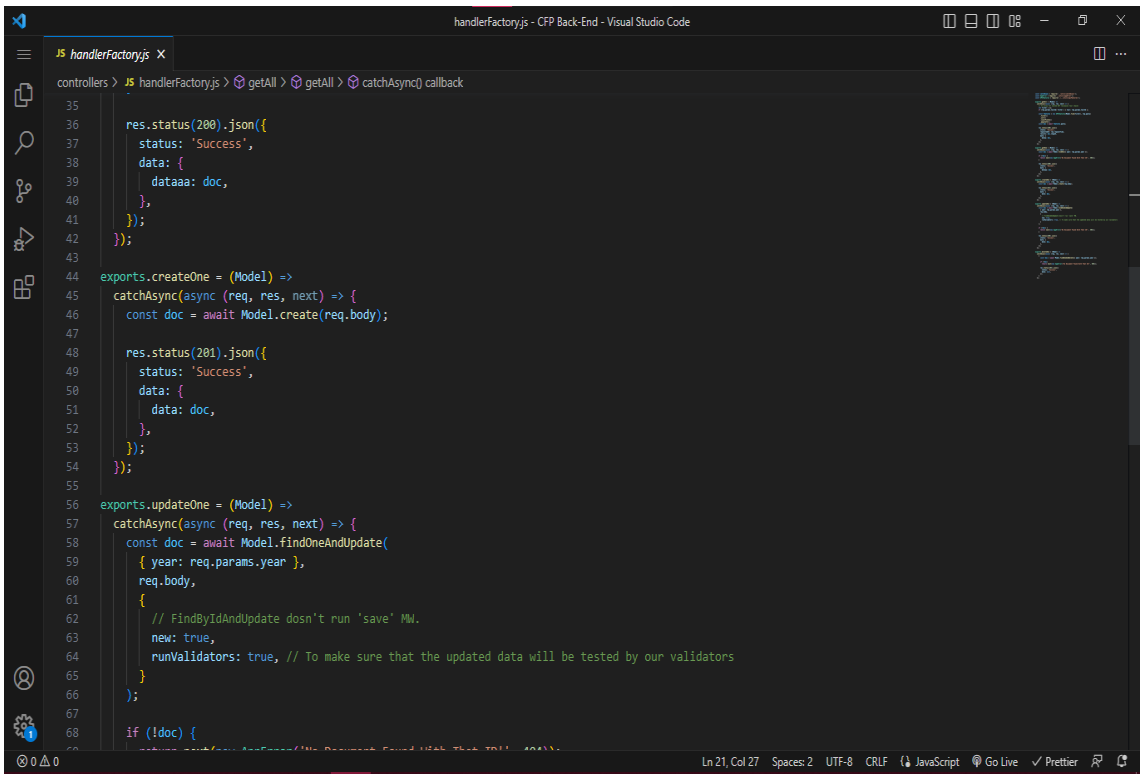
(Figure 5.3)

## Appendix B (Backend Implementation)

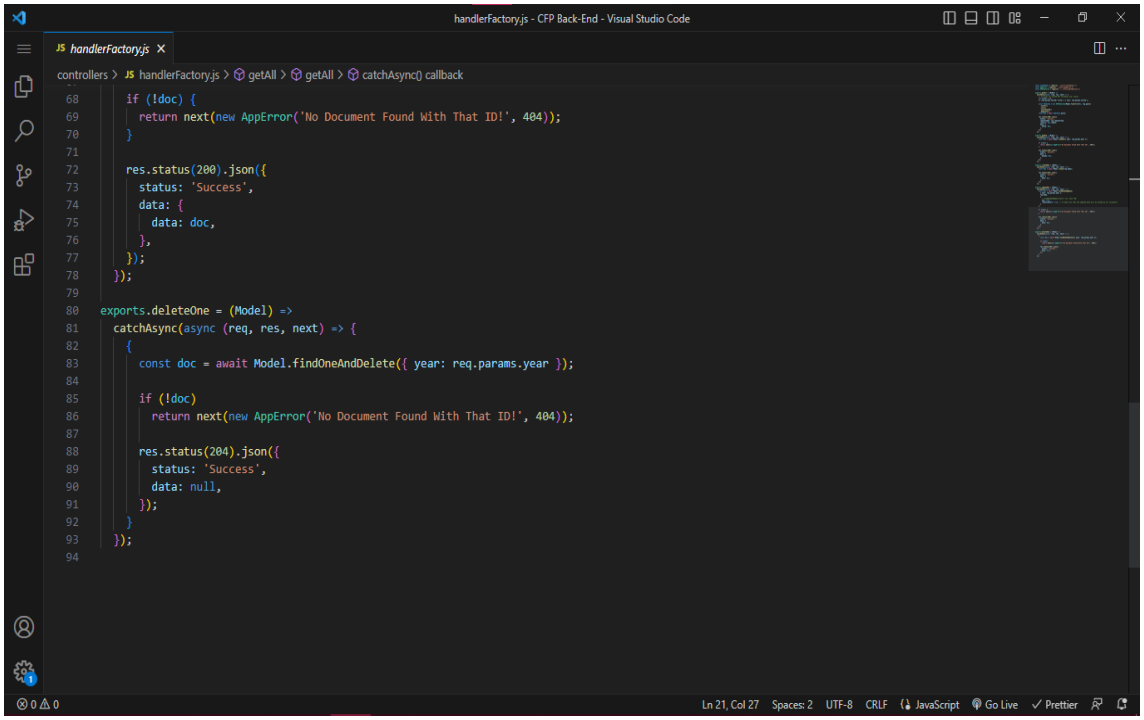
### 1- Handler Factor :




(Figure 6.1)

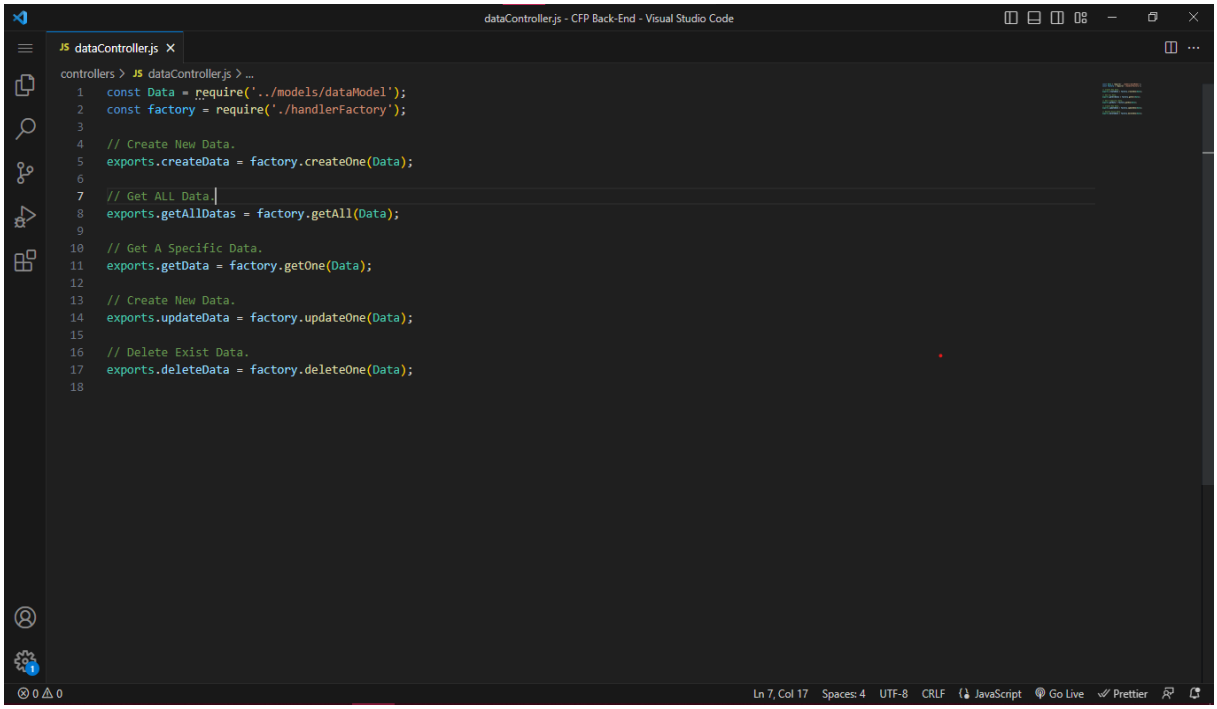



(Figure 6.1.1)



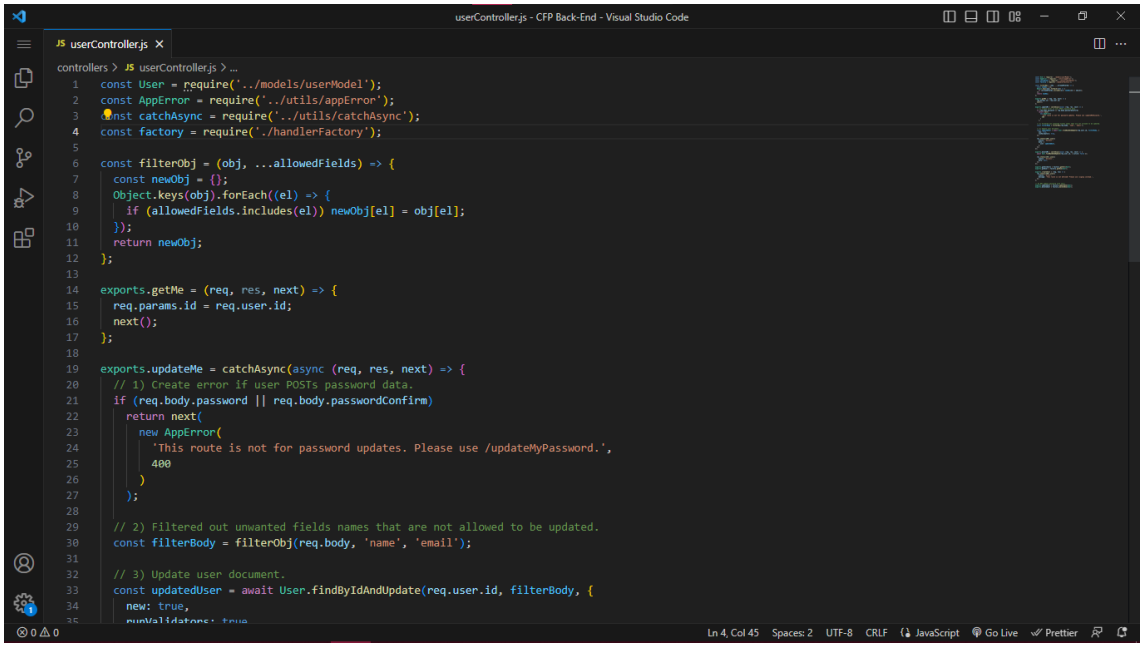

(Figure 6.1.2)

## 2- Data Controller:

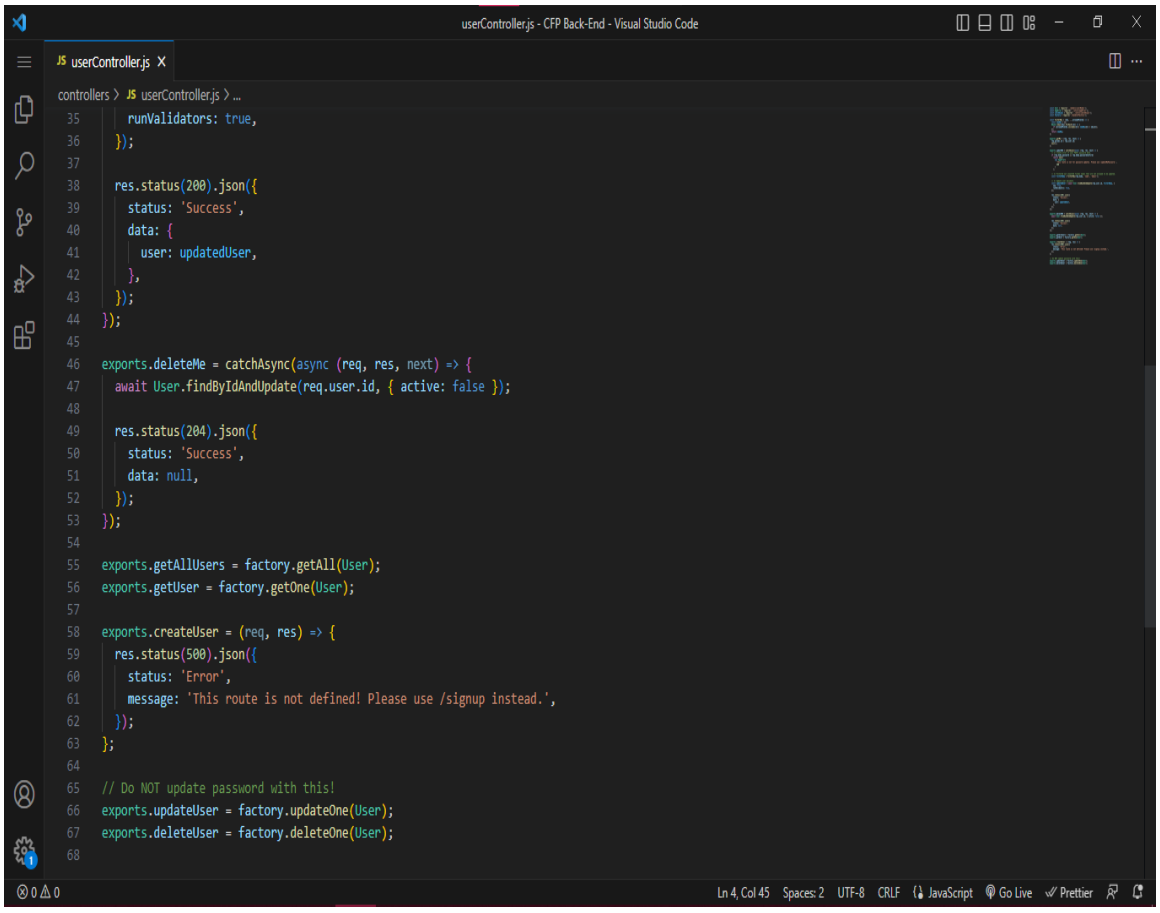



(Figure 6.2)

## 3- User Controller:

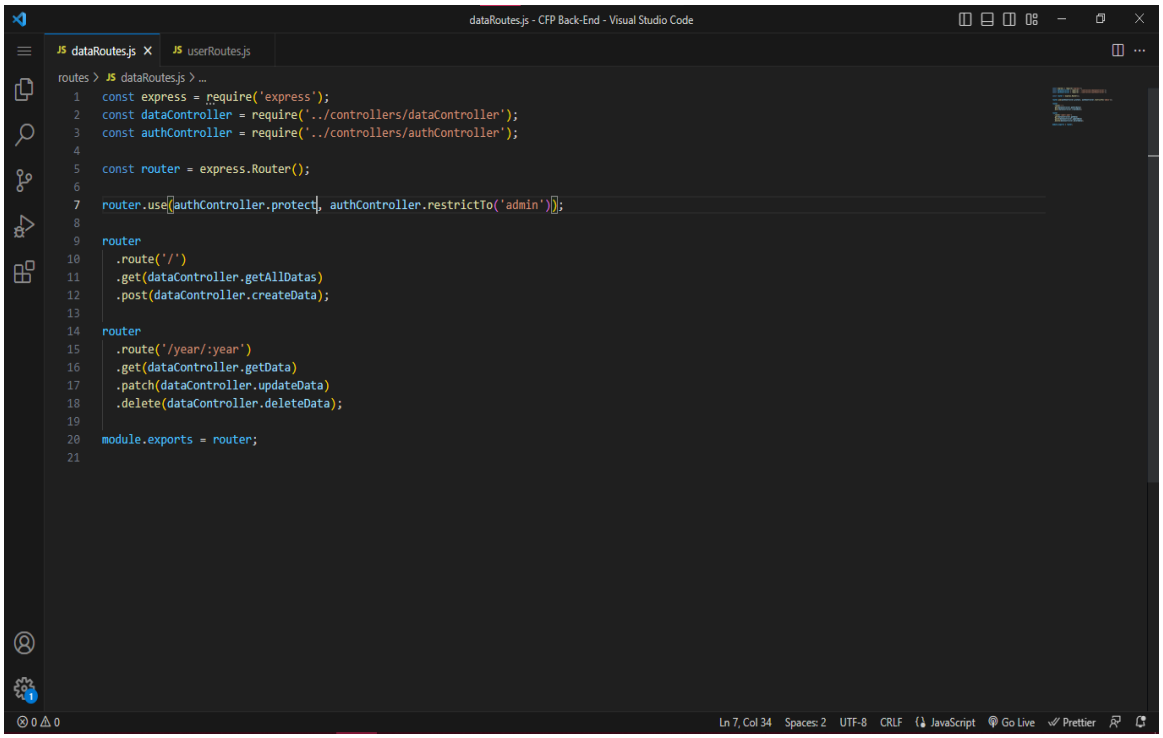



(Figure 6.3)



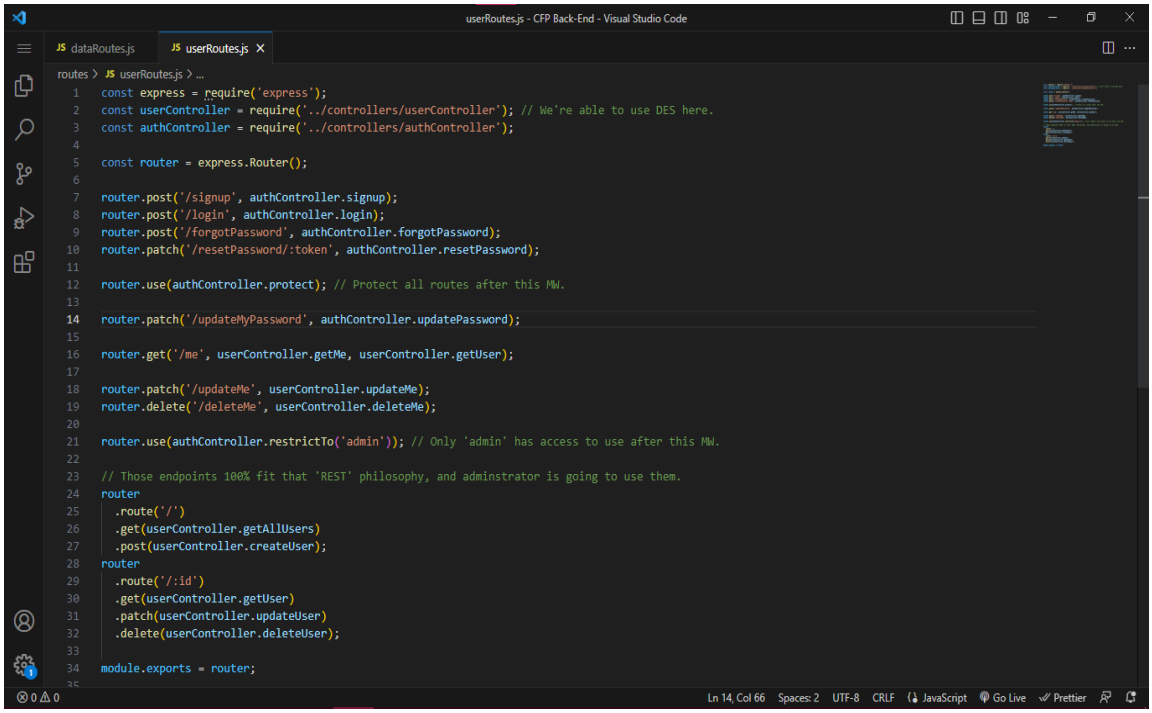

(Figure 6.3.1)

## 4- Data Routes:




(Figure 6.4)

## 5- User Routes:




(Figure 6.5)

الملخص :

تشير البصمة الكربونية إلى الكمية الإجمالية لانبعاثات الغازات المسببة للإحتباس الحراري التي تم إنشاؤها بواسطة فرد أو منظمة أو حدث يساهم في تغير المناخ يتم حسابه من خلال النظر في جميع مصادر ثاني أكسيد الكربون ، بما في ذلك حرق الوقود الأحفوري للطاقة والنقل ، العمليات الصناعية وإزالة الغابات.

في سياق الجامعة :

يمكن أن تنتج الانبعاثات الكربونية من مجموعة متنوعة من الأنشطة ، بما في ذلك تدفئة وتبريد المباني ، واستخدام الكهرباء ، ونقل الطلاب والموظفين ، والموارد، والتخلص من المواد الغذائية والإمدادات.

تعد البصمة الكربونية مهمة لتعزيز الإستدامة والتخفيف من الآثار السلبية لتغير المناخ.

هناك طرق مختلفة لتقليل نسبة الانبعاثات الكربونية للجامعة ، بما في ذلك تدابير كفاءة الطاقة ، واعتمادها لمصادر الطاقة المتجددة ، وتعزيز النقل المستدام بالإضافة إلى ذلك ، يمكن للجامعات المشاركة في لمبادرات التعليمية والبحثية التي ترفع الوعي بأهمية الحد من انبعاثات الكربون وتعزيز الاستدامة.

ختاماً،

يعد الحد من الانبعاثات الكربونية للجامعة خطوة حاسمة نحو إنشاء مستقبل أكثر استدامة وصديقًا للبيئة ، والجامعات تلعب دور حاسم في تعزيز الاستدامة والتخفيف من آثار المناخ.