

Carbo Neutral

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Abstract – The surge in transportation, rapid population growth, and industrialization has led to a notable escalation in atmospheric carbon levels. While transportation, industrialization, and technological advancements have bestowed benefits upon modern society, they concurrently pose significant concerns by contributing to carbon footprint generation.

A carbon footprint serves as a metric to quantify the total greenhouse gas emissions, predominantly carbon dioxide, attributable to individuals, organizations, or activities within a specified timeframe. This metric, typically expressed in metric tons of carbon dioxide equivalent (CO₂e), underscores the environmental impact of human actions.

The potential environmental impact of the digital technologies themselves. While digital management strategies offer promising avenues for carbon footprint reduction, the manufacturing, operation, and disposal of digital devices and infrastructure also contribute to carbon emissions.

Keywords: Survey Assessment, Company and Individual Calculator, Print Report.

I. INTRODUCTION

A carbon calculator is a digital tool designed to quantify an individual's or organization's carbon footprint by assessing their energy consumption, transportation habits, and other activities contributing to greenhouse gas emissions.

The CarboNeutral application represents a proactive solution aimed at assisting organizations in curtailing their carbon footprints, thereby fostering an environmentally friendly business ecosystem.[1]

It helps you understand how much you affect the environment, whether you're a person or a group like a company. This knowledge helps you find ways to do better for the environment and make changes to be more sustainable.

The calculation and mitigation of one's carbon footprint have emerged as crucial elements in fostering environmental consciousness and promoting sustainable living practices.[3]

A. Aim

The aim of a carbon calculator is to raise awareness about carbon emissions and their environmental impact. By quantifying carbon footprints, the calculator encourages individuals and organizations to adopt eco-friendly behaviors, reduce energy consumption, and mitigate climate change.

B. Objectives

- Quantify carbon emissions: The primary objective is to accurately assess carbon footprints by analyzing energy usage, transportation, and other activities.
- Raise awareness: Educate users about the environmental consequences of their actions and encourage behavioral changes to reduce carbon emissions.
- Facilitate decision-making: Provide users with actionable insights and suggestions to help them make informed choices that minimize their carbon footprint.

C. Features

- Real Time Calculation
- User Friendly Interface
- Factors of carbon emission
- Survey Assessment
- Report Generation

II. LITERATURE SURVEY

A Study of Carbon Footprint in an Educational Institution in India likely examines the carbon footprint of a specific educational institution in India, focusing on aspects such as energy usage, waste management, transportation, and overall environmental impact. It probably aims to provide insights into the institution's contribution to carbon emissions and suggests potential strategies for reducing its environmental footprint.-302

Carbon Footprint: Causes, Impacts and Sector-Wise Survey likely provides an overview of the causes and impacts of carbon footprint, along with a sector-wise survey to analyze carbon emissions across various industries or sectors. It might explore the sources of carbon emissions, their environmental and economic impacts, and strategies for mitigation.

"Carbon Footprint Innovation through Environmental Information Management" likely explores the role of environmental information management in fostering innovation to reduce carbon footprint. It may discuss how organizations can utilize data and information management strategies to identify opportunities for carbon footprint reduction, optimize resource usage, and implement sustainable practices. The paper might also highlight case studies or examples of innovative approaches to carbon footprint reduction driven by effective environmental information management.

Reduction of Carbon Footprint: "Digital Management Strategies" likely examines the use of digital management strategies to reduce carbon footprint. It probably discusses how digital technologies, such as data analytics, artificial intelligence, and Internet of Things (IoT), can be leveraged to optimize resource usage, enhance energy efficiency, and mitigate carbon emissions in various sectors. The paper may also explore case studies or examples of successful implementation of digital management strategies for carbon footprint reduction.

"A Prediction Model for CO2 Emission from Manufacturing Industry and Construction in Malaysia" likely presents a model aimed at forecasting carbon dioxide emissions from the manufacturing industry and construction sector in Malaysia. It probably involves analyzing various factors such as industrial activity, energy consumption, production processes, and construction projects to develop a predictive tool for estimating CO2 emissions.

"Enhancing User Experience in Carbon Footprint Calculators: A Comparative Analysis of Features and Functionality" by Patel and Kumar (2021) This research paper presents a specialized carbon footprint calculator tailored to the needs of businesses and organizations. Incorporates advanced functionalities for assessing emissions across various operational activities.

The study emphasizes the importance of survey assessments in validating calculator accuracy and enhancing user engagement. It also discusses the potential for integrating individual-level carbon footprint assessments within company-level sustainability initiatives to promote holistic environmental responsibility

AUTHORS	PAPER	PROBLEM
R-Rahul,J Selvakumar ,R.Pradip Kumar,S Krishnaprabha	"A Study of Carbon Footprint in an Educational Institution in India"	Availability and accuracy of data related to energy consumption, waste generation, and other carbon footprint components can be a significant limitation. In some cases, data may be estimated or based on rough averages, which can introduce uncertainty.
Parth Wadke, Vivek Gonal, Divesh Watwani	"Carbon Footprint: Causes, Impacts, and Sector-Wise Survey"	Complex systems like institutions can be challenging to model accurately. Assumptions and simplifications may be necessary, but they can introduce uncertainty and potentially skew the results.
I.A. Stepanovskaya	"Reduction of Carbon Footprint: -Digital Management Strategies"	Without comparative data from similar institutions, it may be challenging to assess how the institution's carbon footprint compares to peers or industry
Babis Theodoulidis, David Diaz, Mohamed Zaki	"Carbon Footprint Innovation through Environmental Information Management"	The climate and region in which the institution is located can have a substantial impact. For instance, a location with a milder climate may have different energy consumption patterns compared to one with extreme temperatures.

III. ARCHITECTURE

A. Problem Statement/ Definition

Building a Carbo-Neutral Application for Environmental Sustainability. The carbon footprint revolves around the escalating levels of greenhouse gas emissions and their profound impact on the Earth's climate system. Things people do, like burning fossil fuels for energy, cutting down trees, and running factories, have caused a big increase in gases like carbon dioxide in the air warm up the Earth.

This surge is driving global temperatures to unprecedented heights, resulting in erratic weather patterns, rising sea levels, and disruptions to ecosystems worldwide. The lack of consideration for the carbon footprint associated with virtual or online learning platforms. With the increasing prevalence of digital education due to factors like the COVID-19 pandemic and advancements in technology, there's a significant carbon footprint associated with the use of digital devices, data centers, and internet infrastructure [1].

Our mission is to develop an innovative Carbo-Neutral application to combat carbon emissions and foster eco-friendly practices. Limited focus on emerging sectors or technologies with potential for significant carbon footprint reduction. With advancements in renewable energy, sustainable agriculture, transportation, and other sectors, there are new opportunities to reduce carbon emissions [2]. This application will serve as a crucial tool for individuals and organizations to understand and reduce their carbon footprint across key areas such as transportation, energy usage, and dietary habits. Through comprehensive ratings and analytics, users will gain insights into the environmental impact of their daily activities. By quantifying carbon emissions and providing personalized recommendations, the application will empower users to make informed decisions that align with their commitment to sustainability.

B. Proposed Architecture

First, the mentor picked a project called CarboNeutral. Then, our team talked about which software to use, how to design it, what features it should have, and many other details for our project.

We started to:

- Collect and analyze data on the topic
- Prepared the flowchart
- Started on the code according to the algorithm and flowchart
- Compiled the code and eliminated any errors
- Compiled the code again and checked the output
- Presenting the project to the guide/mentor for confirmation
- Edited and revised the project

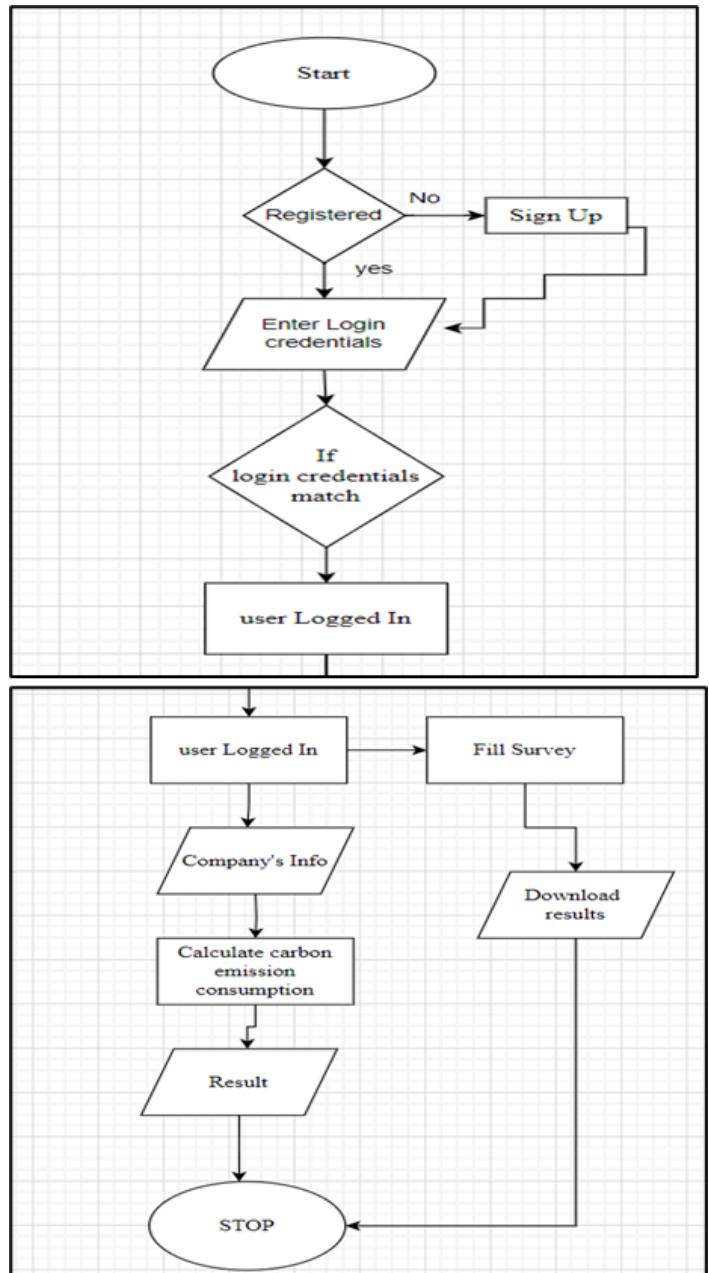


Fig1: Flow Chart

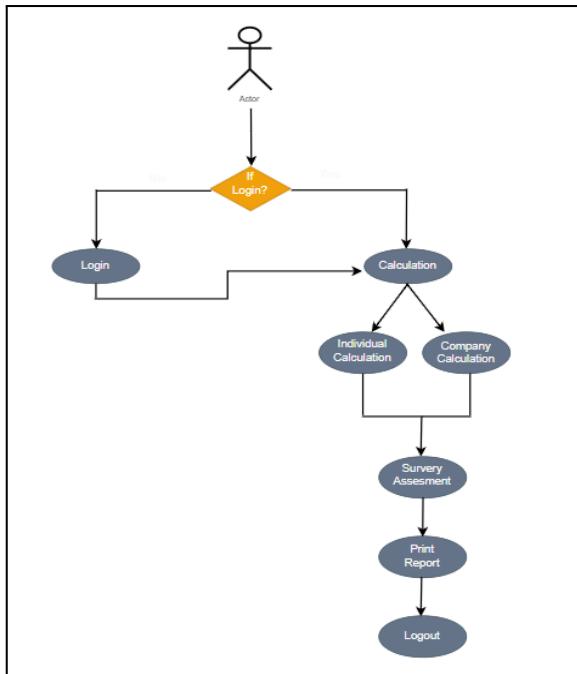


Fig2: Use case Diagram

IV. METHODOLOGY

- Analysis of Previous Papers:**

Conducted a thorough review and analysis of existing research papers and studies related to carbon emissions, environmental impact assessments, and sustainability practices. This helped in gaining insights into current methodologies, trends, and challenges in carbon emission calculations and mitigation strategies.

- Study of Terms and Criteria for CO2 Emission Factors:**

Researched and studied the various terms, methodologies, and criteria used for calculating CO2 emission factors in different countries and regions. This involved understanding factors such as energy consumption, transportation modes, industrial processes, and renewable energy sources that contribute to carbon emissions.

- Declaration of Country-Specific Factors for CO2 Emission Calculation:**

Identified and declared specific factors and parameters relevant to each country or region for accurate calculation of CO2 emissions. This included considering factors such as energy production methods, transportation infrastructure, industrial activities, and policy regulations governing carbon emissions.

- Creation of Surveys for Companies to Generate CO2 Emission Reports:**

Developed comprehensive surveys and assessment tools for companies to collect data on their carbon emissions across various operations and activities. These surveys were designed to capture detailed information on energy usage, transportation practices, waste management, and other factors contributing to carbon footprint.

- Implementation of Authentication for Company's CO2 Calculations and Reports:**

Implemented robust authentication mechanisms to ensure the accuracy and integrity of company-reported CO2 emissions data. This involved verifying the authenticity of data submissions, validating the identity of participating companies, and safeguarding against fraudulent or misleading information.

- Development of Individual Calculator for Users to Calculate CO2 Emissions:**

Created user-friendly calculators within the CarbonNeutral app for individuals to estimate their personal carbon footprint based on various factors such as fuel consumption, energy usage, and lifestyle choices. These calculators provided personalized insights and recommendations for reducing carbon emissions through sustainable practices.

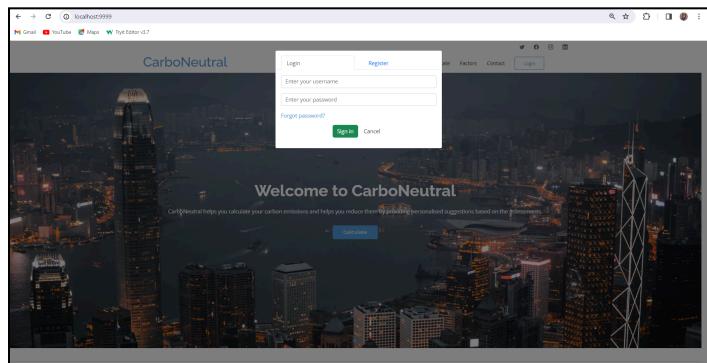


Fig 3.1 Login Page

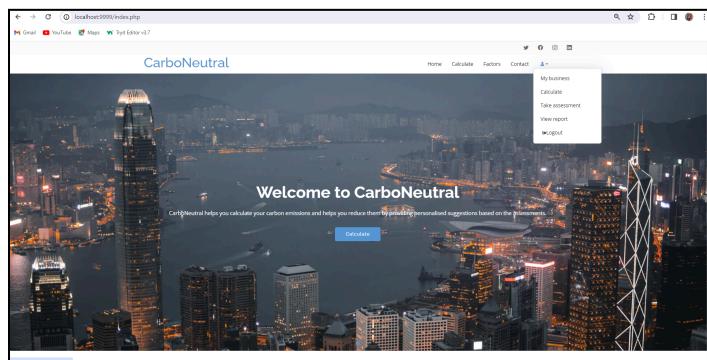


Fig 3.2 Home Page

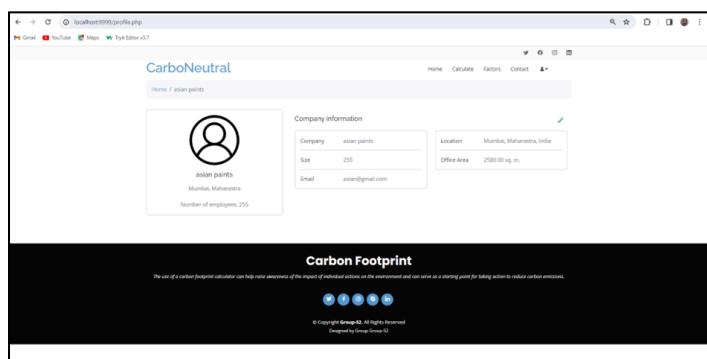


Fig 3.3 Profile Page

CALCULATOR

Business Name: Asian paints
Business Email: asianpaints@gmail.com
Business Size (number of employees): 255
Business Location: India
Business Type: paint and decor
Business Industry: paint and decor
Energy Usage: 500
Water Usage: 50
Waste Generated: 200
Fuel used: 80

Carbon Footprint
The use of a carbon footprint calculator can help raise awareness of the impact of individual actions on the environment and can serve as a starting point for taking action to reduce carbon emissions.

The carbon emitted by your organization is 2040689.35 lbs

Fig 3.4 Company Co2 Calculator

Assessments - Carboneutral - Google Chrome

about:blank

Assessment report

Ratings

Packaging: 20%
Resources: 10%
Shipping: 80%
Waste management: 20%
Water usage: 80%

Areas which need improvement

- Packaging
- Waste management

Suggestions for improvement

Packaging: Reduce packaging material. The first step in making packaging more environmentally friendly is to reduce the amount of packaging material used. This can be achieved by using thinner, lighter-weight materials, and by eliminating unnecessary packaging.

Resources: Implement paperless systems whenever possible, such as electronic invoicing, digital record keeping, and online communication. Use recycled paper for printing and limit the use of unnecessary paper.

Shipping: Consider the entire lifecycle when designing packaging. It is important to consider the entire manufacturing process, from raw material extraction to disposal. This includes the environmental impact of the manufacturing process, transportation, and end-of-life disposal options.

Waste management: Reduce organic waste. Composting organic waste, such as food scraps, can reduce the amount of waste sent to landfills and create nutrient-rich soil for gardening or landscaping.

Company information

- Company name: Asian paints
- Number of employees: 255
- Organization type: Manufacturer & products manufacturer
- Address: 1048-3024

How is it calculated?

The ratings are calculated based on the responses you have given while taking the assessment. Every answer has a particular value.

Suggestions for improvement

Packaging

- Reduce packaging material: The first step in making packaging more environmentally friendly is to reduce the amount of packaging material used. This can be achieved by using thinner, lighter-weight materials,

Fig 3.7 Assessments Report

CarboNeutral

ASSESSMENT FOR ASIAN PAINTS

Choose the answer that best describes your organization.

Questions	Options
Which material is used for packaging?	Option 1: Paper Option 2: Board Option 3: Plastic Option 4: Thermocol
How do the orders shipped?	Option 1: Vehicles Option 2: Fuel-based vehicles Option 3: Ship / water ways Option 4: Always
Are the products made out of recycled goods and also recycled back?	Option 1: Yes Option 2: No Option 3: Not sure Option 4: Never thought of it
Is there any policy for minimizing water usage in production?	Option 1: Yes Option 2: No Option 3: Not sure Option 4: Never thought of it
What are the paper products made from?	Option 1: Bamboo Option 2: Tissue Option 3: Wood pulp Option 4: Recycled
Is there any promotion for sustainable programs?	Option 1: Yes Option 2: No Option 3: Not sure Option 4: Never thought of it

Submit

Fig 3.5 Assessments Page

FUEL CALCULATOR

Name: Your Name
Email: Your Email
Fuel Name: Petrol (l)
Fuel used: Fuel usage

Ratings

General: 20%
Packaging: 10%
Resources: 80%
Shipping: 80%
Waste management: 20%
Water usage: 80%

Company information

Company name: Asian paints
Number of employees: 255
Organization type: Manufacturer & products manufacturer
Date: 1048-3024

How is it calculated?

The ratings are calculated based on the responses you have given while taking the assessment. Every answer has a particular value.

Fig 3.8 Fuel Co2 Calculator

ELECTRICITY CALCULATOR

Name: Your Name
Email: Your Email
Electricity Value: Electricity usage
Electricity Unit: KWh

Calculate

Fig 3.9 Electricity Co2 Calculator

CarboNeutral

Assessment report

Ratings

General: 20%
Packaging: 10%
Resources: 80%
Shipping: 80%
Waste management: 20%
Water usage: 80%

Areas which need improvement

- General
- Packaging
- Waste management

Suggestions for improvement

Packaging

Reduce packaging material. The first step in making packaging more environmentally friendly is to reduce the amount of packaging material used. This can be achieved by using thinner, lighter-weight materials, and by eliminating unnecessary packaging.

Consider the entire lifecycle when designing packaging. One way to do this is to use materials that can be recycled or composted, such as paper, cardboards, or bioplastics.

Resources

Implement paperless systems whenever possible, such as electronic invoicing, digital record keeping, and online communication. Use recycled paper for printing and limit the use of unnecessary paper.

Shipping

Consider the entire lifecycle when designing packaging. It is important to consider the entire manufacturing process, from raw material extraction to disposal. This includes the environmental impact of the manufacturing process, transportation, and end-of-life disposal options.

Waste management

Reduce organic waste. Composting organic waste, such as food scraps, can reduce the amount of waste sent to landfills and create nutrient-rich soil for gardening or landscaping.

Water usage

Consider the entire lifecycle when designing packaging. It is important to consider the entire manufacturing process, from raw material extraction to disposal. This includes the environmental impact of the manufacturing process, transportation, and end-of-life disposal options.

Carbon Footprint

The use of a carbon footprint calculator can help raise awareness of the impact of individual actions on the environment and can serve as a starting point for taking action to reduce carbon emissions.

Fig 3.6 Assessments Output

V. ACKNOWLEDGEMENTS

We want to extend our heartfelt gratitude to everyone who helped and supported us in planning our project smoothly and successfully.

Special thanks to Mrs. Priti Joshi, a faculty member of Computer Engineering at V.E.S. Institute of Technology, for her guidance. We sincerely appreciate her for generously sharing her time and knowledge, which helped us grasp the planning process and ensured a systematic approach to our project on time.

VI. CONCLUSION

In conclusion, the Carbo-Neutral Application stands as a beacon of hope in our collective effort to combat climate change and create a more sustainable world. While the project shows immense promise, it's crucial to address several key areas to fully unlock its potential. Firstly, enhancing data accuracy and reliability is paramount. By ensuring that our calculations are precise and up-to-date, we can provide users with truly meaningful insights into their carbon footprint. Encouraging honest survey responses and expanding the scope of factors considered will further enrich the application's capabilities. We can offer tailored recommendations and inspire meaningful behavior change. Lastly, prioritizing accessibility and adoption ensures that our application reaches and empowers users from all walks of life. By designing a user-friendly interface and providing multilingual support, we can ensure that sustainability is truly for everyone. In essence, by addressing these key areas, the Carbon-Neutral Application has the potential to catalyze a global movement towards a greener, more sustainable future.

Having this semester dedicated to planning and organizing things systematically made it easier for us to plan and allowed us to have a clear strategic process.

VII. FUTURE SCOPE

Carbon calculators may be improved in the future by utilizing more accurate data sources and streamlining calculating techniques to increase accuracy. A more thorough picture of carbon sources and sinks could be provided by integration with GPS data, satellite images, and remote sensing technologies, enabling more precise evaluations of the carbon footprints of individuals and organizations. Furthermore, improvements in data science methods may make it possible to identify subtle elements affecting carbon emissions, which could result in more individualized suggestions for emission reduction plans. Furthermore, greater usability and accessibility via web and mobile applications may encourage wider use and involvement, enhancing the influence of carbon calculators in encouraging sustainable practices and reducing climate change

VIII. REFERENCES

- [1] R Rahul; J Selvakumar; R Pradip Kumar; S Krishnaprabha, "A Study of Carbon Footprint in an Educational Institution in India", Conference at Hyderabad, India.
- [2] Parth Wadke, Vivek Gonal, Divesh Watwani, Prithviraj Chavan, Sunita Sahu, "Carbon Footprint: Causes, Impacts and Sector-Wise Survey", Conference at Navi Mumbai, India
- [3] Babis Theodoulidis, David Diaz, Mohamed Zaki "Carbon Footprint Innovation through Environmental Information Management", Conference at San Jose, CA, USA.
- [4] I.A. Stepanovskaya, "Reduction of Carbon Footprint: Digital Management Strategies' ', Conference at Moscow, Russian Federation.
- [5] Tan Chun Ho, Sim Chong Keat Mohd Zubir Mat Jafri and Lim Hwee San, "A Prediction Model for CO2 Emission From Manufacturing Industry and Construction in Malaysia", International Conference on Space Science and Communication, 2015.