ESSAY
METHODOLOGY

CarbonWise

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CarbonWise

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I-INTRODUCTION

In the face of an escalating climate crisis, individuals, businesses, and governments are seeking new ways to reduce their environmental footprint. According to the International Energy Agency (IEA), transportation remains one of the largest contributors to greenhouse gas emissions, accounting for over a third of CO_2 emissions from end-use sectors (IEA, 2023). To achieve the Net Zero Scenario, significant reductions in emissions must be made by 2030, requiring a shift toward low-carbon travel alternatives such as public transport, cycling, and electric vehicles. However, the success of this transition depends not only on technological advancements but also on behavioral changes driven by awareness and accessibility to data.

One of the key challenges in tackling transportation emissions is the disparity in ecological responsibility. Historically, the burden of climate action has fallen disproportionately on individuals, while major corporations and high-income groups, who contribute the most to global emissions, often evade equivalent accountability (World Inequality Lab, 2022). Moreover, policies such as carbon taxes have sometimes placed a heavier financial strain on low- and middle-income households without effectively altering the consumption patterns of wealthier demographics. Addressing this imbalance requires tools that empower individuals while also encouraging systemic change at the corporate level.

To bridge this gap, we have developed a mobile application that allows users to measure, analyze, and reduce their transportation-related carbon footprint. Our solution provides real-time emission tracking, promotes sustainable mobility choices, and fosters an environmentally conscious culture among businesses and individuals alike. By integrating our platform into corporate sustainability strategies, we aim to create a ripple effect that extends beyond individual users, encouraging companies to take a more active role in reducing emissions.

This essay will explore the development process behind our application, detailing the methodology used to calculate emissions, the data-driven approach behind its functionality, and the business model designed to ensure its scalability and impact. Through this initiative, we hope to contribute to a more equitable and effective approach to climate action, where both individuals and institutions play a meaningful role in reducing global carbon emissions.

THE BUSINESS MODEL CANVAS

KEY PARTNERS

- Government institutions
- NGOs and philanthropic foundations
- Corporate sponsors
- Academic and research institutions

KEY ACTIVITIES

- Develop and update the calculator
- Promote the tool
- Educate SMEs
- Provide reports and training

KEY RESOURCES

- The calculator
- Emissions data from partners

VALUE PROPOSITIONS

- Free, easy-to-use tool
- Supports regulation compliance
- Improves business image
- Offers sustainability insights

CUSTOMER RELATIONSHIPS

- Support team (email/phone)
- Knowledge hub
- Webinars and workshops
- Community forum

CHANNELS

- Digital platform
- Social media
- NGO & government networks
- Referral programs

CUSTOMER SEGMENTS

- SMEs in Europe
  Especially those lacking sustainability tools

COST STRUCTURE

- don't know yet

REVENUE STREAMS

- don't know yet

2.1 Mission Statement

Our mission is to empower small and medium-sized enterprises with the necessary tools to understand, manage, and reduce their carbon footprint at no financial cost. By collaborating with governments, NGOs, and corporate partners, we strive to make sustainability accessible to all businesses, fostering a greener and more resilient economy. Through innovation and education, we aim to create lasting change, enabling SMEs to become active contributors to a sustainable future.

2.2. Target Group

Our business model focuses on providing small and medium enterprises (SMEs) across Europe with a free and accessible carbon footprint calculator. Recognizing that many SMEs lack the resources and expertise to measure and reduce their carbon emissions effectively, we aim to bridge this gap by offering a user-friendly and scientifically backed tool. By affiliating with government bodies, philanthropic foundations, and non-governmental organizations (NGOs), we ensure that our services remain free for SMEs while also aligning with global sustainability goals.

Our target group includes SMEs from various industries that contribute significantly to carbon emissions but may lack the financial capacity to invest in expensive sustainability solutions. By offering a free and effective carbon tracking tool, we empower businesses to take actionable steps towards reducing their environmental impact. Our solution aligns with the increasing demand for corporate social responsibility (CSR) compliance and regulatory requirements across Europe.

Looking ahead, as the demand for sustainable business practices continues to grow, our expansion plans include broadening our target audience to include SMEs in Europe. Given the region's increasing interest in sustainable development and emerging environmental regulations.

2.3 Key Activities

Our key activities revolve around the development, maintenance, and promotion of our carbon calculator. Ensuring the accuracy and efficiency of our tool is our top priority, requiring continuous data updates and scientific validation. Our partnership with government agencies and environmental organizations provides us with access to reliable emissions data, allowing us to refine our calculations based on evolving standards.

In addition to maintaining the calculator, our activities include:

- Collaborating with public and private sector partners to fund and promote the tool.
- Conducting educational campaigns to raise awareness among SMEs about the importance of tracking and reducing carbon emissions.
- Providing businesses with detailed reports and personalized recommendations on how to optimize their sustainability practices.
- Offering workshops and webinars to train SMEs on leveraging our tool for better environmental decision-making.

By focusing on these key activities, we not only provide SMEs with a practical solution but also contribute to broader global sustainability efforts.

2.4 Key Partnerships

Establishing strong partnerships is essential to our success. Our model relies on close collaboration with:

- Government Institutions: To secure funding and ensure alignment with national and international sustainability policies.
- NGOs and Philanthropic Foundations: To support outreach initiatives and facilitate educational programs for SMEs.
- Corporate Sponsors: To provide financial backing and co-branded sustainability initiatives, allowing larger businesses to contribute to SME sustainability efforts.
- Academic and Research Institutions: To ensure our tool remains accurate, up-to-date, and scientifically robust.

These partnerships enable us to expand our reach and credibility while ensuring SMEs receive the best possible support in reducing their carbon footprint.

2.5 Value Proposition

Our business offers SMEs a unique value proposition by providing them with a free, reliable, and easy-to-use carbon calculator that allows them to measure and manage their emissions effectively. The key benefits of our service include:

- Cost-Free Sustainability Support: SMEs can access our tool without financial barriers, removing a major obstacle to environmental compliance.
- Regulatory Compliance Assistance: As governments tighten environmental regulations, our tool helps SMEs stay ahead of compliance requirements.
- Increased Business Credibility: SMEs that actively manage their carbon footprint enhance their reputation, making them more attractive to investors, customers, and partners.
- Data-Driven Decision-Making: Our tool provides SMEs with actionable insights that enable them to optimize their operations for greater sustainability and cost efficiency.

By offering these benefits, we empower SMEs to integrate sustainability into their business strategies while fostering long-term environmental impact.

2.6 Customer Support

To ensure SMEs can effectively use our carbon calculator, we provide comprehensive customer support through multiple channels:

- Dedicated Support Team: Available via email and phone to assist businesses with technical issues and inquiries.
- Online Knowledge Hub: A collection of guides, FAQs, and video tutorials to help users maximize the tool's potential.
- Live Webinars & Workshops: Hosted regularly to educate businesses on sustainability practices and the benefits of emissions tracking.
- Community Forum: A platform where businesses can share best practices and seek advice from sustainability experts.

Our focus on accessibility and education ensures that SMEs receive the support they need to take meaningful steps toward reducing their environmental impact.

2.7 Channels

Our primary channel for reaching SMEs is through our digital platform, where businesses can access the carbon calculator directly. To maximize awareness and adoption, we leverage:

- Social Media Campaigns: Engaging content on LinkedIn, Twitter, and Instagram to promote our tool and share success stories.
- Government and NGO Networks: Partnering with public institutions and sustainability-focused organizations to distribute our tool to SMEs.
- Referral Programs: Encouraging existing users to recommend our tool to other SMEs, fostering organic growth.

By using a combination of digital marketing and strategic partnerships, we ensure that our tool reaches the businesses that need it most.

Methodology, according to the Merriam-Webster, is a body of methods, rules, and postulates employed by a discipline. By presenting freely our methodology in this paper, we aim at raising awareness about the means of transportation that pollute the most, while being as transparent as possible.

calculation

Greenhouse gas emissions of transport vary significantly by factors such as the mode of vehicle, source of energy, and energy efficiency (EEA, 2022, 2). Below, we have a summary of the emission coefficients used for each mode of transport. All of CarbonWise's calculations use a standard formula that can be applied uniformly across all vehicle types:

$$CO2=d \cdot ef/p$$

WHERE:

- CO_2 = carbon dioxide emissions in grams
- d = distance traveled (in kilometers)
- ef = emission factor (in grams CO_2 per kilometer)
- p = number of passengers

For electric vehicles, a specific variant of this formula is used to better reflect electricity-related emissions:

$$CO2=d \cdot ci \cdot ec/p$$

WHERE:

- CO_2 = carbon emissions in grams
- d = distance traveled (in km)
- ci = carbon intensity of electricity production (in gCO_2/kWh), here set at 27 gCO_2/kWh
- ec = energy consumption (in kWh/km)
- p = number of passengers

Carbon intensity refers to the amount of carbon dioxide released in generating one kilowatt-hour (kWh) of electricity. The energy consumption in this case is as much as the usual energy required to move a car over one kilometer.

The carbon intensity value of 27 gCO_2/kWh is calculated based on more up-to-date information about electricity production in northern and western Europe, where renewables account for a high percentage of the mix (3). The default energy consumption for electric vehicles used in CarbonWise's model is 0.18 kWh/km, which is typical of newer vehicle performance (4).

Means of transportation

Transport carbon emissions are very sensitive to mode of transport and fuel type, so personal and societal choice of mobility contributes significantly to individual and collective environmental impact.

1. Passenger Cars

Petrol vehicles remain amongst the most emitting, at 145 g CO_2/km on average, and diesel vehicles produce around 125 g CO_2/km. Engine efficiency and fuel economy gains have lowered these in recent years slightly. Electric cars, capitalizing on cleaner energy sources in most countries, consume about 0.18 kWh/km, with emissions of around 4.9 g CO_2/km when powered by low-carbon electricity (e.g., Norway's average of 27 g CO_2/kWh) [5]. remain some of the highest emitters, with an average of 145 g CO_2/km, and diesel cars emit about 125 g CO_2/km. Efficiency and fuel saving gains have cut these figures slightly in recent years. Electric vehicles, with cleaner fuels widely available in most nations, consume around 0.18 kWh/km, emitting around 4.9 g CO_2/km when powered by low-carbon electricity (e.g., Norway's average of 27 g CO_2/kWh) [5].

2. Airplanes

Air travel is one of the most carbon-emitting modes of transport. An economy-class flight emits around 128 g CO_2/km per passenger, and emissions increase to over 400 g CO_2/km when traveling business and first class. Short flights are more carbon-dense per kilometer due to fuel-guzzling takeoffs and landings. These estimates are based on Framtiden i våre hender [6] statistics. An economy-class flight generates approximately 128 g CO_2/km per passenger, while business and first-class travel generates over 400 g CO_2/km. Short-haul flights are more emissions heavy per kilometer due to the fuel-thirsty takeoff and landing. The above is according to Framtiden i våre hender [6] statistics.

3. Ferries

Ferries, a ubiquitous mode in coastal waters like Norway, can emit 220–230 g CO_2/km per passenger when running on heavy fuel oil [6]. Electric ferries are being introduced but still represent a minority of the fleet.ietetypical of coastal waters like Norway, can emit 220–230 g CO_2/km per passenger when running on heavy fuel oil [6]. Electric ferries are being introduced but still represent a minority of the fleet.

4. Trains

Trains offer one of the cleanest modes of transport. Electric trains in Norway emit around 10 g CO_2/pkm, whereas for Europe as a whole, it is 24 g CO_2/pkm [7]. Such low levels are achievable where railway systems are powered with predominantly renewable electricity. one of the cleanest modes of transport. Electric trains in Norway emit around 10 g CO_2/pkm, whereas for Europe it is 24 g CO_2/pkm [7]. These low prices are possible where rail systems are powered predominantly with renewable electricity.

5. Motorcycles

Most motorcycles in Norway are petrol-powered, with approximately 85 g CO_2/km emissions. With low passenger capacity and low electrification levels (less than 1% of bikes being electric), they remain relatively high emitters per capita [8]. in Norway are petrol-powered, with approximately 85 g CO_2/km emissions. With low passenger capacity and low electrification levels (less than 1% of bikes being electric), they remain relatively high emitters per capita [8].

6. Buses

Diesel buses emit roughly 25 g CO_2/pkm, but emissions drop to 13 g CO_2/pkm for electric variants and 7 g CO_2/pkm for biodiesel options [5][6]. These figures project the potential for public transport reducing per-person emissions in urban and intercity settings. emit roughly 25 g CO_2/pkm, but emissions drop to 13 g CO_2/pkm for electric variants and 7 g CO_2/pkm for biodiesel options [5][6]. These numbers speak to the potential of public transportation to decrease per-capita emissions in both urban and intercity environments.

7. Walking and Cycling

These modes have zero direct emissions and are broadly regarded as the most sustainable transport modes. While not included in emissions calculations, they are at the heart of sustainable urban mobility planning. emit zero direct emissions and are commonly regarded as the most sustainable transport modes. While not included in emissions calculations, they are at the heart of sustainable urban mobility planning.

IV-APPLICATION DEPLOYMENT

For the first launch of the app, we decided to focus on measuring CO_2 levels in the transportation sector. This way, we can concentrate our efforts on one area and make sure we do a solid, well-executed job before expanding further. Since transportation is one of the biggest sources of carbon emissions, we believe that starting here will have a real impact and help users become more aware of their environmental footprint.

With the app, users will be able to track their emissions based on their daily transportation habits and get insights on how to reduce them. The idea is to show simple but effective ways to lower emissions—whether it's switching to public transport, cycling more, or just making small adjustments to their routine.

Right now, since we're still in the implementation phase, the app is quite simple and focused on its core function. But we have big plans for the future. Our goal is to add new features so that users can track their carbon footprint beyond just transportation —things like food consumption, shopping habits, and even energy use at home. We didn't include these features from the start because it's a much bigger challenge. Just in the food sector alone, different producers can have very different levels of emissions, which makes it difficult to create a standard measurement system.

Because of this complexity, we'll be rolling out new features gradually. The idea is to keep improving the app step by step, making sure that each update actually adds value while keeping everything easy to use. Over time, we want the app to become a complete tool that helps people make better choices in different areas of their lives, always with the goal of reducing their environmental impact in a way that feels practical and achievable.

V- SUMMARY & REFERENCES

SUMMARY

Our project introduces a carbon calculator application aimed at helping small and medium-sized enterprises (SMEs) in Europe measure and reduce their transportation-related emissions. Recognizing the urgency of climate action and the unequal burden placed on individuals, our tool promotes collective responsibility by combining individual awareness with systemic corporate change. The application provides real-time emission tracking and practical recommendations to encourage low-carbon mobility choices. Backed by reliable data and strong institutional partnerships, the initiative is offered free of charge to SMEs. It is currently focused on transportation, with plans to expand into other areas such as energy, food, and consumption. While the tool offers valuable insights, we acknowledge the need for ongoing improvement to ensure accuracy and broader impact.

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