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 seek new ways to reduce their environmental footprint. According to the International Energy Agency (IEA), the means of transportation is one of the top contributors to greenhouse gas emissions, more than a third of CO_2 emissions from end-use sectors (IEA, 2023). According to the Net Zero Scenario, significant and immediate actions must be taken to reduce emissions by 2030 from all parties involved within society. One of the proposals to achieve this scenario is to shift to low-carbon alternatives such as public transport and electric vehicles. However, its success depends on technological development and behavioural changes, the last to be mainly driven by awareness and data-based decisions. The responsibility has many parties: individuals, businesses, corporations, among others. Thus, these are the responsible ones to take actions. This paper's objective is to introduce the business model of Carbon Wise for potential clients and collaborators, to give a further understanding on the functionality of the app and the methodology used, as well as to present the main mission of the app.

One of the key challenges in tackling transportation emissions is the disparity in ecological responsibility. Historically, the responsibility for 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 contributed to a more significant gap by placing most of the responsibility on individuals and causing a financial impact on low and middle-income households. Addressing this gap requires tools that empower individuals while encouraging systemic change at the corporate level.

To bridge this gap, we have developed an online calculator that allows users to measure their carbon footprint and analyse 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 SMEs, businesses and individuals. This tool will be available for them to empower these parties to measure their carbon footprint and take the necessary actions to comply with the reductions. By integrating our platform into daily business operations, we aim to create an effect beyond individual users, encouraging small and medium enterprises to take a more active role in reducing emissions. Considering modern pressures from governments and consumers to make more sustainable societies, this tool becomes handy for individuals and SMEs as it does not require financial resources to have access to it.

This essay will show the business model and the operations behind CarbonWise, detailing the methodology used to calculate emissions, the data-driven approach behind its functionality, and the model designed to ensure its scalability and impact. Through this initiative, we hope to contribute to a more equitable and practical approach to climate action, where 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

- not determined

REVENUE STREAMS

- free application

II-BUSINESS MODEL

Before detailing each part of our Business Model Canvas, we would like to highlight its internal coherence. All components are connected by a shared objective: helping SMEs reduce their carbon emissions at no cost. This goal drives our partnerships, activities, and customer support. Rather than isolated ideas, each element plays a role in delivering a free, reliable, and impactful solution.

2.1 Mission Statement

Our mission is to empower small and medium-sized enterprises with the carbon calculator to understand, magnify, and reduce their carbon footprint. By collaborating with governments, NGOs, and corporate partners, we aim to make sustainable decisions reachable to all businesses by offering a free service, which will foster a greener and more resilient economy. We aim to create lasting change through innovation and education, 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 carbon footprint calculator. Many SMEs face a scarcity of 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. The affiliation with the government, philanthropic foundations, and non-governmental organizations (NGOs) ensures that our services remain free for SMEs while aligning with global sustainability goals and consequently fostering accessible sustainability.

Our target group includes SMEs from various industries that may lack the financial resources to invest in expensive sustainability solutions, as big corporations currently do. By offering the possibility to track the carbon footprint, we are empowering local businesses to take action towards reducing their environmental impact based on data. Our solution aligns with the societal demand for corporate social responsibility (CSR) compliance and requirements, of which SMEs will be part.

Looking into the future, as the demand for sustainable business practices continues to grow, our solutions target SMEs in Europe, where interest is currently increasing significantly in sustainable development and emerging environmental regulations.

2.3 Key Activities

Our key activities concern mainly the development, maintenance, and promotion of our carbon calculator. Ensuring accuracy and efficiency is our top priority, which requires continuous data updates and scientific validation. The current methodology will be further explained in its respective section. Our partnership with government agencies and environmental organizations gives us access to reliable information for the methodology of the calculations, consequently allowing us to have a continuously upgraded calculator.

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 tracking and reducing carbon emissions.
- Providing businesses with detailed reports and personalized recommendations on optimizing 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 provide SMEs with a practical solution and contribute to broader global sustainability efforts.

2.4 Key Partnerships

Establishing strong partnerships is essential to our financial success. Our closest collaborators have an interest in pursuing a reduction of the carbon footprint responsibility gap among businesses and individuals; these comprise the following:

- 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.

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2.5 Value Proposition

Our business offers SMEs a unique value proposition by providing a free, reliable, and easy footprint calculator that allows them to measure and, thus, manage and reduce their emissions on their daily operations. The key benefits of our users include the following:

- Free Sustainability Support: SMEs can access our tool without a fee, which removes a significant obstacle for most SMEs in achieving environmental compliance.
- Regulatory Compliance Assistance: As governments tighten environmental regulations, our tool helps SMEs stay ahead of compliance requirements.
- Improve Business CSR Credibility: Businesses that manage their carbon footprint have more opportunities to enhance their reputation, which, in turn, makes them more attractive to investors and customers.
- Data-Driven Decision-Making: Our tool provides SMEs with actionable insights 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 and individuals exploit the full potential of the carbon footprint calculator effectively. The team at CarbonWise will provide comprehensive customer support through multiple channels:

- A Support Team: Available by phone to assist businesses with technical issues and inquiries.
- Online Knowledge Hub: Available guides, FAQs, and audiovisual tutorials help users learn how the calculator operates.
- Live Workshops: To educate businesses' personnel and executives on sustainability practices and the benefits of emissions tracking.

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

2.7 Channels

Our primary and only channel for reaching SMEs with our services is through our digital platform, where businesses can access the calculator directly. To maximize the marketing and adoption, we leverage the following:

- Social Media Campaigns: We will promote our tool by creating engaging content on social media such as LinkedIn, Twitter, and Instagram.
- Government and NGO Networks: Partnering with public institutions and sustainability-focused organizations to make this calculator reach SMEs through their network.
- Referral Programs: Encouraging existing users to recommend our tool to other SMEs, fostering organic growth and WOM.

We use a combination of digital marketing and strategic partnerships to ensure that our tool reaches the businesses that need it most.

III- METHODOLOGY

Methodology, according to the Merriam-Webster Dictionary, is a body of methods, rules, and postulates employed by a discipline. By presenting our methodology on the research used to program the carbon footprint calculator in this paper, we aim to raise awareness about the operational functionality while fostering transparency for users and to our collaborators.

calculation

3.1 basic formulas

Methodology, according to the Merriam-Webster Dictionary, is a body of methods, rules, and postulates employed by a discipline. By presenting our methodology on the research used to program the carbon footprint calculator in this paper, we aim to raise awareness about the operational functionality while fostering transparency for users and to our collaborators.

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

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 instance, a 100-km drive with a 2020 Toyota Corolla (1 pilot, two passengers), not the greenest but not the most polluting vehicle, will emit 100* 197/3 = 6.567 kg of CO2 per person (CO2 Everything, 2025). For electric cars, a specific variant of this formula is used to reflect electricity-related emissions better:

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

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 240 gCO_2/kWh
- ec = energy consumption (in kWh/km)
- p = number of passengers

Carbon intensity is the amount of carbon dioxide released when generating one kilowatt-hour (kWh) of electricity. For the EU, it is around 240g/kWh. In this case, the energy consumption is as much as the usual energy required to move a car over one kilometre. The default energy consumption for a battery electric vehicle used in CarbonWise's model is 0.167 kWh/km, the average for such vehicles, according to the European Environment Agency (EEA, 2024).

To compare with our 2020 Toyota Corolla example, for the same 100km drive and three people, a battery EV in the EU (where the ci accounts for 240gCO2/kWh would produce, on average, 100*240*0.167/3=1336 g of CO2 per capita, which is almost 80% less (Nowtricity, 2024).

3.2 Different means of transportation comprised in the calculator

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

With the purpose of accuracy, the passenger car has different options for users to choose from depending on the type of vehicle they use:

- Petrol vehicles, which on average emit 153g of CO2 per km.
- Diesel vehicles, which on average emit 145g of CO2 per km.
- LNG-fueled vehicles, on average, emit 133g of CO2 per km (ADEME Carbon Base, 2024).

As it is visible, the LNG-fueled vehicles are the least polluting one from the list of options, thus, this kind of information will be visible for the clients so they also know other options within the market for transport to keep conducting their businesses or daily activities, or opt to choose a strategy to reduce the carbon footprint based on the current emissions. Moreover, to make more tailored calculations, the calculator further includes different types of vehicles based on their functionality, as follows:

- On average, sports cars run essentially on petrol, emitting 250g of CO2 per km.
- Family cars emit, on average, 158g of CO2 per km.
- Small cars emit 104g of CO2 per km (ADEME Carbon Base, 2024).

The reason to offer further options on the type of cars is to make it easier for individuals to choose based on daily activities or, if it is the case, choose the sport car option. Furthermore, apitalizing on cleaner energy sources in most countries, electric cars consume about 0.167 kWh/km. We will thus arbitrarily set ec to 0.167. As we are currently opening the carbon calculator to Norway, we will also set ci to 18g/kWh. To compare with non-electric vehicles, this means an emission factor of equal to 240*0.167= 40,08.

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 284g CO_2/pkm when business and first-class travel. Short flights are more carbon-dense per kilometre due to fuel-guzzling takeoffs and landings; these estimates are based on Framtiden I våre Hender 2024 statistics. It is important to notice the big gap between the two types of flights due to the significant difference in emissions, thus, to increase the accuracy of the calculator the distinction is made in the app. In this case, clients can be aware the least carbon emissive is to opt for flights when the route is long. This will surely increase awareness among clients since it will show this gap, aiming to reduce short flights use as much as possible.

3. Trains

Electric trains in Europe emit around 26 g CO_2/pkm in Norway however they only emit around 7 g CO_2/pkm (Knut Erik Helle for Framtiden i våre hender, 2024). We will make the distinction between electric trains, although predominant in Europe, and diesel-based trains, which emit 91g CO_2/pkm.

4. Ferries

Ferries are very typical of coastal waters like Norway, and emit around 186 g CO_2/km per passenger when running on heavy fuel oil (Framtiden i våre hender). Electric ferries are being introduced but still represent a minority of the fleet, we will thus not take them into account for the initial phase

5. Motorcycles

Most motorcycles are petrol-powered, with approximately 114 g CO_2/pkm emissions (Our World in Data, 2023). With low passenger capacity and low electrification levels, less than 1% of bikes being electric, they remain relatively high emitters per capita.

6. Buses

Diesel buses emit roughly 30 g CO_2/pkm, according to Framtiden i våre hender. These figures could drop with the rise of electric buses emitting even less, but diesel buses are still predominant in Norway and Europe.

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. Comparing the different means of transportation, it appears that besides zero-emissions means, electric cars and trains are the greenest, the most polluting ones being cars and planes.

There are different options for flights and vehicles, thus, with the available information businesses and individuals will be able to measure their current carbon emissions and to create a strategy based on their capability to modify their behavior with their data and information.

IV-APPLICATION DEPLOYMENT

For the app's first launch, 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 starting here will have a real impact and help users become more aware of their environmental footprint.

With the app, users can track their emissions based on their daily transportation habits and get insights on reducing them. The idea is to show simple but effective ways to lower emissions—switching to public transport, cycling more, or making minor adjustments to their routine.

Since we're still in the implementation phase, the app is quite simple and focused on its core function. In the future the goal is that the team of CarbonWise aims to add new features so users can track their carbon footprint beyond just transportation—things like food consumption, shopping habits, and even energy use. Initially, we didn't include these features because it's a more significant challenge. Different producers can have very different emissions levels in the food sector alone, for instance, making it challenging 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, ensuring that each update adds value while keeping everything easy to use. Over time, we want the app to become a complete tool that helps people and businesses make better choices in different areas of their daily operations and continually reduce their environmental impact in a practical and achievable way.

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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