ACT 4 EARTH

Paper

The future starts now !

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1. Introduction

The global challenge of climate change requires urgent and comprehensive action in all sectors. The transport sector in particular is a critical area in Europe where significant emissions reductions must be achieved. Current data from the International Energy Agency (IEA) show that the transport sector was responsible for 32% of total emissions in Europe 2023 (IEA, 2025).
On the other side, the public awareness and concern about climate change is steadily increasing (Schwerdtle et al., 2023).
However, this increased awareness among the population often contrasts with the slow implementation of climate protection measures at national level (Reuters, 2025). This discrepancy creates a gap that can be closed by innovative, citizen-centred solutions.

In this context, this paper presents the methodology and business plan for a new carbon footprint app. The idea for this app arises from the need to create a practical tool that collects real data and makes individual impact transparent without relying on complex systems or unrealistic goals. Instead of focusing on multiple users, the app takes a strategic approach by involving companies.

As a group of five students from different countries Italy, France, Belgium, and Germany we bring together a mix of perspectives, habits, and ways of thinking. Each of us comes from a different cultural background, with our own approach to studying, working, and even living more sustainably. These differences have been one of our biggest strengths: they allowed us to look at the same problem from multiple angles and find practical, creative solutions. By working together, we learned how much our everyday behaviors vary from one country to another, and how small habits can have different impacts. This diversity inspired us to design a project that connects people and data across different environments, making it adaptable, inclusive, and relevant beyond national borders.

The structure of this paper is as follows: First, we explain the purpose of the app. Second, the methodology of the app is described in detail, including the algorithms for calculating emissions and the underlying data sources. Next, the business plan connected to the purpose of the app is presented, highlighting the market strategy, revenue model and scalability of the application.

2. The purpose of the App

We started by asking ourselves how we could make people more aware of their impact without relying on complex systems or unrealistic goals.

Instead of focusing only on individual users, we chose to involve companies.
It’s a more strategic approach: when a company joins, all its employees automatically contribute to building a larger, more accurate dataset. This makes the results not only more representative, but also more useful for understanding real trends and habits. In addition, since in current days sustainability has become a big trend (Schwerdtle et a., 2023), companies have to adopt a sustainable business model and present themselves as such to the external environment.

This collective model also helps the project grow faster and more efficiently. Reaching one company means reaching tens or hundreds of people at once, creating engagement and visibility in a natural way.

In order to track each employee's footprint, users must register with the database by creating an account. During this process, they must select their company to enable us to collect each company's carbon emissions data.
After registering for the app, each user is required to select the vehicle they use to travel to work, including the number of kilometres travelled in both directions per day and the type of fuel used. Afterwards, users can also select how many days per week they use each transport mode. This is mainly for two reasons: not all employees go to the workplace the same number of days per week (for example, due to smart working), and some people do not always use the same vehicle or the same type of fuel. This feature allows them to track their emissions in a more accurate way.

For each organization, the app collects individual inputs and we will provide a report that summarizes the last six-month emissions and recommendations for reducing them.
From the second report onwards, a comparison will be made between the last two periods, in order to show whether there has been a decline or an improvement.

In addition to the report, companies will receive a certificate representing their carbon emissions position for that period. This certificate will help companies to improve their image in terms of sustainability.

Therefore, we have found a better way for participants to understand the emissions data in their reports. For example, rather than stating that the company emitted X tonnes of CO_2, it would be clearer to participants if we said, 'To offset the company's emissions, X number of trees would need to be planted.'

After the second period, companies will receive a comparison showing the increase or decrease in their emissions, such as "You have decreased your emissions by X tonnes of CO_2, which is equivalent to saving X number of trees".

In the future, the project could develop in several practical directions. One goal is to turn the certificate into certifications recognised by European environmental authorities.
We also plan to build partnerships with environmental organizations and companies to expand the project’s reach and credibility.
Finally, we aim to increase regional accuracy, adapting calculations to different countries for more precise results.

3. Methodology

3.1 Context

To develop our carbon emission calculation formulas, we needed reliable and accurate data. For that reason, we decided to collect information on vehicles in Europe. We chose to focus on Europe because our team is made up of five international students from Italy, Germany, Belgium and France. This choice gives us a wide range of opportunities for partnerships with different organisations based in Europe.

According to the sources listed below, we have identified the CO_2 emissions associated with different transportation modes. From this information, we have determined an average amount of grams of CO_2 emitted per km and per person. However, these averages can vary depending on the types of vehicles and the route these vehicles wish to take.
For instance, this means that the autonomy of an electric or fuel based vehicle can be reduced due to the range of the vehicle and the terrain. For example, the emissions won't be the same in the Netherlands (which is the flattest country in Europe with more than 50% of the territory which is at sea-level) and Switzerland which has many high summits in the Alps.
Furthermore, the figures are related to direct emissions and do not include manufacturing or upstream energy production.
We will detail below the limitations and specific features that apply to each type of transport.

To carry out this work, we mainly relied on these key sources :

- **Visual Capitalist**, a media platform specialized in data visualization (infographics, charts, maps, etc.) applied to markets, technology, energy, and the global economy;
- **Navit**, a platform designed for businesses that provides mobility management solutions and tools for employee travel budgets.
- **Greenly**, a platform and company that helps organisations measure, reduce and communicate their carbon footprint using digital tools and expert advice. Their articles often use data from Environment and Energy Management Agency (ADEME) and Environmental European Agency (EEA), which are ecological transition agencies that highlight French and European data.

Thanks to these three main sources, as well as many others, we analyse the carbon emissions associated with different modes of transport and present this information to our users, enabling them to track and better understand the evolution of their carbon footprint over time.

3.2 Calculations

Now, in the calculation phase, we are going to present the different modes of transportation selected for our app.
This phase is essential as this is where the users will be able to calculate their CO_2 emissions based on their type of vehicle, the energy source and the distance travelled in kilometres.
For that, we gathered three general formulas: one for the petrol-based emissions, another for the diesel-based emissions and finally for the electric based emissions:

Petrol emissions formula:

$$CO2\ per\ km = \frac{Fuel\ consumption\ \left(\frac{L}{km}\right) x\ 2{,}310}{Number\ of\ passengers}$$

Each litre of petrol burned emits approximately 2,310G of CO_2.

Diesel emissions formula:

$$CO2\ per\ km = \frac{Fuel\ use\ \left(\frac{L}{km}\right) x\ 2{,}680}{Number\ of\ passengers}$$

Each litre of diesel burned emits approximately 2,680 grams of CO_2.

Electric emissions formula:

$$CO2\ per\ km = \frac{Electricity\ use\ \left(\frac{kWh}{km}\right) x\ Grid\ emission\ factor\ \left(\frac{g\ CO2}{kWh}\right)}{Number\ of\ passengers}$$

This electric emission formula is affected by the Grid emission factor, which corresponds to the amount of CO_2 released per unit of electricity produced. On average, in Europe, an electric car would emit 200g of CO_2 per kWh.

In this case, the formula is the following:

$$Grid\ emission\ factor = \frac{CO2\ emitted}{Electricity\ generated}$$

On average, in Europe, the grid emission factor is about 250g CO_2/kWh due to the mix of fossil fuels and renewables (« CO_2 emissions FROM STATIONARY COMBUSTION OF FOSSIL FUELS » , n. d.).

3.2.1 Car

A car can pollute through various mechanisms depending on its propulsion method, whether it’s petrol, diesel, or electric power.

The CO_2 emissions data we have collected comes from the EEA, an economic union comprising thirty European states: the twenty-seven member states of the European Union and three of the four member states of the European Free Trade Association (Life-cycle greenhouse gas emissions from passenger cars in the European Union, 2025).

Electric cars have direct CO_2 emissions of zero, as they do not emit exhaust when driving. The average values for diesel and gasoline are based on newly registered vehicles and can vary depending on the segment and model, but these figures are EEA benchmarks for the current European fleet. These are the most recent direct exhaust CO_2 values published by the EEA for new cars in Europe.

As a result, there are numerous factors contributing to the emission profile of a vehicle :

Type Carbon	Europe
Petrol Car	122 gCO_2/km (for average petrol according to EEA)
Diesel Car	148 gCO_2/km (for average diesel according to EEA)
Electric Car	0 gCO_2/km (for average electric according to EEA)

3.2.2 Ferry

Despite the much lower use of ferries compared to Norway or other Nordic countries, ferries are among the most polluting forms of transport.

According to the EEA, ferries can emit 267g of CO_2 equivalent per kilometre. Furthermore, the EEA does not provide any figures for cruise ships, but we can assume that their carbon footprint is similar to that of ferries (*Empreinte carbone et comparatif par type de transport*, 2024).

- **Diesel ferry:** 267 g CO_2/km/passenger.

3.2.3 Train

Emissions for electric trains can vary by country depending on the electricity mix, and are generally lower in countries with a high share of renewables or nuclear power. This can be seen much more in Northern Europe such as in Iceland, Sweden or Norway (Shedding Light On Energy In Europe – 2025 Edition - Interactive Publications - Eurostat, n. d.).

Diesel trains remain significantly more polluting per passenger-kilometre, although improvements in efficiency have helped reduce average emissions in Europe.

Type Carbon	Europe
Diesel Train	63 gCO_2/km (according to EEA, Navit and VisualCapitalist)
Electric Train	5 gCO_2/km (according to EEA, Navit and VisualCapitalist)

3.2.4 Airplane

Air travel is one of the most polluting forms of transport in Europe, if not the most polluting. Emissions can vary depending on the type of flight and the technology used, but generally remain high due to high fuel consumption.

Long-journey flights and older aircraft are particularly polluting. Unlike energy innovations in other modes of transport, such as cars, the possibility of creating an electric aircraft is much more complicated due to battery life and boarding capacity (When will commercial electric aircraft become a reality ? , n. d.).
We decided not to differentiate between long-journey, small, and medium-journey flights because we plan to calculate CO_2 emissions based on mileage. For example, some domestic flights are longer than some international flights. Therefore, we calculated an average.

- **Plane:** 225g CO_2/km/passenger.

3.2.5 Bus

Bus transport is one of the main modes of mobility in urban areas, regions, and across countries. It plays a crucial role in providing accessible and affordable public transport. The environmental impact of buses can vary significantly depending on factors such as vehicle type, fuel used, and occupancy rate.

Unlike private cars, buses enable shared mobility, which can significantly lower emissions per passenger when occupancy levels are high. As with other modes of transport, we decided not to distinguish between urban, regional, or intercity buses, since emissions will be calculated based on mileage and average efficiency.

However, electric buses and hydrogen buses are now increasingly being developed, which can greatly reduce CO_2 emissions (Mathieu, 2023).
In our app, we do not provide information on electric buses due to not enough accurate data.

- **Diesel Bus:** 80g of CO_2/km/passenger

3.2.6 Motorcycle

Motorcycle emissions vary depending on the type of engine and fuel used. Diesel motorcycles remain more polluting per kilometre traveled, while gasoline motorcycles, although slightly less polluting, also contribute significantly to CO_2 emissions and local pollutants.
However, technical improvements and European standards have gradually reduced average emissions (Clairotte et al., 2020).

As the difference is not significant, we have decided to take an average of the two types of fuel :

- **Motorcycle diesel/petrol:** (89 and 112) → 100 g CO_2/km/passenger.

3.2.7 Scooter

Electric scooters, which have been popular for several years, are growing rapidly in major European cities. Their emissions are generally low due to being used mostly for short journeys, especially in countries where electricity is based on renewable energy or nuclear power. As a result, CO_2 emissions from electric scooters depend mainly on manufacturing, which accounts for 79% of emissions, and logistics, which includes collection and recharging *(Empreinte carbone du vélo et de la trottinette électrique, 2023).*

- **Scooter:** (60/0.79) → 34 g CO_2/km/passenger.

3.2.8 Walking/Cycling

People travelling on foot do not produce any direct CO_2 emissions, as we do not take into account CO_2 emissions produced by food or personal equipment.

In addition, for direct CO_2 emissions from people travelling by bicycle, these are very low or even zero, as we do not take into account the energy used in manufacturing the bicycle or the energy provided by the food consumed by the cyclist. However, electric bicycles require electricity to operate (*Bus, Train, Car Or E-scooter : Carbon Emissions Of Transport Modes Ranked*, n. d.).

- **Walking:** 0 g CO_2/km
- **Traditional bike:** 0g CO_2/km
- **Electric bike:** 3g CO_2/km

Here is a summary of the average CO_2 emissions per kilometre traveled in Europe for each type of transport in 2025, calculated based on usage only. The values are given in grams of CO_2 per passenger per km:

Transport	**Type of transport**	**g CO_2/km/passager**
CAR	Diesel	**148**
	Petrol	**122**
	Electric	**0**
FERRY	Diesel	**267**
TRAIN	Electric	**5**
	Diesel	**63**
PLANE	Kerosene	**225**
BUS	Diesel	**80**
MOTORCYCLE	Diesel/Petrol Motorcycle	**(89-112) → 100**
SCOOTER	Electric	**34**
WALK	X	**0**
BIKE	Normal	**0**
	Electric	**3**

4. Business Model Canvas

The main purpose of the application is to provide companies and organisations (customer segments) with a free, simple and fast measurement of their mobility CO2 footprint (value proposition). This B2B focus uses the combined data from employees to build a large, accurate dataset (Key Resource), which is processed by strong calculation methods (Key Activity) to deliver formal reports and an Official Certificate. The app's design is intended to be easily adapted to different sizes of screen, and the Key Partners section shows how the app is being used to grow the market and make money. This framework makes a direct link between the app's special data model and the important parts of the Business Model Canvas.

4.1 Key Partners

The Key Partners are categorized into Pilot, Technical, and Future partners. Pilot Partners are the primary organizations that help test and verify the model. The primary Technical Partner is AWS for cloud infrastructure. The Future partners are strategic: an Official Validation Partner to make the certificate official, and Promotion Partners to help with distribution and advertising.

4.2 Key Activities

The key activities of the business are focused on maintaining the product and growing the number of users. These include constant app development and maintenance, strict data analysis and keeping the emission algorithm accurate. Another important task is finding pilot partners. In the future a key activity will be building partnerships for official certifications, which are important for earning money and credibility.

4.3 Key Resources

The key resources are grouped into four categories. Technology includes the app platform itself and the special algorithms that calculate emissions. The infrastructure is hosted by AWS hosting to make it scalable and reliable. Human Capital is the team that develops, designs, and analyses business. Finally, the last resource is the Data: a large, realistic set of data on mobility emissions collected from the user base.

4.4 Value Proposition

For organisations, the app provides a suite of powerful tools designed to make sustainability efforts more efficient. The main product is a free, simple and fast way to measure the mobility CO_2 footprint, which means you can collect data straight away and easily. The app also gives personalised, practical tips for cutting emissions. This helps organisations make real changes. A key benefit is that it helps to protect the environment by encouraging employees and students to behave more sustainably. It also provides an Official Certificate and in the future a detailed report to help with formal reporting and recognition. This report includes a summary of six months of emission data and a clear, strategic section on how to improve or reduce emissions.

4.5 Customer Relationships

Customer relationships are managed through a combination of automated and personal support. The Automated Service includes the main features of the app: it is easy to use and it calculates CO_2 automatically. Personal support is offered when needed, for example by giving special advice to organisations with high emissions. This makes sure the app is more than just a reporting tool, and helps users make real improvements.

4.6 Channels

The channels section is divided into the platform and the acquisition strategy. The Platform is made up of the Mobile App and the underlying AWS Hosting infrastructure. The first step in getting customers is to find out about them directly, without spending a lot of money. In the future, we're going to be doing much more marketing to get more people to sign up. The app is launching a one-month cycling challenge. Employees from the companies taking part will track how many kilometres they cycle. The participants can win prizes. The idea is to get people's attention straight away, get more people to use the app, and find partners and sponsors.

4.7 Customer Segments

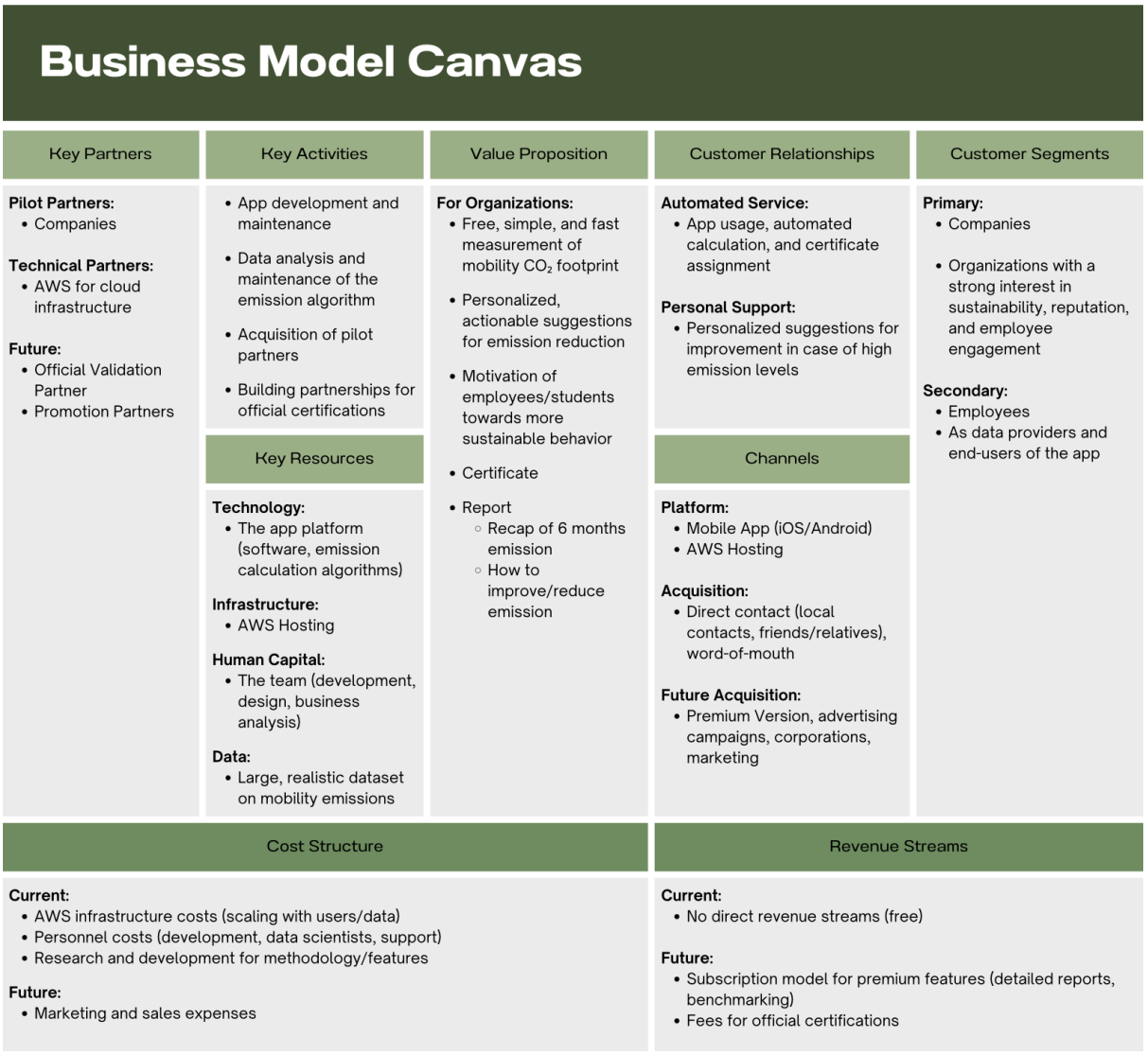
The main customer segments are small to medium-sized Businesses that want to improve their environmental performance, protect their reputation and get their employees more involved in environmental projects. The second group of customers are the employees who provide the data. They are important because they use the app to see how they travel and they use the app's personalised features and tools to help them. This means they can make money from both businesses and consumers.

4.8 Cost Structure

The cost structure is divided into current and future expenses. Current costs are: AWS infrastructure costs, personnel costs for the core team, and expenses related to research and development for the methodology and new features. Future costs are primarily focused on Marketing and sales expenses, which will be necessary to transition from the low-cost, direct-contact acquisition model to a scalable, market-driven growth strategy with a premium subscription version.

4.9 Revenue Streams

Currently, the app operates with no direct revenue streams to attract new customers. The future strategy focuses on two primary channels to achieve financial sustainability. First, a Subscription Model will offer a premium version. Second, Fees for Official Certifications will be changed.



5. Conclusion

The global need to address climate change requires innovative, data-driven solutions, particularly in the emissions-intensive transport sector, which causes high environmental pollution. This paper successfully explains the idea and business plan for ACT 4 EARTH, a carbon footprint app that aims to connect companies' awareness of climate change through the companies they work in. In collaboration with companies, the app collects real data on how much carbon emissions are caused by employee transport. This provides a detailed and adaptable method for calculating CO_2 emissions for different transport types. The app translates complex emissions data into easy-to-understand figures, such as the equivalent number of trees to be planted. This makes it clearer and easier for users to understand the impact and to demonstrate their awareness to the outside world. The proposed business plan, which includes certificates and reports in the future, shows that ACT 4 EARTH can be used to motivate companies to be more environmentally friendly and reduce their CO_2 emissions. Finally, the project offers a practical, citizen-centred approach to green digitalisation that transforms individual mobility decisions into collective, measurable environmental progress.

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