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Introduction

Our app is designed for young people, mainly students, because they represent the next generation of travellers. While many tools calculate emissions, few speak directly to the daily choices young users make. We wanted to create something simple, motivating, and relevant to the way they actually move.

Transportation plays one of the most essential roles when it comes to connecting people, goods, and services, yet it remains one of the largest contributors to global greenhouse emissions. Every year climate change becomes an increasingly more urgent issue, which forwards the importance of developing tools that promote environmental awareness. This paper presents the development and framework of a sustainability-focused project, designed to help individuals understand and reduce their carbon footprint.

Sure, there are plenty of apps out there that spit out emission numbers, but we want to go further. We want sustainability to make sense, to feel easy, and to matter. Our app isn't just about stats; it pushes you to think and maybe do things a bit differently. By combining data transparency, clear design and behavioural insight, we aim to help a new generation of travellers take ownership of their environmental choices.

How we work

We are a group of 7 individuals from different parts of Norway. Through weekly meetings and open discussions, we constantly help each other and have grown into a strong, collaborative team. To support this teamwork, we use GIT as our shared development platform. GIT has made it possible for everyone to contribute from different locations by keeping all code in a shared, version-controlled repository. Each member works on their own separate branches. This allows features and fixes to be developed independently without interfering with the main code branch. Changes are committed with clear messages, pushed into the remote repository, and then merged through pull request. By working in separate branches, we can review each other's changes and review all updates before becoming part of the final product. This workflow makes it easy to track progress, avoid conflicts, and maintain a clean, organized development process where everyone can contribute safely and consistently.

Methodology - Approach and data sources

In our work to build a solid methodology, we have conducted thorough research across a range of data sources. Ensuring that our app is based on a relevant and well-founded methodology is essential for it to serve its purpose. For most of our data collection, we have used Chalmers tekniska högskola (2024). We consider this a reliable source, which is also referenced by both VY (n.d) and «fremtiden i våre hender» (Helle, 2025). The only three vehicles we have used a different source for are motorcycles,

where the data is taken from Miljødirektoratet (2020), electric ferries from Williment (2025), and Bybanen where we use Skyss (2022, 2024).

When it comes to calculating emissions, this can be done in different ways. One option is a “tank to wheel” approach, which only considers the direct emissions from a vehicle while it is in use. Another approach is “wheel to wheel.” This method also includes indirect emissions related to the production of fuel and electricity. In our Methodology we have decided to use this approach, as it provides the most complete picture. In addition, the emission factor for cars includes emissions related to production in the calculation. This is not relevant for public transport, as the volume of passengers transported over its lifetime is significantly larger, and therefore the effect is negligible (Chalmers tekniska högskola, 2024).

Assumptions and limitations

Our methodology is based on a few necessary assumptions to keep the app both user friendly and relevant for our target group (students). Given that our business model focuses on young people in Norway, we have primarily based our Methodology on Norwegian emission data. The differences compared to other European countries will therefore be smaller than for regions elsewhere in the world, where emissions differ even more from those in Norway.

Furthermore, it is necessary to make certain assumptions regarding traffic and the age of vehicles. These are variables that will naturally affect emissions but are difficult to estimate. To avoid making the app complicated or demanding for our users, we use average values that represent typical conditions. The same applies when calculating certain types of public transport, we calculate emissions per passenger using an average passenger rate, since users usually do not know how many passengers the total emissions should be distributed among.

This problem disappears in the calculations for cars and motorcycles, though it results in a small adjustment to the formula shown below. These simplifications ensure that the app remain easy to use while still giving students meaningful and trustworthy insights into their travel-related emissions.

Our formulas

In our Methodology, we will distinguish between two general formulas. The formulas are based on the same fundamental calculation, which is that total CO2 emissions equal distance multiplied by the emission factor. The formulas differ in how they handle passengers: for public transport, we use an average value per passenger-kilometre, while for cars and motorcycles, we divide the total emissions by the number of passengers.

This gives us the following formulas:

Public transport:

$$CO_2 = Distance * Emission\ factor$$

Cars/Motorcycle:

$$CO_2 = Distance * \frac{Emission\ factor}{Passengers}$$

Where:

CO2 = The total amount of CO2 emission for each trip

Distance: Measured in kilometres

Emission factor: Based on average emission per km for the given means of transport

The formulas are taken from the GHG Protocol (2013) and are referred to as activity/distance-based formulas. This is clear since we multiply distance in kilometres by the emission factor.

Human powered

The most environmentally friendly forms of transport are the ones powered by human energy. We do not emit greenhouse gases when walking or cycling. In addition to being more environmentally friendly, these modes of transport also contribute to better health and less noise. We have therefore chosen to include human-powered means of transport in our app in the form of walking and cycling.

Car

According to VY (2023), road traffic in Norway accounts for as much as 18% of the country's annual CO2 emissions. A large part of this is caused by cars. In our methodology, we distinguish between three types: diesel, petrol, and electric cars. The emissions for diesel are 229 g/km, and for petrol 198 g/km. Here, production emissions are calculated as 10% of the total. For electric cars, the emissions are 59 g/km, where production emissions make up 69% of the total. As previously mentioned, we choose to include this in our methodology to show the full picture.

Motorcycle

Motorcycles are flexible means of transport that take up less space, often reach their destination faster, and use less fuel than cars. At the same time, their emissions are considerable, as most motorcycles still are powered by fossil fuels. Electric alternatives are still relatively limited, which is why we have chosen not to include them in our app. According to Miljødirektoratet (2020), the emissions from motorcycles are 95 g/km.

Bus

Compared to cars and motorcycles, buses are a more environmentally friendly option, as the emissions per passenger are lower. This effect is even greater now that more cities have switched to electric

buses, which significantly reduces emissions. In our app, we therefore distinguish between diesel and electric buses. The emissions from electric buses are 13 grams per passenger-kilometre, while diesel buses emit 30 grams per passenger-kilometre.

Bybanen

For this app to be user-friendly for students (especially in Bergen), we will also include the light rail or "Bybanen". The emission factor related to the light rail is difficult to find information on, so we will make an estimate based on some key figures. Skyss (2024) reports that the number of boardings in 2024 was 25,9 million. Skyss (2022) also reports that the total emissions related to the light rail in 2022 were approximately 200 tons of CO2. This gives us 7,7 g per boarding. If we assume that an average trip on the light rail is 5 km, we end up with an emission factor of 1,5 g CO2 per passenger-kilometre.

The transport methods we have presented so far are those typically used by students while they are in Bergen. We will now look at modes of transport students commonly use when traveling to and from the student city.

Train

Trains are a major part of Norway's transportation system. Nevertheless, the emissions associated with the railway account for less than 0.1% of Norway's annual CO2 emissions (Vy, 2023). This means that trains are generally a very environmentally friendly alternative. The emissions from diesel-powered trains are 91 g/passenger-km. For an electric train in the Nordic countries, the emissions are significantly lower at only 7 g/passenger-km. The emissions from electric trains are related to indirect emissions from electricity production.

Airplane

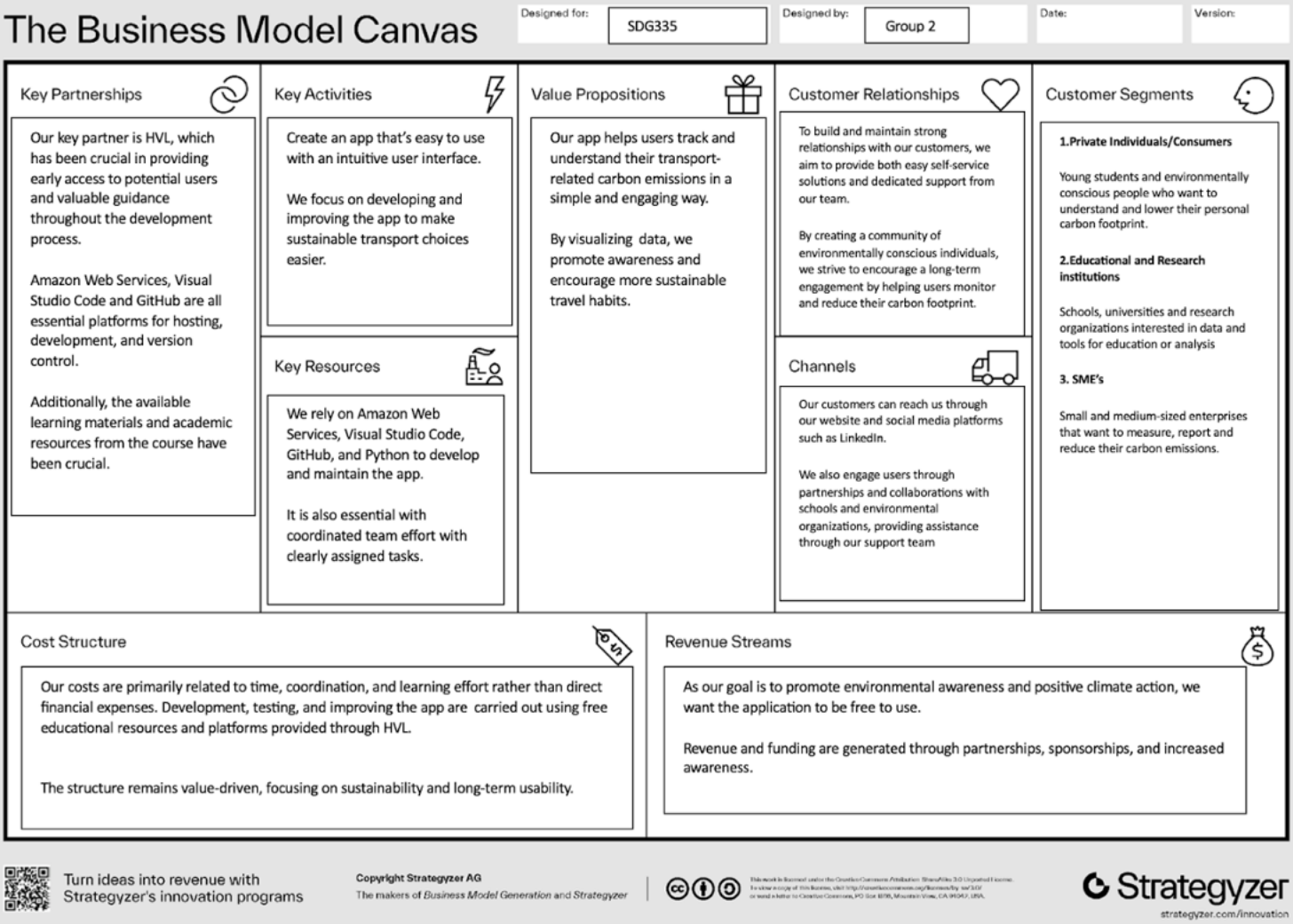
Air travel is a fast mode of transportation that efficiently connects people. At the same time, it is a form of transport with a significant environmental impact, as they still mainly operate on fossil fuels. We will divide air travel into two categories: economy and business class. The emissions per passenger-kilometre for economy class are 127 g. while business has emissions of 284 g per passenger-kilometre.

Ferry

Emissions from ferry operations in Norway have declined by 50% over the past ten years, according to Statens vegvesen (2025). This has happened at the same time as ferry traffic has increased. The CO2 emissions associated with a fossil-fueled ferry are 186 g per passenger-kilometre. Since the implementation of electric ferries is still in its early stages, it is challenging to find precise emission figures. We therefore use data from a new ferry in Stockholm, where CO2 emissions are only 23 g per passenger-kilometre (Williment, 2025). Although the emissions from electric ferries are significantly

lower, replacing traditional ferries is a very costly process. This is a major reason why the transition has not progressed further yet.

The Business Model Canvas



The business model

Our business model is built around one clear idea: helping students understand their transport-related carbon emissions in a simple, visual, and motivating way. What makes our app different from other calculators is that it focuses on the transport modes young people use. Especially buses, the "bybane", walking, and cycling as we have mentioned in our methodology.

Our main users are students aged 18-30, a group that travels often but usually has limited time and money. By tailoring the app to their daily travel habits, the results feel more relatable and useful. This also explains why our methodology uses local and student-relevant emission factors instead of generic global data.

The value we offer is a tool that makes carbon emissions easy to understand. Instead of long reports or complex numbers, the app gives users quick visual feedback that helps them reflect on their daily choices. The purpose is educational and supportive, not commercial.

Our key activities focus on building and improving a lightweight, user-friendly app. We work mainly with reliable data, simple design, and continuous testing with students to make sure the tool stays relevant and easy to use. The most important resources are the development tools we use (Python, Visual Studio Code, GitHub, AWS) and the guidance we get through HVL.

Since the project is value-driven rather than profit-driven, the app is free to use. Our goal is to help students understand how everyday choices affect the environment and to raise awareness about sustainable travel. If a student sees how much they reduce their footprint by walking, cycling or taking the bus instead of driving, that insight supports more informed decisions. This approach aligns with the core idea of sustainability "Meeting today's needs without limiting the ability of future generations, and their children, to meet their own needs. Costs are kept low by relying on open-source tools, and any potential funding in the future would come from sustainability-related support rather than commercial fees.

Customer relationships are built on clarity and trust. We want users to feel supported, not pressured, and we aim to create engagement by showing emissions in a way that feels personal and meaningful. Our main channels are the app itself, and the communication through student networks and social media platforms such as LinkedIn.

Inspired Strava friend system

In the future we want to innovate our app to the social "friend system," inspired by Strava. While most carbon apps focus on individual tracking, we believe that climate action is growing stronger through connection. Our friend system allows users to add friends, form groups, and compare their progress in reducing transport related emissions. This can be more motivating for people, rather than working with their carbon emissions alone.

Here's how it works

Every user has a profile showing their travel habits and total CO2 savings. You can add friends and follow each other's progress, making climate action more social and motivating. Through friendly competition and encouragement, users can challenge each other, like "bike to campus all week" or "no fossil-fuel travel day". Leaderboards allow users to compare results within friend groups, across universities, or even nationally. Monthly eco-challenges reward achievements with badges and ranks, making greener choices fun, not stressful. This way, students can learn from each other, celebrate improvements, and build habits that have lasting impact.

Our long-term goal

Our goal goes beyond helping students track emissions, we want to spark a lasting shift in travel habits. Over time, we aim to grow the app into a shared sustainability platform where greener choices become visible, rewarding, and part of everyday student culture.

By expanding gradually, the app can include more aspects of student life, such as food or energy use. This gives the users a clearer picture of their total footprint. Most importantly, we want people to feel that even small decisions matter when we act together. Our long-term ambition is simple: make sustainable living easier, more engaging, and something students are genuinely proud to be a part of.

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