Green Journey

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GROUP N°2

CANDIDATE NUMBERS:

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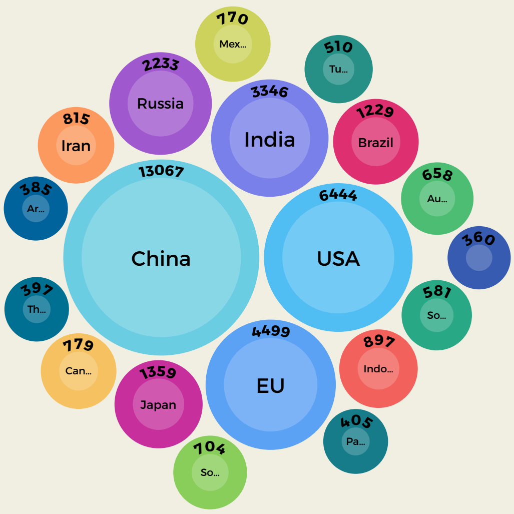
INTRODUCTION

To fight climate change, in 2015, all the United Nations Member States adopted an agenda for sustainable development. In this agenda, they listed 17 calls to action called the Sustainable Development Goals (SDGs), targeting the developing countries as much as the developed countries to emphasize that “ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests” (United Nations, n.d.).

Annually, global temperatures continue to rise, surpassing the limits set by the consensus of United Nations Member States at the 2015 Paris COP 21 (United Nations Environment Programme, n.d.). Consequently, the impacts of climate change are intensifying. Droughts, fires, and storms pose significant threats to nature, wildlife, and humans alike. These events exacerbate inequalities as less affluent nations are more vulnerable to their impacts and are less equipped to combat them. According to the 2023 IPCC report, poverty, poor access to resources and basic services, and conflicts are aggravating factors in the face of climate change.

Graph 1: The greenhouse gases emmitters



thousands of kilotones CO2 equivalent
Source : (European Parliament, 2023)

Yet, the more developed a country is, the more it pollutes. As a consequence, vulnerable countries do not have their future in their own hands and are dependent on decisions taken by the developed countries (graph 1). Therefore, the efforts of developed nations to combat climate change are crucial. Since the EU is the 3rd biggest polluter in the world, we have decided to focus on this Union of countries to gather our data. Our emphasis on these particular countries is guided by our multicultural team from various parts of Europe and the solid relationships these nations maintain with the EU, empowering us to make a substantial impact in these partner countries. According to an article from the European Environmental Agency (2024), 25% of the EU's total greenhouse emissions are directly or indirectly bound to transportation. Consequently, aiding European citizens, particularly Norwegians initially, in evaluating their transportation-related carbon emissions and adjusting their behaviours could serve as an effective strategy in the fight against climate change.

Our objective is to measure individuals' carbon emissions from transportation and then guide them in distinguishing between sustainable habits and those that could be changed, empowering them to join our green journey to a more environmentally friendly world. To further emphasise our goals, we decided to build an application aligned with 3 of the 17 UN SDGs:

“Take urgent action to combat climate change and its impacts”

With our app, we want to create a tool that will help people understand how they can fight climate change.

“Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”

Our goal is not only to raise awarness and to calculate people carbone’s foot print from their transportations, we also want to give them alternatives to have a more sustainable lifestyle

“Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development”

Because united we stand while divided we fall, and because we know that there are a lot of different actors working on helping people to change their life habits and to be more eco-conscious, it is important for us to collaborate and to associate our strengths to have a greater impact

(UN, 2015)

METHODOLOGY

INTRODUCTION

In this section of the essay, we will explain how the calculator in our app has been constructed and present the data we have used. We will demonstrate the methods used to calculate the metrics for various types of transportation, along with our unit of measurement. We have decided to use CO2 equivalents (CO2-eq) as our unit of measurement for all the transport types' emissions. We decided on this because different greenhouse gasses have different global warming potential (Brander, 2023). This makes CO2 equivalents an easy way to take into account all the different emissions and present them in a user friendly way. This enhancement will boost both the integrity of the application and the user experience, as interacting with a single emission factor simplifies the process compared to managing multiple factors.

Our transport options are divided into three groups: 1) Cars, 2) Public transport and 3) Fossil-free traveling. The first group, Cars, consists of small cars and SUV's. Here the user can choose between the two alternative car modes, as well as fuel type (petrol, diesel, electric), kilometers traveled and the amount of people travelling in the car. The second group, Public transport, includes trains, tram, ferry, long-haul flights and domestic flights and both normal and coach buses. Here the user's only input option is kilometers traveled. We opted for this approach because users of public transport typically lack both the control and the knowledge necessary to input variables such as fuel type or passenger count. The app will still portray reliable emission numbers from averages that we have calculated. Lastly the Fossil-free traveling group consists of biking and walking. In this group the user can also only input kilometers traveled since there are no emissions from this type of transport.

To differentiate our app we have also added a feature that will suggest an alternative, more green, way of travel based on the user's latest input. This 'travel suggestion' feature will also show exactly how many grams of CO2 equivalents the user could have saved if they had chosen the recommended type of transportation. This approach will clearly illustrate which transportation options are more environmentally friendly and provide users with actionable insights on how to reduce their carbon footprint.

DATA FOUNDATION

The data used for our application stems from three sources: NAF.no, carsguide.com.au and ourworldindata.org. For the first group, Cars, we pulled numbers from NAF and CarsGuide that displayed fuel consumption per 100km. We decided to use data from six different cars from the brand BMW. We were careful to choose cars that did not deviate a lot from normal price ranges of their respective car type, to best represent all types of cars. After that we processed and converted the data to be displayed as grams of CO2 equivalents (g CO2-eq). To process emissions from electric cars, we used data from the EEA that displayed average g CO2-eq per kWh generated. Note that the emission per kWh produced differs depending on the country. In Norway for example, 98% of energy production is renewable (Fornybar Norge, n.d.). To process emissions from diesel and petrol fueled cars, we used data from Miljødirektoratet that displayed average CO2-eq per liter of the respective fuels burnt.

For the second group, Public transport, we pulled average emissions per passenger kilometer from OurWorldInData, which has processed CO2 emission data from the UK Government. For the final group, Fossil-free traveling, we have not gathered any data since the assumption is zero emissions from this type of transportation. Table 1 in the Appendix displays the origin of all data for the transportation types included in our application.

USER-INPUT FUNCTIONALITY

Our carbon calculator application allows users to choose from 11 different types of transportation. As previously mentioned, users can also select fuel options and input the number of passengers for group Cars. When inputting any of the above input options, the user also needs to add how many kilometers they are traveling. When the user has completed their entry, their carbon footprint will be calculated and our suggestion for a greener method of transportation will be given. Along with this suggestion, a calculation based on our suggested form of transport will be shown, displaying how many CO2 equivalents the user could save. Additionally, the application will display four graphs providing users with an overview of their total kilometers traveled, emissions generated, and the transportation types they have used.

GROUP 1, CARS: CALCULATING EMISSION CONSTANTS FOR ELECTRIC AND FOSSIL FUEL CARS

The data for group Cars is in the format fuel consumption per 100 km traveled. Since our app displays the emissions in grams of CO2 equivalents per 1 kilometer traveled, we had to convert the data. For electric cars the conversion is done by multiplying the average grams of CO2-eq per kWh produced in the EU, the Emission constant (251g CO2-eq), by the average power consumption for the given car, and then dividing that given input by 100 to produce the output in g CO2-eq/km (EEA, 2023). The formula for calculating CO2 equivalents for electric cars is displayed below.

$$\frac{gCO_2 - eq}{\text{km}} = \frac{\frac{kWh}{100km_{Electric\_car\_option}} \times \frac{gCO_2{-}eq}{1kWh\_produced_{emission\_constant}}}{100}$$

For example, a BMW i3 has an average power consumption of 16,5 kWh/100 km and producing 1 kWh in the EU emits, on average, 251 g CO2-eq (NAF, n.d.;EEA, 2023). Plotting that into the equation above, we calculate that the BMW i3 on average emits 41,415 g CO2-eq/km. This is displayed below.

$$\frac{41,4gCO_2 - eq}{\text{km}} = \frac{\frac{16,5kWh}{100km_{BMW\_i3}} \times \frac{251gCO_2{-}eq}{1kWh\_produced_{emission\_constant}}}{100}$$

When converting the data for diesel- and petrol-fueled cars, it is done by multiplying the average grams of CO2-eq emission per liter of the given fuel by the average fuel consumption per 100 km. We then divide that given input by 100 to produce the output in g CO2-eq/km. This formula is displayed below.

$$\frac{gCO_2 - eq}{\mathrm{km}} = \frac{\frac{l}{100km_{Fossil\_fuel\_car\_option}} \times \frac{gCO_2{-}eq}{1l_{emission\_per\_liter\_of\_given\_fuel}}}{100}$$

To exemplify; a petrol fueled BMW 320i has a fuel consumption of 6,3 liters/100 km, and burning a liter of petrol emits 2320 g CO2-eq. Plotting that into the equation above, we calculate that the BMW 320i emits 146,16 g CO2-eq/km, this is displayed below.

$$\frac{146,16gCO_2 - eq}{\mathrm{km}} = \frac{\frac{6,3l}{100km_{BMW\_320i}} \times \frac{2320gCO_2{-}eq}{1l_{emission\_per\_liter\_of\_petrol}}}{100}$$

Lastly, the user can input how many passengers are traveling in the car with them. This means we will display the final data in emissions per passenger-kilometer. Passenger-kilometers can be calculated by multiplying transport kilometers by the number of passengers (Statistics Finland). To implement this into our equation for Cars, we divide the left side (g CO2-eq) by the number of passengers (1/p). This is displayed in the formula below.

$$\frac{gCO_2 - eq}{\mathrm{km}} \times \frac{1}{p} = \frac{gCO_2 - eq}{pkm}$$

In conclusion, this section displayed the calculations for emission constants per passenger-kilometer for the group Cars.

GROUP 2 & 3, PUBLIC TRANSPORT & FOSSIL-FREE TRAVELING: EMISSION CONSTANTS

For group 2, Public transport, the raw data displays average g CO2-eq per passenger kilometer, and therefore it is not necessary to implement the above equations for Public transport. Group 3, Fossil-free traveling, is assumed to be emission free and therefore the emission constant is zero.

CALCULATING TOTAL CO2-EQ EMITTED PER PASSENGER FOR TRANSPORTATION GROUPS 1, 2 & 3

With the equations above and our gathered data, we have created emission constants per passenger kilometer traveled for all transportation types. To calculate the final output of CO2 equivalents emitted per passenger we take the user kilometer input data and multiply it by the chosen transportations emission constant. This will produce the output of total CO2-eq emissions for the application user. This formula is displayed below.

$$total\ CO_2\ - eq\ emitted\ per\ passenger = Emissions\ constant * km\ traveled$$

To exemplify; Ingrid travels 1000 km by domestic-flight, which has an emission constant of 246 g CO2-eq per kilometer. Plotting that into the equation above, we calculate that her total emissions are 246 000 g CO2-eq, or 246 kg CO2-eq. Equation is displayed below.

$$246\ 000g\ CO_2\ - eq = 246g\ CO_2\ - eq \times 1000$$

THE 'TRAVEL SUGGESTIONS' FEATURE: CALCULATIONS

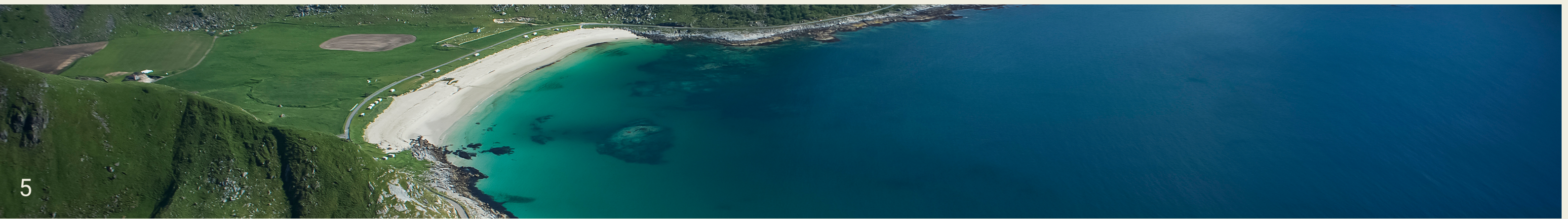
The 'Travel suggestion' feature displays our travel suggestions to the application user, and carbon emissions that could be saved from choosing that suggestion. We use 'if' statements to determine which suggestion to give based on kilometers traveled. The suggestion table is displayed in the appendix as Table 2. The numbers next to each transportation type is the upper limit for giving a suggestion. Likewise the number above is the lower limit, before prioritizing another suggestion. An example would be that Ingrid wants to travel 500 kilometers by plane. 500 is less than 750 (upper limit) and bigger than 250 (lower limit), so the carbon app suggests to travel by train instead.

The output also contains a message that shows how many less grams of CO2 equivalent the user would emit by choosing our suggestion instead. This is calculated by subtracting our suggestion from the user's choice. Formula is displayed below:

$$gCO_2 - eq_{saved} = gCO_2 - eq_{user\_choice} - gCO_2 - eq_{our\_suggestion}$$

Building on the earlier example if Ingrid chooses the domestic flight, she would generate 246 kg CO2-eq emissions. However, by following our suggestion to use the train instead, her emissions would reduce significantly to only 35 kg CO2-eq. We plot that into our equation, and see that Ingrid could save the environment by 211 kg CO2-eq if she chooses to travel by train instead.

$$211\mathrm{kgCO_2} - \mathrm{eq_{saved}} = 246\mathrm{kgCO_2} - \mathrm{eq_{Ingrid's\ choice}} - 35\mathrm{kgCO_2} - \mathrm{eq_{our\_suggestion}}$$



BUSINESS MODEL

In order to create the best customer experience we have created an easy to use application that can accommodate the needs of individuals as well as different household sizes. The app features a user-friendly interface that simplifies navigation and usage. Furthermore the design of the app strictly follows the color palette of the UN's sustainable development goals in order to create an identifiable sign of sustainability, in recognition of the aim towards carbon neutrality by 2050, thereby further motivating users to lower their carbon footprint.

Our app is designed not just to track users' emissions but also to guide individuals in reducing their overall carbon footprint by presenting actionable strategies for lowering emissions.To achieve this, we've integrated tailored suggestions linked to travel distances, illustrating the potential savings users can gain by choosing different alternatives. We hope suggestions like this can encourage users to choose more sustainable means of transportation and in doing so become a part of our green journey towards a more sustainable future.

Additionally we plan to expand our app's functionality with new innovative features in the future. Our plan is to introduce a friend and leaderboard system where you can see where you rank among your friends, as well as globally. This will foster friendly competition, and incentivize users to lower their emissions as well as to actively use our app to keep track of emissions. This not only enhances user engagement but also helps our marketing efforts through word-of-mouth promotion. To further attract users, we are planning to add a referral system, enabling existing users to earn unique icons or achievements on our platform, facilitating cost-effective marketing. Complementing this we intend to use social media for targeted marketing, sharing engaging content that promotes sustainable living and the benefits of our app, aiming to further boost interaction and user engagement.

When launching our application, it is important that we focus on a small target group, who are likely to use the app. Consequently, we decided to target people who are environmentally conscious and therefore likely to change their consumption habits. Given Norway's renowned commitment to sustainability, launching our app here initially is a strategic move. Furthermore, we believe that individuals between the ages of 18 and 30 align most closely with our target audience. Therefore, our primary customer segment consists of Norwegians within this age bracket. Upon successful completion of our testing phase, we aim to broaden our target audience to include young people from other European countries, with a particular focus on Spain, Finland, and France, given that these are the home countries of our team members.

Considering our target demographic is young and aiming to promote barrier-free access, we've opted to offer the app free of charge, supported by advertisements to sustain it. This strategy helps us cover the costs of essential services such as AWS ensuring our app maintains fully operational. In the future, we're considering introducing a freemium version of the app that includes both additional features and an ad-free experience. This strategy is aimed at generating increased revenue, which will enable us to further expand and enhance the app's capabilities in order to create a better product for the customers.

Moving forward we want to grow with our user base and incorporate new features in order to add more value to our product. We're planning to make the app more user-friendly and make it easier for the user to do the calculations only relying on one app instead of moving across platforms to figure out how far of a distance they have traveled. To do so we want to add a new feature reminiscent of Google Maps, or integrate it directly in our service. The idea is to allow users to specify their journey's start and end points, select a transportation method, and receive an automatic calculation of the associated carbon emissions. By adding new features and continuing to make the app better, we'll provide more value to our users and make our app stand out from the competition.

A more comprehensive business model canvas overview can be found in the appendix

.

POLICY IMPLICATIONS AND DISCUSSION

It’s clear that there is a pressing need to reduce the carbon emissions from the transport sector and our app has the potential to play a role in reducing it. But in terms of making a bigger impact, we might fall short of the policy makers.

Lately there has been a growing trend in regulation, and reducing carbon emissions across businesses (European Environment Agency, n.d.). By targeting individuals and opting for a free app, we hope we can build a big platform, enabling us to create a community and along with them help pressure policymakers to make the changes needed in the transportation sector, both private and public.

Policies like the EU Taxonomy to facilitate investments in sustainable projects and combat greenwashing by providing clear, comparable sustainability information in the market have made a big impact (European Commission, n.d.). This has played a part in companies transitioning to more green transportation methods, as well as lucrative tax deals and subsidies from the government has made it cheaper for companies to do so.

Tax credits, subsidies and policies like this help decrease the overall environmental impact from carbon emissions. Through our app, we aim to inspire policymakers in our Target Group’s respective countries towards adopting more eco-friendly measures, potentially leading to a broader environmental impact than the direct effects of the app itself.

SUMMARY

The transport sector's carbon emissions are a significant contributor to global carbon emissions, highlighting an urgent need for change. Recognizing this, our carbon calculator app is designed to make a tangible impact by enabling users to measure their emissions from transportation. By providing insights into their carbon footprint, the app empowers users to opt for greener alternatives, thus promoting sustainable behavior.

Our business model centers on broad accessibility, offering the app for free to encourage widespread adoption, with plans to introduce a premium version with enhanced features. Targeted at a young and motivated user base, the app aims to catalyze action towards reducing emissions. We aim to continuously improve the app by incorporating user feedback and evolving environmental data, ensuring it remains a relevant and effective tool for change.

Moreover, by demonstrating the collective will of individuals for sustainable transportation, the app seeks to influence policymakers. By showcasing user engagement and preference for greener alternatives, it adds pressure for policy reforms that support sustainable transport infrastructure.

We firmly believe in the app's potential to contribute significantly to the global fight against climate change. Through individual empowerment and collective action, the app serves as a catalyst for broader environmental and policy change, aligning with our vision for a green journey towards a more sustainable and responsible society.

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APPENDIX

Table 1

Transportation group	Transportation type	Fuel type	gCO2-eq	l/100km, kWh/1000km	Source*
Car	Small car	Electric	41,415	16,5	NAF (BMW i3)
	Small car	Petrol	146,16	6,3	CarsGuide (BMW 320i)
	Small car	Diesel	119,7	4,5	CarsGuide (BMW 320d)
	SUV	Electric	47,69	19	NAF (BMW iX3)
	SUV	Petrol	208,8	9	NAF (BMW xDrive40i)
	SUV	Diesel	183,54	6,9	NAF (BMW wDrive40d 7 -s)
Public Transport	Domestic flight	Fixed	246		OurWorldInData
	Long-hall Flight	Fixed	148		OurWorldInData
	Bus	Fixed	97		OurWorldInData
	Long distance bus (coach)	Fixed	27		OurWorldInData
	Tram	Fixed	29		OurWorldInData
	Train	Fixed	35		OurWorldInData
	Ferry	Fixed	19		OurWorldInData
Fossil-free travelling	Bike	Fixed	0		None
	Walk	Fixed	0		None

*Full citatations are available in the references

Table 2

Transportation type	Kilometers
Walk	2
Bike	10
Ferry	25
Tram	50
Long distance bus (coach)	250
Train	750

BUSINESS MODEL CANVAS

Our Business model can be described with two words: affordable and innovative. Our goal is to have an app that can be used by people aware about climate change and prone to do what is necessary to fight it. Since our target is quite young, we built a business model that allows us to access our main features for free so that money is not a barrier. We pride ourselves on our innovation, aiming not only to inform individuals about their transportation emissions but also to empower them with tailored suggestions related to travel distances. Our goal is to illustrate the potential savings users can achieve by opting for different alternatives.

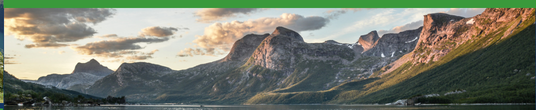
KEY PARTNERS

- Developers and designers
- Associations engaged in fighting climate change

VALUE PROPOSITION

"An easy and intuitive app that addresses climate change, while educating people about their carbon emissions using different transportation methods and offering clues to reduce them"

- 3 pillars:
  - Environment (to fight climate change)
  - Society (education about transport carbon emissions)
  - Technology (intuitive and unique app)



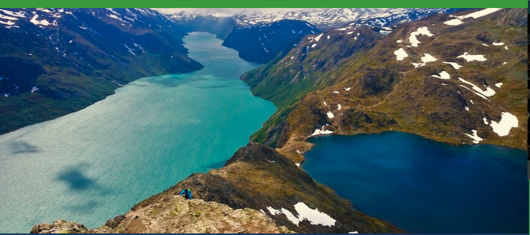
CUSTOMER SEGMENT

- People aware about climate change
- Norway: very aware of this topic
- Population between 18 and 30 years old

Norwegians aged between 18 and 30 years old

KEY ACTIVITIES

- Main activity: the **app**
  - Developing the best possible app
  - Maintaining and improving the app



COST STRUCTURE

- AWS
- Maintenance of the app
- Development of new features
- Salaries (in the future)

CUSTOMER RELATIONSHIP

- Main activity: contact page on the website
- Social Media: to promote the brand and gain insights on our followers opinions

KEY RESOURCES

- Business built around the **app**
- Development and programming tools (Python, HTML, CSS and Java)
- AWS (to host the app)
- Marketing strategies, mainly through social media

REVENUE STREAM

- Stage 1:
  - Free with ads (to gain as many users as possible)
- Stage 2:
  - Development of a freemium model (transport carbon emissions are free, but we charge for the new features)
  - In this phase ads would be removed

CHANNELS

- App: the main interface for user interaction
- Social media: to reach our audience and partners
- Channels directed to raising awareness and fostering community involvement
- Word-of-mouth