**CO$_2$ EMISSION PREDICTOR INITIATIVE**

# Project Overview

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# The Climate Challenge

Transport contributes significantly to carbon emissions, making it a leading cause of global pollution. As vehicle ownership rises, so do emissions, impacting climate change and public health. Understanding these trends is crucial for developing informed policies. This project aims to leverage data-driven insights to combat this challenge, fostering sustainable transportation solutions that benefit both the environment and society.
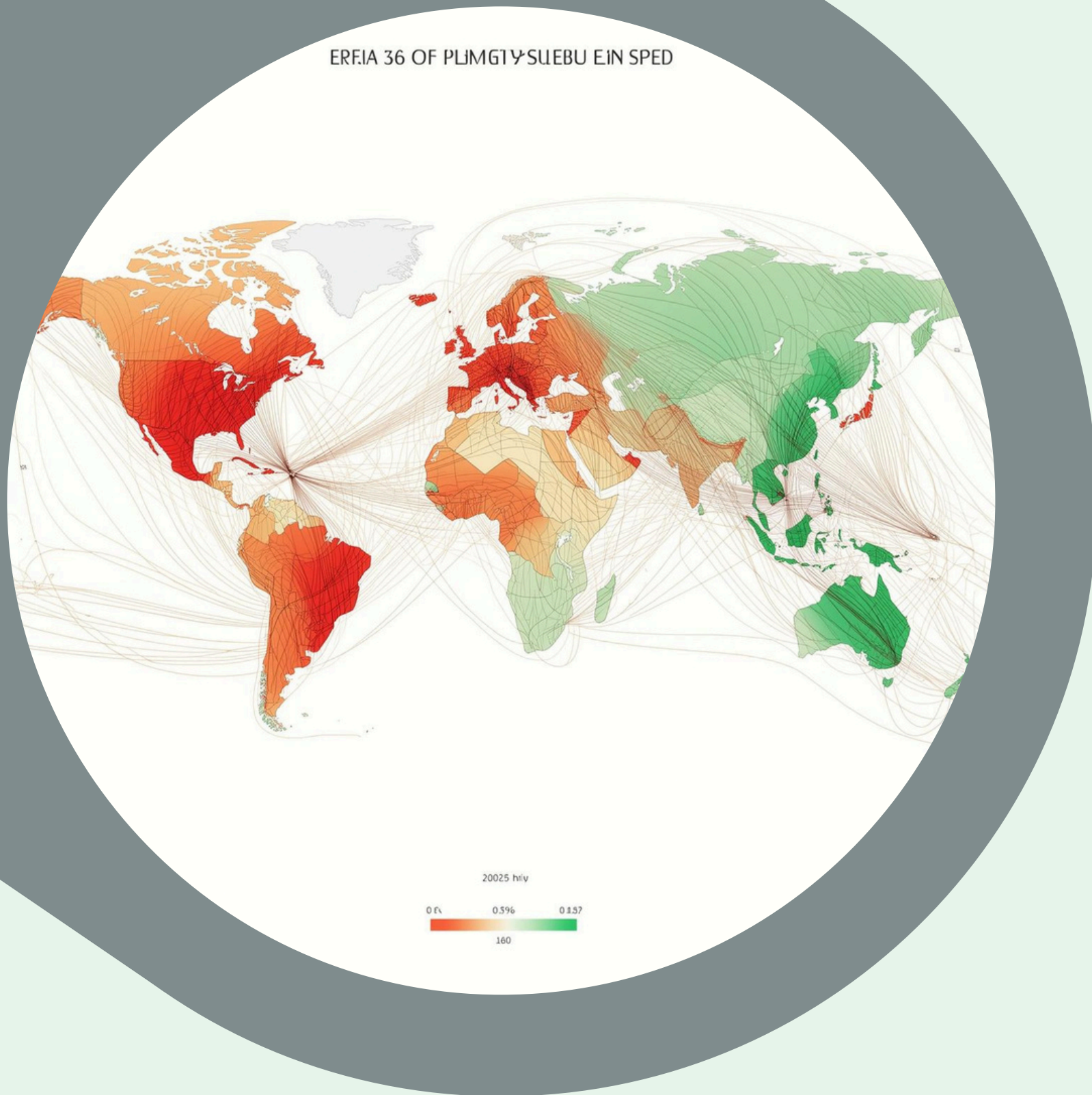
# Project Objective

**01**   **Predictive Model**

We aim to develop an AI model that predicts vehicle emissions based on various input features and data.

**02**   **Data Analysis**

The project involves analyzing patterns from engine specifications, fuel types, and vehicle transmission information to improve accuracy.

**03**   **Real-Time Predictions**

Our goal is to provide users with real-time predictions of $CO_2$ emissions to facilitate informed eco-friendly choices.

# Dataset Attributes

The $CO_2$ Emission Predictor utilizes a dataset with **12 essential attributes** that include Engine Size, Cylinders, Fuel Type, and $CO_2$ emissions. Each column has been meticulously cleaned and preprocessed to ensure accuracy. This dataset serves as the foundation for our machine learning model, providing vital insights into the relationships between vehicle specifications and emissions, ultimately enabling better predictive capabilities.

# Model Development



The regression model employed for predicting vehicle $CO_2$ emissions is the **RandomForestRegressor**. This robust model analyzes various features, including engine size, fuel type, and transmission details. By utilizing an 80/20 training/testing split, we ensure reliable performance validation. Evaluation metrics such as MAE, $R^2$, and RMSE confirm the model's accuracy, establishing a strong foundation for our predictive capabilities in environmental sustainability.
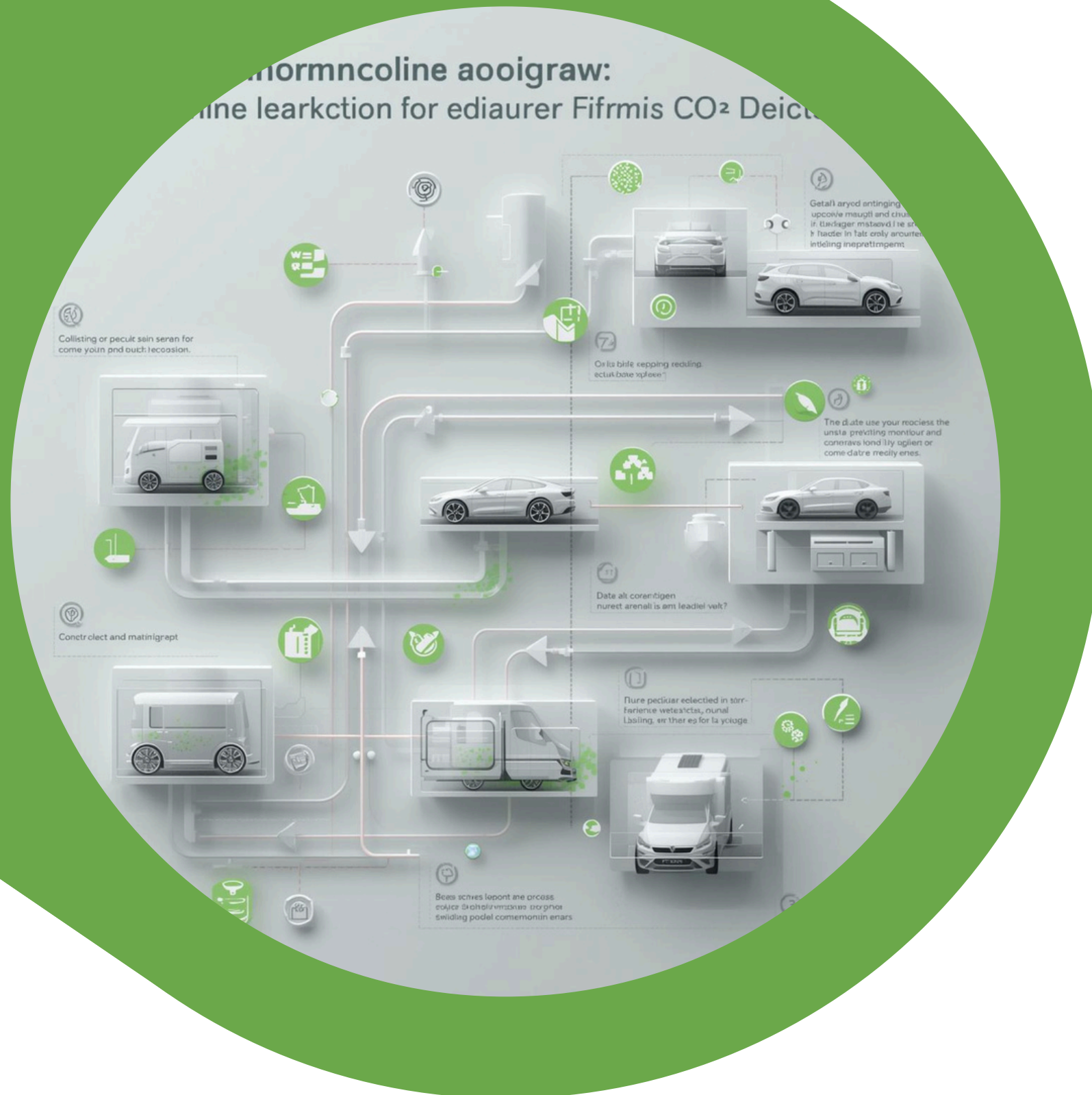
# Model Performance
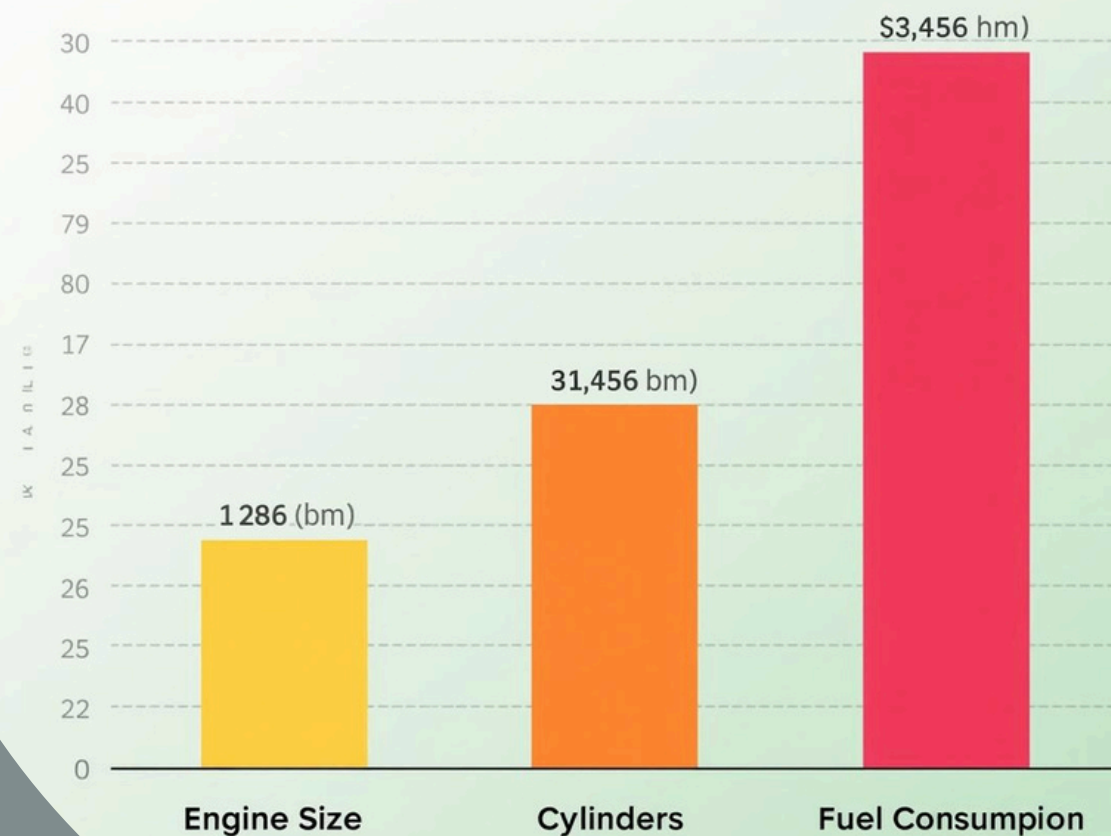


The predictive model demonstrates impressive capabilities, achieving an **$R^2$ value of approximately 0.91**, indicating strong predictive accuracy. This means that 91% of the variance in vehicle $CO_2$ emissions can be explained by the model. The analysis reveals that key features contributing to emissions include engine size, cylinder count, and fuel consumption, highlighting critical areas for future emissions reduction strategies.
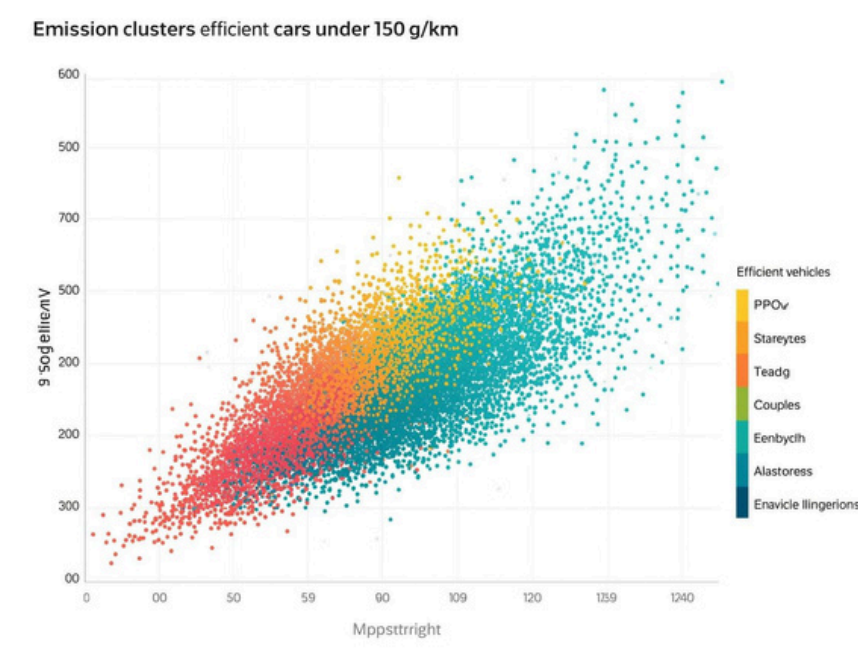
# Visual Insights on CO₂ Emissions
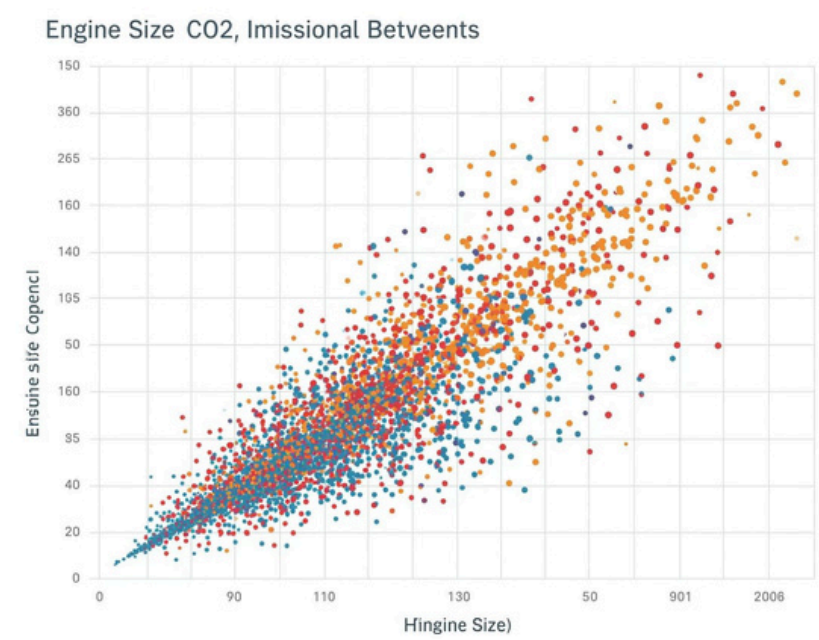


### Engine Size

CO₂ emissions rise alongside engine size increase.
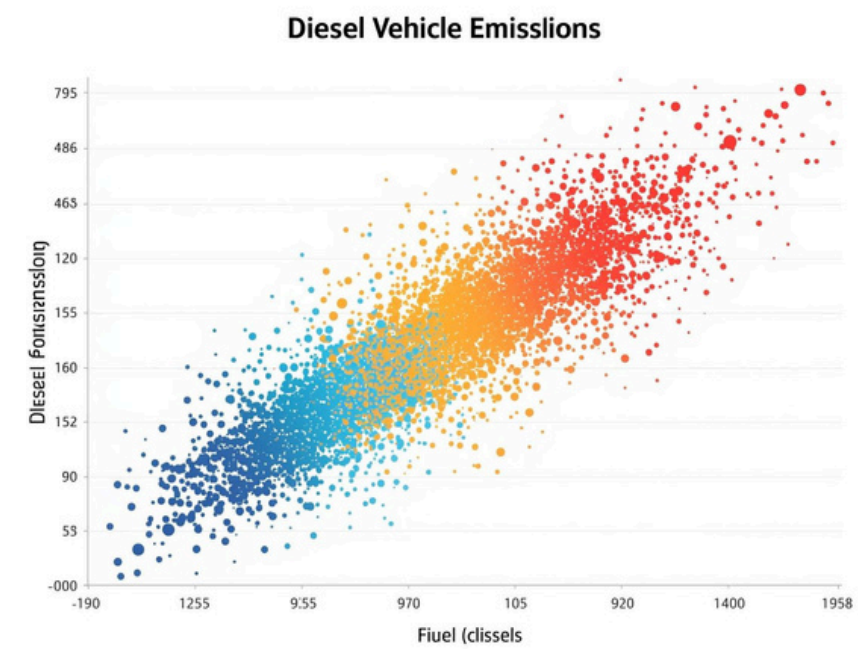
### Diesel Emissions

Diesel vehicles emit significantly higher CO₂ levels.

### Efficient Cars

Efficient vehicles cluster below 150 g/km emissions.

# User Input App

The User Input Prediction App allows users to easily enter their vehicle specifications to receive **instant $CO_2$ emission estimates**. Built on a Python Streamlit framework, the app enhances user engagement by providing personalized insights into vehicle emissions based on selected features. This interactive tool empowers users to make informed decisions, contributing to a sustainable future through data-driven awareness.
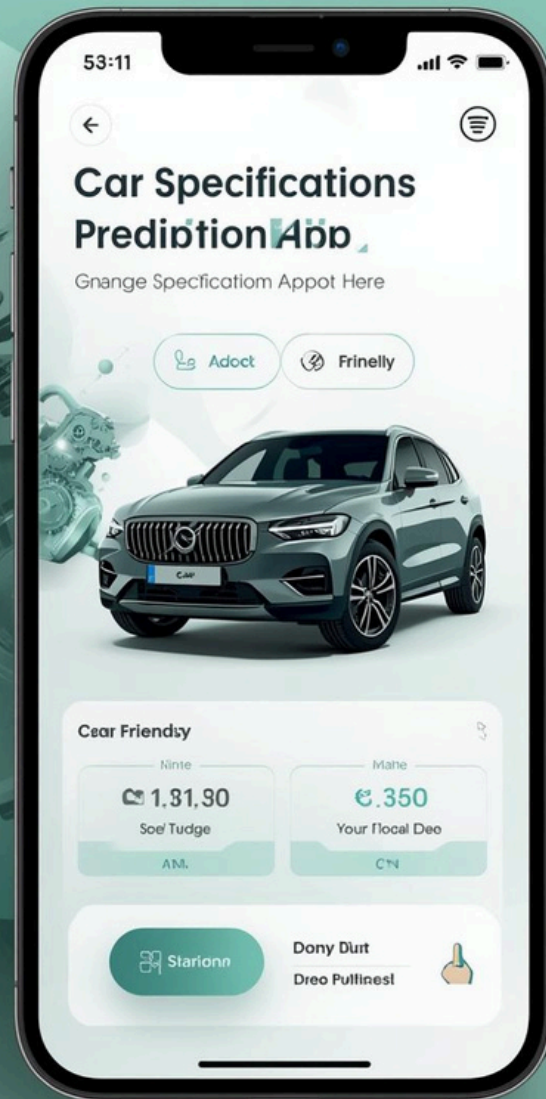
# Future Impact



The $CO_2$ Emission Predictor project aims to **support policy making** and enhance consumer awareness about vehicle emissions. By providing accurate data-driven insights, we encourage informed choices that contribute to environmental sustainability. Our future plans include integrating real-time vehicle data APIs and expanding the model to compare emissions from electric vehicles, paving the way for a greener, cleaner world.
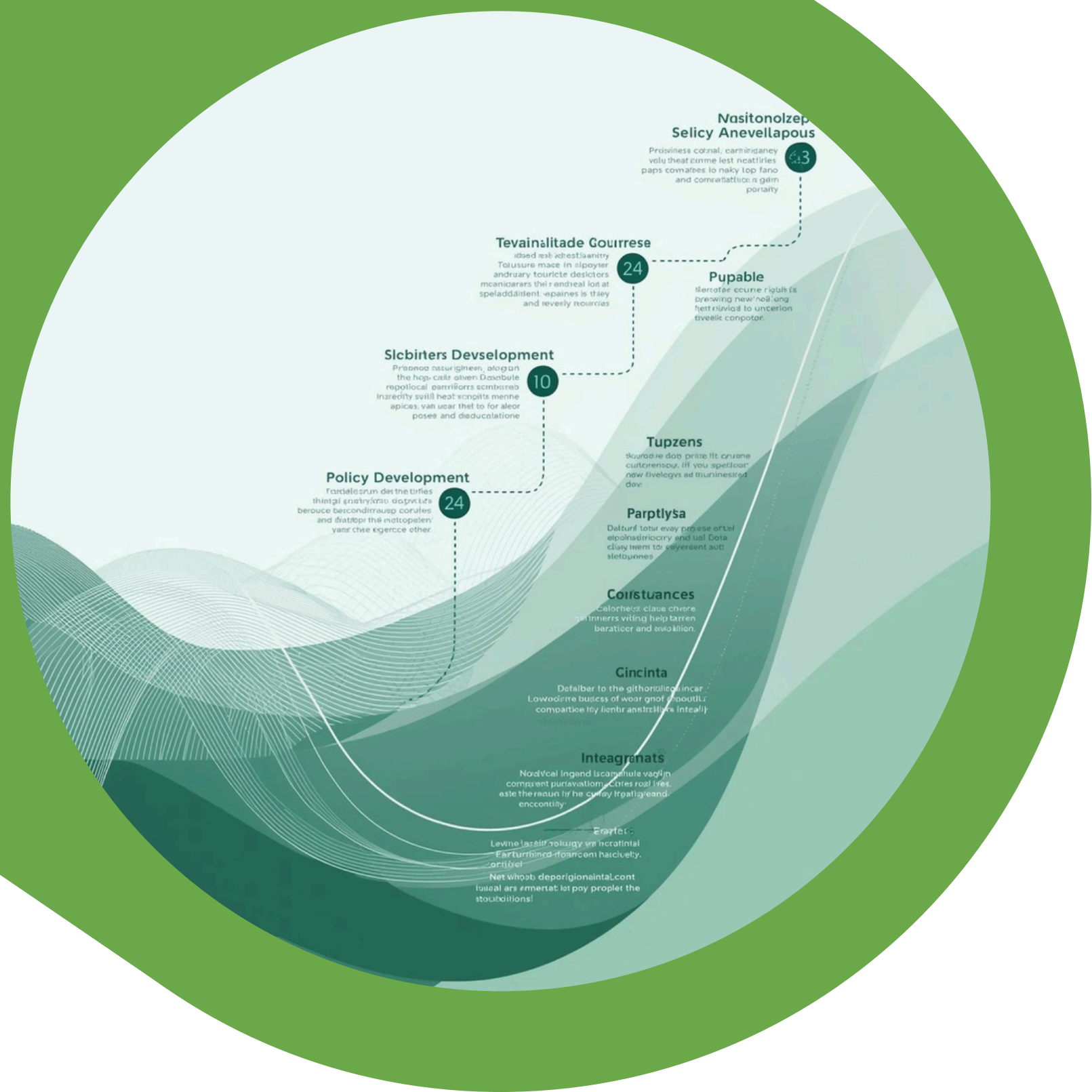
# Drive Green

**WITH DATA**

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