A Proposal for SMART

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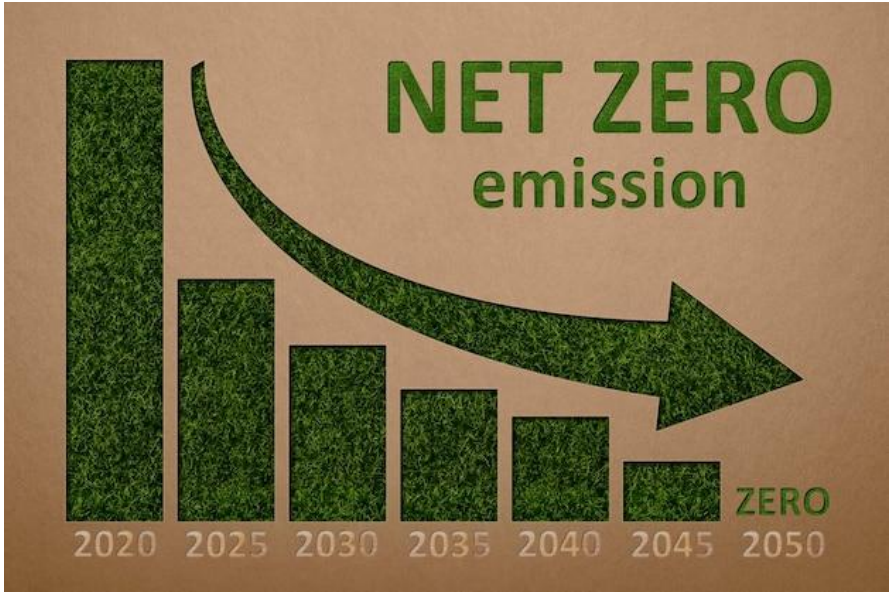
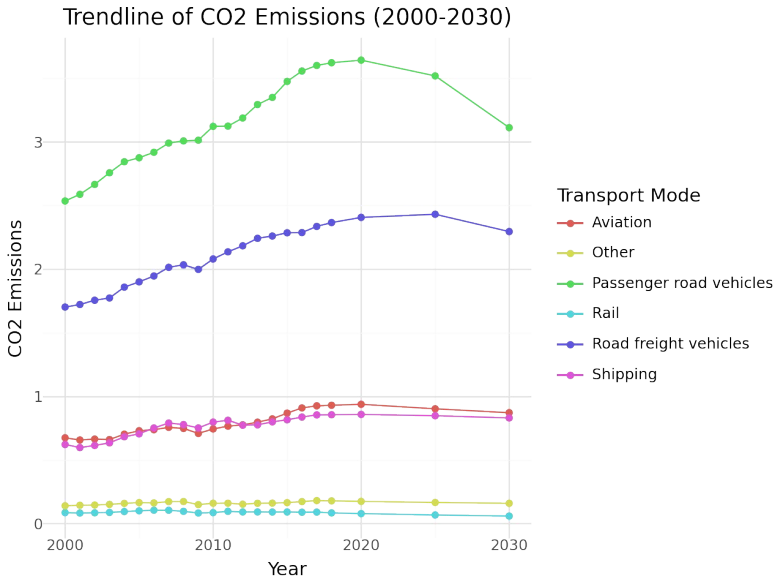
Project Objective

Our goal is to identify high emission transportation modes and provide actionable recommendations to reduce CO_2 emissions for SMART.



Dataset 1: Emission Predictions (2000–2030)

- Tracks CO2 emissions by transportation mode (aviation, rails) from 2000-2030
- With predictors being year and mode

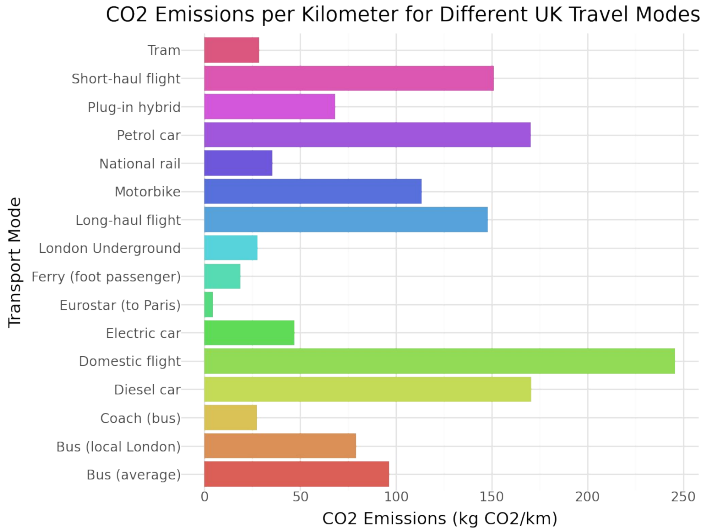


Dataset 1 Summary Statistics

	Year	Passenger road vehicles	Aviation	Road freight vehicles	Rail	Shipping	Other	Total Emissions	High Emission
mean	2011.181818	3.127460	0.785468	2.091297	0.087655	0.762523	0.160897	22.045898	0.500000
std	7.817175	0.345027	0.095132	0.235283	0.010614	0.084090	0.011204	3.169683	0.511766
min	2000.000000	2.535501	0.656728	1.701686	0.058566	0.596998	0.139543	17.271990	0.000000
25%	2005.250000	2.886176	0.713467	1.911128	0.083674	0.716273	0.153354	19.529278	0.000000
50%	2010.500000	3.117142	0.760674	2.107606	0.089171	0.783865	0.159943	22.118577	0.500000
75%	2015.750000	3.443902	0.870295	2.286937	0.093097	0.826369	0.170335	24.934049	1.000000
max	2030.000000	3.642847	0.937136	2.431087	0.104573	0.857857	0.180136	26.288308	1.000000

Dataset 2: Carbon Footprint by Travel Mode (UK 2022)

- CO2 emissions (g/km) for transport modes (e.g., bus, diesel car, flights
- Emissions based on direct measurements or estimates for 2022



Dataset 2 Summary Statistics

	Year	Transport emissions per kilometer travelled	High Emissions
mean	2022.0	89.587500	0.250000
std	0.0	70.390426	0.447214
min	2022.0	4.460000	0.000000
25%	2022.0	28.410000	0.000000
50%	2022.0	73.880000	0.000000
75%	2022.0	148.657500	0.250000
max	2022.0	245.870000	1.000000

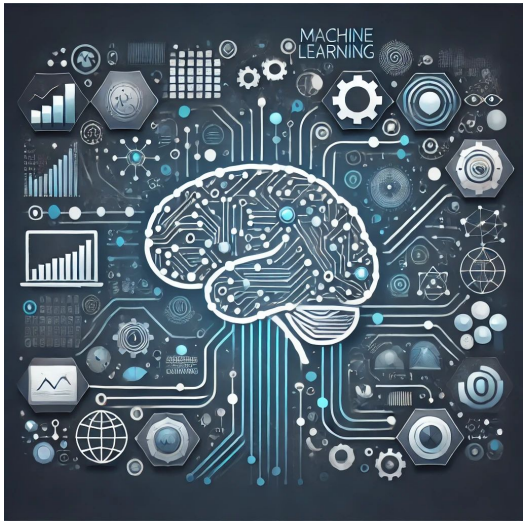
Our Approach

Modeling & Analysis:

- Built predictive models to estimate emissions under baseline and policy scenarios.
- Evaluated the impact of reducing high-emission modes and shifting to low-emission options.

Scenario Testing & Policy Insights:

- Simulated “what-if” scenarios to assess policy shifts.
- Identified meaningful reductions to guide recommendations.



Modeling Results

Variables Considered:

- Year, Transport Mode, and Policy Intervention Indicators

Model Comparison:

- **Best-Performing Model:** Logistic Regression (Accuracy: 0.75)
- **Other Models Tested:**
  - Linear Discriminant Analysis (LDA)
  - K-Nearest Neighbors (KNN)
  - Decision Tree

Actionable Insight #1

- **Reduce High-Emission Modes:**
  a. **Baseline Scenario (2030):** Projected emissions at 7.33 gigatonnes.
  b. **Proposed Policy:** Reduce road freight by 20% and aviation by 15%.
  c. **Impact:** Emissions drop to 2.58 gigatonnes.
  d. **Key Insight:** Targeting high-emission modes achieves significant reductions.

Actionable Insight #2

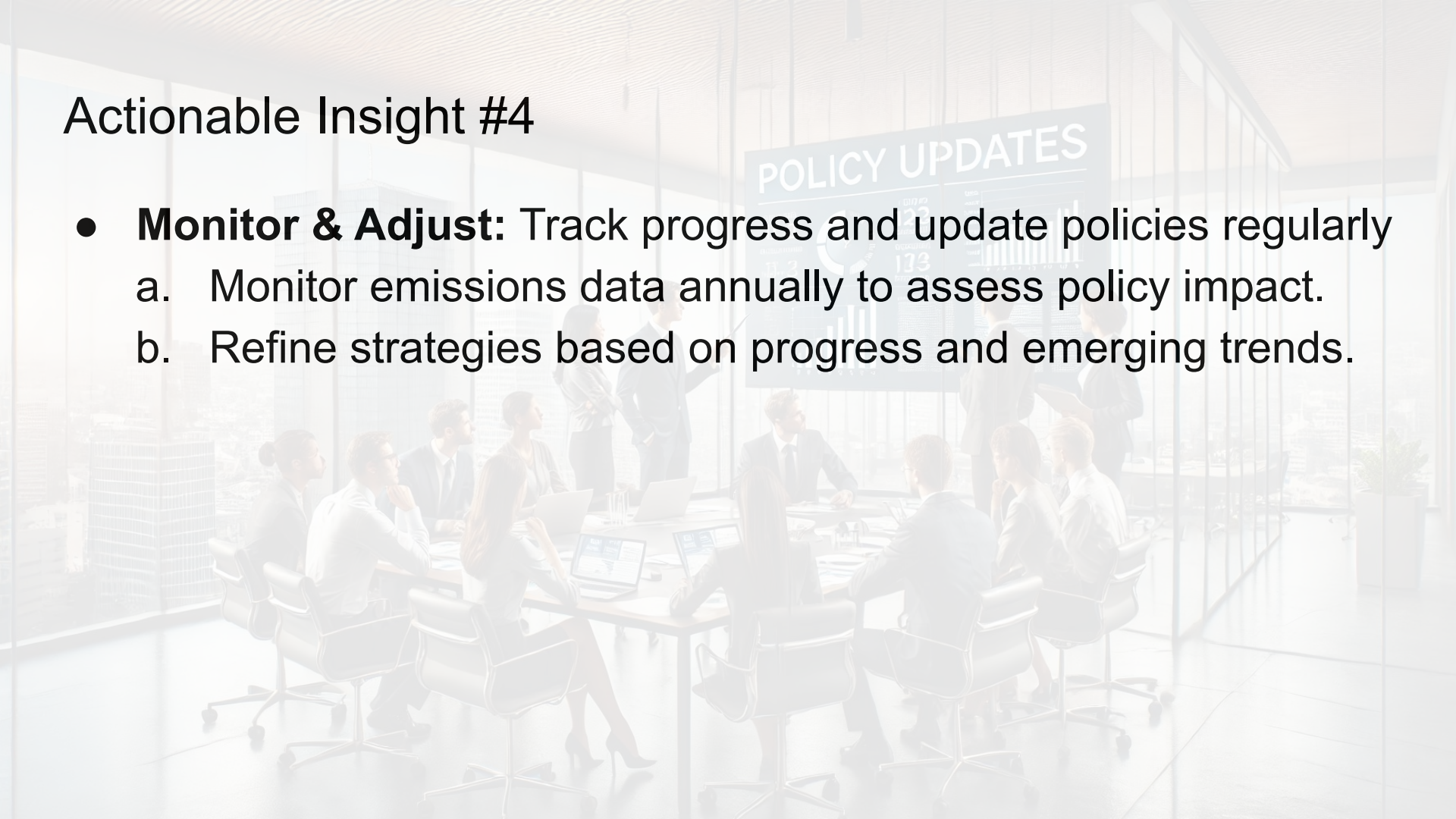
- **Boost Low-Emission Options:** Invest in rail and EV infrastructure.
  a. **Study Focus:** Emissions reduction through electric vehicles (EVs) and public transit.
  b. **Baseline Emissions (2030):** 7.33 gigatonnes of CO2.
  c. **Transition Scenario:** Emissions drop to 6.92 gigatonnes (0.41 gigatonne reduction).
  d. **Key Insight:** Prioritizing EVs and public transit supports achieving environmental targets.

Actionable Insight #3

- **Promote Active Transport:** Expand cycling lanes and e-bike programs.
  a. **Baseline Emissions (BAU, 2030):** 9.37 million metric tons (MT) of CO2.
  b. **Policy Scenario:** 20% reduction in car usage, 50% increase in electric bike usage.
  c. **Impact:** Emissions drop to 8.62 MT CO2 (8.04% reduction).
  d. **Key Insight:** Prioritizing cycling and reducing car use significantly cuts emissions.

Actionable Insight #4

- **Monitor & Adjust:** Track progress and update policies regularly
  a. Monitor emissions data annually to assess policy impact.
  b. Refine strategies based on progress and emerging trends.



Impact for SMART

- **Informed Decision-Making:** Data-driven insights guide targeted policy proposals.
- **Strategic Investments:** Allocate resources efficiently toward low-emission infrastructure.
- **Reputation & Leadership:** Position SMART as a forward-thinking advocate for sustainable transport.
- **Long-Term Value:** Foster stakeholder trust and contribute to global sustainability goals.

Limitations and Next Steps

Limitations:

- **Data Gaps:** Some future projections may be uncertain.
- **Model Scope:** Focused on select modes; more comprehensive datasets needed.

Next Steps:

- Expand data sources and refine assumptions.
- Test additional models and scenarios.
- Integrate real-time monitoring for iterative improvements.


Thank You