Analysis of CO2 Emission Reduction and Energy Interactions in Turkey Via Genetic Algorithm and BUEMS-macro for Electric Vehicles

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CONTEXT

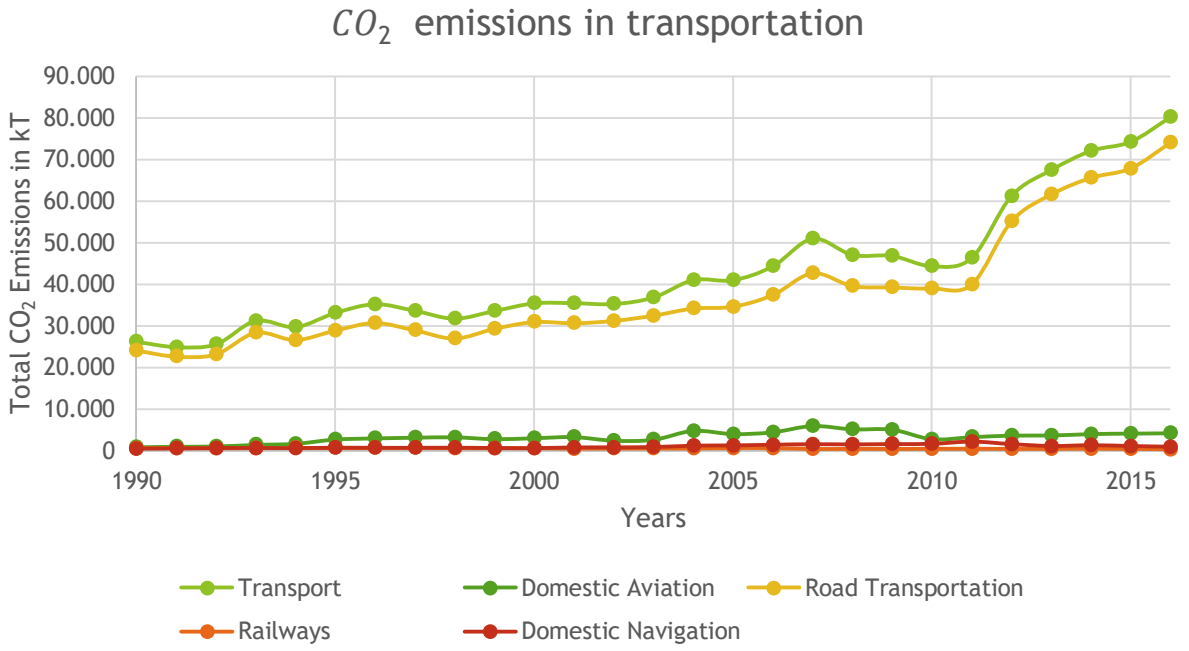
- Introduction
- CO_2 Emission in Turkey
- Genetic Algorithm Application in Transportation Sector for Energy Demand
- BUEMS Application in Transportation Sector for Energy Demand
- Future Estimations
- Refinery Case
- Comparing Both Methods in Different Scenarios
- Conclusion

INTRODUCTION

- Demand Projection of EV in Turkey between 2020 and 2050
- CO_2 emission
  - Direct
  - Indirect
- Top-down approach ⇒ Genetic Algorithm
- Bottom-up approach ⇒ Bogazici University Energy Modeling System

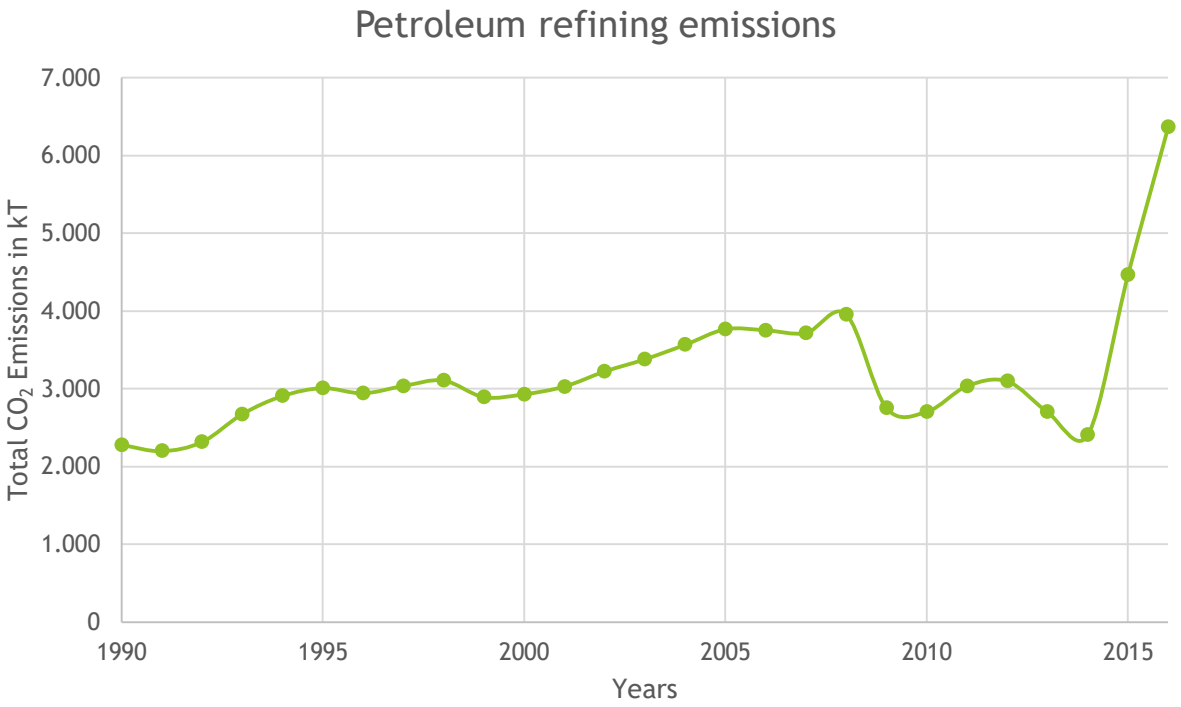
CO_2 EMISSION IN TURKEY

- Transportation sector
  - Road Transportation



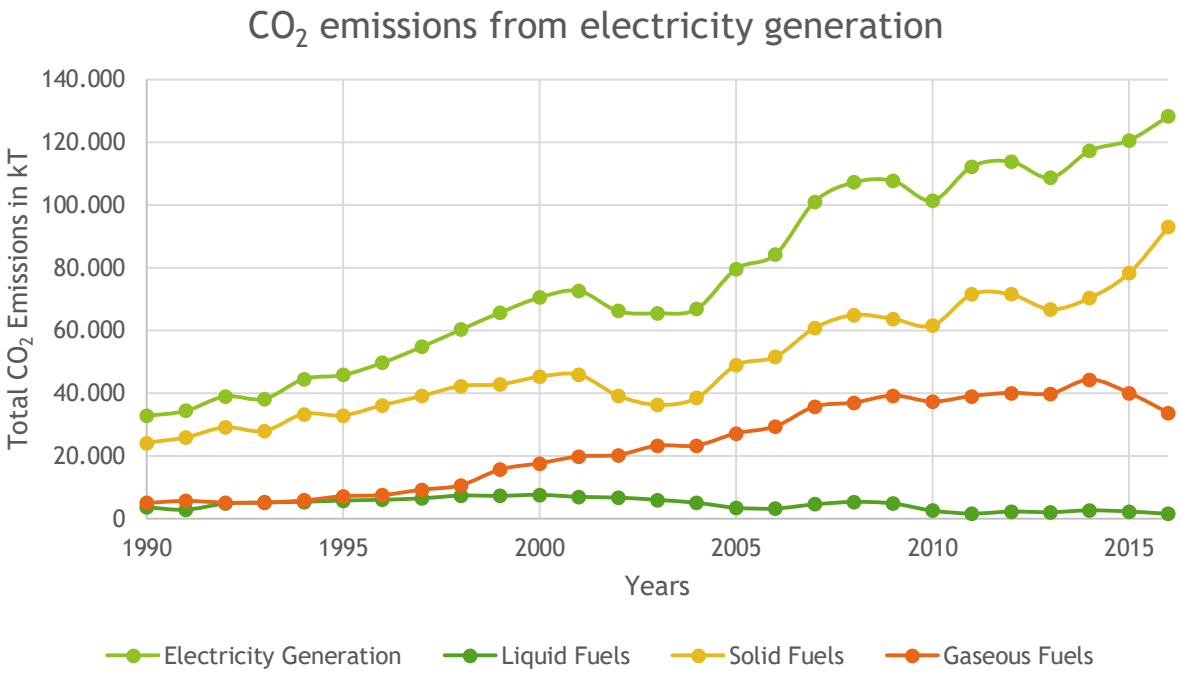
CO_2 EMISSION IN TURKEY

- Refining



CO_2 EMISSION IN TURKEY

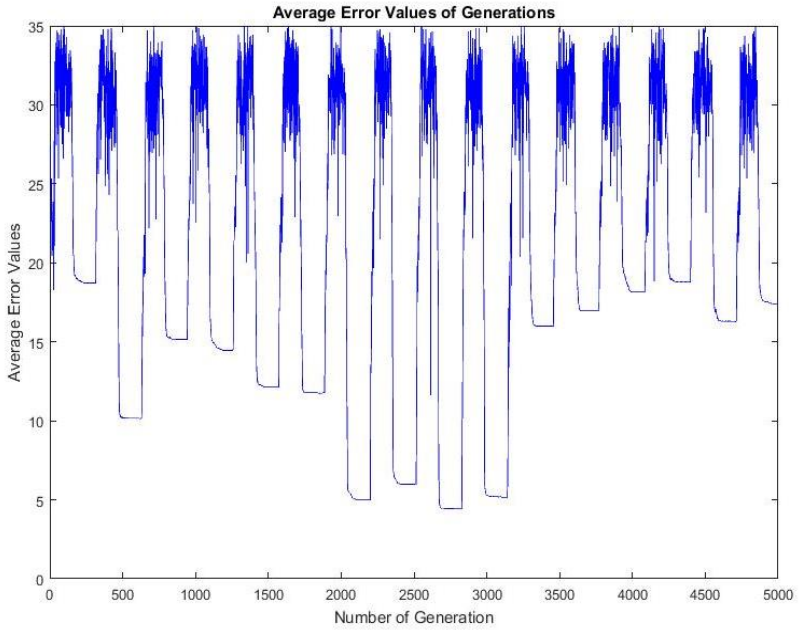
- Electricity generation

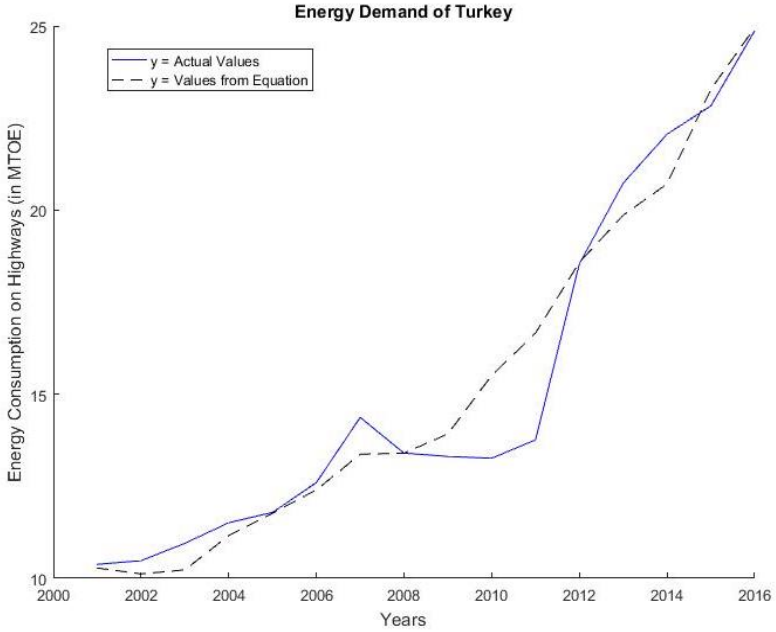


GENETIC ALGORITHM APPLICATION IN TRANSPORTATION SECTOR FOR ENERGY DEMAND

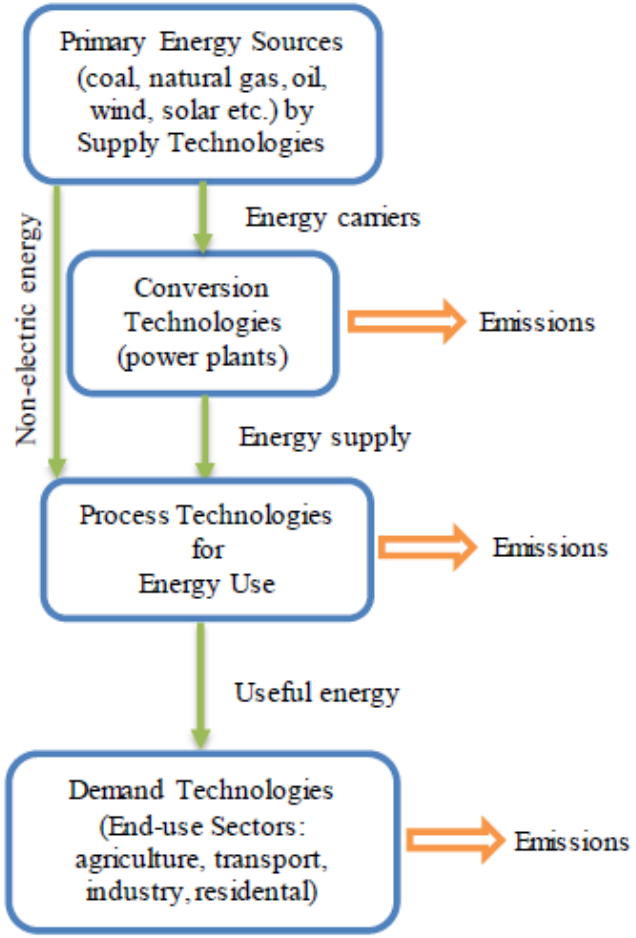
- An adaptive heuristic search method
  - Genetics
  - Natural selection
- $E = w_1 {X_1}^{w_2} + w_3 {X_2}^{w_4} + w_5 {X_3}^{w_6} + w_7$ (Exponential Form)
- GDP - Population - Total vehicle-km

GENETIC ALGORITHM APPLICATION IN TRANSPORTATION SECTOR FOR ENERGY DEMAND



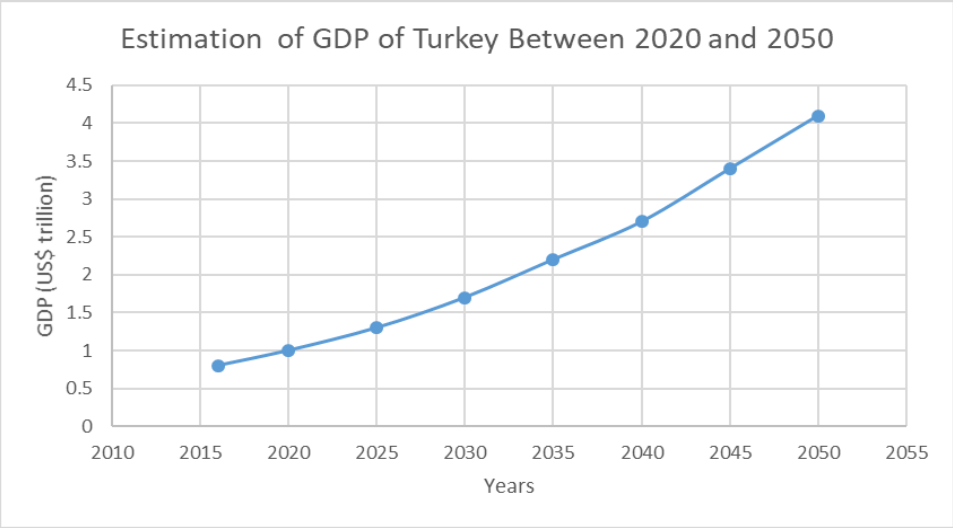


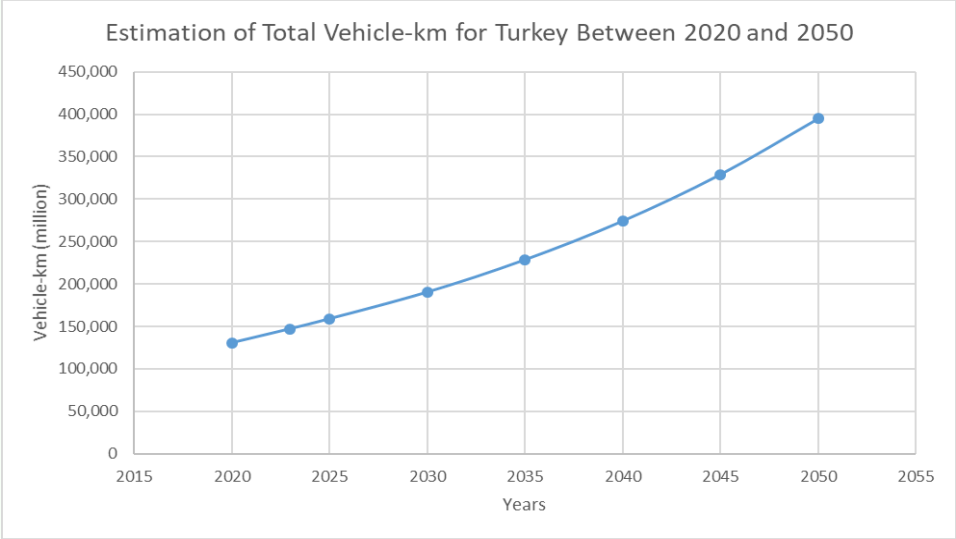
BUEMS APPLICATION IN TRANSPORTATION SECTOR FOR ENERGY DEMAND

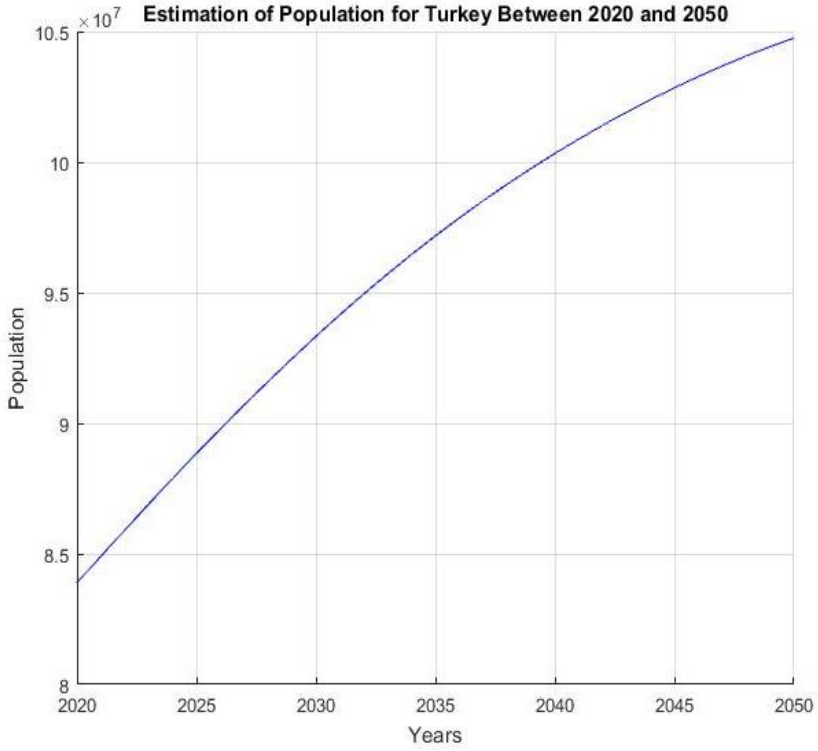


- Linear optimization model
- Bottom-up structure
- Similar to TIMES and MARKAL

FUTURE ESTIMATIONS







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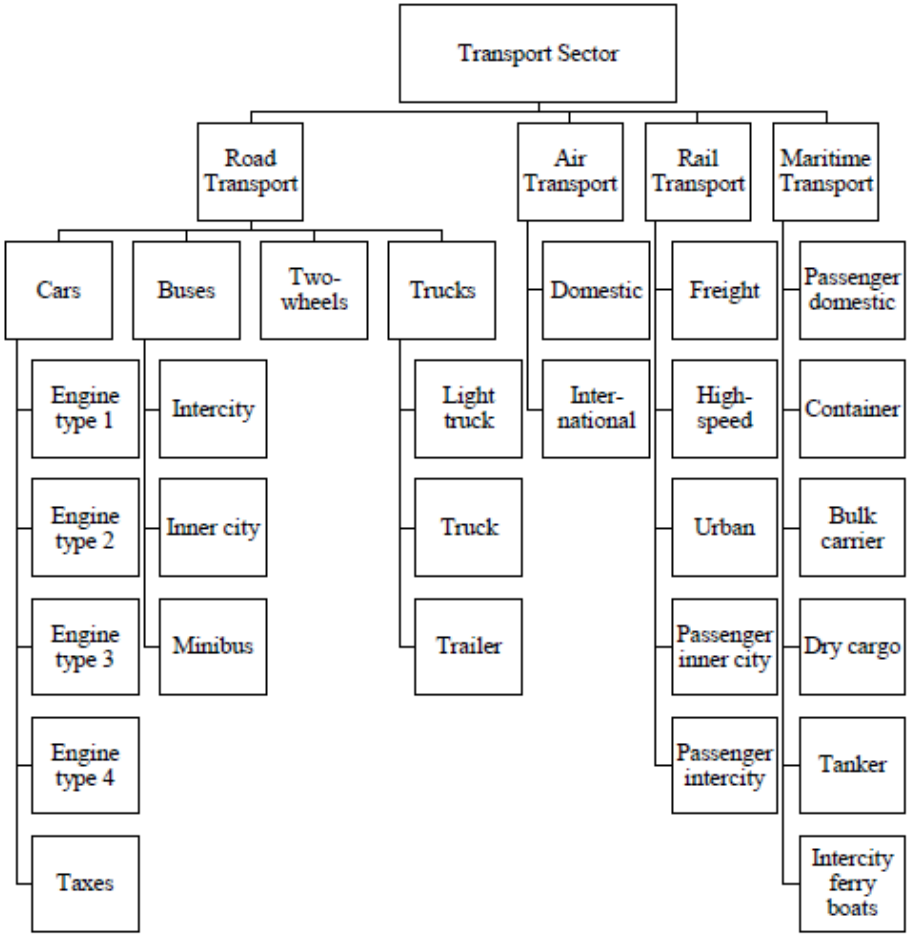
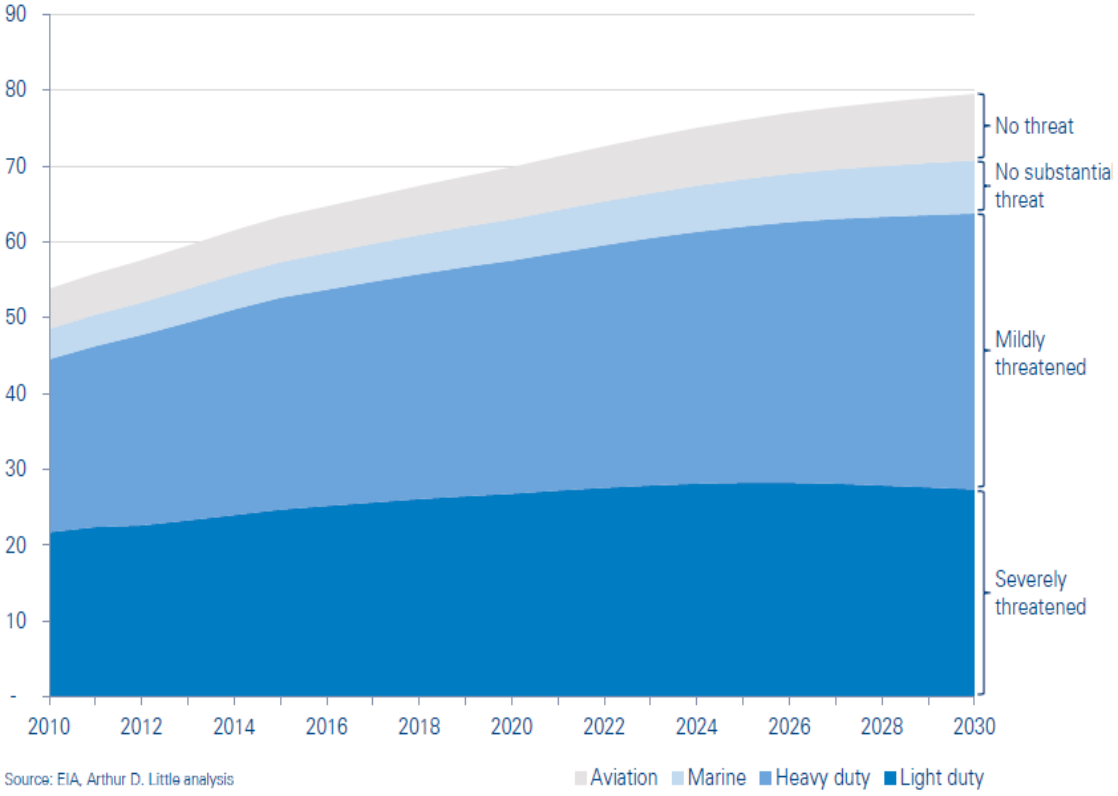


- Transport Sector Structure
- Demand for road transportation
- EV Consumption
- Other data

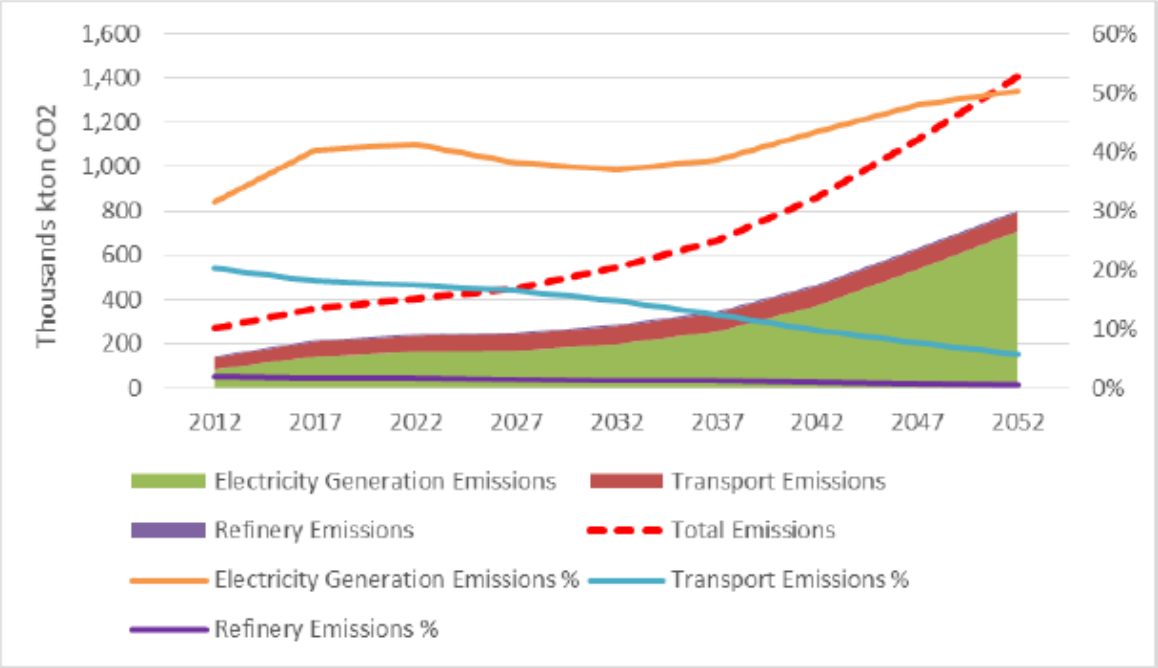
REFINERY CASE

- Trucks, ships, jet planes ?



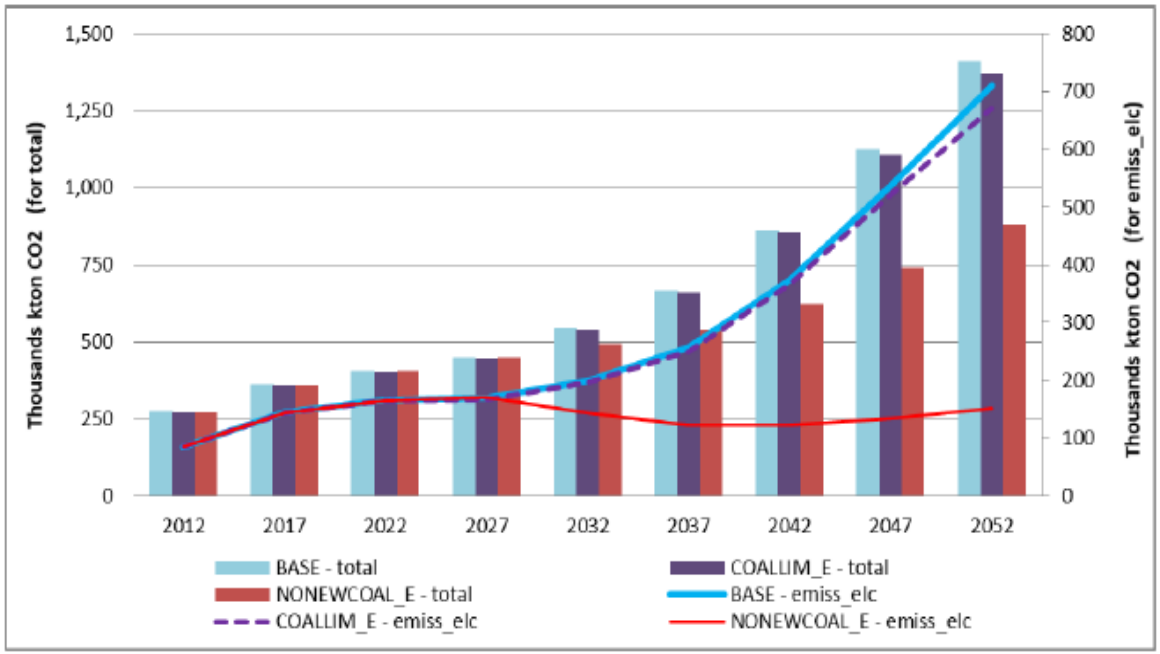
COMPARING BOTH METHODS IN DIFFERENT SCENARIOS

- Base Scenario
- Decrease in transportation sector



COMPARING BOTH METHODS IN DIFFERENT SCENARIOS

- Coal Restriction Scenarios



CONCLUSION

- Both methods give similar answer.
- Many scenarios can be created.
- Refineries have to be considered.