

LCA Analysis of Transportation for the City of Pittsburgh

Introduction

- Urban populations growing means new infrastructure will be needed
- Building sustainable infrastructure will create more sustainable cities

The City of Pittsburgh

- The city of Pittsburgh grows at around 0.6% every year
- Supports a population of 2.4 million people
- Creating good public infrastructure could draw more people to city



Conducting an LCA

- The scope will be looking at bus, electric car, and gas-fueled car
- Using TRACI 2.1 V1.05 / US-Canadian 2008 and Ecoinvent libraries

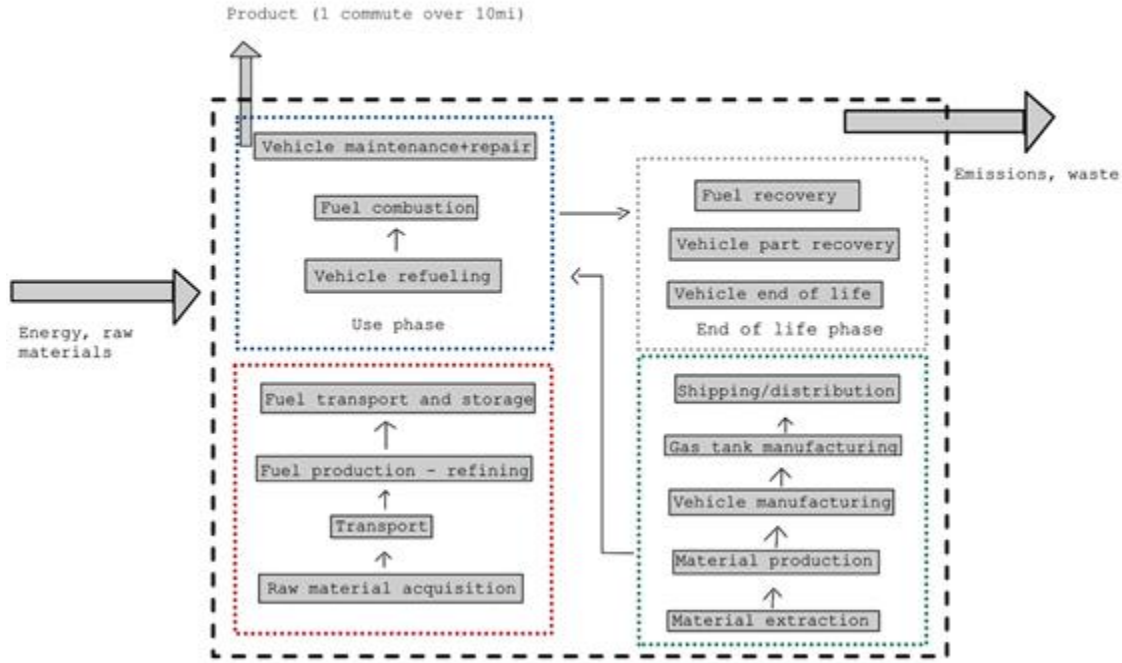


Goal of the LCA

The goal of this LCA is to compare major transportation methods in the city of Pittsburgh on a distance basis. The findings of this study are intended to inform urban planning and policy-making surrounding transportation from both environmental and human health perspectives. This comparative study will be available to the public to demonstrate the environmental impacts of different transportation methods and to direct improvements to transportation systems.

System Boundaries

system diagram for petrol vehicle



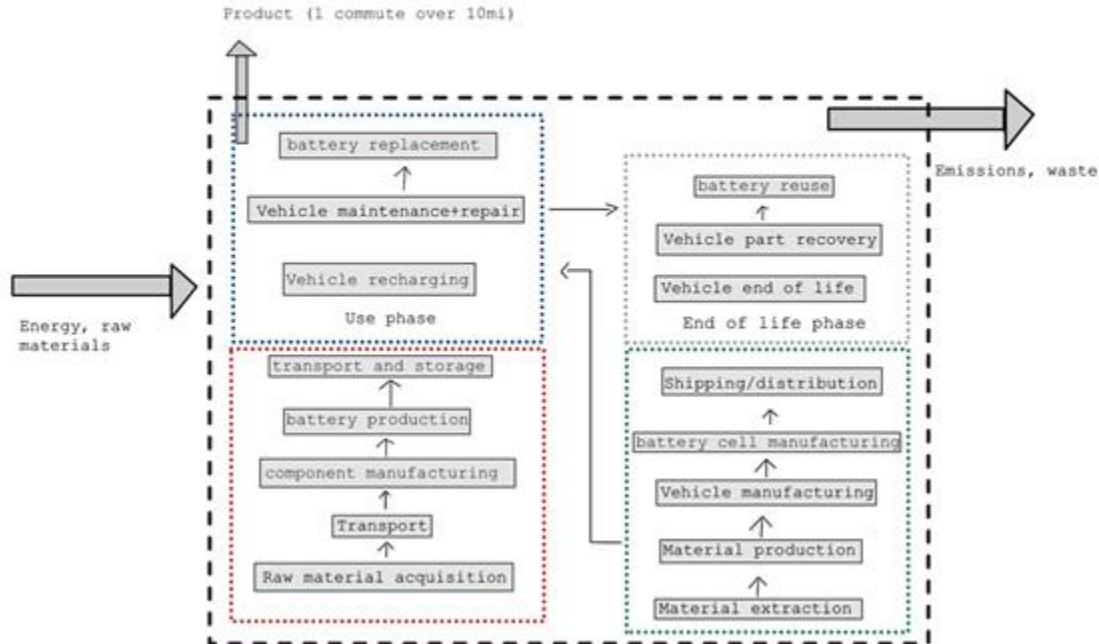
Major inputs
Electricity, construction
material, crude oil, iron

Major outputs
Scrap metals, CO2, NO2,

Elementary flows
Waste water, CO2 NO2,
raw resources

System Boundaries

system diagram for electric vehicle



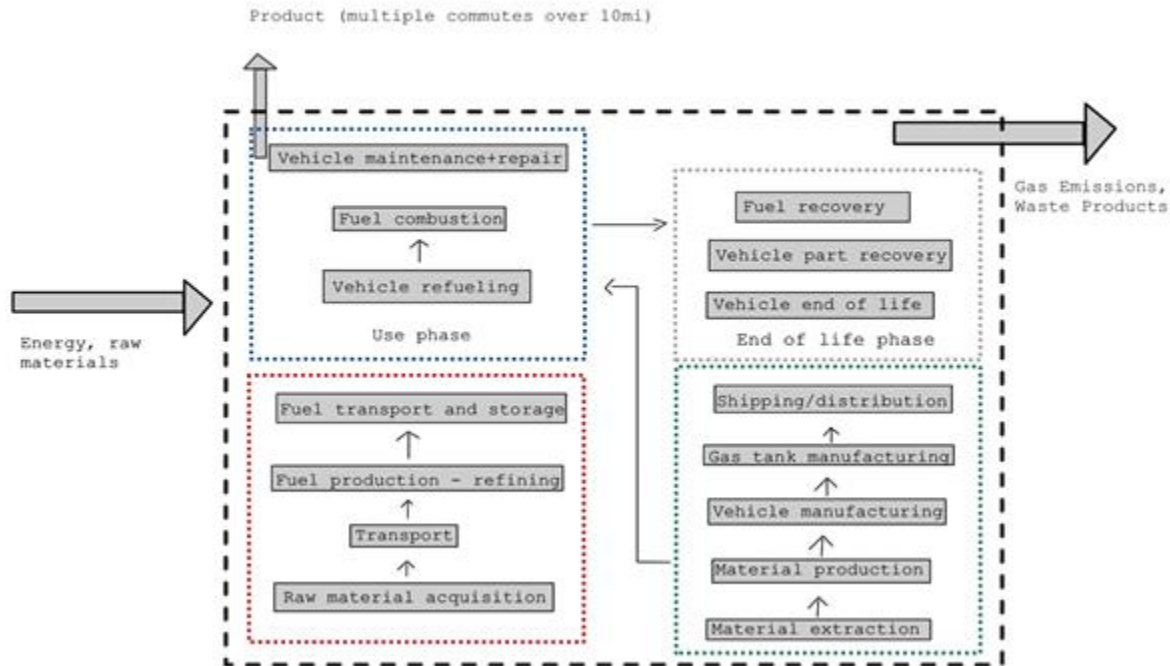
Major inputs
Electricity, construction
material, raw resources

Major outputs
Scrap metals, CO2, NO2,
heavy metals

Elementary flows
Waste water, CO2 NO2,
raw resources

System Boundaries

system diagram for gas bus



Major inputs
Electricity, construction
material, crude oil, iron

Major outputs
Scrap metals, CO2, NO2,

Elementary flows
Waste water, CO2 NO2,
raw resources

Results

TRACI Results

Gas Car

As expected, performed worst in global warming and ozone depletion categories

Electric Car

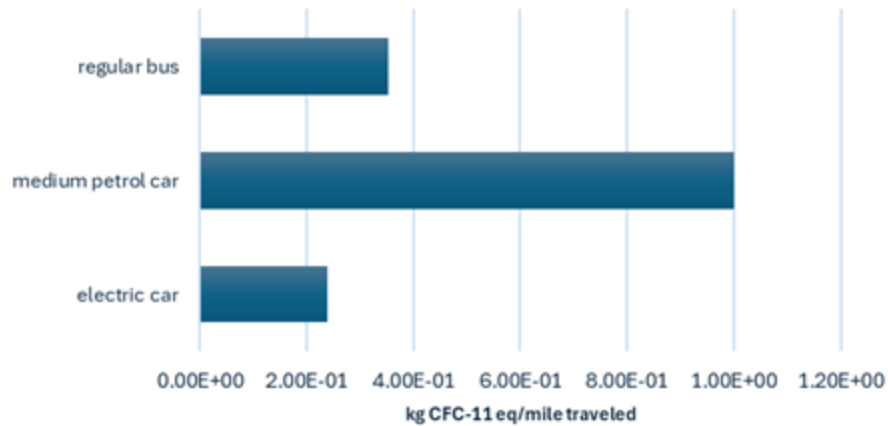
Performed poorly in many categories, likely because of the content of the batteries

Bus

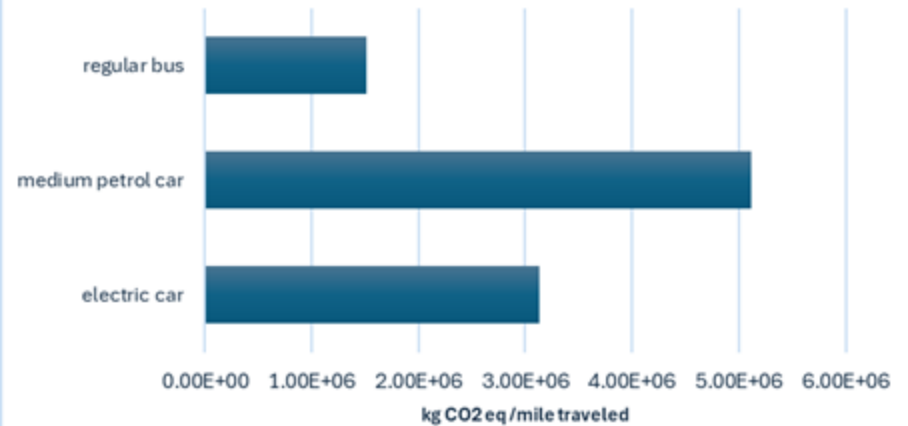
Performed worst in smog and acidification, likely because of diesel fuels

Gas Car

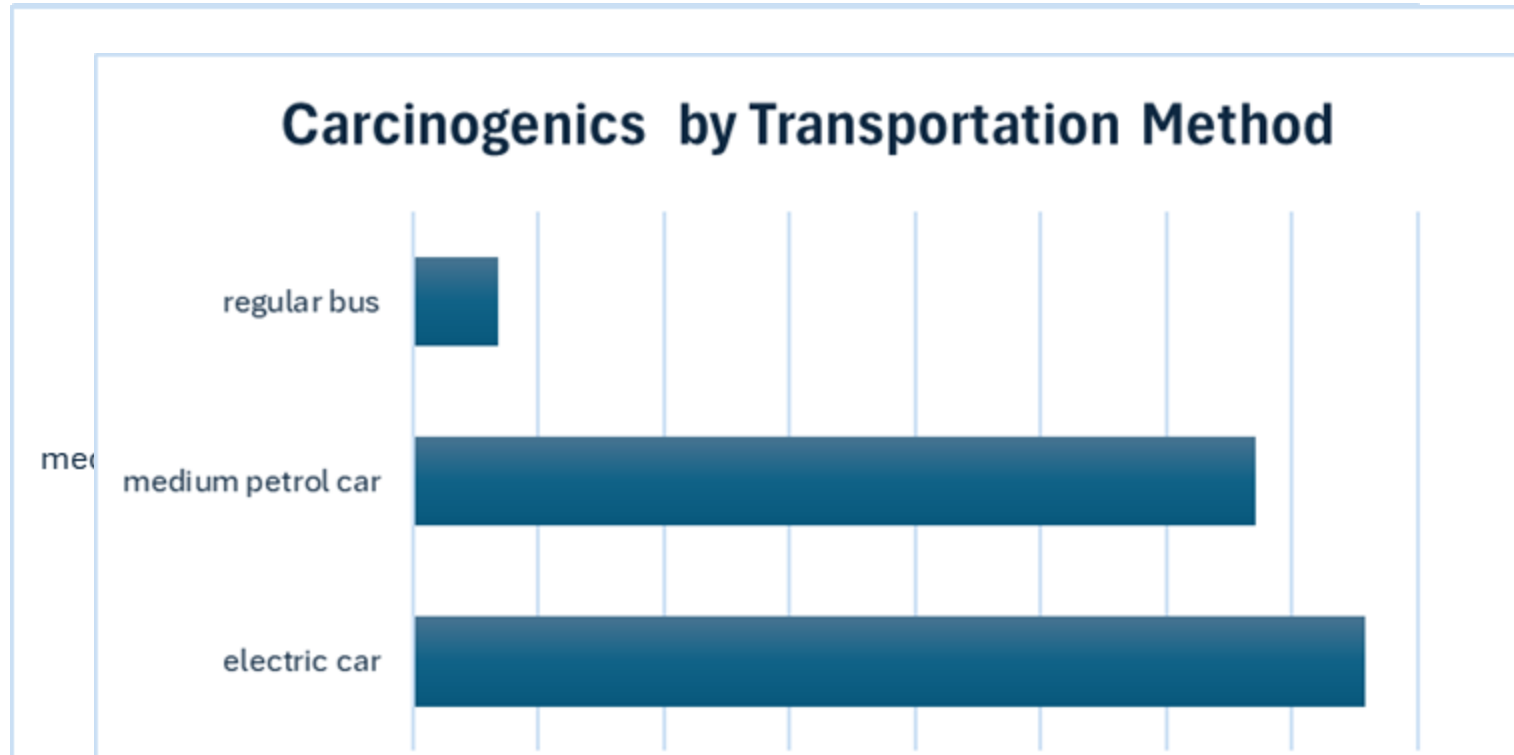
Ozone Depletion by Transportation Method



Global Warming by Transportation Method

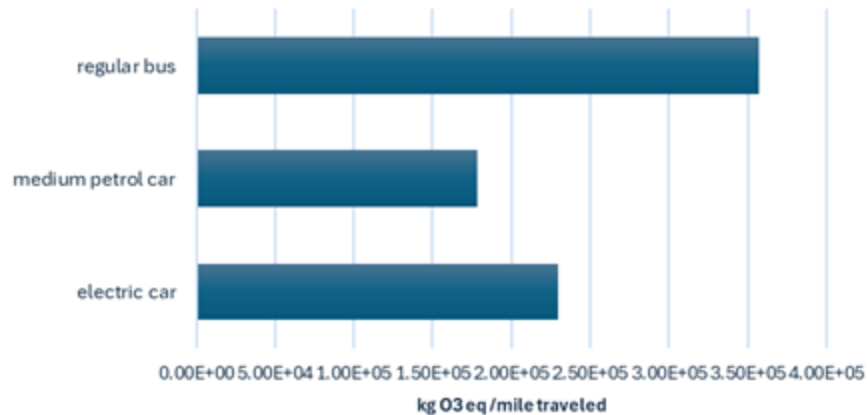


Electric Car

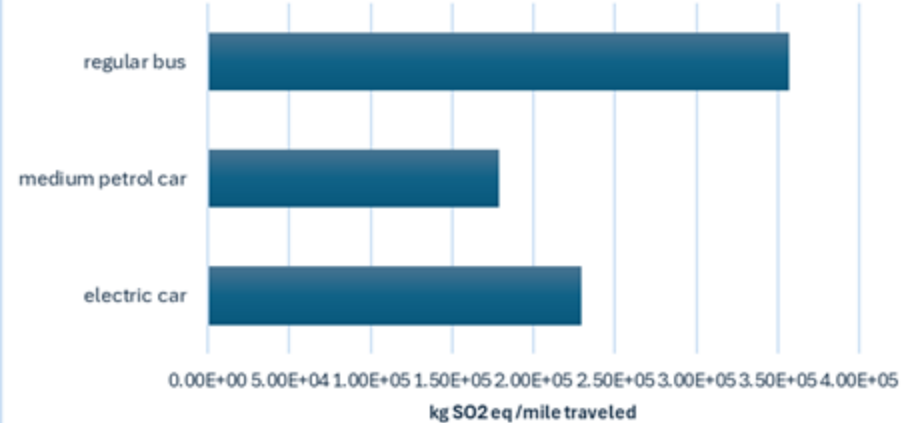


Bus

Smog by Transportation Method



Acidification by Transportation Method



Compiled Results

	Ozone Dep.	Warming	Smog	Acid.	Eutroph.	Carcin.	Non Carcin.	Respiratory
Gas Car								
Electric Car								
Gas Bus								

The above table shows the compiled results of each category. With red symbolizing the method that ranked worst, yellow ranking in the middle, and green as the best in that specific category. When comparing the results in this manner, it seems that the gas bus ranks the best, whereas the gas car and electric car ranking similarly with the gas car appearing slightly better. This is likely due to the more expensive construction of the electric car.

Conclusion

- We found that Gas-Powered Buses are the most environmentally friendly transportation option, winning in most TRACI categories other than smog and acidification

Future Work

- Pittsburgh should move toward further improving public bus infrastructure and routes, allowing more people to depend on them compared to driving personal vehicles or using ride-sharing services
 - More Routes
 - Increased Bus Security/Safety