

IPRO 322 Carbon Footprint of Automobiles

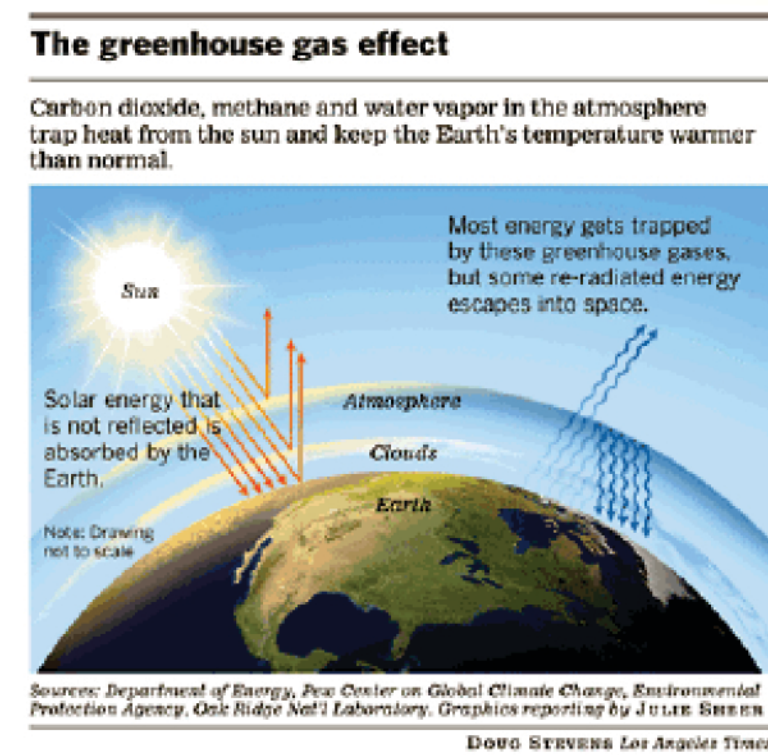
Problem

Carbon dioxide is the most preeminent form of all green house gases in the atmosphere.

Advanced information about green house gas emissions and carbon footprint is not easily accessible.

Public/Consumers have no way to **directly compare** between automobiles' carbon foot print.

34% of CO₂ emissions in the atmosphere are produced from cars and trucks.



Increase of greenhouse gases has been major contributor to global warming through greenhouse effect.

Background



Individual carbon footprint provides information about the impact of personal behavior on global warming.

Objective

To develop and present a "user friendly" way of identifying vehicles with respect to the emission of green-house gases (GHG) throughout their life cycle

Find out how much CO₂ emissions were produced during the manufacturing, use, and recycling process of a car.

Find a variety of vehicles that demonstrate the contrast in green house emissions.

Work collaboratively and successfully with a foreign institution to fulfill objectives.

Methodology

The demonstration of efficiency in fuels:
gasoline/alcohol blends
diesel/bio-diesel
electric/hybrids

Environmental friendliness of vehicles by:
carrying capacity
new/used
driving habit differences

Determine how far carbon footprint can stretch with respect to:
carbon release in manufacturing components
tail pipe

Team Structure

IIT and VGTU students are to obtain information from various sources

Research and report GHGs for vehicles using current engineering power source options.

Students will independently research GHG emissions with regard to the production, usage, and disposal of vehicles.

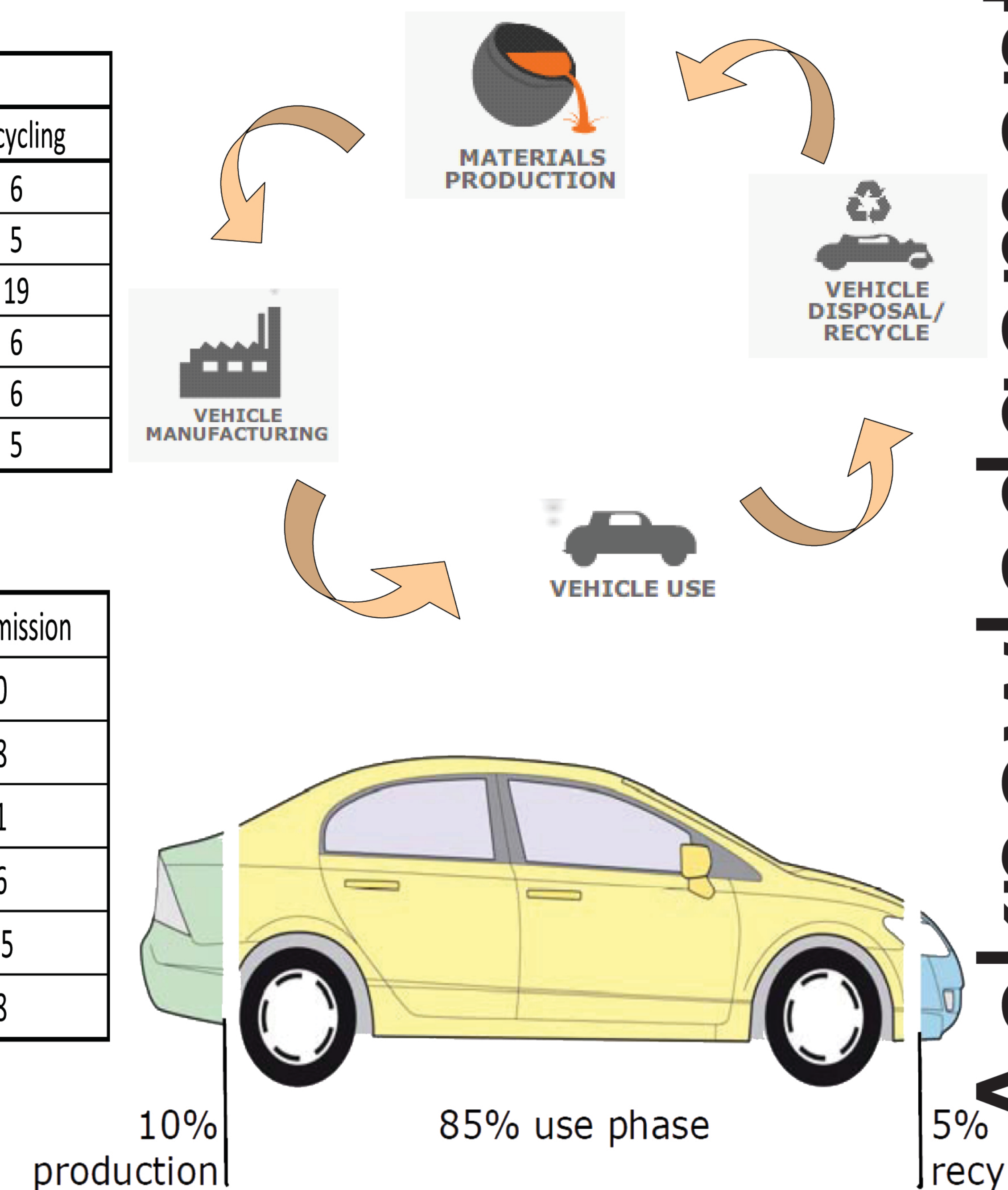
Information will be used to inform the public about GHG emissions and carbon footprint concerning the life-cycle of automobiles.

Results

Car	Percentage Breakdown (%)		
	Production	Fuel-Cycle	Recycling
Audi A3	26	74	6
Mazda 5	21	79	5
Nissan Leaf	80	20	19
Hyundai Sonata	22	78	6
BMW X5d	25	75	6
Chevrolet Impala	21	79	5

Car	Production	Fuel-Cycle	Total avg. Emission
Audi A3	24,529	56,264	75,900
Mazda 5	24,522	73,506	93,138
Nissan Leaf	20,430	4,232	20,661
Hyundai Sonata	23,779	66,246	85,296
BMW X5d	36,384	87,119	116,035
Chevrolet Impala	25,397	75,321	95,638

LIFE CYCLE assessment



Conclusion

There is more than one stage where a car produces CO₂. We reduced these to three stages: manufacturing, fuel-cycle, and recycling/disposal.

The CO₂ emission values for the fuel-cycle of a car are openly available to the public, but in the US, the values for the other two categories are not disclosed since there are no laws requiring them.

In-depth studies must be made in order to find the total values for each category for each automobile



Acknowledgements

Illinois Institute of Technology

Vilnius Gedimino Universitetas

Proffesor Don Tijunelis and Edita Baltreinaite

Andrew Burnham from Argonne National Laboratory



IIT VGTU