Research
• General brainstorm for proper approach to solve problem
• State of current problem
• Different fuel types (electric, hybrid, regular, bio-fuels, diesel, hydrogen, etc)
• Different Car Types
• Profound lack of fundamental information discovered
• Compiled basic information to calculate the actual carbon footprint including numerous considerations of the entire vehicle-life:
  • Material – Extraction/production
  • Assembly
  • Recycling/disposal
  • Fuel production
  • Fuel Use
• Calculated carbon footprint for specific vehicles to compare with European values and other provided values
• Europe has more information readily available

Why should you care?

• CO₂ comprises of over 75% of the total GHGs emitted.
• Current ice cap and glacial melt; rising of sea levels
• Future consequences are predicted to be catastrophic.
• Less fortunate will pay for the consumptive behaviors of the wealthy

What is Carbon Footprint?
• Total GHG emissions from consumption and production activities
• Individual carbon footprint
• Your personal responsibility!
Problem Statement
• There is a profound lack of information and excess ‘misinformation’
• How do you present such complex information in a way that is accurate but socially relevant
• Compile enough necessary basic information to calculate the ‘actual’ carbon-footprint of a vehicle
• Worked in conjunction with VGTU to assess global condition of current methods to address the global vehicle GHG emissions reductions

Challenges
• Make carbon foot-print personally meaningful
• Obtain ‘accurate’ total carbon footprint of a automobile
• Lack of standards in given emissions value (tonne vs. ton, etc.)
• Where do all the given values come from?
• Given values only consider energy costs to produce not environmental impact (extraction)
• Difficulty in comparing cars using different energy sources

<table>
<thead>
<tr>
<th>Automobile</th>
<th>Total avg. emission of CO₂ (Kg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audi A3</td>
<td>75900.50</td>
</tr>
<tr>
<td>Mazda 5</td>
<td>93137.95</td>
</tr>
<tr>
<td>Nissan Leaf</td>
<td>20660.54</td>
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<tr>
<td>Hyundai Sonata</td>
<td>85296.15</td>
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<tr>
<td>BMW X5d</td>
<td>116035.19</td>
</tr>
<tr>
<td>Chevrolet Impala</td>
<td>95637.84</td>
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</table>

Table 1: Total CO₂ emissions from life cycle of automobiles in United States

<table>
<thead>
<tr>
<th>Automobile</th>
<th>Total avg. emission of CO₂ (Kg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VW GOLF</td>
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<td>BMW 3 SERIES</td>
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<td>PEUGEOT 407</td>
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<td>OPEL ASTRA</td>
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<tr>
<td>FIAT PUNTO</td>
<td>78579.76</td>
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</tbody>
</table>

Table 2: Total CO₂ emissions from life cycle of automobiles in Europe.

Future
• Determine most accurate carbon foot-print
• Design meaningful method to communicate information to the general public
• Globally standardize emissions calculations and display

Recommendations
• Research and consolidate other available models (EU, GREET, UN, etc.)
• Work with and further develop tools such as Argonne’s GREET; incorporating some of our more fundamental goals
• Improve communication with our VGTU counterparts
• Anticipate events which may disrupt sessions and progress

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