GFEI Project
Objectives

Jane Akumu – UN Environment
Vehicle Growth

- Global light duty vehicle fleet set to triple by 2050
- Almost 2/3 of all vehicle fleet growth will be in non-OECD countries; few have fuel efficiency strategies
Motorization in Africa

Passenger cars per 1000 persons

Countries:
- Ethiopia
- Sudan
- Burundi
- Malawi
- Uganda
- Tanzania
- Liberia
- Mauritania
- Madagascar
- Burkina Faso
- Mali
- Mozambique
- Cameroon
- Zambia
- Nigeria
- Kenya
- Togo
- Benin
- Ghana
- Senegal
- Angola
- Africa
- Egypt
- Zimbabwe
- Morocco
- Tunisia
- Algeria
- Botswana
- South Africa
- Mauritius
- Congo
- Libya
Push For Cleaner, More Efficient Vehicles

Vehicle age distribution in Tanzania.
Source: Tanzania Revenue Authority
What is fuel economy?

• Fuel economy measures energy per unit of vehicle travel
  o Litres per 100km (Europe)
  o Km per litre (Japan)
  o Miles per gallon (United States)
• Fuel economy, fuel efficiency, fuel intensity are all fairly interchangeable terms
• Also measured in CO₂ emissions
  o CO₂ g/km
• Look for the tested fuel economy number for the vehicle
GLOBAL FUEL EFFICIENCY INITIATIVE

Goal: improvement in fuel economy across the global vehicle fleet by 2050

Currently: Global average 8L/100km

The goal: Global fleet average 4L/100km (25km/L)

- Emission reduction
- Fuel savings
- Global greenhouse gases reduction
GFEI has set graduated global fuel economy improvement targets

Based on a 2005 Baseline:

30% by 2020: All new cars in OECD countries

50% by 2030: All new cars GLOBALLY, (from 8 to 4 L/100km, on avg.)

50% by 2050: All cars GLOBALLY
Figure 2.4: Number of Registered Vehicles, 1999 – 2009

Source: CSO - Digest of Road Transport & Road Accident Statistics, 2009
Partners and Donors

Partners:

Donors:
Countries are at various points in developing fuel economy policies

Note: light vehicle fuel economy values normalized or NEDC test cycle
Source: IEA ETP 2015 and ICCT
Activities under GFEI

- Information Campaigns
- Data Collection & Analysis
- Support Policy Making Efforts
- Outreach to Stakeholders
Support Policy Making Efforts

- Develop improved data and analysis of the current situation on fuel economy
- Work with government to develop sound policies to encourage fuel economy improvement for vehicles produced and/or sold in their country
- Work with stakeholders (such as auto makers, importers) to better understand the potential for fuel economy improvements and solicit their support
- Support awareness initiatives to provide consumers and decision makers with information on options
Oversight of the project

- Agreement signed with local partner
- Technical experts supporting analysis the data
- National, regional and International consultation
The GFEI Process

1. Set Your Objectives
2. Obtain Vehicle Registration Data
3. Clean Data
4. Structure Your Data
5. Estimate Baseline Fuel Economy
6. Report Findings
GFEI Implementation Steps

• Data collection and analysis
  o Vehicle fleet – light duty vehicles (3500kgs and below)
  o Vehicle regulations
  o Fiscal incentives
  o Fuel standards
• Baseline setting -2005
• Policy options based on cost benefit analysis
• National consultations
Vehicle Data Categories

- Data to be collected is for all vehicles entering a country for the first time:
  - new vehicles manufactured/assembled in the country
  - new vehicles imported
  - Used vehicles imported into the country
  - car that is already in-country, but re-registered because re-sold should not be counted

- Useful to keep separate track of these three categories of vehicles, as well as creating a combined average set of information
Minimum Information Required

- Vehicle make and model
- Model production year
- Year of first registration
- Fuel type (petrol or diesel)
- Engine size
- Domestically produced or imported
- New or used import
- Rated Fuel Economy per model and test cycle basis
- Number of sales by model
## IEA Data Frame of Key Variables

<table>
<thead>
<tr>
<th>Vehicle Type</th>
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</tr>
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<tbody>
<tr>
<td>Model</td>
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<tr>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>Body type</td>
<td></td>
</tr>
<tr>
<td>Simplified Body Type</td>
<td></td>
</tr>
<tr>
<td>Segment</td>
<td></td>
</tr>
<tr>
<td>Axle configuration</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Engine cylinders</td>
<td></td>
</tr>
<tr>
<td>Engine ccm</td>
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</tr>
<tr>
<td>CC Category</td>
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<td>Engine kW</td>
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<tr>
<td>KW class</td>
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</tr>
<tr>
<td>Engine horse power</td>
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</tr>
<tr>
<td>Engine valves</td>
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</tr>
<tr>
<td>Fuel type</td>
<td></td>
</tr>
<tr>
<td>Model year</td>
<td></td>
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<tr>
<td>Number of gears</td>
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</tr>
<tr>
<td>Transmission type</td>
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<tr>
<td>Turbo</td>
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<tr>
<td>Gross vehicle weight</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
</tr>
<tr>
<td>Number of seats</td>
<td></td>
</tr>
</tbody>
</table>
Average fuel economy

At the simplest level, taking a weighted average (by sales) of all new (including newly imported second hand) vehicles in the database will provide the average fuel economy of new vehicles sold in the country in the given year:

\[
\text{Harmonic average annual fuel economy} = \frac{\text{Total sales in the year}}{\sum_{i=1}^{n} \frac{\text{sales model } i}{\text{fuel economy model } i}}
\]

In a similar way, average CO₂ intensity can be obtained through weighted average with the sales of each model:

\[
\text{Average annual emission} = \frac{\sum_{i=1}^{n} \text{sales model } i \cdot \text{emission model } i}{\text{Total sales in the year}}
\]
Estimating average fuel economy

- Look for the tested fuel economy number for the vehicle
- If not available the fuel economy figures for a given make, model and year can usually be retrieved from the vehicle manufacturers
- GFEI partners are compiling a list of fuel economies into a common database for use by countries undertaking baseline-setting exercise
- For the sake of comparison, all drive cycle data obtained be converted to the NEDC cycle
- Conversion factors can be downloadable from ICCT website www.theicct.org/info/data/GlobalStdReview_Conversionfactor.xlsx
## Final Data

<table>
<thead>
<tr>
<th>Make</th>
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<th>Condition</th>
<th>Body Type</th>
<th>Engine CC</th>
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<th>Model Year</th>
<th>Registration Date</th>
<th>L/100km</th>
<th>CO2</th>
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<td>1800</td>
<td>Diesel</td>
<td>2004</td>
<td>2005</td>
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<td>Diesel</td>
<td>2005</td>
<td>2005</td>
<td>7.0</td>
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<td>TOYOTA</td>
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<td>S.WAGON</td>
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<td>2005</td>
<td>7.0</td>
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<td>Diesel</td>
<td>1998</td>
<td>2005</td>
<td>7.0</td>
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<tr>
<td>FORD</td>
<td>RANGER</td>
<td>New</td>
<td>VAN</td>
<td>2500</td>
<td>Petrol</td>
<td>2005</td>
<td>2005</td>
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<td>170</td>
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Additional information


- U.S. Fuel Economy Regulations: http://www.epa.gov/oms/climate/regulations.htm
EXPECTED OUTCOMES

- Vehicle Inventory
- Cost-benefit analysis
- Policy recommendations
- Publicise adoption
- Awareness campaign
- Long term strategy
Regional fuel economy trends

- Countries with FE policies in place show encouraging improvement rates
- Size shift vs. technology evolution moderates non-OECD improvement

Source: IEA 2014
# Average Fuel Economy Levels

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<td>Non-OECD Average</td>
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<table>
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<th>2014</th>
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<td>7.0</td>
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<td>5.8</td>
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<table>
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<tr>
<td>Average (l/100km)</td>
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<td>11.14</td>
<td>11.34</td>
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<table>
<thead>
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<th>Kenya</th>
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<th>2011</th>
<th>2012</th>
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</thead>
<tbody>
<tr>
<td>Average (l/100km)</td>
<td>7.4</td>
<td>7.6</td>
<td>7.7</td>
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</tbody>
</table>

<table>
<thead>
<tr>
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<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average (l/100km)</td>
<td>8.4</td>
<td>7.9</td>
</tr>
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</table>
# Kenya Fuel Economy

<table>
<thead>
<tr>
<th>Year</th>
<th>Average fuel consumption metric combined (L/100km)</th>
<th>Average CO₂ emission (g/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>7.4</td>
<td>178.2</td>
</tr>
<tr>
<td>2011</td>
<td>7.6</td>
<td>182.0</td>
</tr>
<tr>
<td>2012</td>
<td>7.7</td>
<td>185.4</td>
</tr>
<tr>
<td>Grand Average</td>
<td>7.5</td>
<td>181.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year of vehicle registration</th>
<th>Fuel Type</th>
<th>Grand Average</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Diesel</td>
<td>Petrol</td>
</tr>
<tr>
<td>2010</td>
<td>8.0</td>
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<tr>
<td>2011</td>
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<td>7.5</td>
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<tr>
<td>2012</td>
<td>8.0</td>
<td>7.6</td>
</tr>
<tr>
<td>Grand Average</td>
<td>8.0</td>
<td>7.4</td>
</tr>
</tbody>
</table>
# Policy Options

| VEHICLE FUEL EFFICIENCY STANDARDS | • Introduce and regularly strengthen mandatory standards  
• Establish and harmonize testing procedures for fuel efficiency measurement. |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FISCAL MEASURES               | • Fuel taxes and vehicle taxes to encourage the purchase of more fuel-efficient vehicles.  
• Infrastructure support and incentive schemes for very fuel-efficient vehicles. |
| MARKET-BASED APPROACHES       | • Voluntary programs such as U.S. SmartWay and other green freight programs |
| INFORMATION MEASURES          | • Vehicle fuel economy labels  
• Improving vehicle operational efficiency through eco-driving and other measures. |

*Source: ICCT*
**GFEI baseline setting – little progress in fuel economy improvement in countries without policies**

**Baseline Light-Duty Vehicle Fuel Economy and Trends**

- Algeria
- Bahrain
- Chile
- China
- China
- Ethiopia
- Egypt
- EU
- Georgia
- Indonesia
- Japan
- Kenya
- Mauritius
- Montenegro
- Peru
- Philippines
- Sri Lanka
- Uganda
- Uruguay
- Uruguay
- US
- Vietnam
Next steps

Instruments

- Regulatory
  - Standards
- Economic
  - Feebate
  - Registration Tax
- Information
  - Labeling

Case Studies

- Europe
- North America
- Africa
- Latin America
- Asia
- Middle East

Resources

- Baseline
- Finance
- FE Resources

http://www.unep.org/transport/gfei/autotool/
European Union

- 12% of total CO₂ emissions from transport

- average for all new cars is 130 grams of CO₂ per kilometre (g/km) by 2015 and 95g/km by 2021

- reductions of 18% and 40% compared to 2007 -158.7g/km

- 2015 fuel consumption target
  - 5.6 l/100 km of petrol
  - 4.9 l/100 km of diesel

- 2021 target
  - 4.1 l/100 km of petrol
  - 3.6 l/100 km of diesel
Chile

- Adopted a mandatory fuel economy labelling scheme from February 2013 becoming the first Latin American country to adopt such a scheme.

- In September 2014 adopted a taxation scheme that puts a tax on less efficient and polluting vehicles, based on CO2 and NOx ratings.

- In 2015 was adopting a scheme to provide subsidies for cleaner and more efficient taxis based on the fuel economy labeling scheme, with the aim to replace the 60,000 taxi fleet over the next 8 years.
Vietnam

- Adopted voluntary fuel consumption limits for light-duty vehicles and motorcycles in 2013
- Adopted fuel economy labelling for new domestically assembled and imported cars - must be labelled with energy labels before selling to consumers
Mauritius

- Vehicle CO2-based tax introduced 2011
- This was a feebate scheme that puts a fee/rebate on cars above/below 158 CO2g/km
- 2013 amended to 150 CO2g/km
- Scheme resulted to an improvement of fuel economy from 7l/100km in 2005 to 5.8l/100km in 2014
- In July 2016 this was abolished and excise duty on cars with 1,001 - 1,600 cc was lowered from 55% to 50%
- Duty on hybrid motor cars was reduced by 30% for all cars
- The rate on a hybrid car below 1,600 cc will decrease from 55 to 25%
- From 2009 to 2014, the number of hybrid and electric cars has increased from 43 to 1824 and from 0 to 8 respectively
Two-wheelers Emissions Comparison – Total Emissions [g CO₂-equivalents / km]

One two-stroke scooter emits double the NOx emissions of a modern passenger car, 300 times the HC emissions and 80 times the CO emissions.

Particle Emissions [g PM/ km]

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