Promoting Cleaner & Efficient Vehicles in Malawi

Jane Akumu
UN Environment
Impacts of Transport

Air Quality & Health
• Largest source of air pollution in cities, exceeding WHO standards and costing more than 5% GDP

Energy Security
• Consumes 25% of world energy, 90% are fossil fuels

Climate Change
• Responsible for 23% global CO2 emissions & fastest growing sector in GHG emissions, 2.5% yearly until 2020
CO2 Emissions from Transport

THE TRANSPORTATION SECTOR
A major contributor to global energy-related CO2 emissions

GLOBAL ENERGY-RELATED EMISSIONS
≈ 30 Gt CO2

TRANSPORT EMISSIONS
≈ 7 Gt CO2

ROAD TRANSPORT EMISSIONS
≈ 5 Gt CO2

4% RAIL
11% AIR
73% ROAD
12% SEA
47% HEAVY-DUTY VEHICLES
53% LIGHT-DUTY VEHICLES

Sources:
What is fuel economy?

- Vehicles use energy, and fuel economy measures energy per unit of vehicle travel. It is the RATE of energy use.
  - Litres per 100km (Europe)
  - Km per litre (Japan)
  - Miles per gallon (United States)

- Fuel economy, fuel efficiency, fuel intensity are all fairly interchangeable terms. But fuel economy always refers to fuel use relative to distance travelled.

- Also measured in CO$_2$ emissions=CO$_2$ g/km
THE GLOBAL GOALS: FUEL ECONOMY

DOUBLE AVERAGE FUEL ECONOMY

OF NEW CARS BY 2030 AND ALL CARS BY 2050
GFEI Benefits

- Reduced urban air pollution
- Fuel savings: estimated at over USD 300 billion in 2025 and 600 billion in 2050
- CO2 reduction: estimated at over 1 gigatonne a year by 2025 and over 2 gigatonnes by 2050

Partners

Donors
◆ CO2 Emission Reduction in Japanese Transportation Sector

CO2 emissions (million tons) vs. Year

Fuel Economy
Traffic Flow
Eco-Drivering
Alternative Fuels
Travel Distance (modal shifts, etc)
Others

Integrated Approach

Government
Automakers
Consumers
Fuel/Energy Suppliers

SUSTAINABLE MOBILITY

source: JAMA
Cumulative oil savings from selected vehicle fuel-economy standards, 2010-2035

Already adopted & planned fuel-economy standards for passenger vehicles in the US, Japan, EU, China & India alone are set to save cumulatively 17 billion barrels of oil
GFEI Country Engagement

<table>
<thead>
<tr>
<th>countries with ongoing projects</th>
<th>new countries 2016/2017</th>
<th>Countries expressed interest</th>
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<tbody>
<tr>
<td>1 Chile</td>
<td>28 Malaysia</td>
<td>63 Panama</td>
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<td>2 Ethiopia</td>
<td>29 Bangladesh</td>
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<tr>
<td>3 Indonesia</td>
<td>30 Kazakhstan</td>
<td>65 Angola</td>
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<tr>
<td>4 Kenya</td>
<td>31 Mali</td>
<td>66 Bhutan</td>
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<td>5 Georgia</td>
<td>32 Nigeria</td>
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<td>50 St. Lucia</td>
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<td>97 Uzbekistan</td>
</tr>
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<td></td>
<td></td>
<td>98 Bosnia-Herzegovina</td>
</tr>
<tr>
<td></td>
<td></td>
<td>99 Albania</td>
</tr>
</tbody>
</table>
Global Progress on Fuel Economy Policy (2017)

- FE Policy in Place
- FE Policy in Progress

February 2017 - For more information visit www.globalfuelleconomy.org
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

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
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<td>7.0</td>
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<tr>
<td>Non-OECD Average</td>
<td></td>
<td>7.5</td>
<td>7.6</td>
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<table>
<thead>
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<tbody>
<tr>
<td>Average (l/100km)</td>
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<td>10.94</td>
<td>11.14</td>
<td>11.34</td>
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<table>
<thead>
<tr>
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<th>Mauritius</th>
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<th>2013</th>
<th>2014</th>
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<tr>
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<td>7.0</td>
<td>6.6</td>
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<td>7.5</td>
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<table>
<thead>
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<th>2011</th>
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<td>7.4</td>
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<td>7.7</td>
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<tr>
<td>Average (l/100km)</td>
<td></td>
<td>8.4</td>
<td>7.9</td>
</tr>
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</table>
Example of Uganda

### Average diesel import age

<table>
<thead>
<tr>
<th>Year</th>
<th>Average</th>
<th>Year</th>
<th>Average</th>
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</thead>
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<td>2005</td>
<td>8.1</td>
<td>2008</td>
<td>10.3</td>
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<tr>
<td>2011</td>
<td>10.6</td>
<td>2014</td>
<td>16.4</td>
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</tbody>
</table>

### Average vehicle import (l/100km)

- **Uganda**
  - 2005: 10.94
  - 2008: 11.14
  - 2011: 11.34
  - 2014: 12.15
## Kenya Fuel Economy

<table>
<thead>
<tr>
<th>Year</th>
<th>Average fuel consumption metric combined (L/100km)</th>
<th>Average CO\textsubscript{2} emission (g/km)</th>
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<tr>
<td>2010</td>
<td>7.4</td>
<td>178.2</td>
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<tr>
<td>2011</td>
<td>7.6</td>
<td>182.0</td>
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<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>
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</table>

### Kenya Fuel Economy Levels

<table>
<thead>
<tr>
<th>Year of vehicle registration</th>
<th>Fuel Type</th>
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<td>Diesel</td>
<td>Petrol</td>
<td>Grand Average</td>
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<tr>
<td>2010</td>
<td>8.0</td>
<td>7.2</td>
<td>7.4</td>
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<tr>
<td>2011</td>
<td>7.9</td>
<td>7.5</td>
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<tr>
<td>2012</td>
<td>8.0</td>
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<td>7.7</td>
</tr>
<tr>
<td>Grand Average</td>
<td>8.0</td>
<td>7.4</td>
<td>7.5</td>
</tr>
</tbody>
</table>
Fuel economy policies can work substantially

![Baseline Light-Duty Vehicle Fuel Economy and Trends for New LDVs](chart)

GFEI objectives at country level

- Inventory of the current situation on fuel economy

- Support government agencies to develop sound policies to encourage fuel economy improvement for vehicles produced and/or sold in their countries

- Involve stakeholders 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

- Long term strategy that will involve multiple policy interventions
GFEI Activities

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

Vehicle Type
Model
Manufacturer
Body type
Simplified Body Type
Segment
Axle configuration
Driven wheels
Engine cylinders
Engine ccm
CC Category
Engine kW
KW class
Engine horse power
Engine valves
Fuel type
Model type
Model year
Number of gears
Transmission type
Turbo
Gross vehicle weight
Height
Length
Number of seats
GFEI is important to African countries

- The project provides a good understanding of vehicles imported into the country e.g. models, sizes, technologies

- This will allow policymakers to choose the right combination of policy instruments to meet
  - national emission targets
  - energy security, and
  - efficiency goals
Fuel Economy Estimation

• Data Collection
  o Baseline Setting - 2005
  o Analysis of Trend (2010, 2013, 2016)

• Analysis of
  o Vehicle fleet
  o Vehicle regulations
  o Fiscal incentives
  o Fuel standards

• Policy Options

• National Consultations

• Regional Consultations
Vehicle data categories

- Data to be collected is for all vehicles entering a country for the first time:
  - new vehicles manufactured in the country
  - new vehicles imported
  - second hand 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 categories of vehicles, as well as creating a combined average set of information
Minimum vehicle 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 second hand import
- Rated Fuel Economy per model and test cycle basis
- Number of sales by model
**Additional information**

- Vehicle Information / Identification Number
- Injection system type
- Body type
- Transmission type and other vehicle configuration details, as available
- Vehicle foot print
- Vehicle curb weight
- Emissions certification level
- Use of vehicle (private, public, for hire, etc.)
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
<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
<th>Condition</th>
<th>Body Type</th>
<th>Engine CC</th>
<th>Fuel Type</th>
<th>Model Year</th>
<th>Registration Date</th>
<th>L/100km</th>
<th>CO2</th>
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</thead>
<tbody>
<tr>
<td>BMW</td>
<td>316I</td>
<td>Used</td>
<td>S.WAGON</td>
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<td>MITSUBISHI</td>
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<td>1800</td>
<td>Diesel</td>
<td>2004</td>
<td>2005</td>
<td>7.0</td>
<td>188</td>
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<td>Diesel</td>
<td>2005</td>
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<td>1998</td>
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<td>Diesel</td>
<td>1998</td>
<td>2005</td>
<td>7.0</td>
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<td>FORD</td>
<td>RANGER</td>
<td>New</td>
<td>VAN</td>
<td>2500</td>
<td>Petrol</td>
<td>2005</td>
<td>2005</td>
<td>8.1</td>
<td>170</td>
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</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 CO$_2$ intensity can be obtained through weighted average with the sales of each model:

$\text{Average annual emission} = \frac{\sum_{i=1}^{n} \text{sales model } i \times \text{emission model } i}{\text{Total sales in the year}}$
Additional information

• A Test Cycle Conversion Tool: www.theicct.org/info/data/GlobalStdReview_Conversionfactor.xlsx


• South African Comparative Passenger Car Fuel Economy AND CO2 Emissions Data: http://www.naamsa.co.za/ecelabels/


• U.S. Fuel Economy Policy: http://www.fueleconomy.gov/

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

Fuel economy policies & instruments

- Target group: Consumer
- Manufacturer
- Monetary instruments
  - Fiscal instruments
- Consumer information
  - Labelling
- Regulatory
  - Fuel economy or CO\(_2\) emission standards
China’s Example


- 3rd most stringent in the world, behind the EU and Japan

- requires display fuel economy labels from 2009

- banned the import of used vehicles for uses other than personal, diesel vehicles (except Jeeps) and two-stroke engine cars

- penalize large-engine cars and encourages the purchase of fuel efficient cars
European Union

- 12% of total CO2 emissions from transport
- mandatory emission reduction targets for new cars
- 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
- fuel consumption, the 2015 target is 5.6 l/100 km of petrol or 4.9 l/100 km of diesel. The 2021 target to 4.1 l/100 km of petrol or 3.6 l/100 km of diesel
Mauritius

• Vehicle CO2 tax introduced 2011
• Adopted a feebate scheme in 2011 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
• 50 % excise duty waived on electric and hybrid cars and Registration fee also reduced by 50%
• From 2009 to 2014, the number of hybrid and electric cars has increased from 43 to 1824 and from 0 to 8 respectively
• 2016 feebate abolished and moved to taxation system with additional incentives to electric vehicles
Hybrid and Electric cars in Sri Lanka

- Hybrid and electric cars in 2014 was 56% of the total number of cars
- Hybrid-petrol, petrol and diesel vehicles attract 58%, 253% and 345%, respectively, in excise tax
- Fully electric vehicles are levied at 25%.
Vehicle excise tax rates in Thailand combines CO2 ratings and engine capacity

Mandatory eco-sticker

<table>
<thead>
<tr>
<th>Types of Vehicles</th>
<th>Fuel type / Tax rates</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CO2/ engine capacity</td>
</tr>
<tr>
<td>Passenger vehicles – cars and vans with less than 10 seats</td>
<td>≤ 100 g/km</td>
</tr>
<tr>
<td></td>
<td>101-150 g/km</td>
</tr>
<tr>
<td></td>
<td>151-200 g/km</td>
</tr>
<tr>
<td></td>
<td>&gt;200 g/km</td>
</tr>
<tr>
<td></td>
<td>&gt;3,000 cc</td>
</tr>
</tbody>
</table>

Electric vehicle/ fuel cell

|                   | ≤ 3,000 cc (180 Kw) | 10 |
|                   | > 3,000 cc (180 Kw) | 50 |

Summary

- High growth rate of passenger car sales (and other vehicles) with relatively high fuel economy will persist without fuel economy policies
- Implementing fuel economy policies can substantially reduce CO2 emissions – supporting the Paris Agreement
- Also reduces fossil fuel consumption and national expenditures on fossil fuels
- Improves air quality through adoption of more advanced vehicles and technologies
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