Case Study-Kenya Fuel Economy Baseline

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Introduction

Global Fuel Economy Initiative (GFEI) methodology gives guidelines on how to reduce pollution from transport. The methodology specifies:

• What parameters to measure?
• How to monitor the parameters?
• How to manage the parameters?
The GFEI Objectives includes:

- To improve fuel economy of motor vehicles.
- To reduce amount of generated pollutants.
- To promote better maintenance of motor vehicles
- To promote better policies for management of mobility
Background circumstances

• Most countries do not manufacture vehicles domestically.

• Entire fleet could be imported.

• Record of car import or registration are the sources of data.

• Institutions that collect and maintain the records do so for their own needs.

• The needs may not be compatible with those for establishing fuel economy.
Steps in Developing Vehicle Fuel Economy Database

Step 1: Obtain vehicle registration records

- Such data include all categories of vehicles – motorcycles and mopeds, three wheelers, Light Duty Vehicles (LDV’s), Heavy Duty Vehicles (HDV’s) > 3500kg (buses and trucks)

Step 2: Clean Data

- To remove non-LDV’s from database.
- Rectify errors e.g. spelling mistakes and wrong entries.
- Classify vehicles as new or used.
Step 3: Key attributes

• Fuel consumption tests conducted in laboratories are representative of actual average on road performance.

• **Urban cycle:** These are carried out at ambient temperature of 20 – 30 degrees centigrade from a cold start. The cycle consist of a series of accelerations, steady speeds, decelerations and idling. Max speed is 50km/hr, average speed is 19km/hr and distance covered is 4km.

• **Extra Urban Cycle:** This is conducted immediately after urban cycle. Max speed 120km/hr, average speed 63km/hr and distance covered 7km.

• **Combined Fuel Consumption Figure:** Is the average of the two tests weighed by the distance covered in each part.
Step 4: Basic fields used in determining fuel economy:

- Vehicle make
- Vehicle model
- Vehicle identification number/Chassis number
- Body type
- Engine capacity (cc)
- Fuel type
- Year of manufacture
- Year of registration
- Tare weight
Information From Manufacturers Websites/Car Guides

• Check fuel economy and CO2 emissions.
• Example is the Australian Government Initiative accessible at https://www.greenvehicleguide.gov.au/

<table>
<thead>
<tr>
<th>Total</th>
<th>Condition</th>
<th>Body</th>
<th>Make</th>
<th>Model/Description</th>
<th>Year of Prod.</th>
<th>Year of Reg</th>
<th>Fuel Type</th>
<th>Engine Capacity (CC)</th>
<th>CO₂ (g/km)</th>
<th>Fuel Economy (L/100km)</th>
<th>Vehicle Use</th>
<th>No. of Passengers</th>
<th>Tare Weight (kg)</th>
</tr>
</thead>
</table>
Step 5: Convert fuel economy and CO2 to NEDC

- Europe, Japan, and the United States have each developed their own test procedures to determine fuel economy and GHG emissions. Below is a comparison of the majority of test procedures used globally.

- CAFE – United States Corporate Average Fuel Economy
- NEDC – New European Driving Cycle
<table>
<thead>
<tr>
<th>Type</th>
<th>Make</th>
<th>Model</th>
<th>Test Cycle FE (MPG)</th>
<th>Test Cycle Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>NEDC</td>
<td>CAFE</td>
</tr>
<tr>
<td>Small Car</td>
<td>Ford</td>
<td>Focus</td>
<td>26.0</td>
<td>29.8</td>
</tr>
<tr>
<td></td>
<td>Toyota</td>
<td>Corolla</td>
<td>32.4</td>
<td>34.8</td>
</tr>
<tr>
<td></td>
<td>Toyota</td>
<td>Yaris</td>
<td>40.6</td>
<td>42.2</td>
</tr>
<tr>
<td></td>
<td>Honda</td>
<td>Fit</td>
<td>36.0</td>
<td>40.1</td>
</tr>
<tr>
<td></td>
<td>Hyundai</td>
<td>Accent</td>
<td>35.1</td>
<td>39.0</td>
</tr>
<tr>
<td></td>
<td>Kia</td>
<td>Rio</td>
<td>35.4</td>
<td>39.1</td>
</tr>
<tr>
<td></td>
<td>Daewoo</td>
<td>Aveo</td>
<td>31.2</td>
<td>35.5</td>
</tr>
<tr>
<td>Large Car</td>
<td>Toyota</td>
<td>Camry</td>
<td>24.7</td>
<td>26.6</td>
</tr>
<tr>
<td>Minivan</td>
<td>Dodge</td>
<td>Grand Caravan</td>
<td>20.5</td>
<td>23.9</td>
</tr>
<tr>
<td>SUV</td>
<td>Ford</td>
<td>Explorer</td>
<td>17.6</td>
<td>20.2</td>
</tr>
<tr>
<td>Pickup</td>
<td>Chevrolet</td>
<td>Silverado</td>
<td>15.9</td>
<td>18.8</td>
</tr>
<tr>
<td>Crossover</td>
<td>Saturn</td>
<td>Vue</td>
<td>23.0</td>
<td>26.3</td>
</tr>
<tr>
<td>Simple Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Step 6: Calculate weighed averages of:

- baseline fuel economy in L/ 100 km
- CO₂ emissions gCO₂/ km

Step 7: Report findings on fuel economy, CO₂ emissions and Trends for period of study
Selected results from GFEI Study in Kenya

**Current Situation – Fleet Size**

Number of vehicles by type (2016)

- Car: 862,795
- Bus: 27,526
- Minibus: 77,470
- Motorcycle: 971,081
- Van: 283,884
- MedTruck: 125,959
- HeavyTruck: 32,164
Average private car age is 11 years

Age Profile of Cars in 2016

- Number of vehicles on the y-axis
- Age of vehicle on the x-axis

The graph shows the distribution of car ages in 2016, with the majority of vehicles being between 8 and 12 years old.
# Vehicle Registration Data and Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>2010 (Actual)</th>
<th>2011 (Actual)</th>
<th>2012 (Actual)</th>
<th>2030 (Projected)</th>
<th>2050 (Projected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDV Yearly registration</td>
<td>93,136</td>
<td>96,484</td>
<td>110,474</td>
<td>307,445</td>
<td>518,025</td>
</tr>
<tr>
<td>Cumulative registration (Millions)</td>
<td>1.6</td>
<td>1.9</td>
<td>2.0</td>
<td>5.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>
## Fuel Economy and CO$_2$ emission standards

<table>
<thead>
<tr>
<th>Year</th>
<th>Average fuel Consumption Metric combined(L/100Km)</th>
<th>Average CO$_2$ 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>
Comparison of Average Fuel Economy (L/100km) with selected countries

![Graph showing fuel consumption trends for different countries from 2000 to 2016.](image)
Start of exponential growth, esp. motor cycles and station wagons

Source: KNBS Annual Surveys 1970,..,2018
Thank You