

# LIGHT DUTY VEHICLES FUEL CONSUMPTION AND CARBON DIOXIDE EMISSION IN KENYA



Climate XL

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## Climate XL undertakes study to determine Light Duty Vehicles Fuel efficiency in Kenya

Carbon dioxide gas, mostly derived from the combustion of fossil fuels has been responsible for vast environmental effects including contribution to global warming as well as numerous human health complications.

Scientific surveys indicate that the transportation sector contributes about 26% of the total global Carbon emissions and this is projected to increase to 75% in the year 2020 (US EPA,2002).

Greenhouse gas emissions from motor vehicles present long term problems, potentially with severe health, environmental and economic consequences. Reducing emissions from the transport sector is therefore crucial for Stabilizing atmospheric concentrations of pollutants.

As part of the Global Fuel Economy Initiative (GFEI) to

reduce emissions from transport, the United Nations Environmental Programme (UNEP) asked Climate XL Africa to conduct a study for baseline data gathering on the vehicle fleet in Kenya in order to help calculate the ecological footprint of the growing vehicle fleet in the country for inclusion in a worldwide database.

The purpose of the Kenya database was:

- 1) To provide a basis for tracking progress in improving fuel economy
- 2) To provide evidence for policy making and develop appropriate guidelines for vehicle fuel efficiency and GHG standards

The outcomes of the study by Climate XL were presented in a stakeholder's forum held on the 30th November 2010

at the UNEP headquarters in Nairobi Kenya.

The Kenya database comprised all newly registered light duty vehicles in Kenya categorized by year of registration, model year, engine size, fuel type and tare weight. Information on the vehicle consumption and CO<sub>2</sub> emission were obtained from the various vehicle manufacturers.

Findings from the study showed that the average LDV fuel consumption in 2005 was 7.69 L/100Km while in 2008 the consumption was 7.6 L/100Km. CO<sub>2</sub> emissions were 283.9gCO<sub>2</sub>/Km and 184.7gCO<sub>2</sub>/Km for the two years respectively.



**It is estimated that a gallon of gasoline produces 8.8 kilograms of CO<sub>2</sub>.**

*Emission Facts: GHG Emissions from a typical passenger vehicle  
(www.epa.gov/oms/climate)*

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## Methodology used for determining the LDV fuel consumption and developing database for Kenya



In the GFEI, a global survey was undertaken to determine the base year level of fuel consumption and

CO<sub>2</sub> emissions by light duty vehicles globally with 2005 set as the base year.

Climate-XL carried out a pilot case for Africa taking Kenya as the base to develop a methodology to be included in the GFEI toolkit for determining emissions for developing countries.

Data required for the study included both aggregate and particular information of the vehicle fleet in the country.

General information of the total vehicle fleet composition including the total number of vehicles registered in the country between the years 2005 and 2010 were obtained from the

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# LIGHT DUTY VEHICLES FUEL CONSUMPTION AND CARBON DIOXIDE EMISSION IN KENYA

## Vehicle attributes in the GFEL database:

1. Vehicle type
2. Model
3. Manufacturer
4. Body type
5. Simplified body type
6. Segment
7. Axle configuration
8. Driven wheels
9. Engine cylinders
10. Engine CC
11. Engine KW
12. Engine Horse power
13. Engine Valves
14. Fuel type
15. Model year
16. Number of gears
17. Transmission type
18. Turbo
19. Gross vehicle weight
20. Height
21. Length
22. Number of seats
23. Fuel consumption
24. CO<sub>2</sub> Emission

“ engine technology, fuel type, engine size and the use of catalytic converters were some of the most influential factors on individual vehicle fuel consumption and consequent CO<sub>2</sub> emissions ”

## Methodology for developing the Kenya database

### Continued from page 1

registrar of motor vehicles based at the Kenya Revenue Authority. The data was then sorted out and underwent a ‘cleaning’ process to separate irrelevant entries which included vehicles not classified as light duty such as trucks, busses, prime movers etc. The database was then configured to include additional vehicles attributes not captured by the registrar's office at the point of registration.

These included attributes such as vehicle transmission, engine horse power, number of engine valves etc which are included in the global database. This was to ensure that the Kenya database is as compatible as possible to the global database.

Once all the attributes were determined then through partners in the initiative, vehicle manufacturers provided the fuel consumption levels of individual

vehicles and their corresponding carbon dioxide emission levels based on European test cycles. For old vehicle models or where CO<sub>2</sub> emission levels could not be readily obtained then the Global Standard Converter was used.

## Light duty vehicles in Kenya and study findings.

There has been a steady increase in the total number of vehicles registered in Kenya as indicated by data obtained from the registrar of motor vehicles. Analysis of the data obtained further shows that though over 80% of the vehicles registered between 2005 and 2010 were used, a combined total of 63% were between year 2006 and 2008 models. This implies that the newly registered fleet in the country is relatively new with an average age of less than five years.

years of age.

The most popular models registered are as shown in the table below:

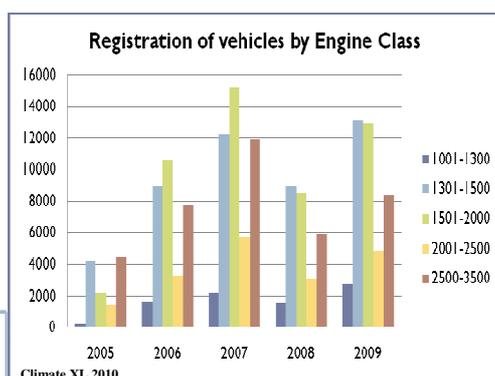
| Vehicle Make          | Percentage Share |
|-----------------------|------------------|
| Toyota                | 60%              |
| Nissan                | 13%              |
| Mercedes Benz and BMW | 2.7%             |
| Subaru                | 3.0%             |
| Isuzu                 | 3.7%             |

Climate XL 2010

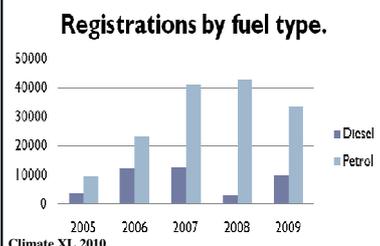
In the analysis, it was found that engine technology, fuel type, engine size and the use of catalytic converters were some of the most influential factors on individual vehicle fuel consumption and consequent CO<sub>2</sub> emissions. Vehicle maintenance habits, traffic conditions and fuel quality were of influence on the on road fuel efficiency.

Since the baseline year of 2005, the average fuel efficiency of LDVs in Kenya has been gradually improving probably with improving vehicle engine technologies. The improvement of 0.9 L/100Km between 2005 and 2008 as indicated earlier, can be therefore linked to the popularity of smaller engine efficient vehicles.

Also, the city and highway vehicle fuel consumption levels varied slightly with driving in the city consuming a slightly higher amount of fuel. This is because of the slower city speeds and the ‘stop and go’ nature of city traffic.



As shown in the graphs, the LDV fleet in Kenya is mainly composed of petrol powered sedans which range in engine size of between 1300-2000 CC and comprise about 60% of all registered vehicles. These are mainly used imported vehicles from Asia which are as required by Kenyan law on vehicle importation, are usually less than eight



Petrol powered vehicles have generally been more popular for LDVs than diesel powered vehicles which in most cases are heavy duty vehicles

## Fuel in Kenya

Kenya, like other non oil producing countries imports crude oil from producers which is then refined at the Kenyan coast prior to inland transportation of the products by pipeline, rail and road.

The Kenya bureau of standards is responsible for testing and ensuring that set standards on petroleum products are attained.

Since 2004 Kenya has been able to phase out lead in petrol and is currently pushing to

achieve the 50ppm of Sulfur in diesel. Authorities indicate that Sulfur levels have so far been reduced to as low as 500ppm, a fact disputed by critics who claim that this could be as high as 5000ppm.

Fuel prices have been on the increase globally and this has had a direct influence on the preferred vehicle types consumers have been willing to purchase and use.

Fuel prices have also led to increased popularity of vehi-

cles that operate on alternative fuels such as solar, electricity and bio fuels. Though making an entry to the Kenya market, they are yet to make a significant imprint in Kenya and other sub-Sahara African countries despite their relatively higher fuel economy.

Fuel quality can be considered to be the single most influential factor that influences vehicle emissions.



## Emissions from other sectors of the economy

Emissions from transport are complemented by that of other sectors of the economy such as industries, agriculture and other non road equipment. In Kenya, though these contribute a significant percentage to the total emissions by the country, there lack the structures for regular monitoring and reporting on the levels of emissions from these sectors. There is therefore no basis upon which policies can be structured to cut on these

emissions. The National Environmental Management Authority (NEMA) in Kenya, which is anchored on the provisions of the Environmental Management and Coordination Act, is only able to react to situations of extreme gaseous discharge from industries and other pollutants. Sources in the ministry of Environment and Natural Resources however revealed that this is about to be something of the past through

the gazetting of the Air quality regulations which will stipulate the exact acceptable levels of emissions from industries and other emitters. The enforcement of these regulations is however likely to present a new capacity challenge to the environmental authority as witnessed in the difficulty in enforcing noise regulations. Given the severity of the situation, will NEMA be able to rise to the occasion?

“ there lack the structures for regular monitoring and reporting on the levels of emissions from these sectors ”

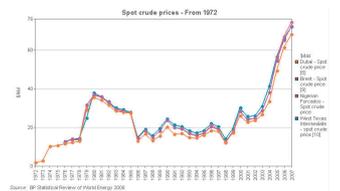
## Next steps

To date, numerous studies have been carried out indicating the effects of GHGs on the environment and on human health. It is hence upon **policy makers** to formulate policies that address these concerns. Already in Kenya, there are Air quality regulations which have been formulated and are currently awaiting gazetting.

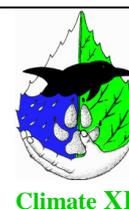
**Automobile associations**, for example the Automobile As-

sociation of Kenya, that have vast knowledge and information on vehicle maintenance and efficiency should be able to organize educational forums with their membership to pass the knowledge and improve decision making of car owners as pertains to vehicle fuel efficiency. **Vehicle owners** should also be targeted in various other initiative particularly by manufacturers and car dealers to in-

form their decision making while purchasing vehicles. This could also be used as an advertisement forum by **manufacturers and dealers** on the sale and production of more fuel efficient, environment friendly vehicles.



**Take some time to calculate how much you would save by driving a vehicle 50% more efficient and the subsequent reduction of GHG emissions.**



## Excellence in Climate Change Adaptation and Mitigation

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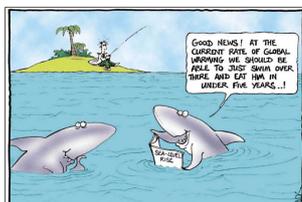
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Follow us on the web:  
<http://www.climatexl.org>

Jokes for the month



**Quote of the month:**

**"If you think mitigated climate change is expensive, try un-mitigated climate change"**

*Dr. Richard Gammon  
Public lecture at University of Washington dept. of chemistry*

Climate XL is a not for profit NGO registered in Kenya in the year 2007 (reg. no OP 218 / 051 / 2007 / 0387/4835). Our activities include:

- 1) Climate proofing of plans and strategies for private and public sector organizations
- 2) Supporting integration of climate change and climate change adaptation strategies into local, national, regional and international development policies, programs and planning processes
- 3) Facilitating development and deployment of intelligent tools and policies for climate change adaptation into various sectors
- 4) Promoting biodiversity, bio-security and environmental sustainability to enhance food security
- 5) Bridging the gap between North and South priorities and facilitate South-South cooperation towards an inclusive global agenda for climate justice based on the principle of "common but differentiated responsibility."

We champion sustainable environmental practices and climate change combating methods in Africa and globally. We encourage partnerships with interested members and institutions (both government and private).

### Upcoming events:

1. World Day to Combat Desertification (17th June)
2. Sub-regional workshop on the costs and benefits of clean fuels and vehicles in sub Saharan Africa at UNEP head quarters, Nairobi ,Kenya.(June 23-24)

### The Team at Climate XL

Kenneth Odero, CEO  
Herbert Orwa, Program Associate - *Research*  
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Did you know that, **traffic congestion** globally wastes three billion gallons of fuel every year? However, it's not possible to save energy by reducing congestion, because every attempt to facilitate traffic flow simply results in more traffic. *Bicycleuniverse.info*

## Kenya to achieve 500ppm in diesel Sulfur this year

The adoption of low Sulfur diesel - at 500 parts per million (ppm) Sulfur - by Kenya and Tanzania is set to result in cleaner diesel for the Eastern Africa region.

To mark this move, the USEPA Assistant Administrator Ms Michelle DePass, the United Nations Under-Secretary General and UNEP Executive Director Mr. Achim Steiner, Kenyan Assistant Minister for Petroleum Energy Hon. Magerer Lang'at, and the Assistant Minister for Environment and Natural Resources Hon. Ramadhan Kajembe participated in an event on 18 Feb 2011 at the UN Petrol Station at Gigiri.

The event, aimed at recognizing this progress, also called for further reduction of Sulfur levels in fuels to 50ppm and for segregation of the low Sulfur diesel for major cities which have the highest concentration of vehicle fleets.

This move to low Sulfur diesel by the two countries will have a significant impact on diesel vehicle emissions in the whole of the Eastern Africa

region as the neighbouring countries of Uganda, Rwanda, Burundi, and to some extent the northern part of Democratic Republic of Congo and Southern Sudan import petroleum fuels through Kenya and Tanzania.

Low Sulfur fuels reduce the levels of air pollutants emitted by vehicles – such as Sulfur oxides, soot and smoke particles – which, among other health risks, can trigger respiratory and cardiovascular diseases and pose an increased risk of lung cancer. Low Sulfur fuels also allow the use of emission-reducing technologies in vehicles.

For more information and other related stories check out the partnership for clean fuels and vehicles, partnership newsletter on:

*(<http://www.unep.org/transport/pcfvl/pcfvlnewsletter/2011issue1/>)*