

# TRANSPORTATION AND CLIMATE CHANGE INNIGERIA

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# INTRODUCTION

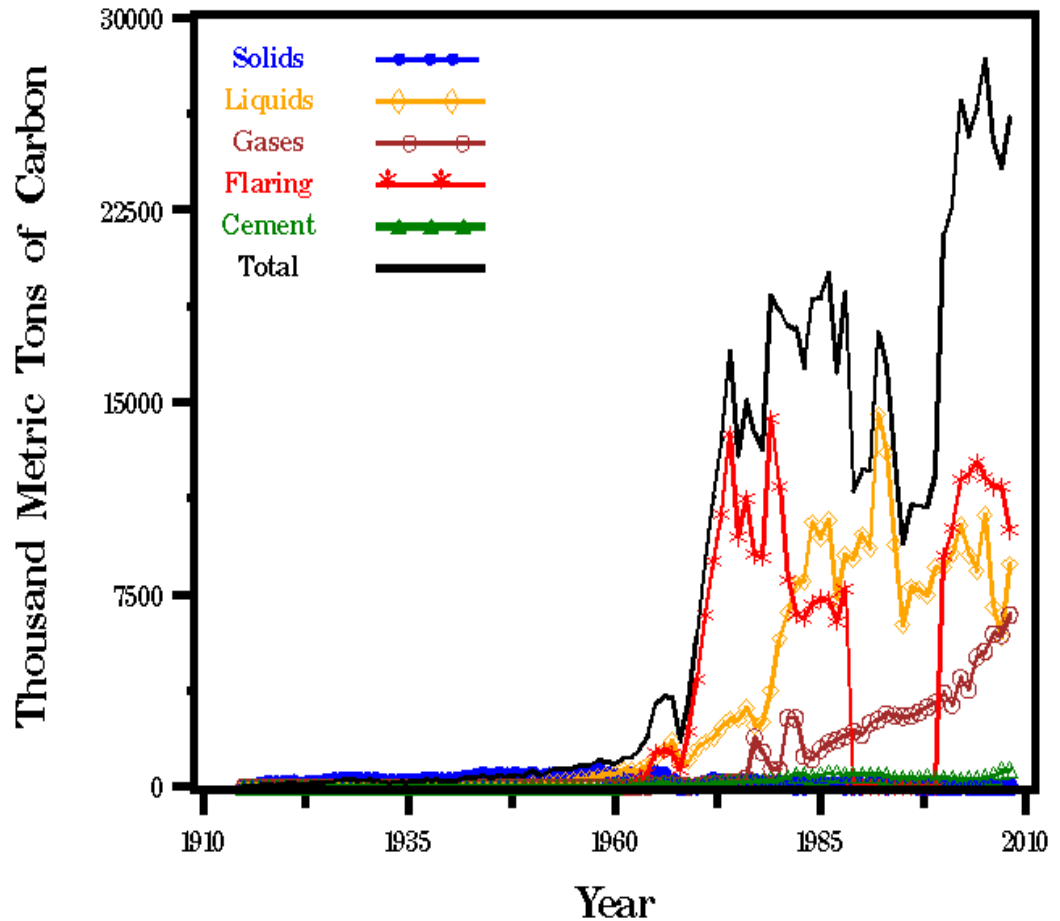
- Globally, transport sector responsible for **23%** of energy related CO<sub>2</sub> emissions and **13%** of GHGs.
- CO<sub>2</sub> emissions predicted to **increase by 120%** on 2000 levels by 2050.
- IPCC CAUTIONS! Global GHG emissions need to peak by 2015 and **decrease by 50%** in developing countries.

# Road Sub-sector

- Road transport- major contributor to total transport emissions. Example London: road transport accounts for 80% of CO2 emissions.
- Incidentally, road transport forms the major mode of internal movements in Nigeria.

## CO2 from fossil fuel- Nigeria

- Transport : a major user of fossil fuel.
- Significant increase over the last century, 54% over two and half decades. Steep Upward climb in total from about 1997.
- Large contributions from liquid fuels from 1970s to 1990s.



## CO2 emissions by economic activity - Nigeria

➤ transport sector's large contributions to CO2 not matched by sector's contribution to GDP- 3.6% in 1999 and 2.6% in 2003.

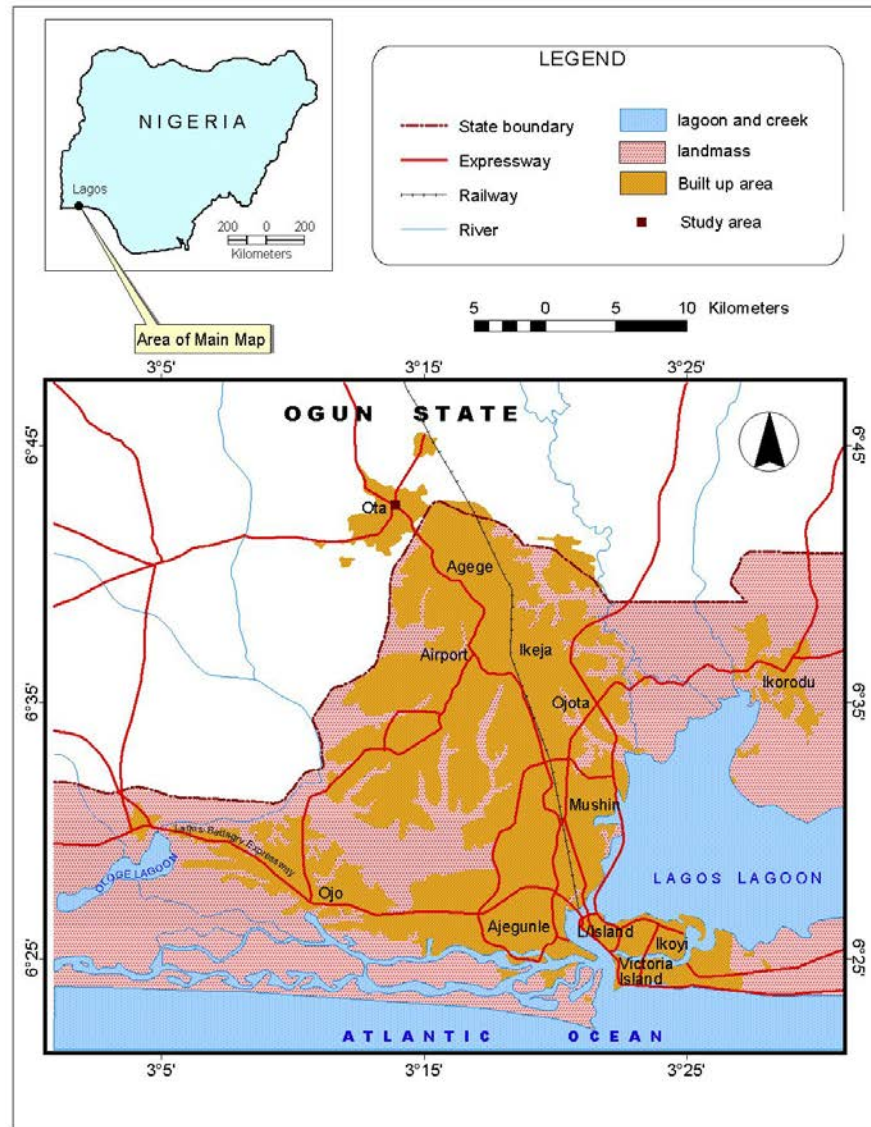
Economic Activity	Per cent Contribution of CO <sub>2</sub> Emissions	
	1999	2003
Electricity and heat production	14.3	13
Other energy industries	14.3	11.5
Manufacturing & construction	21.5	11
<b>Transportation</b>	<b>38</b>	<b>41.6</b>
Residential	7.2	9.3
Agric and other sectors	4.7	0.0
<b>TOTAL</b>	<b>100</b>	<b>100</b>

# Conceptual issues: urban morphology, transport demand & climate change

- Urban spatial structure (mono, poly, composite)
- Land use
- Transport network
- Transport modes (individual, transit)
- Daily trip patterns (VKmT & PKmT)
- **GHG EMISSIONS**

## Study Context- Lagos, Nigeria

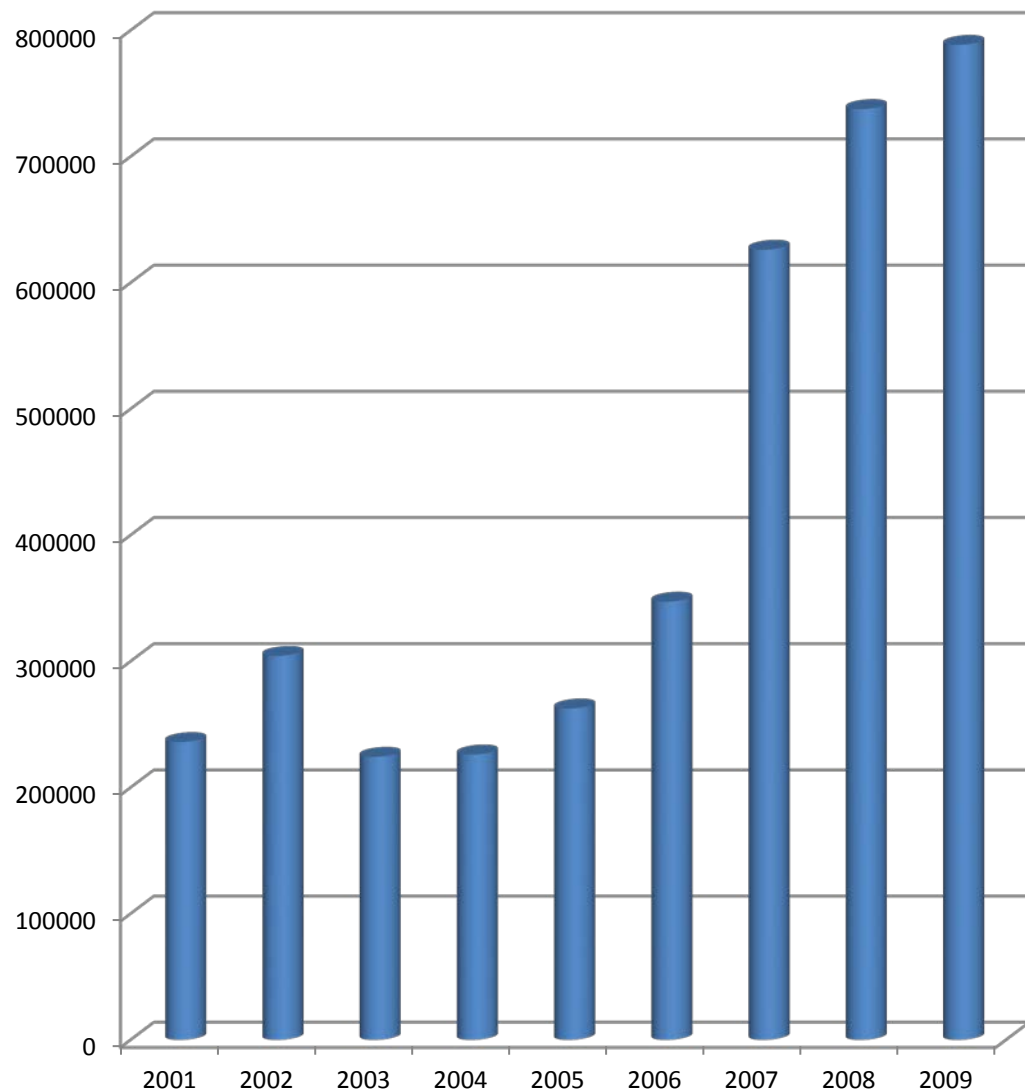
- small territorial size but most complex urban area in Nigeria
- Pop- 17.5m (Lagos census)
- 3,577 sq.km, Lagoons & waterways-22%
- Megacity region- 37% of land area, 90% of pop.
- Density-5,032 ppskm (state); 20,000 (megacity region)
- Untamed economic growth coupled with unmitigated immigration following oil boom in the 70s.
- CBD in Lagos Island, major commercial business districts have also emerged in Ikeja, Agege & Ikorodu.



## Vehicle inventory

- Total reg. increased by 234% over a decade.
- Composed mostly of private cars (average of 78% for the period).
- Globally, about two thirds of GHG emissions attributed to the private car.
- Mcycles also increasing (511 percent)
- Public transport vehicles still in short supply.

Total Vehicle Registrations in Lagos





# Vehicle Profile/modal split paradox

## Share of vehicle fleet

- Private car- 78%
- Buses – 10%
- BRT- <1%
- Water reps 22% of spatial territory.

Source: Lagos Vehicle statistics, 2010

## Share of trips

- Private car- 7.8%
- Buses- 70%
- BRT- 2.3%
- Water- 1.03 %
- Others- 5.17%

Source: Lagos household survey, 2010

# Implications- development issues

- Public transport in short supply
- Proliferation of private cars which are less efficient users of road space (higher propensities for congestion and consequently pollution).
- Most polluting modes are most popular modes

# Climate parameters

## 1976-1990

- Annual max . temp. range: 29-30.2 degrees celsius.
- Periodic temp average: 27.9
- Annual rainfall range: 49-200mm
- Periodic rainfall average: 138.8mm

## 1991-2005

- Annual max . temp. range: 29.4-31.3
- Periodic temp. average : 30.4
- Annual rainfall range: 88-200mm
- Periodic rainfall average: 143.2mm
- Summary: higher average rainfall and temp. Records and wider variabilities in this latter period.



### **Implications- development issues**

- Increasing volumes of rainfall coupled with flat topography of Lagos predisposes to frequent flooding.



## **Implications- development issues**

➤ 38% of households' street access affected. Floods due to combination of factors: Increased rainfall, Failure of infrastructure & Anthropogenic activities



**Implications – development issues  
Beach, Lagos Aug 19 2012**

**Kuramo**

Hydrologic change in Lagos as seen in flooding episodes has consequences for the coastal city, such as erosion of beaches



**Implications – development issues**

**Lagos**

**June 28, 2012**

Inundation of highways, erosion of road bases and of bridge supports.



### **Implications- development issues**

Warmer temperatures add to driver stress through physiological discomfort and fatigue. Human errors are therefore more likely to occur.



# Linking the two scenarios in Lagos: transport modes and climate change

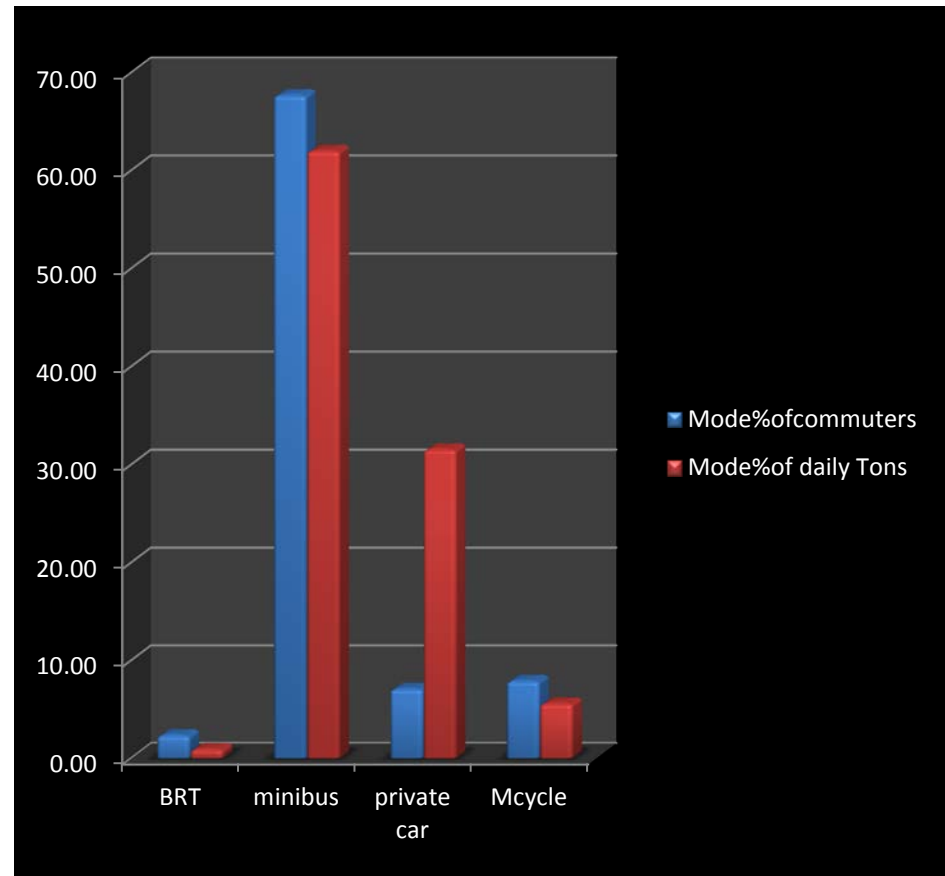
- While we cannot entirely ascribe changes in climate evidenced in recent extreme weather events to emissions from transport, literature on conceptual issues and data on CO2 emissions in Nigeria suggests there are linkages.
- Reverse effects, yes! Floods depreciate transport infrastructure, less road space for cars, more congestion and more pollution.

# CO2 emissions from major transport modes (Lagos)

Mode	distance	daily commuters	mode %of ttl	co2perv kmt	Lf	Lf%	co2per pkmt	Total Tons daily	mode%of TTL
BRT	15	233,308.	2.33	1000	47	100	21.3	149.08	0.89
Public bus	15	6,766,692.	67.67	720	14	100	51.4	10,434.24	61.99
private car	15	708,000.	7.08	375	1.5	37.5	250	5,310.00	31.55
Mcycle	10	789,000.	7.89	119	2	100	59.5	938.91	5.58
Others		1,503,000.	15.03				Daily Tons	16,832.23	100.00
		10,000,000.	100.00						

# CO2 emissions from major transport modes (Lagos)

- Table contains best case scenario. In the absence of data on emission levels of cars in use in Nigeria, we have assumed vehicle emission levels as that which obtains in New York city (Bertaud model).



# CO2 emissions from major transport modes (Lagos)

- Kg/ per year per commuter from major modes = 517.03 of CO2 equivalent.
- That amounts to a total of 0.52 metric tons per year for all commuters.
- Annual per capita CO2 emissions for Nigeria (from all sources) in the period 2000-2005 ranges from 0.6-0.8 (WB, 2011)
- What is the message? Lagos commuters appear to be contributing a lot to the total pool of CO2 emissions..

# Suggestions

- Policies to reduce daily distance travelled (through changes in land use) often unpopular politically; not likely to be effective.
- Alternatives are to change vehicle fleet performance, increase load factor or shift to the most energy efficient modes.
- This last option most feasible for Lagos. BRT to be prioritized.

# Suggestions

- Presently, some BRT buses operate in mixed traffic. Not good enough.
- Other challenges of BRT (facility/vehicle) maintenance to be addressed.
- BRT fleet should be increased, but this cant be done indefinitely.
- Light rail transit will have to be developed considering limited road capacity.
- Concentration of destinations in Lagos Island makes urban structure of Lagos suitable for transit.

# Conclusion

- Modal shift towards public transport will happen in Lagos only if price, transit time and convenience are competitive with other modes, especially the private car.

➤ **THANK YOU  
FOR  
LISTENING**