TRANSPORTATION AND CLIMATE CHANGE IN NIGERIA

DARAMOLA Adebukola Yewande
Research Fellow, Nigerian Institute of Social & Economic Research (NISER), Ibadan
&
Olubunmi Alugbin
Lagos State Ministry of Physical Planning & Urban Development.
INTRODUCTION

- Globally, transport sector responsible for 23% of energy related CO2 emissions and 13% of GHGs.
- CO2 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.

<table>
<thead>
<tr>
<th>Economic Activity</th>
<th>Per cent</th>
<th>Contribution of CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>2003</td>
</tr>
<tr>
<td>Electricity and heat production</td>
<td>14.3</td>
<td>13</td>
</tr>
<tr>
<td>Other energy industries</td>
<td>14.3</td>
<td>11.5</td>
</tr>
<tr>
<td>Manufacturing &amp; construction</td>
<td>21.5</td>
<td>11</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td><strong>38</strong></td>
<td><strong>41.6</strong></td>
</tr>
<tr>
<td>Residential</td>
<td>7.2</td>
<td>9.3</td>
</tr>
<tr>
<td>Agric and other sectors</td>
<td>4.7</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
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, Lagons & 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.
Vehicle Profile/modal split paradox

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

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

Source: Lagos Vehicle statistics, 2010
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
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)

<table>
<thead>
<tr>
<th>Mode</th>
<th>distance</th>
<th>daily comuters</th>
<th>mode %of ttl</th>
<th>co2pervkmt</th>
<th>Lf</th>
<th>Lf%</th>
<th>co2perpkmt</th>
<th>Total Tons daily</th>
<th>mode%oF TTL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRT</td>
<td>15</td>
<td>233,308.</td>
<td>2.33</td>
<td>1000</td>
<td>47</td>
<td>100</td>
<td>21.3</td>
<td>149.08</td>
<td>0.89</td>
</tr>
<tr>
<td>Public bus</td>
<td>15</td>
<td>6,766,692.</td>
<td>67.67</td>
<td>720</td>
<td>14</td>
<td>100</td>
<td>51.4</td>
<td>10,434.24</td>
<td>61.99</td>
</tr>
<tr>
<td>private car</td>
<td>15</td>
<td>708,000.</td>
<td>7.08</td>
<td>375</td>
<td>1.5</td>
<td>37.5</td>
<td>250</td>
<td>5,310.00</td>
<td>31.55</td>
</tr>
<tr>
<td>Mcycle</td>
<td>10</td>
<td>789,000.</td>
<td>7.89</td>
<td>119</td>
<td>2</td>
<td>100</td>
<td>59.5</td>
<td>938.91</td>
<td>5.58</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>1,503,000.</td>
<td>15.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Daily Tons</td>
<td>16,832.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10,000,000.</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
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 can't 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