Global Change Analysis Model- CEEW Version

Transport Sector – Structure, Assumptions and Results

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Content

• GCAM model structure

• India specific updates

• Results and Insights
- Global model (32 regions) with India as a separate region
- India specific version, set up at IIM Ahmedabad during 2007-09, under the guidance of Prof P. R. Shukla
- Extensively published in high impact international journals
- An important part of IPCC assessments on modelling related literature
- One of CEEW’s in-house models
Structure of the sector (1/2)
Structure of the sector (2/2)
Assumptions
Key Assumptions

• Energy calibrated to IEA energy balances

• Cost
  – For commercial vehicles, cost represents total cost of ownership across the lifetime
  – For private vehicles, cost represents initial capital cost
  – For cars, cost is a weighted average of TCO and capital cost, weighted by the sales of commercial taxis and private cars
  – Costs of all vehicle categories reflect latest market data
  – Electric cars reach cost parity with petrol cars by 2030
  – NG price regime reflects the increase in global supply following the US shale gas discovery

• Survival curves for all vehicle types based on stock survival curves by IIT-Delhi

• We assume efficiency improvement for various technologies based on historical trends, i.e. for IC engines and electric drive trains across modes

• Model takes into value of time travel for switching between modes, e.g. as the income level rises a person is more likely to switch to a faster mode of travel
Survival Curves

Source: Based on IIT Delhi analysis
Results
Transport passenger service demand increase would be driven by cars

• Four wheeler growth to emerge as a big story of the next three decades in India

• Another important component is going to be two wheelers

• A big shift towards four wheelers could have important implications for this sector’s energy and emissions futures
Ownership rate will grow fast for personal vehicles

- Four wheeler ownership rate increases up to 100 per 1000 people by 2050
- Two wheeler ownership rate saturates post 2040

Source: CEEW Analysis
New Sales - Electric vehicles will come in a big way especially in four and two wheeler segment

Source: CEEW Analysis
Fast electrification of passenger transport means that the share of airlines in energy and emissions becomes significant by 2050.

- Electrification of four wheelers negates their negative aggregate efficiency impact.
- This has important implications for congestion and road infra requirements.

Source: CEEW Analysis
Transport freight service demand - trucks to grow fast

- Freight demand to grow by over five times in the next three decades
- The truck segment continues to dominate the freight business
- Railways continues to increase in absolute terms and its share marginally increases in the next three decades

Source: CEEW Analysis
Transport energy consumption would be heavily dominated by trucks, oil and NG become the two main fuels of this segment.
Emissions
Total emissions – Ref. Scenario vs 2_deg scenario

Ref. scenario - Emissions by Sector

2_deg scenario - Emissions by sector

Ref. scenario - Emissions share by sector

2_deg scenario - Emissions share by sector

Source: CEEW Analysis
Freight trucks and airlines emerge to be the top emitters in the Ref sc
2 degree scenario

- 30 percent reduction by 2050
  - 25 percent comes from freight; mainly trucks
  - 5 percent comes from passenger; dominated by domestic aviation

Source: CEEW Analysis
Key Insights

• Four wheeler growth, fueled by economic growth

• Electrification of passenger transport, particularly 4W

• NG penetration in trucks

• Domestic airlines and freight trucks are the ‘hard to abate’ transport sectors
Thank you

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