ELEMENTS OF A SUSTAINABLE FREIGHT STRATEGY

by

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14 October 2015
Elements of a Sustainable Freight Strategy

Sustainable Freight Transport Systems: Opportunities for Developing Countries
Geneva, October 14, 2015
The mission of ICCT is to dramatically improve the environmental performance and efficiency of cars, trucks, buses and transportation systems in order to protect and improve public health, the environment, and quality of life.

- Non-profit research organization
- Air pollution and climate impacts
- Focus on regulatory policies and fiscal incentives
- Activity across modes including aviation and marine
- Global outreach, with special focus on largest markets
Growing Importance of Freight Transport

- Global Freight transport consumes almost 45% of total transport energy (IPCC)
- The value of freight exports has grown significantly over the past 20 years
- CO2 emissions from international freight transport projected to grow by a **factor of 4** from 2010 to 2050 (ITF).
- Freight movement is a **global and multimodal** issue

![Graph of Value of Exported Merchandise](image1)

**Total Value of Exported Merchandise (Trillions of current USD)**

- **Year**: 1940, 1960, 1980, 2000, 2020
- **Value of Exported Merchandise**: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

![Pie Chart of International Trade related CO2 emissions by mode](image2)

**International Trade related CO2 emissions by mode**

- **Sea**: 37%
- **Road**: 53%
- **Air**: 7%
- **Rail**: 3%

Source: World Trade Organization

Source: ITF
Growing Importance of HDVs

- Transportation sector impacts are increasing
  - About 50 million barrels oil per day, a third of global climate emissions
- Heavy-duty vehicles are major, growing energy demand, CO2 source
  - Typically the highest transport energy, CO2 source outside US, EU
- Growth in HDV energy consumption (and CO2 emissions) predicted to outpace growth in other modes. Forecasted 72% increase from 2010-2030

Source: ICCT Roadmap (2014)
Country/Region Specific Challenges

- Unique challenges for every country
- Country specific freight assessments are needed

- Availability of modal options
- Duty Cycles
- Technology availability
- Market structure
- Logistics
- Infrastructure
- Regulatory compliance
- Additional regulations (e.g. weights and measures)

Portfolio of Sustainable Freight Strategies

- Fuel consumption and fuel/emission standards
- Improved infrastructure and transportation systems
- Financial incentives
- Carbon taxation
- Advanced technology development and deployment
- Green Freight and other in-use programs/policies
New Vehicle Emissions Standards

- Emissions standards (and complimentary fuel sulfur standards) for heavy-duty diesel engines have been progressively driving down criteria pollutant emissions.
- US 2010 and Euro VI Emissions standards require the lowest emissions of PM and NOx and require the use of Ultra Low Sulfur Diesel Fuel.
  - These standards covered 27% of HDVs sold in 2014.

|---------------------|-----------|-------------------|--------|-----|--------|----------|-------|----------|-----|--------|-------|-----------|-------|-----------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|

**Year of implementation (all sales & registrations)**

**Euro-equivalent standard**
- 1/I
- 2/II
- 3/III
- 4/IV
- 5/V
- 6/VI
- Post 6/VI
New Vehicle Fuel Efficiency Standards

- HDV efficiency standards are used to overcome existing market barriers to efficiency technology
  - To drive fleet-wide CO2 reductions year to year
- HDV standards are relatively new compared with LDV standards
- Currently 4 countries have HDV standards – some others are working towards standards

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<td>Phase 1</td>
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Hashed areas represent unconfirmed projections of the ICCT
Costs and Benefits of New Vehicle Policies

- Emissions standards: benefits of typically outweigh costs significantly
  - For China VI, benefit:cost ratio of nearly 6:1
- Efficiency standards: payback times for technologies are considered
  - Payback time for US efficiency standards is less than two years for long haul trucks in Phase 2

Cost-Benefit of China VI


Costs and Benefits of US Phase 1 and 2

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<tr>
<th>Proposal</th>
<th>Phase 1</th>
<th>Proposed Phase 2</th>
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<tbody>
<tr>
<td>Final rule (expected)</td>
<td>2010</td>
<td>2015</td>
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<td>Model years</td>
<td>2014-2018</td>
<td>2018-2027</td>
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<table>
<thead>
<tr>
<th>Percent CO₂ reduction</th>
<th>Combination tractors (Class 7 and 8)</th>
<th>Trailers</th>
<th>Vocational vehicles (Class 2b-8)</th>
<th>Heavy-duty pickups and vans (Class 2b and 3)</th>
<th>Engine</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>9%–23%</td>
<td>-</td>
<td>3%–9%</td>
<td>10%–15%</td>
<td>16%</td>
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<tr>
<td>Vehicle technology cost</td>
<td>Combination tractors (Class 7 and 8)</td>
<td>$6,215</td>
<td>Trailers</td>
<td>-</td>
<td>$1,770</td>
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<td>Vocational vehicles</td>
<td>$378</td>
<td>$3,380</td>
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<td>Heavy-duty pickups and vans (Class 2b and 3)</td>
<td>$1,048</td>
<td>$1,340</td>
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<tr>
<td>Average payback period</td>
<td>Combination tractors (Class 7 and 8)</td>
<td>1</td>
<td>Trailers</td>
<td>-</td>
<td>2</td>
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<tr>
<td></td>
<td>Vocational vehicles</td>
<td>1</td>
<td>$1,770</td>
<td></td>
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<tr>
<td></td>
<td>Heavy-duty pickups and vans (Class 2b and 3)</td>
<td>2</td>
<td>$3,380</td>
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</table>

| Energy and climate impact | Greenhouse gas emission reduction by calendar year (million metric ton CO₂) | 76 (2030) | 108 (2030) | 127 (2035) | 183 (2050) |
|                                 | Fuel reduction by calendar year (million gallons per year) | 6.0 (2030) | 8.7 (2035) | 13.4 (2050) | |
|                                 | Greenhouse gas reduction over regulated vehicle lifetimes (million metric ton CO₂ equivalent) | 273 | 961 | |
|                                 | Fuel reduction over regulated vehicle lifetimes (billion gallons) | 22 | 75 | |
| Monetary impact | Fuel savings (billion) | $50 | $170 | |
| Other benefits (billion) | $7 | $99 | |
| Total costs (billion) | $8 | $25 | |
| Overall benefit-to-cost ratio | 7.1 | 10.1 | |

Improving the Legacy Fleet

- Green freight programs
  - Voluntary partnerships with shippers/carriers/logistics companies
- Vehicle replacement programs
  - Accelerate fleet turnover
- Retrofit/repower programs
  - Cost effective way to clean existing, older vehicles
- Inspection and maintenance
  - Ensure proper operation of in-use vehicles’ emissions control
- Spotter and remote sensing
  - Identify and repair high emitters
- Low emissions zones
  - Restrict travel zones for high emitting, older vehicles
Green Freight Programs

- CO2 reductions from SmartWay programs (determined based on reporting from members)
- Reductions due to – efficiency technologies, improved strategies, driver training, accelerated fleet turnover
- Nominally, this represents 5-10% annual improvement from 25% of the in-use fleet
- Using similar assumptions – potential for 90 MMT annual reductions from G20 countries

Source: US EPA
Vehicle Replacement Programs

Best Practices

1. Clean replacement vehicles
2. Strong implementation, management, enforcement
3. Optimize the subsidy offered
4. Define policymaker roles at national, regional, and local level
5. Compliment with other incentives

<table>
<thead>
<tr>
<th>Program</th>
<th>Vehicles targeted</th>
<th>Approximate average subsidy offered</th>
<th>Complimentary policies used</th>
</tr>
</thead>
<tbody>
<tr>
<td>US: California: Carl Moyer Program</td>
<td>Multiple types, including on-road and off-road</td>
<td>-$28,000 per vehicle</td>
<td>Mandatory upgrades of high polluting vehicles (regulatory backstops)</td>
</tr>
<tr>
<td>US: Consumer Assistance to Recycle and Save (CARS)</td>
<td>Light-duty vehicles</td>
<td>$3,500-$4,500</td>
<td>None</td>
</tr>
<tr>
<td>US: National Clean Diesel Campaign (NCDC)</td>
<td>Heavy-duty vehicles</td>
<td>-$9,400 per vehicle spent for the program</td>
<td>None</td>
</tr>
<tr>
<td>Germany: Scrappage Bonus</td>
<td>Light-duty vehicles</td>
<td>$3,500</td>
<td>Low emission zones</td>
</tr>
<tr>
<td>China: National Vehicle Scrappage Program</td>
<td>Light- and heavy-duty vehicles</td>
<td>Varies by vehicle type; between $980 and $2,940</td>
<td>Mandatory vehicle age limits</td>
</tr>
<tr>
<td>China: Local Vehicle Scrappage Program</td>
<td>Light- and heavy-duty vehicles</td>
<td>Varies by vehicle type; LDVs: $410-$2410 HDVs: $1,330-$2,100</td>
<td>Mandatory vehicle age limits and low emission zones</td>
</tr>
<tr>
<td>Mexico: Program to Modernize Federal Road Transportation</td>
<td>Heavy-duty vehicles on federal highways</td>
<td>Up to 15% of the cost of the replacement vehicle</td>
<td>None</td>
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<tr>
<td>Mexico: Mexico City: Program to Replace Microbuses with New Autobuses</td>
<td>City buses</td>
<td>Up to $7,700</td>
<td>None</td>
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<tr>
<td>Chile: Swap your Truck</td>
<td>Heavy-duty trucks</td>
<td>From $8,000 to $24,000 depending on vehicle category</td>
<td>Partial: there is a ministerial decree to implement a low emission zone, but it has not been executed.</td>
</tr>
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Developing a Sustainable Freight Strategy

1. Freight assessment – all modes
2. Emissions inventory
3. Set targets
4. Stakeholder involvement
5. Funding
6. Develop short, mid, long term strategy

Source: http://www.arb.ca.gov/gmp/sfti/sfti.htm
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