World Bank Case Studies on Green Trucks/Freight Transport Initiatives

Shomik Mehndiratta
Ke Fang
Georges Darido, gdarido@worldbank.org

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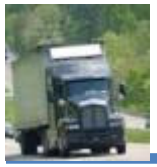
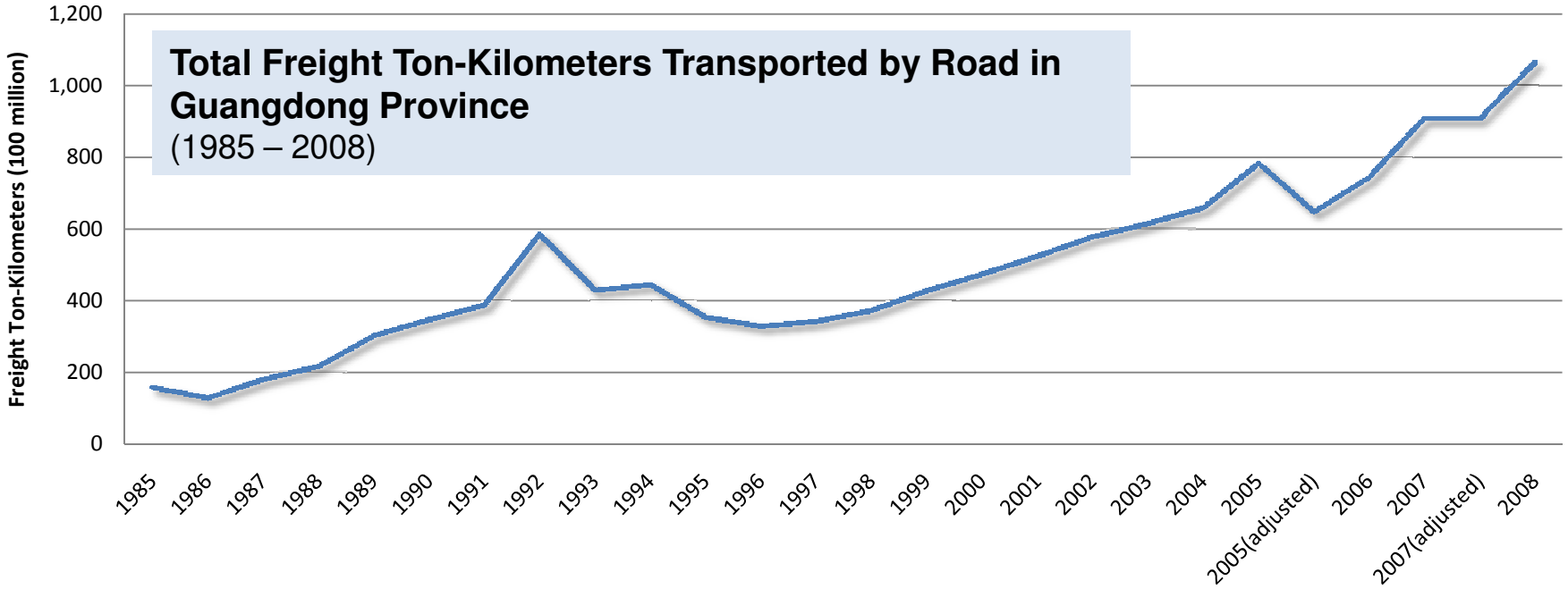
World Bank Green Freight Initiatives

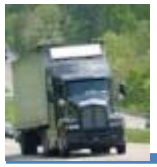
CHINA CASE STUDY



Road Freight in China

- Trucks account for 54% of total transport sector fuel consumption in China.
- Road freight volume grew rapidly along with the fast growth of China's manufactory-dominated economy.

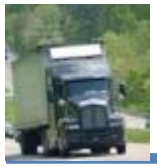




Energy Efficiency

- Energy efficiency in the sector remains very low.
  - Poor fuel economy of trucks
  - A large portion of “empty miles”

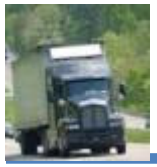
- **Energy efficiency technologies and practices** are not well utilized, despite potential fuel savings and economic benefits



Barriers on Energy Efficiency

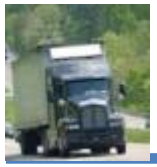
- Market failure occurs mainly because:
  - Trucking companies reluctant to experiment with new or unknown technologies
  - Lack of information and confidence on the performance, cost and availability of fuel efficiency technologies

- National and local governments are reluctant to take “heavy-handed” measures, worried about their impact on economic growth



Objectives of Green Freight Initiative

- Aiming to address the market failure by
  - providing better information and better confidence in the performance of proved energy efficiency technologies and practices,
  - increasing awareness and demand for energy efficiency technologies, and
  - facilitating the increase of the technology supply in Chinese market.



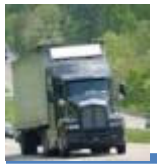
Areas & Steps for Policy Intervention

4. Modal Shift

3. Improved Logistics

2. Behavior & Maintenance

1. Technologies



The Project Development Process

- Snowball-effect:

a tiny-sized pilot testing

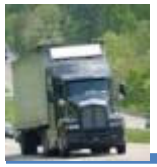
Dissemination
Communication
Training

Developing a conceptual framework for collaboration

Preparation of a demonstration project, incl. suveys of the industry and financing market

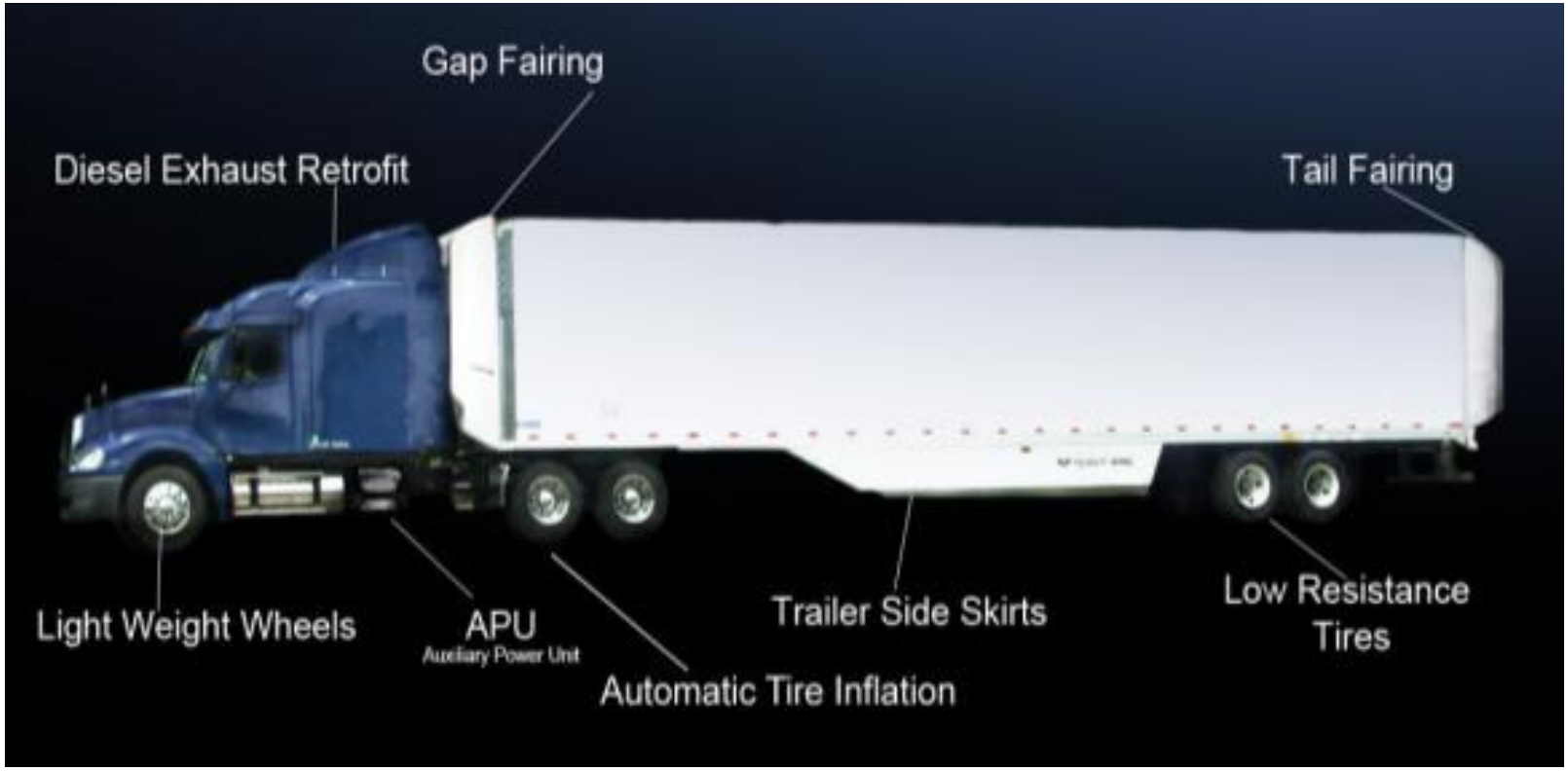
Sector situation in China

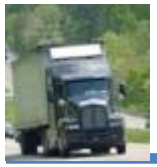
- Tire pressure
  - Most drivers only use hammer to check tire pressure
  - 14% of drivers check pressure less than once per week
- Truck loads
  - Empty of partially empty trucks are common
  - Overloading is common
- Many cost-effective technologies available but not yet widely applied
  - Low rolling resistance tires
  - Aluminum wheels
  - Automatic tire pressure monitoring
  - Aerodynamics: e.g. skirts or nosecone
- Introduction of Euro IV fuel makes emission reduction technologies possible



Pilot Testing

- Carried out in Guangzhou, 2008-2009
  - Technology testing on 14 trucks in three truck fleets
    - Tire systems
    - Aerodynamics





Pilot Testing: Tire equipment (a)

- **Dual low rolling resistance tires:** reduces rolling resistance

X One® XDN®2

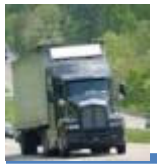
Michelin's longest-wearing, best traction X One drive tire for highway and regional operations.

Load and Inflation

- **830 kPa**
- **5,000 kg**

455/50R 22.5

RULE: For every 70 kPa under inflation is 1% penalty in fuel economy



Pilot Testing: Tire equipment (b)

- **Aluminum wheels:** reduces weight of wheel

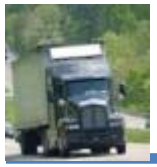
Pilot Testing: Tire equipment (c)

- **Automatic tire pressure monitoring system:** keeps tire pressure more constant

DORAN

Doran 360HD™

Tire Pressure Monitoring System For Trucks

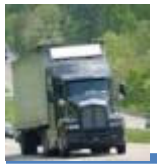


Pilot Testing: Aerodynamics (a)

- **Skirts:** reduce wind underneath the trailer

HDPE plastic will last life of trailer

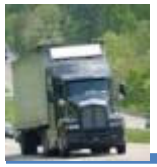
FREIGHT WING INC.™
Driving Fuel Efficiency Into Tomorrow



Pilot Testing: Aerodynamics (b)

- **Nosecone:** reduces turbulence

NoseCone®
World Leader in Truck and Trailer Aerodynamics



Pilot Testing: Aerodynamics (c)

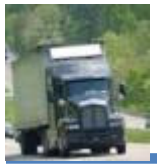
- **Gap fairing:** reduces the tractor-trailer gap

Distance between back of cab and front of trailer
Trailer Gap
Will make difference in % of savings

Green Trucks Pilot Project Guangzhou

3 Fleets + Driver Training

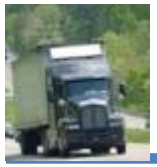
- XingBang Co. – Tires & Monitoring, [local & Long Haul] ~1.8% fuel efficiency improvement
- Star of City Logistics Co. – Tires, Monitoring, nose cone, Trailer Skirts, [Long Haul] ~ 3.5% improvement
- Baiyun Municipal Garbage – Tires, Monitoring, [Local] up to 18% improvement



Training and Overseas Study Tour

- Training workshops for government staff and enterprise management in Guangzhou
- Two-week tailor-designed training program (including site visits) in the US for senior officials
  - 17 directors, chiefs, and general mangers across different government agencies in Guangdong, learned about:

- Smatway Program (US EPA)
- Freight Logistics (CS Robinson, Safeway, Port of Tacoma)
- Emissions Policy (California Resource Board)
- Green Freight Technology & Financing (CSS)
- Vehicle Scrapping (Port of Seattle Truck Scrapping Program)



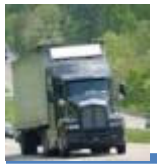
Dissemination/Communication/Collaboration

Guangzhou Transport Committee

World Bank Project Management Office, Guangzhou

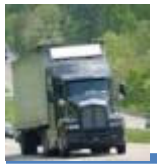
Guangzhou Environmental Protection Bureau

Guangdong Provincial Department of Transport



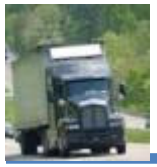
Guangdong Demonstration Project (1)

- Technology Demonstration
  - Energy Efficiency truck technologies demonstration
    - 1500-1800 trucks
  - Pilot testing of logistics operation technologies:
    - Pilot Advanced Brokerage Information System
    - Pilot “Drop-and-Hook” freight operations



Guangdong Demonstration Project (2)

- Innovative Finance
  - Green Freight technology rebate
    - based on the prevailing down payment rate for a truck loan
  - performance-based payments
    - based on the prevailing interest rate of a truck loan
  - better access for SMEs to commercial finance
    - creating quality pipeline projects for commercial banks
    - sharing information between banks and SMEs

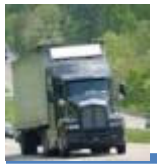


Guangdong Demonstration Project (3)

- Large-scale Capacity Building
  - Policy research
  - Training for installation and operation of technologies
  - Training for government officials and enterprise managers
  - Marketing and branding
  - Awareness raising and information dissemination
  - “Green Freight Trade Fairs” and “Green Freight Submits”
  - Driving market demand for green freight service providers
  - Enhanced Carbon Accounting and Supply Chain Efficiency

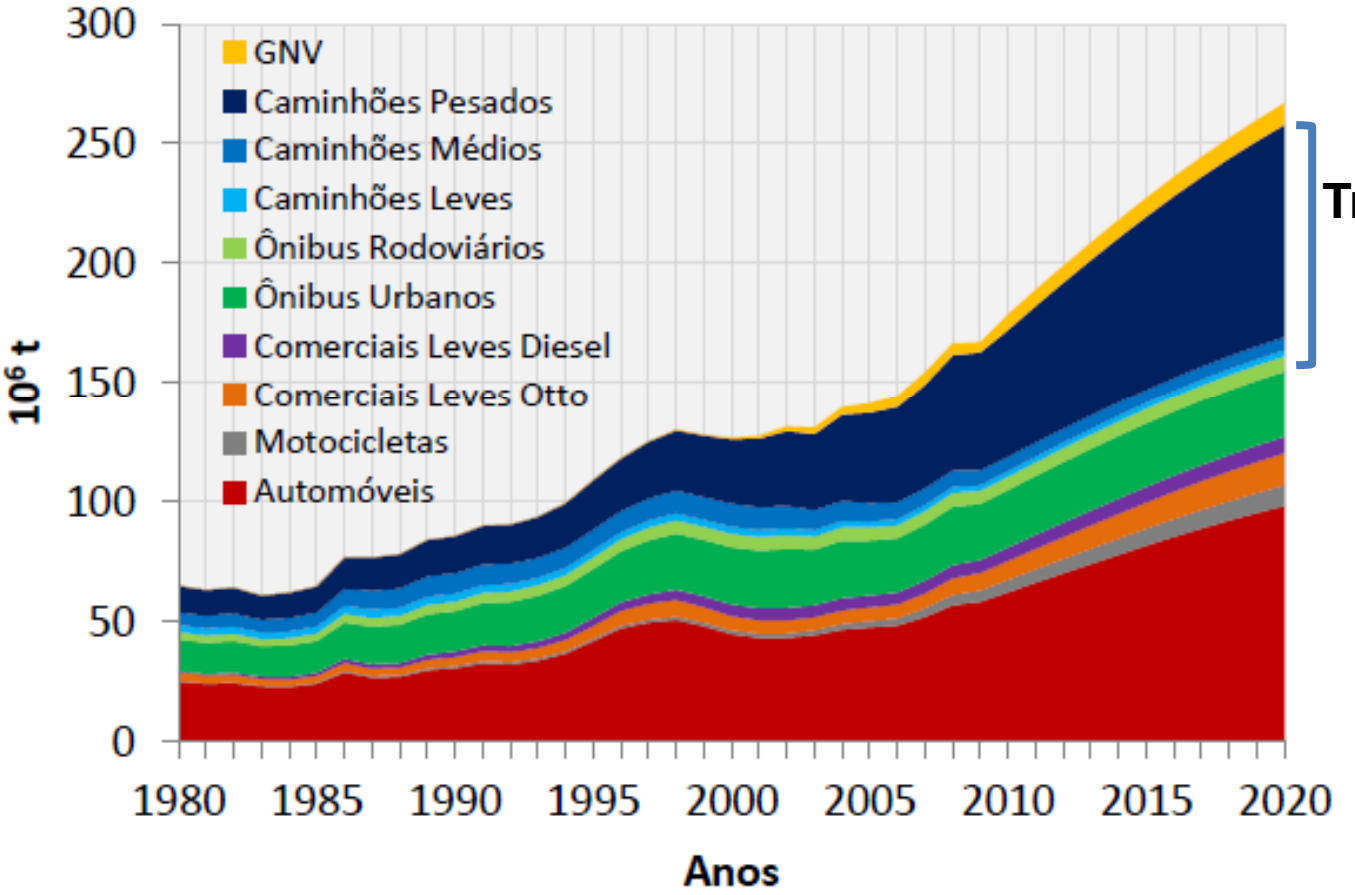
World Bank Green Freight Initiatives

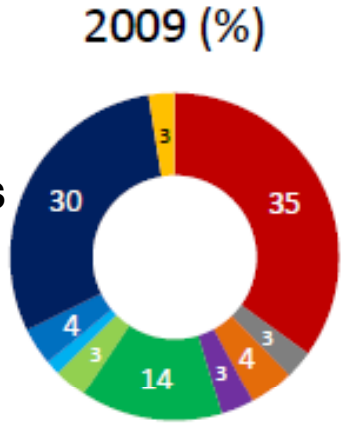
BRAZIL CASE STUDY

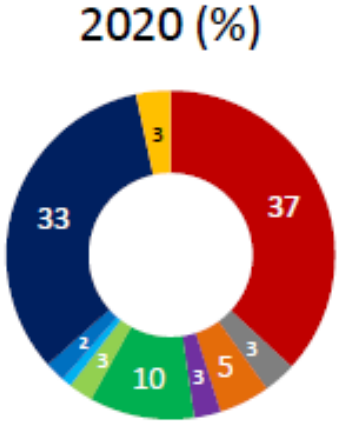


Emissions from the sector will continue to grow

Brazil CO2 Emissions by Vehicle Category



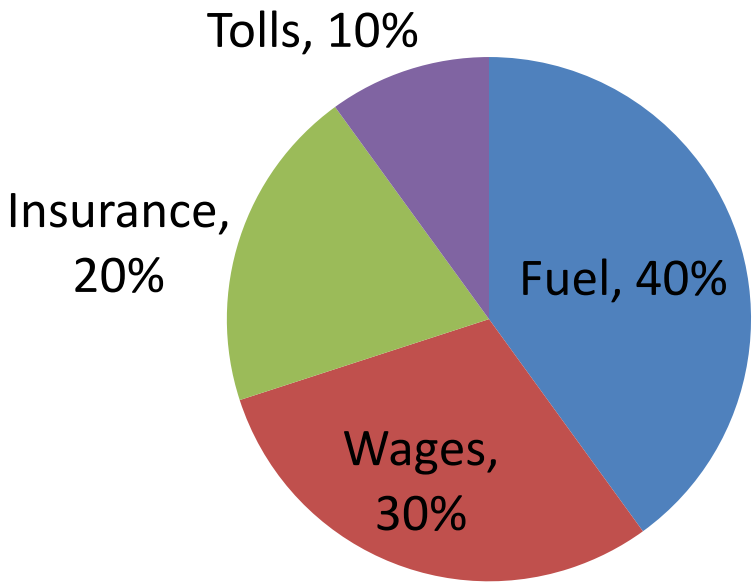




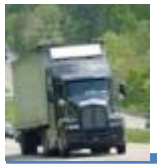
Ministério do Meio Ambiente, 1º inventário Nacional de Emissões Atmosféricas Por Veículos Automotores Rodoviários, Janeiro 2011.

Fuel costs compared to total costs

- Fuel is a very important part of truck operating costs (excluding maintenance and depreciation costs)
- Approximate share of total operating costs in Brazil:



- In China, fuel can be as much as 59% of operating costs

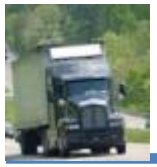


Convergence of agendas on green freight

1. *Logistics: efficiency, competitiveness and growth*
   Supporting improvements in the freight and logistics sector to drive efficiency, competitiveness, and growth

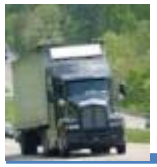
2. The "Green" agenda:

- Promoting climate change mitigation by supporting steps to reduce the carbon intensity of the freight sector
- Supporting governments dealing with local air pollution
- Finding synergies and other co-benefits, such as congestion management in urban areas



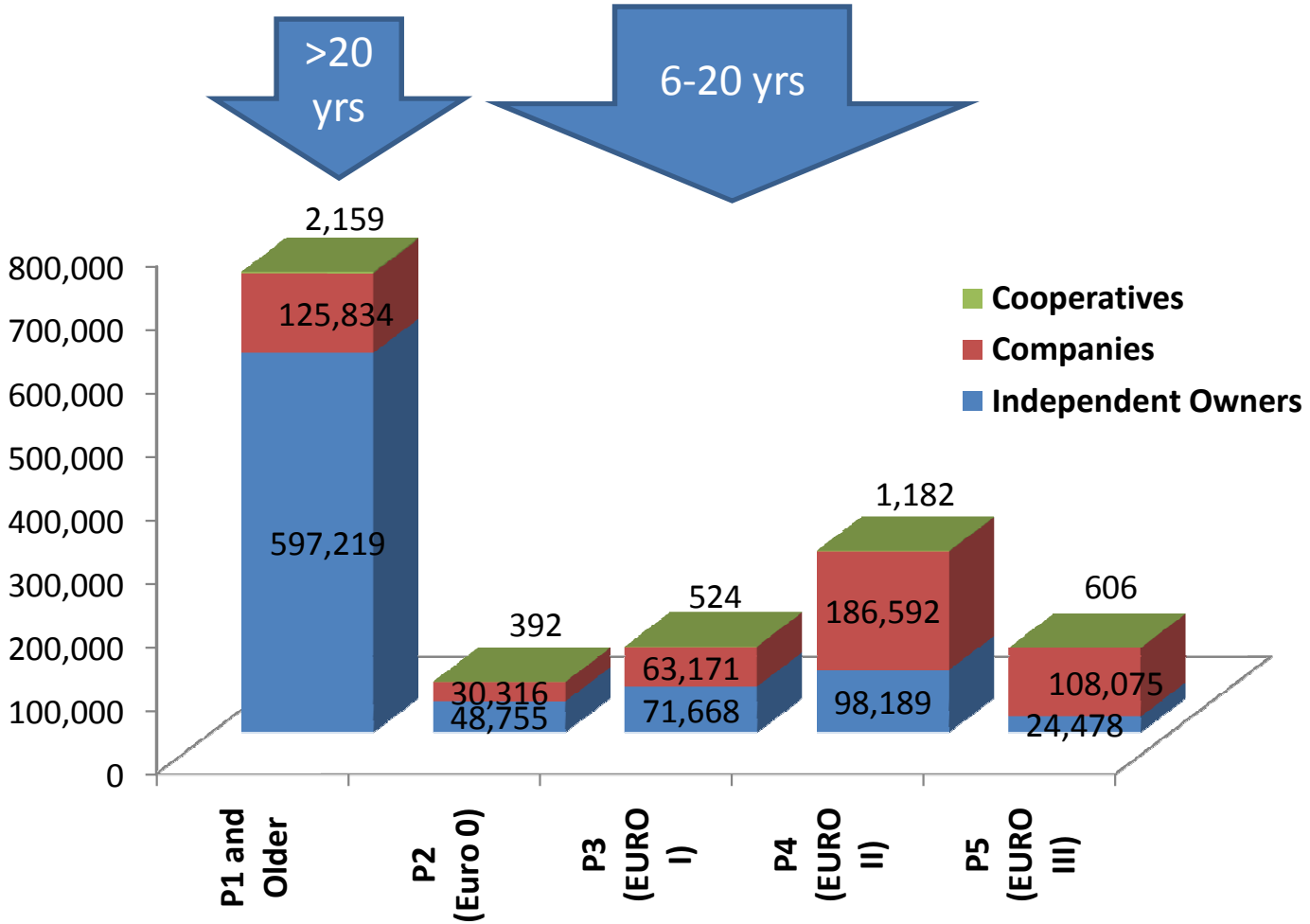
Elements of a Market study

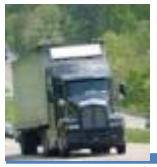
- Large share of truck fleet is quite old, mostly used by owner-operators (see next slide)
- Large number of “empty” truck-km due to demand and production imbalances and lack of an integrated network
- Targeting “green” strategies for a diverse sector
- Building blocks for a “green freight” program considering the fragmentation of policies
- Industry surveys to identify common practices, awareness of technologies, win-win conditions
- Working in partnership with Government, Industry Associations and NGOs



Profile of Truck Fleet in Brazil, 2009

>1.3 million trucks by engine/emissions technology and type of ownership:





Green strategies: short to long-term

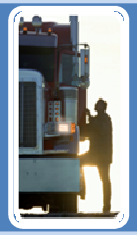
Increasing Cost and Effort

Infrastructure

- Improving condition of existing roadways to reduce operating costs
- Expanding rail/waterway network to induce mode shifts

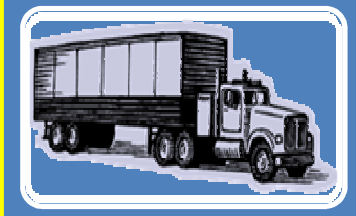
Logistics (reducing empty truck kms)

- Network optimization with communications equipment and new facilities (terminals, etc.)



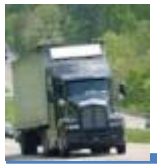
Behavior and maintenance

- Driver training (eco-driving)
- Financing and capacity building for small operators
- Better regulations and enforcement



Technologies for Energy Efficiency

- Oldest trucks: scrappage programs
- **Trucks in operations: incremental technology improvements, incentives for experimenting and adopting**
- New trucks: standards, smart incentives (tax) and regulations
- **Public-Private Partnerships and voluntary programs to mainstream technologies (e.g. SmartWay)**



Building Blocks to a Voluntary Program

Elements of a truck program

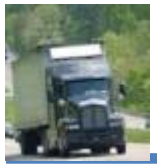
Cost

- Mainstream cost-effective technologies
- Training for drivers and maintenance
- Voluntary partnership programs
- Regulation and enforcement
- Financial incentives (e.g. scrappage)
- Long-term infrastructure investments

Effort

Example of initial approach

- Technology pilot
- Pilot carbon footprinting of supply chain
- Forum for dialog with industry
- Risk-sharing with incremental financing



Creating a menu like this for Brazil

SmartWay Strategies *Costs vs. Fuel Savings*

Trailer Side Fairings
$1,450 - $2,500
Saves 7%

Trailer Mounted Gap Reducers
$700 - $1,100
Saves 2%

Smart Way Approved Tractor Cap
$1,300 differential cost
Saves 5%

2010 Engine
$9,000 Plus Model Year Escalator - more than 2007 compliant engine
85% less PM than 2006MY
85% less NO_x than 2009MY

Diesel Exhaust Fluid
$.01 CPM
Burn 2 gallons DEF per 100 gallon/diesel
CPG = $3.00

Trailer Boat Tail
$2,000 - $3,000
Saves 5%

Low Rolling Resistance Tires
$2,500 Trailer (2%)
$3,000 Tractor (2%)
Saves 4%

Idle Reduction Equipment (APU's)
$6,000 - $15,000
Saves 8%

Fuel Tank Side Fairings
$1,700 - $2,100
Saves 1%

Aero Mirror & Bumper
$325 differential cost
Saves 2%

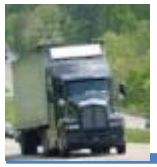
Tractor (18% fuel savings)
Additional Costs per Tractor: $20,025 - $29,425
Additional Weight: 850 lbs (approx)

Trailer (16% fuel savings)
Additional Costs per Trailer: $6,650 - $9,100
Additional Weight: 900 lbs (approx)

* Fuels saving strategies are not cumulative. Conservative estimate of 25% overall savings yields ROI on all equipment = 1.8 yrs to 2.6 yrs. (Based on long-haul application, 120,000 annual VMT, 2,000 idle hours on APU, and $3.00/gal.)

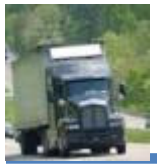
* Information Courtesy of Interstate Distributor Company: IDC Shippers Summit & Green Freight Training Program 2010

Unique features of Brazilian trucks



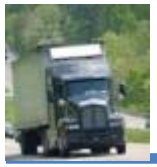
Technology pilot test

- Understand what technologies are available or are inappropriate
- Truck fleet made up of two or more companies
- Technologies to be tested:
  - Aerodynamic deflectors, gap fairings, and trailer skirts
  - Low rolling resistance tires (not super singles)
  - Tire pressure monitor (next generation of *Rodo-ar*)
- Experimental design, lessons learned from China pilot test:
  - Recognizing daily and seasonal variables like demand, behaviors
  - Short-duration vs long-duration test
  - Representative fleet vs. outlier fleet
  - Training of drivers (before/after)
- Monitoring and evaluation by an independent and respected local partner



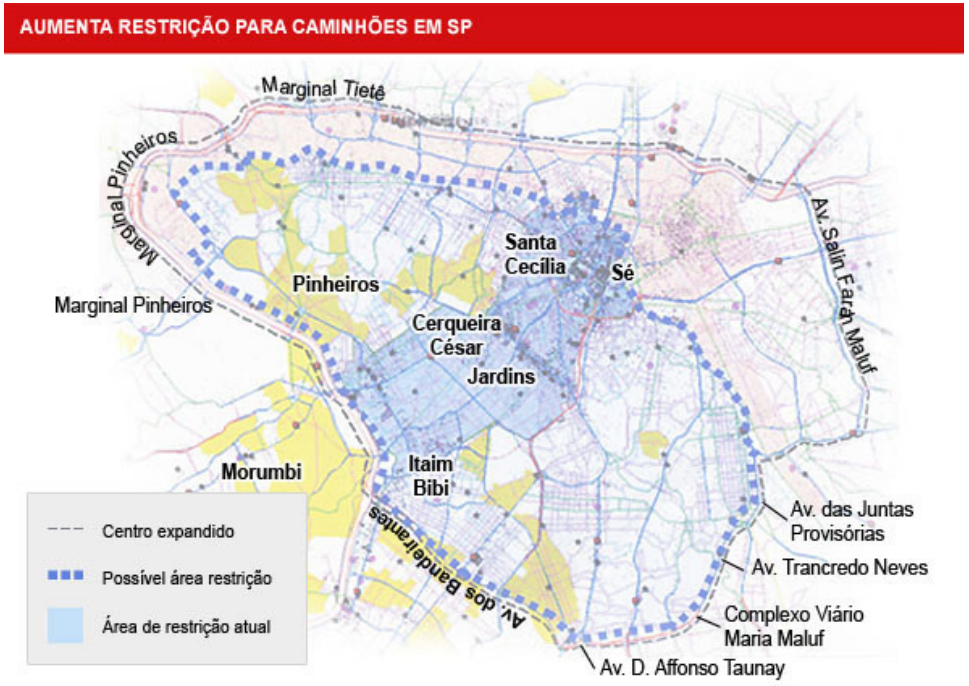
Next steps

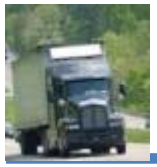
- Policy Dialog
  - Developing a constituency with government, leading companies, industry associations, NGOs
  - Understanding current incentives and financing mechanisms, e.g. *BNDES Procaminhoneiro*
- Dissemination
  - Finding partners to disseminate results from seminars with the highest levels of government to capacity-building with truckers
  - Technical site visit for officials
  - Trade fairs
  - Website, materials, and videos
- Urban Freight Management – a growing problems in big cities



Urban Freight Management in São Paulo

- Area and time restrictions for trucks
- Urban Freight Vehicle (VUC): size and performance standard
- Distribution hubs and logistics platforms
- Exclusive corridors and bypasses: ring road and rail
- Tolling/pricing?
- World Bank/GEF funded effort to develop tools:
  - First freight origin-destination study (freight flow survey)
  - Urban freight transport model





Thanks for your attention

- Georges Darido
  202-473-7319
  gdarido@worldbank.org