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Session 20:
Transport and Energy: Examples that Work and Directions for the Future

Development of Fuel Economy Standards for Light Duty Vehicles in Sri Lanka

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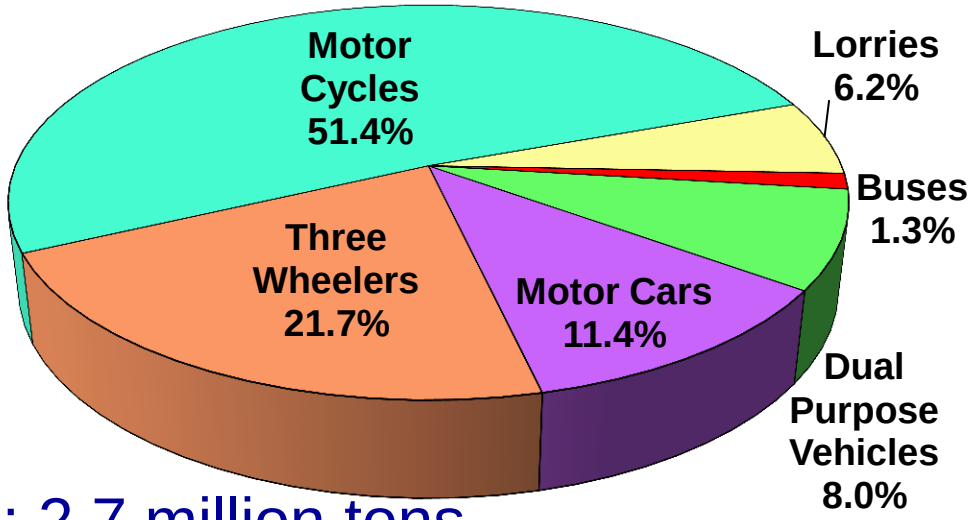
AN OVERVIEW

- Transport Sector in Sri Lanka
  - Dominated by road transport
  - 110 billion passenger-km/yr
    - ✓ 95.0% road; 5.0% rail
  - 7 million ton-km per year
    - ✓ 97.5% road; 2.0% rail; 0.5% water
- Road Transport:
  - Active fleet: 4.5 Million



  - Annual fuel consumption: 2.7 million tons
  - Average fuel economy: 0.025 litre/passenger-km

FUEL ECONOMY OF ROAD TRANSPORT

- Local Initiatives
  - Main interventions so far are primarily related to mitigation of air emission
    - ✓ Vehicle Emission Testing Programme
    - ✓ Fuel Quality Improvements
    - ✓ Fiscal measures.
  - Energy Efficiency / Fuel Economy
    - ✓ Awareness & education / Eco-driving
    - ✓ Baseline data collection (in progress)
    - ✓ Development of driving cycle (in progress)
    - ✓ Fuel economy labeling (proposed).
  - Technology shift in LDVs
    - ✓ Hybrid/Electric vehicles
    - ✓ Integrated EV to Solar PV (net metering)
    - ✓ Conversion of ICE to electric/hybrid (pilot testing).

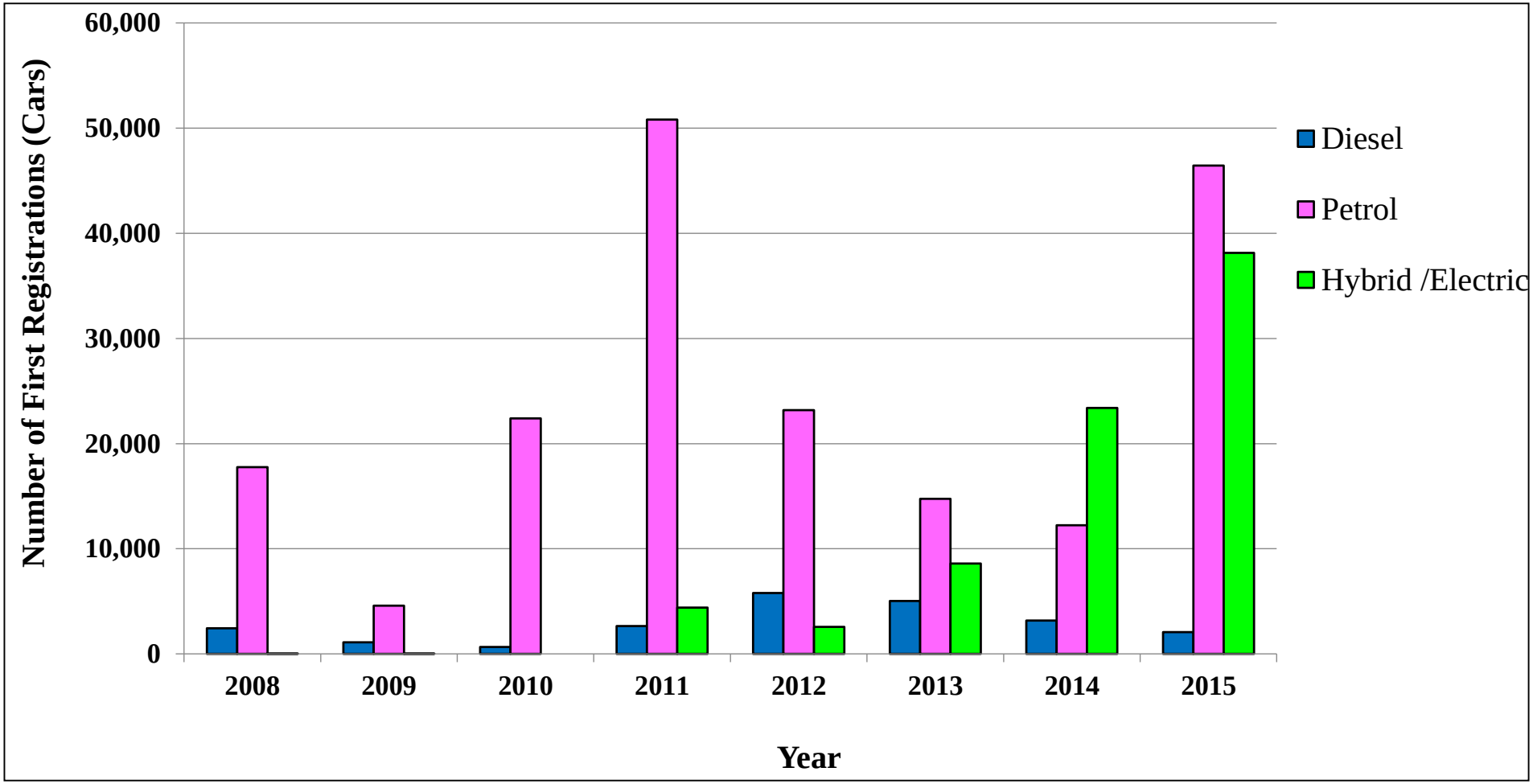
Key Interventions proposed within urban development programs:

- ✓ Mass transit: BRT / Monorail
- ✓ Railway electrification
- ✓ NMT

Yet, the private vehicles would have dominant influence on the performance of the transport sector for the years to come.

FUEL ECONOMY OF ROAD TRANSPORT

- Local Initiatives
  - Emergence of Hybrid/Electric Vehicles



FUEL ECONOMY OF LDVs

- Scope:
  - Objective is to establish a baseline for the fuel economy of new passenger cars in the country
    - ✓ develop strategies and implement vehicle fuel economy policies,
    - ✓ supporting the regional and global tracking of the fuel economy performance towards 50by50 target set by GFEI.
- Methodology: Main Steps – GFEI

Step 1: Establish the baseline year.

Step 2: Establish the data points that are required to collect for the estimation of a robust baseline.

Step 3: Find and evaluate available new car registration data sources.

Step 4: Calculate the average fuel economy and other characteristics for newly registered vehicles in the baseline year.

Step 5: Repeat the same exercise using uniform methodology at regular intervals (to derive annual average variations).

FUEL ECONOMY OF LDVs

- Methodology: Estimation of FE / GHG Emissions
  - Reported in international databases/ Manufacturers data:
    - ✓ Based on various test driving cycles (and different units)
    - ✓ Need to converted to a single test driving cycle (and same unit), for which conversion factors have been developed.
  - Units:
    - ✓ Fuel economy: l/100-km; mpg; MJ/km; km/l
    - ✓ GHG Emissions: gCO_2/km; gCO_2/mile
  - Driving cycles:
    - ✓ New European drive cycle (NEDC): EU, India, China, Australia
    - ✓ US Corporate Average Fuel Economy (US CAFE): US, Canada, South Korea. Mexico
    - ✓ JC08: Japan
    - ✓ World-wide Harmonized Light-duty Test Cycle (WLTC) is been developed.

FUEL ECONOMY OF LDVs

- Methodology: Estimation of FE / GHG Emissions
  - Conversion formula:

[Adjusted fuel economy value] = [Original fuel economy value] × [Unit conversion] × [Test cycle multiplier].

  - Test cycle conversion factors:

Conversion Factor	Test Cycles		
	NEDC-JC08	CAFE-JC08	CAFÉ- NEDC
Test cycle multiplier (simple average)	1.15	1.29	1.12

Source: ICCT, 2007

  - Unit conversions in fuel economy and GHG emissions:

Metric	Standard A	Standard B	Conversion
Fuel economy	km/l	mpg	B = A × 2.35
	l/100 km	mpg	B = 235.2/A
	CO_2 g/km	mpg	B = 5469/A(1)
GHG emissions	km/l	CO_2 g/km	B = 2325/A
	l/100 km	CO_2 g/km	B = A × 23.2
	mpg	CO_2 g/km	B = 5469/A(1)

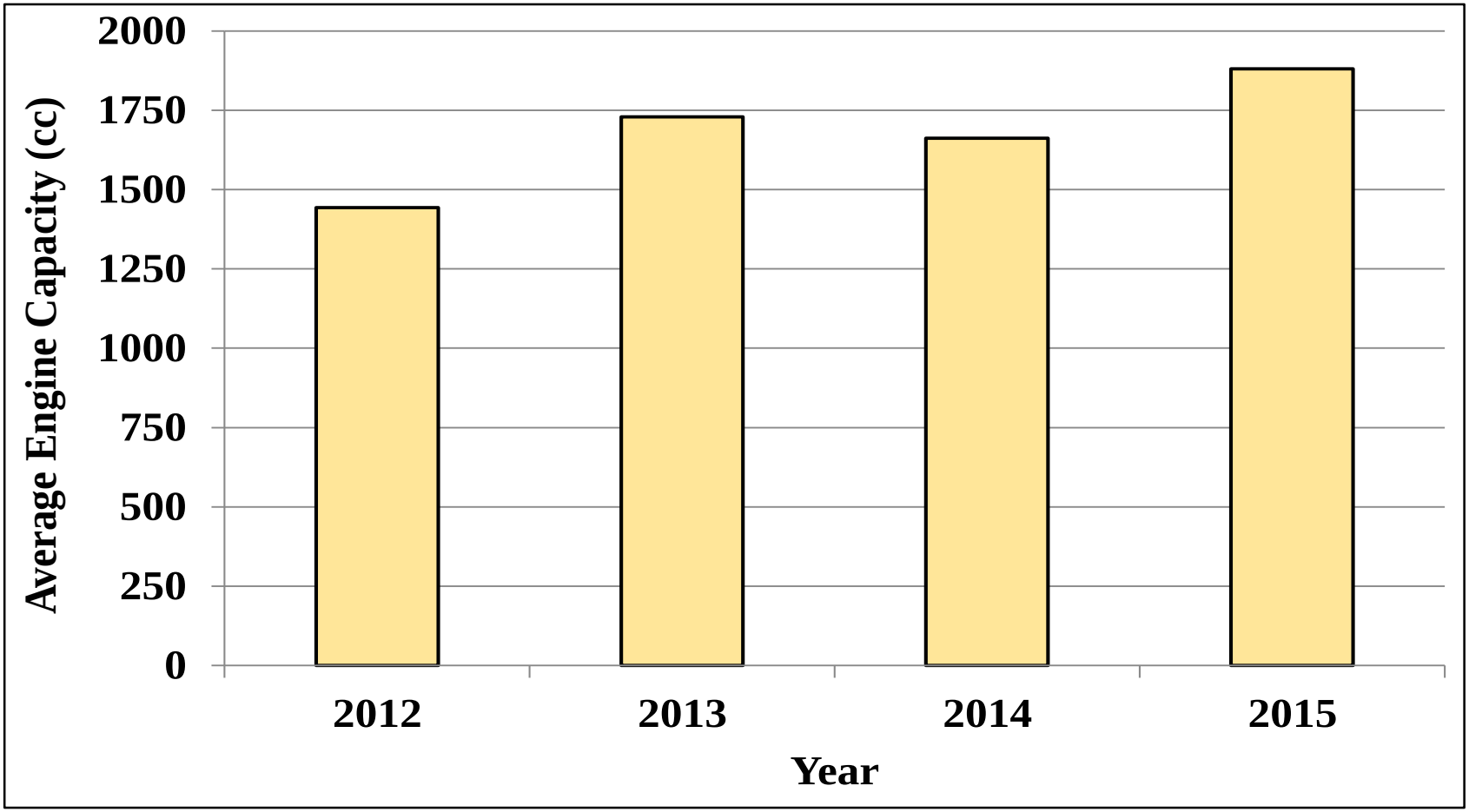
Notes: (1) For diesel vehicles, B = 6424/A to reflect the higher carbon content of diesel fuel.
Source: ICCT, 2007

FUEL ECONOMY OF LDVs

- Data Requirement
  - Main Information:
    - ✓ Vehicle make and model, and if possible configuration,
    - ✓ Model production year & Year of first registration,
    - ✓ Fuel type and Engine size,
    - ✓ Domestically produced or imported,
    - ✓ New or second hand import,
    - ✓ Rated fuel economy per model and test cycle basis,
    - ✓ Number of sales by model.
  - Main Sources:
    - ✓ Local – DMT, Vehicle Importers; VET Project Office
    - ✓ Global – Vehicle manufacturers; Fuel economy data bases.
  - Sample (Random selection - VET database during a year)
    - ✓ Sample size = 16,825 (73% Gasoline; 27% Diesel)
    - ✓ 45 makes.

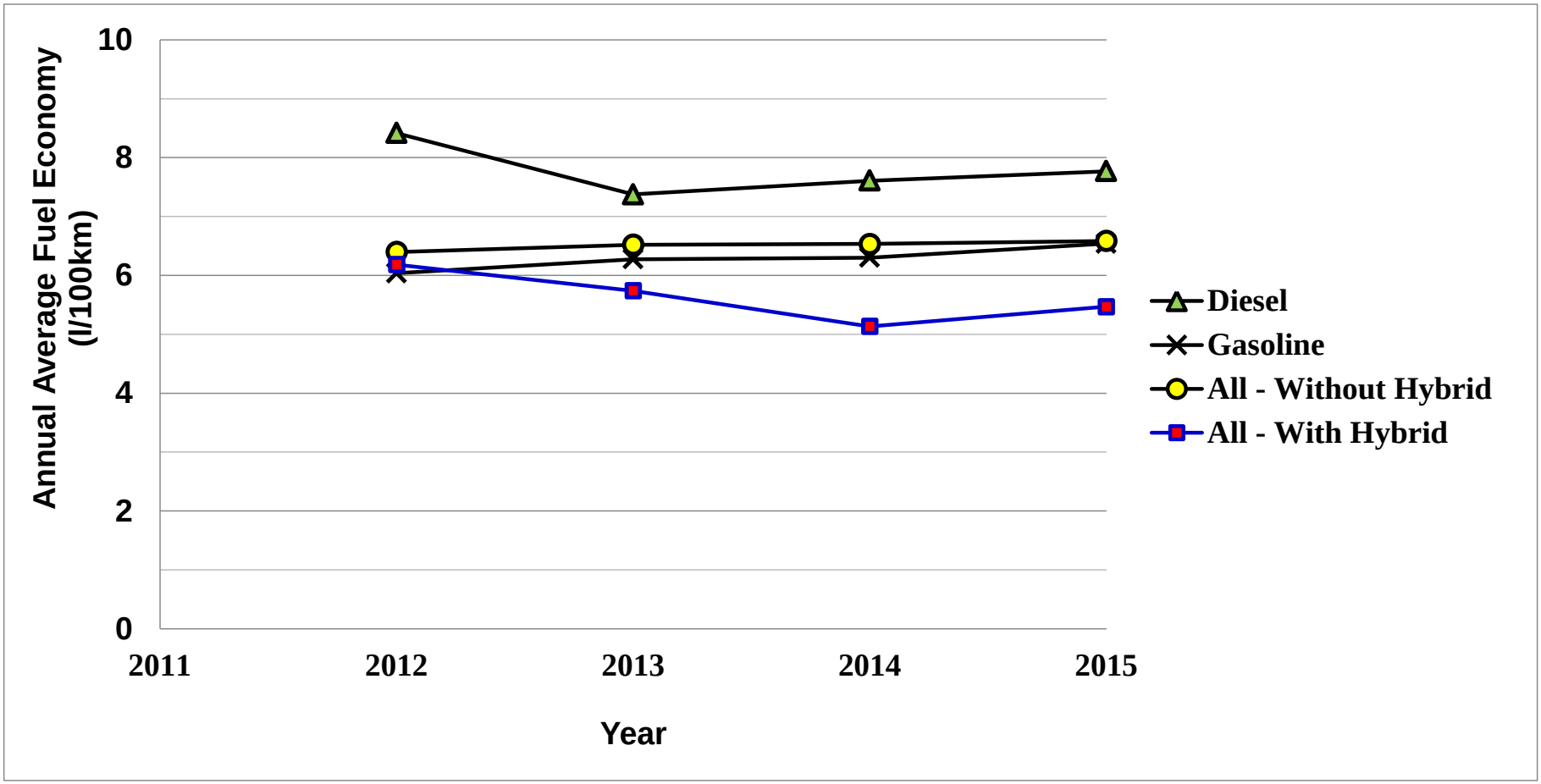
FUEL ECONOMY OF LDVs

- Characteristics of the Vehicles
  - Engine Capacities - Yearly average:



FUEL ECONOMY OF LDVs

- Characteristics of the Vehicles
  - Annual average fuel economy of cars:

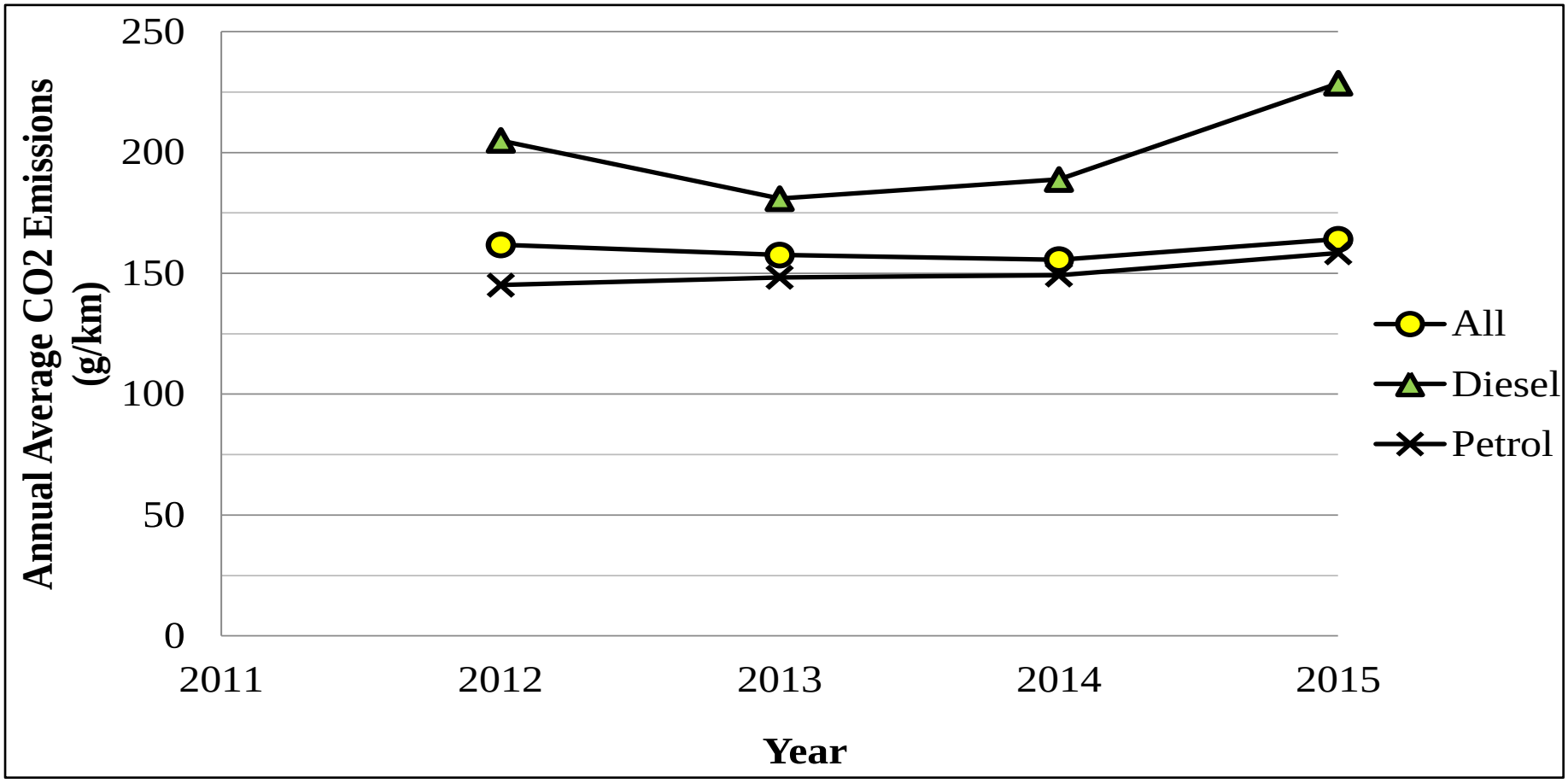


→ Without Hybrid: Average FE = 6.5 l/100-km (Global Average = 7.1 l/100-km)

→ With Hybrid: Average FE = 5.6 l/100-km (15% Reduction)

FUEL ECONOMY OF LDVs

- Characteristics of the Vehicles
  - Annual average GHG emissions of cars:



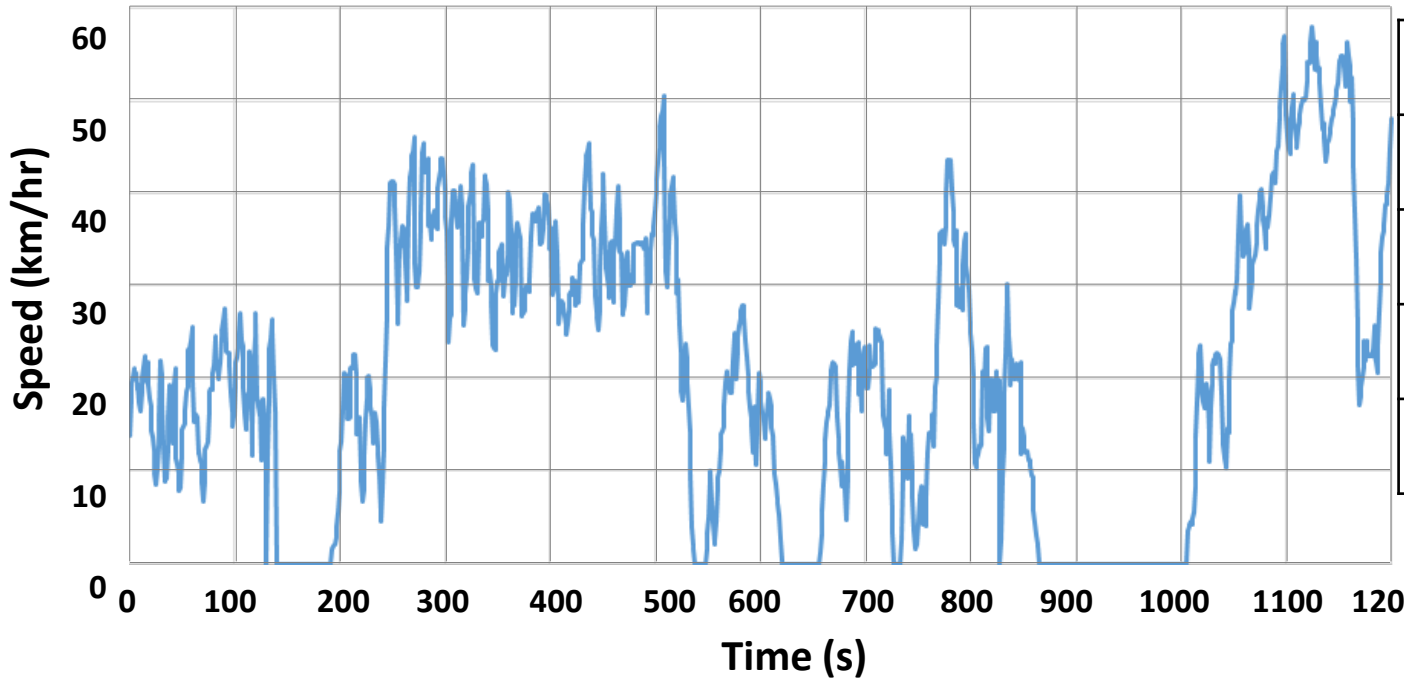
→ Without Hybrid: Average GHG Emissions = 160 g CO_2/km

FUEL ECONOMY LABELING

- Main Steps
  - Establish a representative driving cycle
  - Determine cycle conversion factor
  - Design format of the fuel economy label
  - Set fuel economy benchmarks for the energy labeling.

Expected to accomplish by mid 2017

Colombo Driving Cycle



Average Speed (km/h)	20.26
Time Proportion for Idling	20.5%
Time Proportion for cruising	12.8%
Time Proportion for acceleration	36.1%
Time Proportion for Deceleration	30.7%

CONCLUTIONS

- Use of cars in the country is on the rise, so does the average engine capacity.
- Still the ICE technology dominates, though use of hybrid/electric vehicles are emerging (16% of active fleet, surpassing diesel).
- Annual average fuel economy and GHG emissions of ICE cars in Sri Lanka are about 6.5 l/100 km and 160 g/km of CO_2.
- Use of hybrid vehicles has improved the fuel economy by 15%, indicating considerable potential for further improvements.
- Fuel economy labelling is expected to improve the energy efficiency in the transport sector.
- Improving fuel economy of vehicles would play a major role within broader interventions in sustainable city programmes.

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