Evaluating Impact of Green Freight Technologies

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Clean Air Asia

Better Air Quality conference
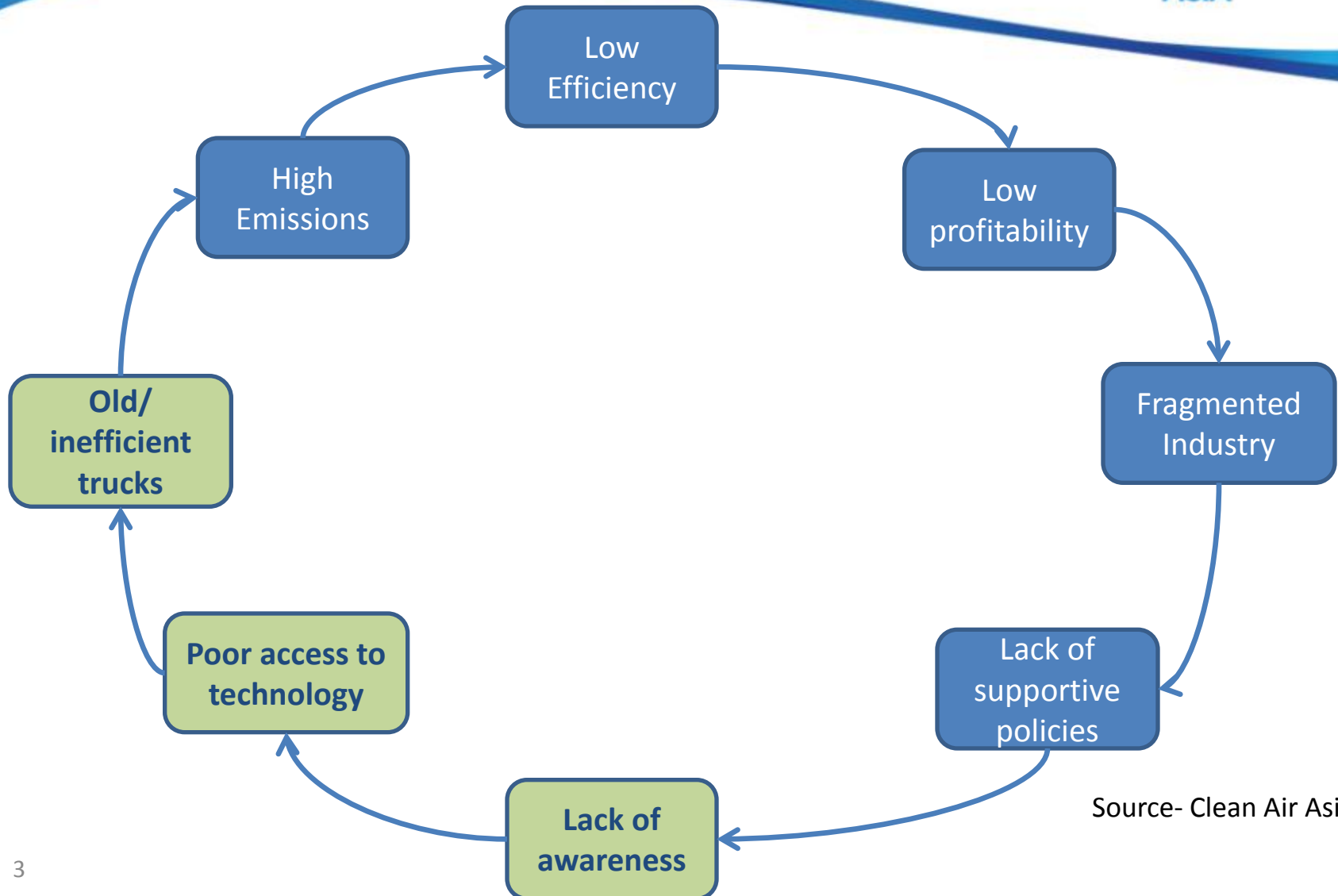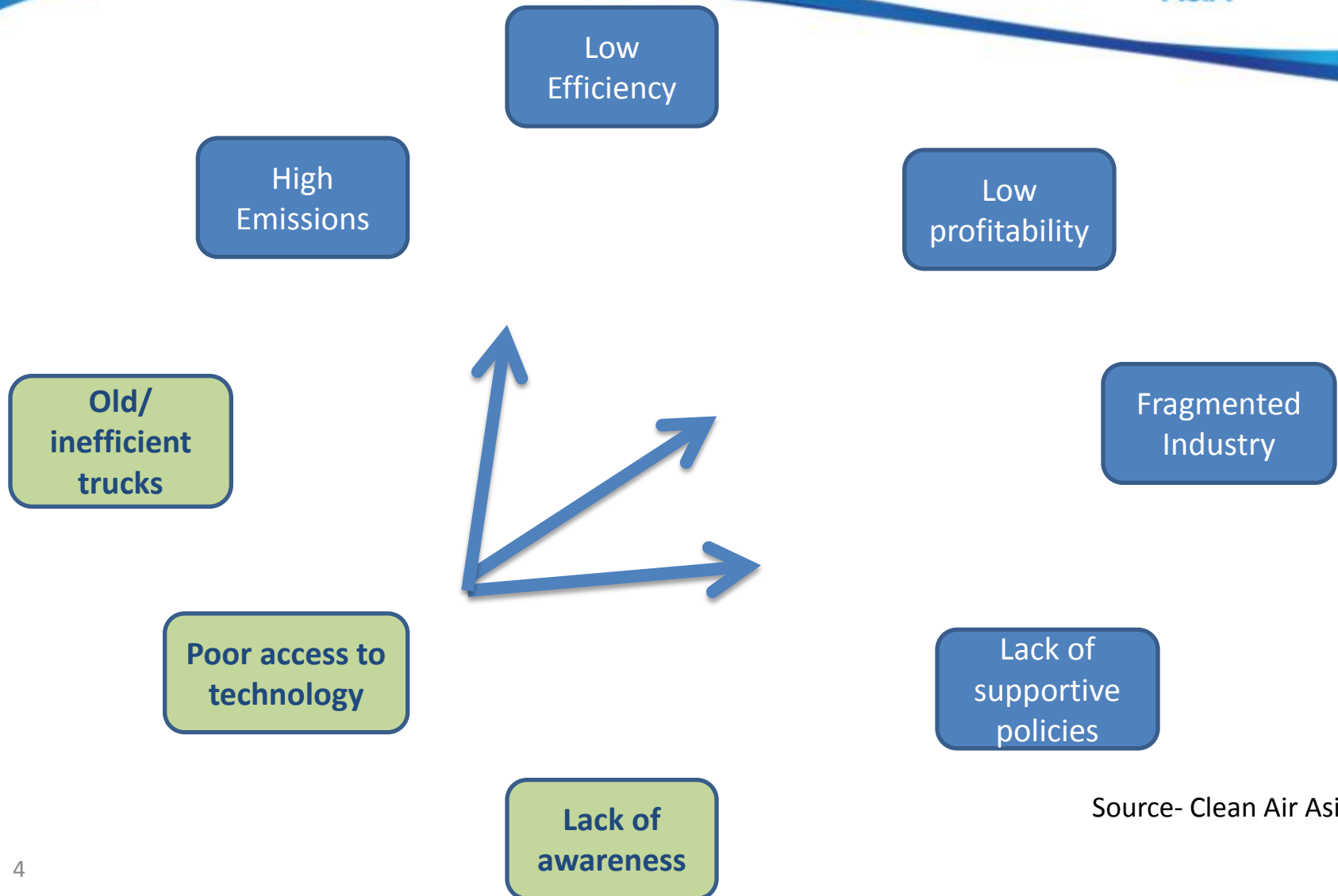
Hong Kong

5-7 December, 2012

CLEAN AIR ASIA

Trucks in Asia

Fuel is about 40- 60% of truck operating costs

Breaking the Vicious Cycle in Road Freight Sector

Low Efficiency → Low profitability → Fragmented Industry → Lack of supportive policies → Lack of awareness → Poor access to technology → Old/ inefficient trucks → High Emissions → Low Efficiency

Source- Clean Air Asia

Breaking the Vicious Cycle in Road Freight Sector

Low Efficiency

High Emissions

Low profitability

Old/ inefficient trucks

Fragmented Industry

Poor access to technology

Lack of supportive policies

Lack of awareness

Source- Clean Air Asia

Technologies for Trucks to reduce emissions

Gap Fairing

Diesel Exhaust Retrofit

Tail Fairing

Light Weight Wheels

APU
Auxiliary Power Unit

Automatic Tire Inflation

Trailer Side Skirts

Low Resistance Tires

Source : Cascade Sierra Solutions
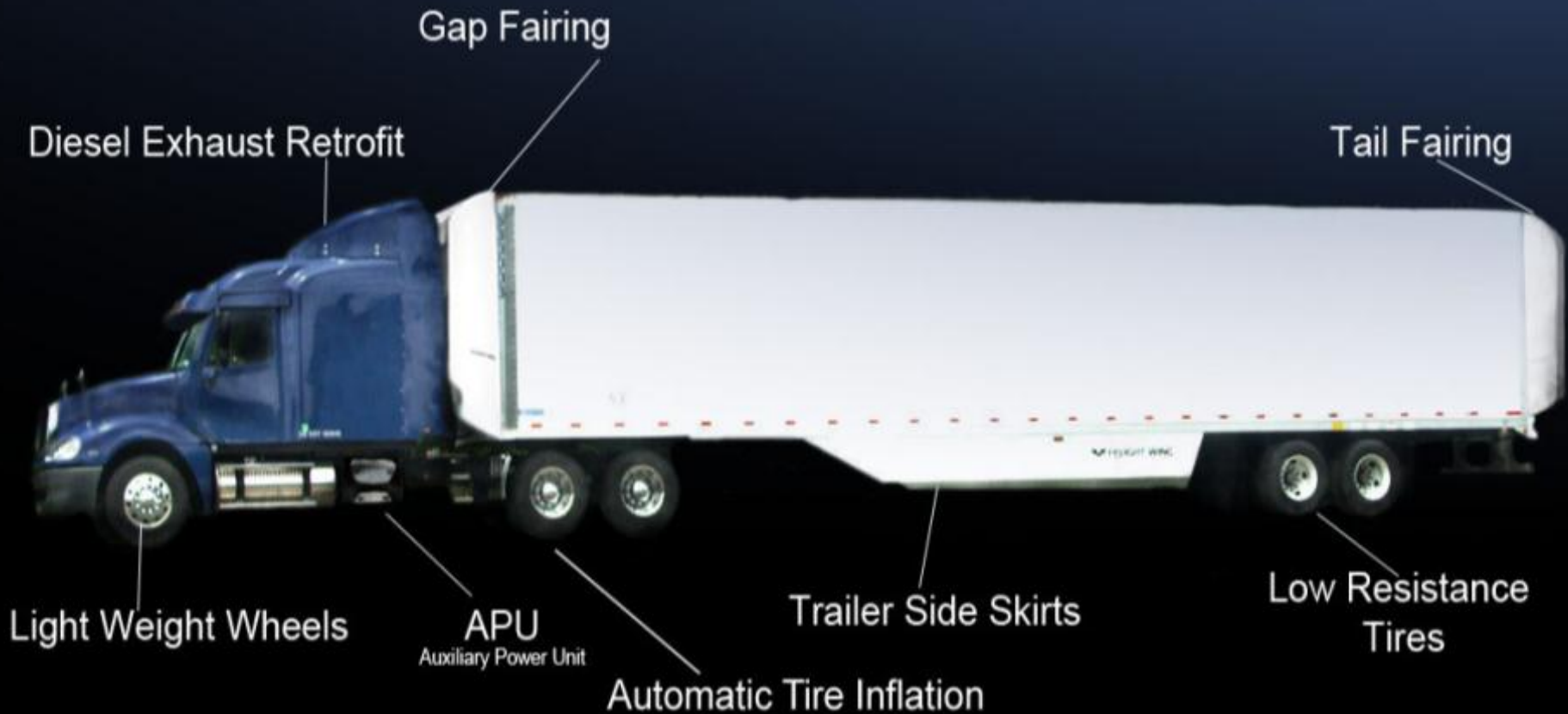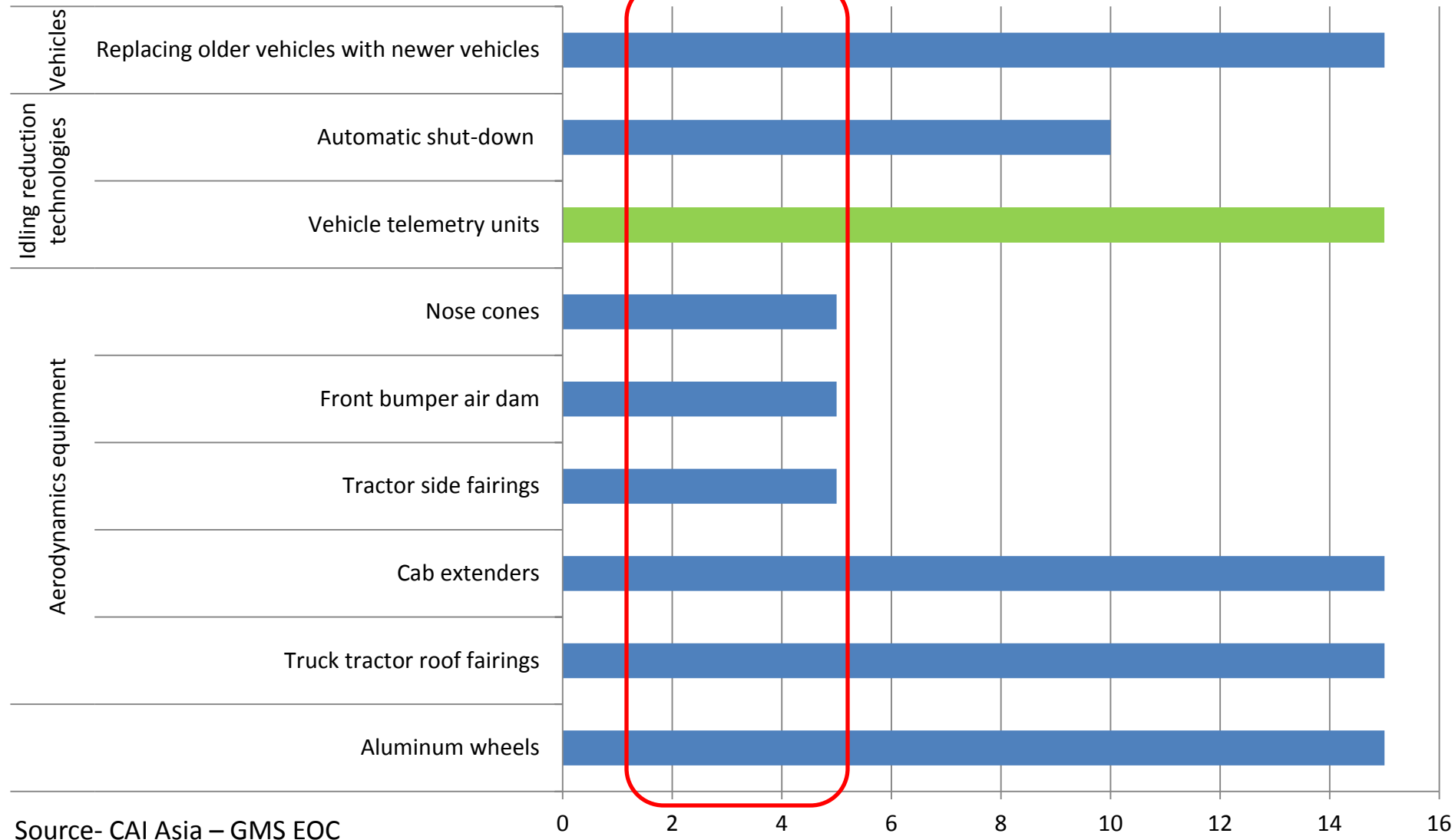
Lack of confidence in Truck Technologies

1. What technologies would work for my fleet?

2. How much would be the impact on our roads, our trucks, our loads and our driving behavior?

3. Would the technology pay for its cost?

4. Would the technology adversely impact my business?

5. Is it legal to use such technologies?

In a recent GFAN survey of 39 companies it was found that the one of the biggest barrier is *__"Technologies are too expensive/ have poor rate of return"__*
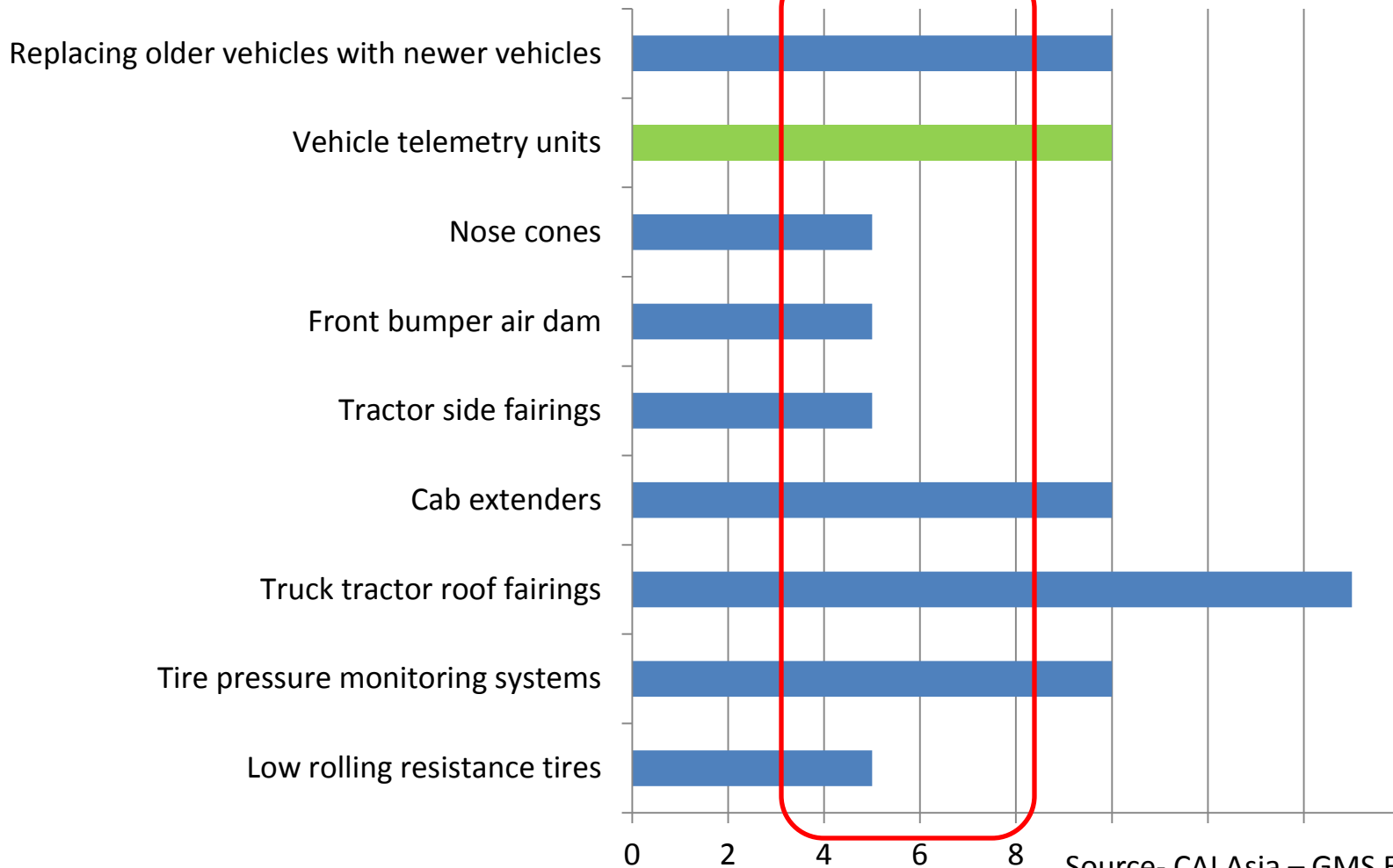
Thailand – Technologies (interview with suppliers)

Impacts on FE %

Category	Technology	Value
Vehicles	Replacing older vehicles with newer vehicles	15
Idling reduction technologies	Automatic shut-down	10
Idling reduction technologies	Vehicle telemetry units	15
Aerodynamics equipment	Nose cones	5
Aerodynamics equipment	Front bumper air dam	5
Aerodynamics equipment	Tractor side fairings	5
Aerodynamics equipment	Cab extenders	15
Aerodynamics equipment	Truck tractor roof fairings	15
Aerodynamics equipment	Aluminum wheels	15

Vietnam – Technologies (interview with suppliers)

Impacts on FE %

- Replacing older vehicles with newer vehicles
- Vehicle telemetry units
- Nose cones
- Front bumper air dam
- Tractor side fairings
- Cab extenders
- Truck tractor roof fairings
- Tire pressure monitoring systems
- Low rolling resistance tires

0   2   4   6   8

Source- CAI Asia – GMS EOC

Green Trucks Pilot Project - Guangzhou

Pilot Unit	SOCL	XBWL	BYGF
Truck Type	Long Haul	Short Haul	Short Haul
Pilot Truck/ Control Truck	2:1	3:3	2:1
Technologies Tested	Low Resistance Tires, Tire Pressure Monitoring System , Aluminium Rims, Gap Fairing, Nosecone, Trailor Skirts	Low Resistance Tires, Tire Pressure Monitoring System	Low Resistance Tires, Tire Pressure Monitoring System
Actual Saving (%)	6.70%	1.80%	18.50%
Payback Year	2.74	3.97	0.65

Star of the City Logistics (SOCL), Xinbang Logistics (XBWL) and garbage fleet of Baiyun District
Project Partners - Guangzhou Transport Commitee, Guangzhou Environmental Protection Bureau, World Bank, CAI Asia, USEPA, Cascade Sirra Solutions
Lessons Learnt – Low speed, poor monitoring, Driver training provided but piloting with other drivers

Green Trucks Pilot Project - GEF Guangdong Demonstration

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This 14 Million USD project involves

1. Technology Retrofit for **1200 Trucks** (Aerodynamics, Tires, Idling)
2. Driver Training for 1200 Drivers
3. Freight logistics management Component - Freight logistics platform and "drop-and-hook"
4. Institutional Development and Capacity Building

Main goal of this project is to reduce the road freight emission in Guangdong Province by **10%** i.e. direct reduction **of 165,989** tons of CO_2e emission each year.

1. **38,650** tons are reduced through the demonstration of green freight truck technology,
2. 55,270 tons of reduction volume is realized through the "drop and hoop transport" project, and
3. 72,069 tons of emission reduction is realized through the logistics transaction information platform.
4. The total fuel savings amount to **approx 64 million liters of Diesel**

Green Trucks Pilot Project - Transport Incentive Program in Thailand

Dimension	Measures	Expected Saving (%)	Average (%)	Number of operators	Number of trucks
Engineering & Technology	GPS installation	4.21-5.03	4.25	4	15
	Tire pressure monitoring	1.25-7.97	4.61	3	17
	Preventive maintenance	1.15-3.39	2.75	2	168
	Increase capacity of truck	10.36-16.60	13.48	2	9
	Roof spoiler installation	4.31	4.31	1	2
	Fuel pumping system improvement	3.24	3.24	1	1
	Use energy saving tires	0.39-24.37	9.34	18	392
	Install more axle wheel	8.59-59.10	36.62	4	23
Management	Full truck load implementation	0.87-20	10.43	2	9
	Warehouse management	10.03	10.03	1	3
Drive	Driving training	0.36-5.92	3.08	8	176
Task Force	Capacity building on transport management team	1.85	1.85	1	50

Source : ADB GMS EOC

Raise Awareness - Green Trucks Toolkit

Developed under the Greater Mekong Subregion (GMS) Core Environment Program (CEP) funded by the Asian Development Bank (ADB)

Objectives

- **Rapid assessment** of pollution and greenhouse gas emission impacts of their truck fleets
- **Raise awareness** on the **strategies** for reducing the environmental impacts of their fleets and increase their fleets' efficiencies
- **Rapid analysis of costs and benefits** of implementing such strategies.
- Monitoring of technologies

- Available – free @ http://cleanairinitiative.org/portal/node/8074
- Being used by GMS EOC in three countries in Asia and IADB in 10 Latin American countries.
- Based on ASIF framework, has defaults and easy to use

Aerodynamics

Current Status

Your fleetwide fuel consumption (excluding idling consumption)

4,12,435.55	liters of diesel
31,167.54	liters of gasoline
-	kgs of CNG
24,010.22	liters of LPG

Costing you:

3,91,813.77	USD for diesel
40,517.80	USD for gasoline
-	USD for CNG
18,727.97	USD for LPG

Scenario: Aerodynamic Technologies

Assumptions:

Technology database

10%	assumed average improvement in fuel efficiency if an aerodynamic equipment package is installed
70%	% of travel that is done over 50 kmph
	12 of trucks have aerodynamic styling
1,000	Initial cost of package (USD)
100	Annual maintenance costs per package (USD)
5	Equipment lifespan (years)
10%	Discount rate (%)

The average speed is <50 kmph, aerodynamic styling may not be effective, analyse the % of travel in speeds more than 50 kmph and compare with the travel in speeds less than 50 kmph.
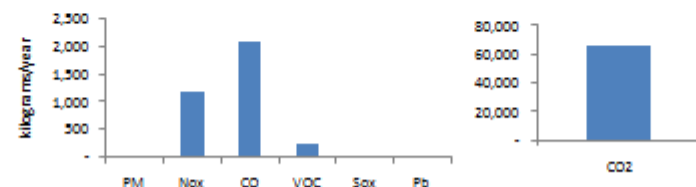
Fuel Savings per Year

20,996.72	liters of diesel
2,181.73	liters of gasoline
-	kgs of CNG
1,680.72	liters of LPG

40,816.93	Average gross savings per year (discounted)
1.07	Discounted payback period (years)

Cumulative Savings (USD)

Update Graph
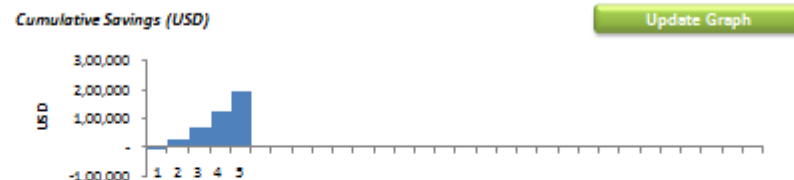
Emission Savings (kg/year)

PM	31
Nox	1,192
CO	2,112
VOC	229
Sox	20
Pb	-
CO2	65,298

Scope of the Tool

Pollutants
• Particulate matter
• Nitrogen oxides
• Carbon monoxide
• Volatile organic compounds
• Sulfur oxides
• Lead (for gasoline trucks)
• Carbon dioxide

Strategies
• Eco-driving
• Aerodynamic Styling
• Tires and Wheels
• Reduction of Idling
• Reduction of empty trips
• Sulfur reduction
• Lead reduction/elimination
• Emission control devices
• Replacement with CNG/LPG trucks

Output provides emissions savings as well as financial indicators such as fuel savings per year (in actual amount and in terms of cost), payback periods and accumulated savings.
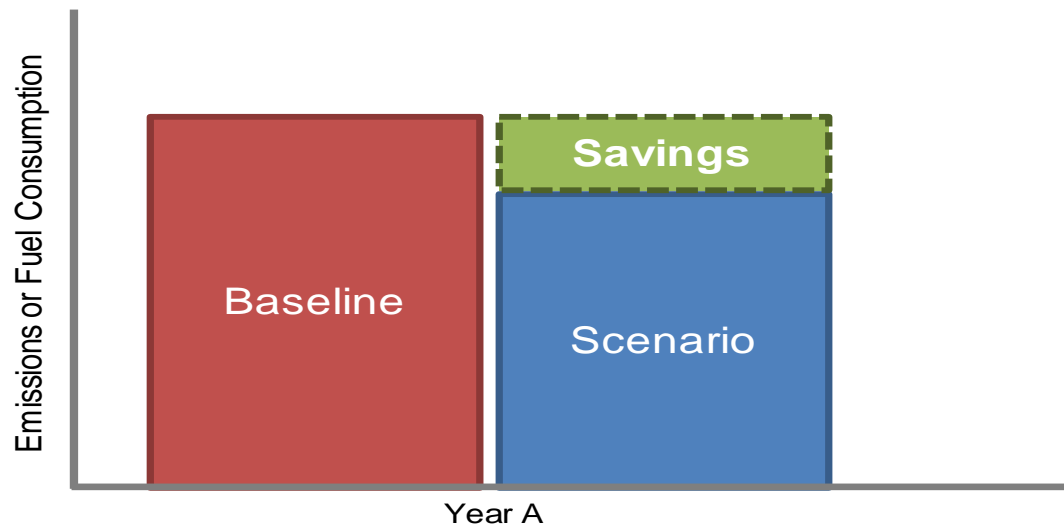
Steps in Using the Tool

Define the current status of your fleet (baseline)

Analyze the baseline

Define the scenarios that you can do in order to increase efficiency and lower emissions

Analyze the scenarios and pick out strategies that suit you

Emissions or Fuel Consumption

Baseline

Savings

Scenario

Year A

Input and Output parameters

Input

- Company name
- Country name
- Year of assessment
- Fleet Average
- Fuel price
- Individual Trucks
- ID Number/Name
- Number of wheels
- Fuel type
- Kilometers/year
- Fuel consumption
- Average payload per loaded trip
- Average distance per trip
- Year of manufacture
- Gross vehicle weight
- Empty trip %
- Average speed
- Average idling time
- Average number of days in operation/year

Base line Output (Fuel type/ vehicle type)

Fuel consumption (and associated costs)
- Total fuel consumption
- Consumption during idling
- Consumption during empty trips

Kilometers driven
- Total kilometers driven
- Kilometers driven during empty trips

Fuel Efficiency
- Histogram of fuel efficiencies

Emissions
- Indicators (emissions per ton-km, per km)
- Total emissions

Scenario analysis - emissions savings and financial indicators

Insights from Technology Demonstration/Surveys/Evaluation

1. The margin of error may exceed the savings percentage – Strong commitment and good measurement/piloting required

2. Participating companies were keen to be considered **leaders** in their sector

3. Aerodynamics not only saves fuel but stabilises the vehicle thus improving safety (cobenefits)

4. consider technology packages (consider weight, impact, cost and rebound)

5. **Not all technology options would work for fleet effectively. Retrofit early to get more savings, technologies with less than 3 years payback are most attractive (fuel prices would increase in future)**

6. Identify Local players who provide technology (import works for demonstration only)

7. **Identify key stakeholders – government, private and NGO/Universities and build a transparent partnership for success**

Vicious Cycle to Virtuous Cycle/Green Freight
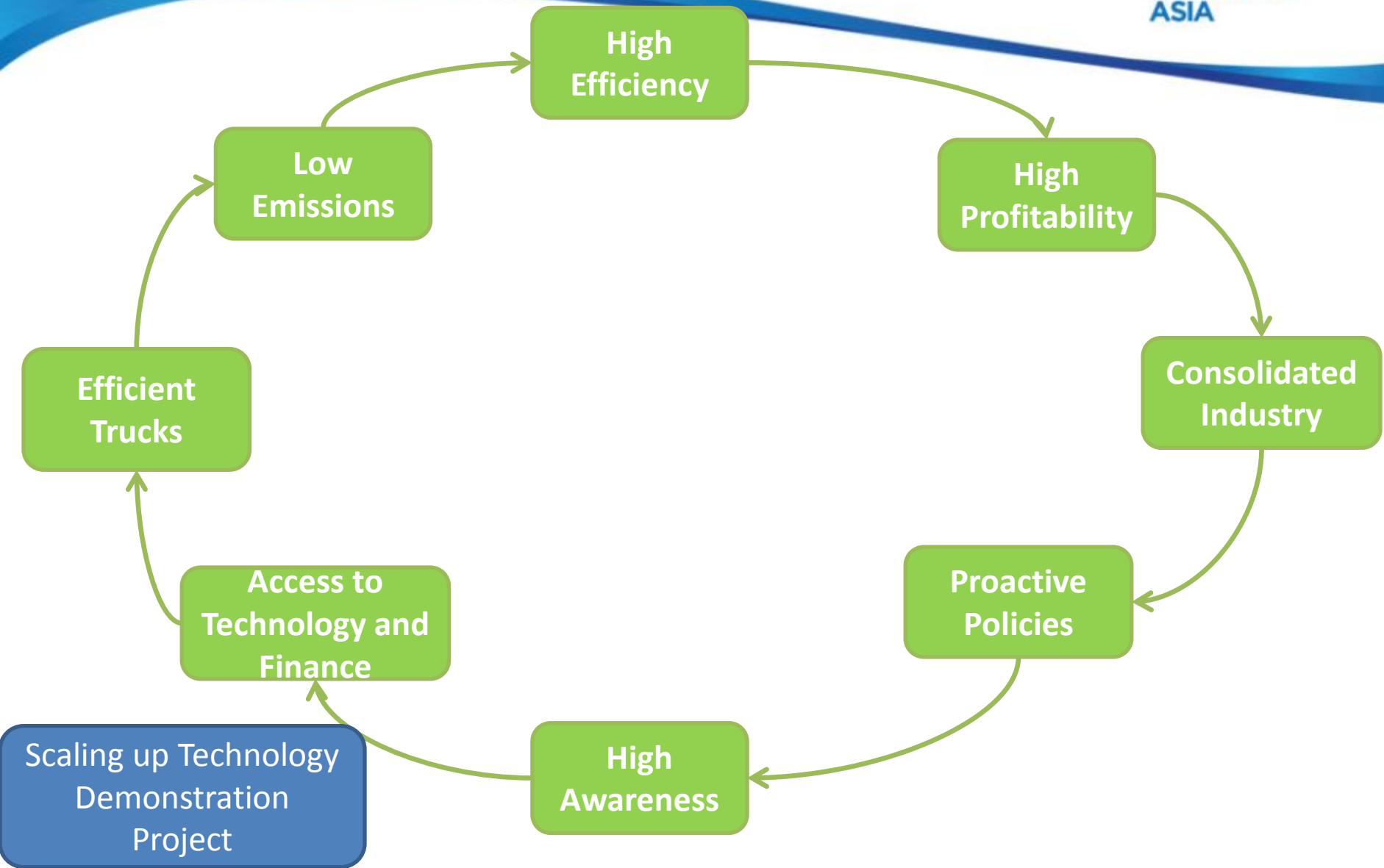
For more information: www.cleanairasia.org

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