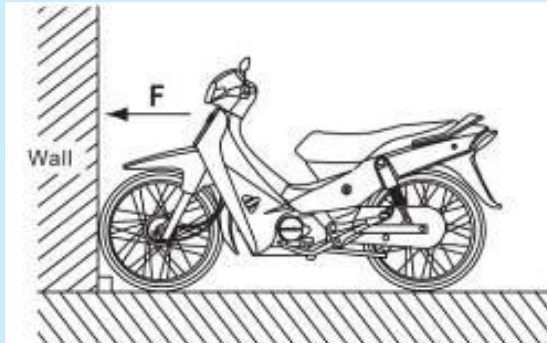




Emission Improvements from Transportation in Malaysia

GIZ

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Focus Applied Technologies



Outline

- **Fundamentals of Sustainability in Transportation**
- **Transportation Efficiency and CO2**
- **Transportation Question:
Where are you going?**
- **Economics, Technology and Consumer Choices**
- **Highlights from recent Malaysian Study**
- **2- Wheelers and e-Bikes**
- **Electric Vehicle Standards**
- **Recommendations for sustainable transport and a few other points**



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Pillars of Sustainable Transport 1/2

Urban Planning 101: City Layout

- **Prevent necessity of moving people/goods large distances**
- **Design cities with efficient transport in mind**
- **Mass Transport Systems are much less expensive to build ahead, more difficult to “retrofit” in later**
- **Mass Transit requires first/last mile options**
- **People want “convenience” of private vehicles, even when inconvenient**

Vehicles: USE ONLY WHAT YOU NEED

Getting one person to work doesn't require an MPV

Design your cities so there is less “NEED”

Pillars of Sustainable Transport 2/2

Make sure consumers pay the “full price” of their transport choice:

- **Don't subsidize fuels**
- **Tax inefficient transportation options**
- **Insure lower impact options are viable**

A 30 min car trip shouldn't take 2 hours by bus!

Even if petrol cost 20RM/liter the “Fat Cats” would still drive luxury pickup trucks instead of taking the train, while poor people couldn't afford food.

Don't Subsidize “Fat Cats”, Tax them. They can afford it.

GET THE DATA: Decisions need to be based on real data

Transportation Efficiency

How much energy should it take to get from Parit Buntar to Penang (30km)?

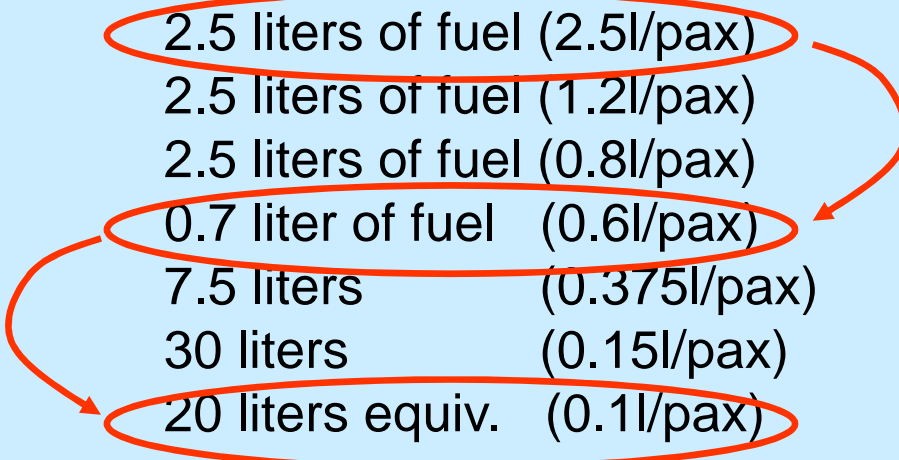
Taxi	5.0 liters of fuel (5.0l/pax)
Car (Solo)	2.5 liters of fuel (2.5l/pax)
Car (2 pax)	2.5 liters of fuel (1.2l/pax)
Car (3 pax)	2.5 liters of fuel (0.8l/pax)
Motorbike (1.2 riders)	0.7 liter of fuel (0.6l/pax)
Bus (with 20 others)	7.5 liters (0.375l/pax)
Diesel Train (with 200 pax)	30 liters (0.15l/pax)
Electric Train (with 200 pax)	20 liters equiv. (0.1l/pax)

One key point to recall is the total number of **passenger kilometers per unit fuel consumed** is the important measure.

Transportation Efficiency

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Taxis are the *least* efficient mode

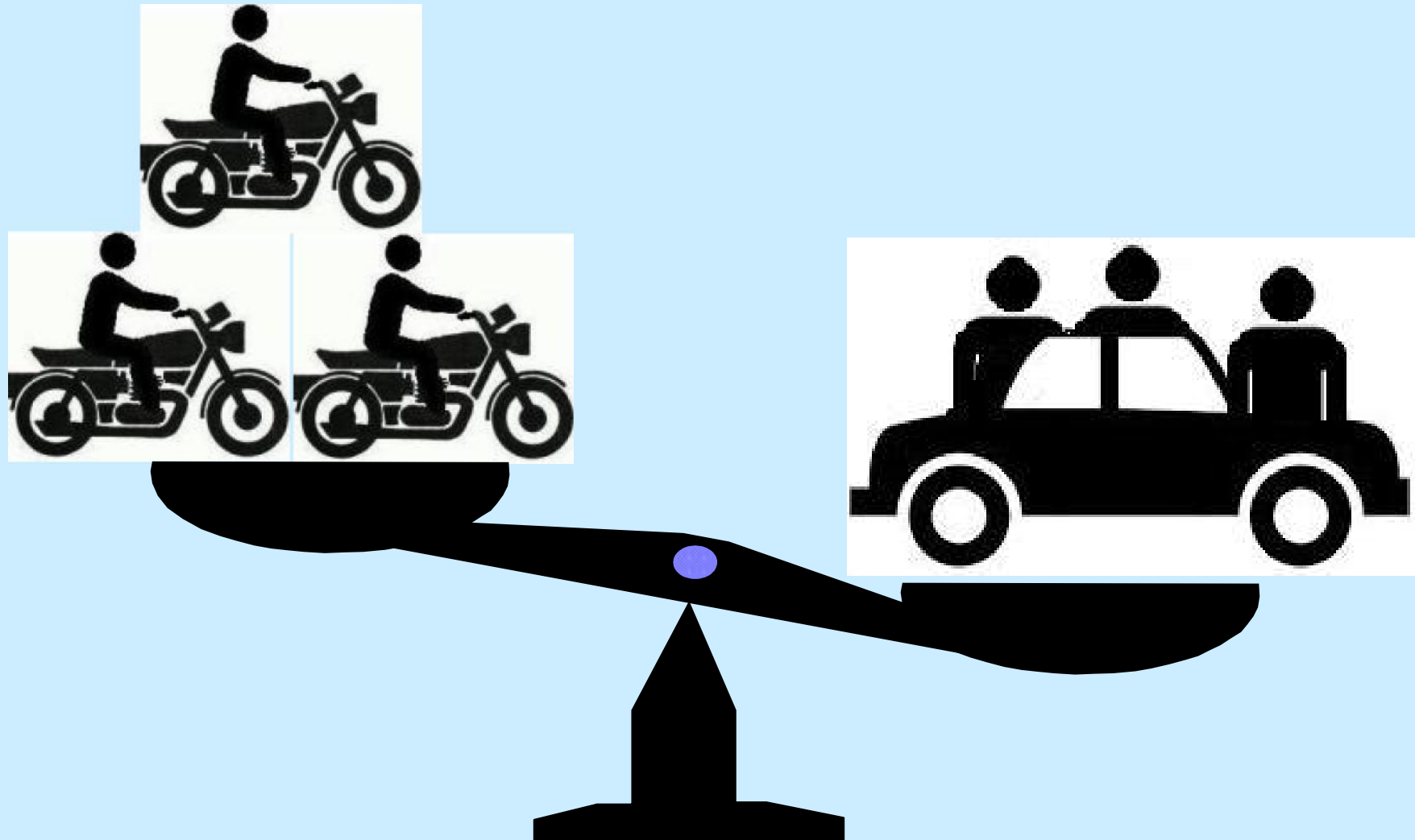
2-Wheelers are much more efficient than cars

Electric Mass Transit is the most efficient form of transport

More efficient transport modes require certain infrastructure, and first/last km options.

Transportation Efficiency

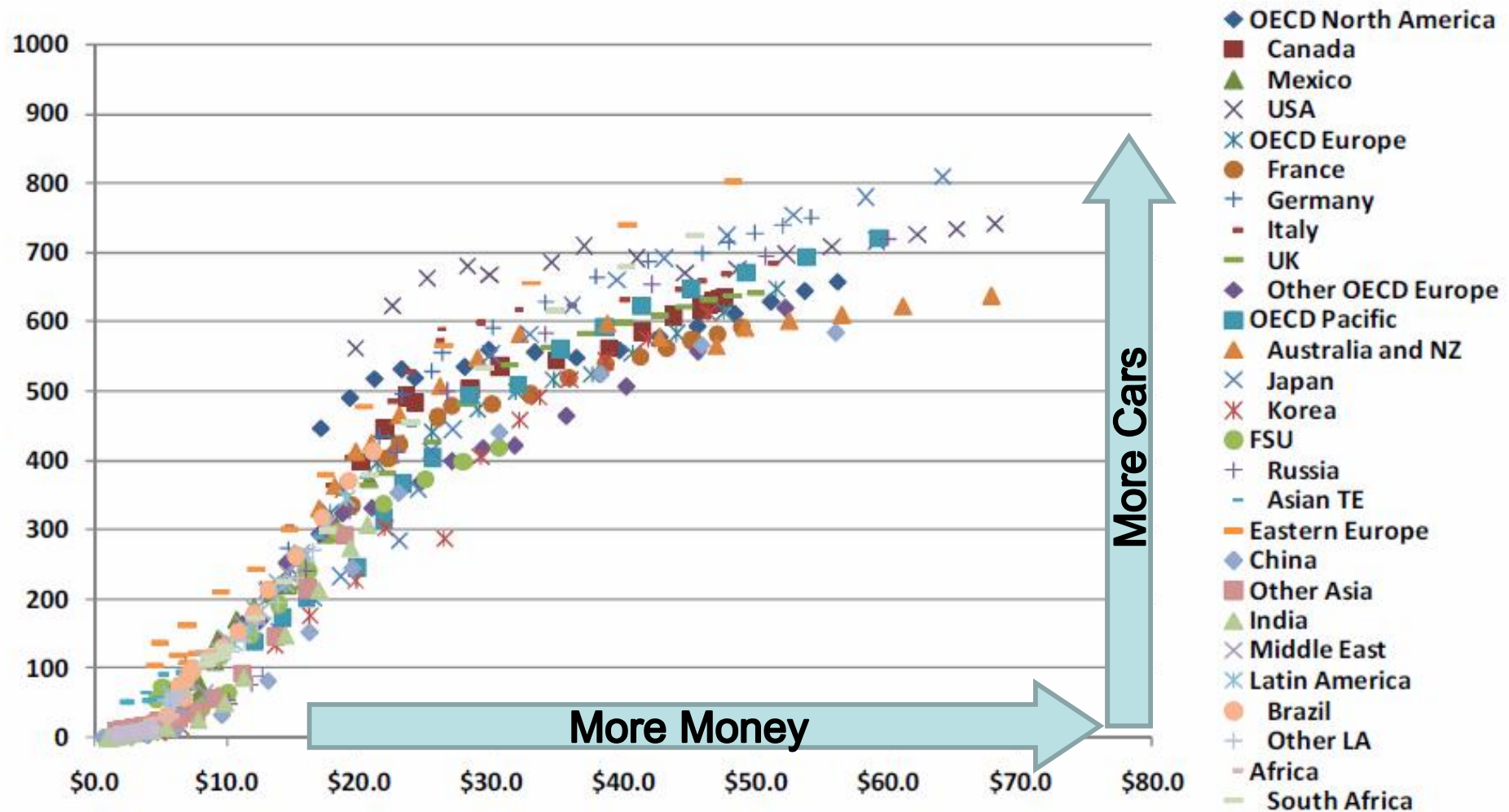
3 guys on 3 bikes is more efficient than 3 guys in 1 car!



2-Wheelers are so efficient, their actual efficiency is often overlooked.

Economy: More money means more cars

Cars per 1000 as a function of GDP/cap

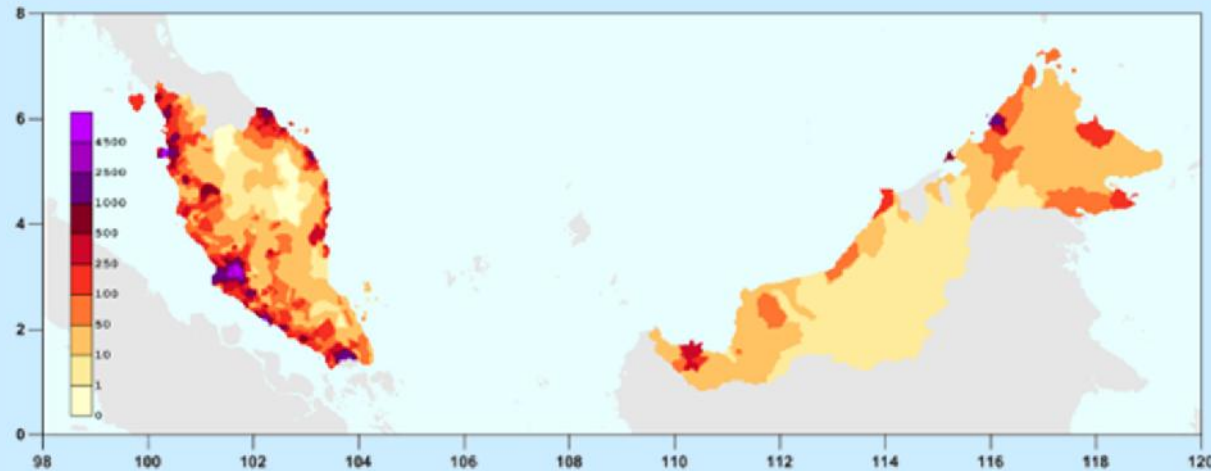


It is a continual fight to keep people in smaller, efficient vehicles.
One more area of government planning that requires DATA.

Example: Malaysia Macro Data

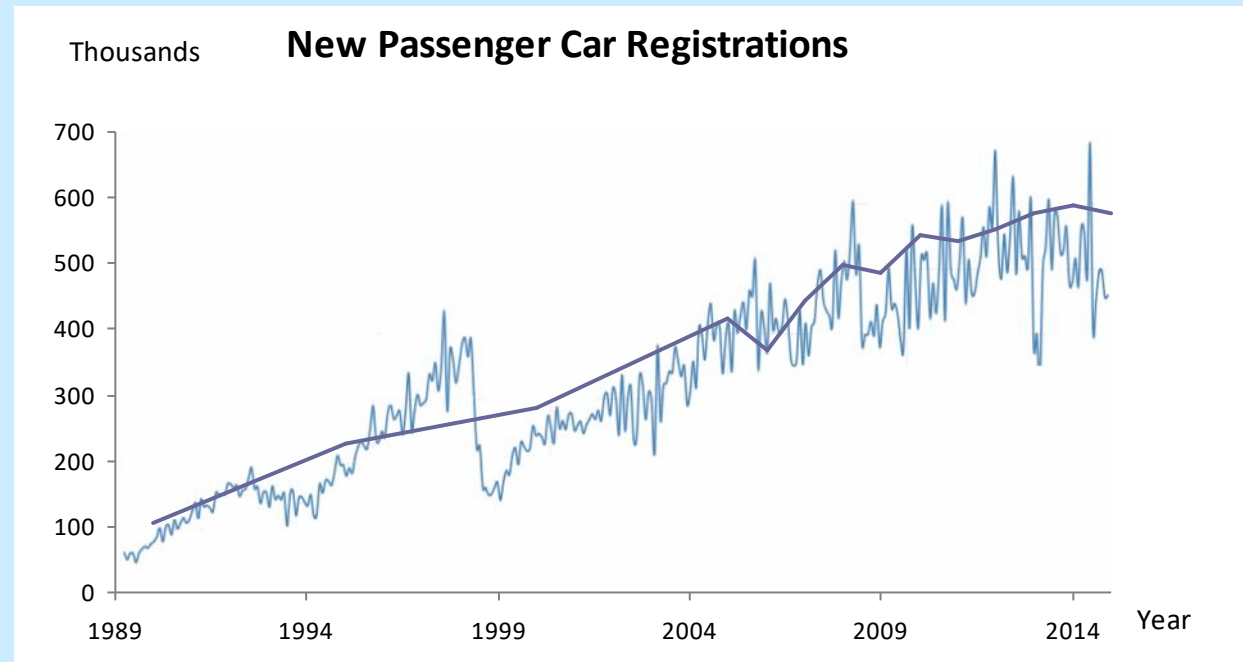
**Population
Concentration**

**30M
~2M undocumented**



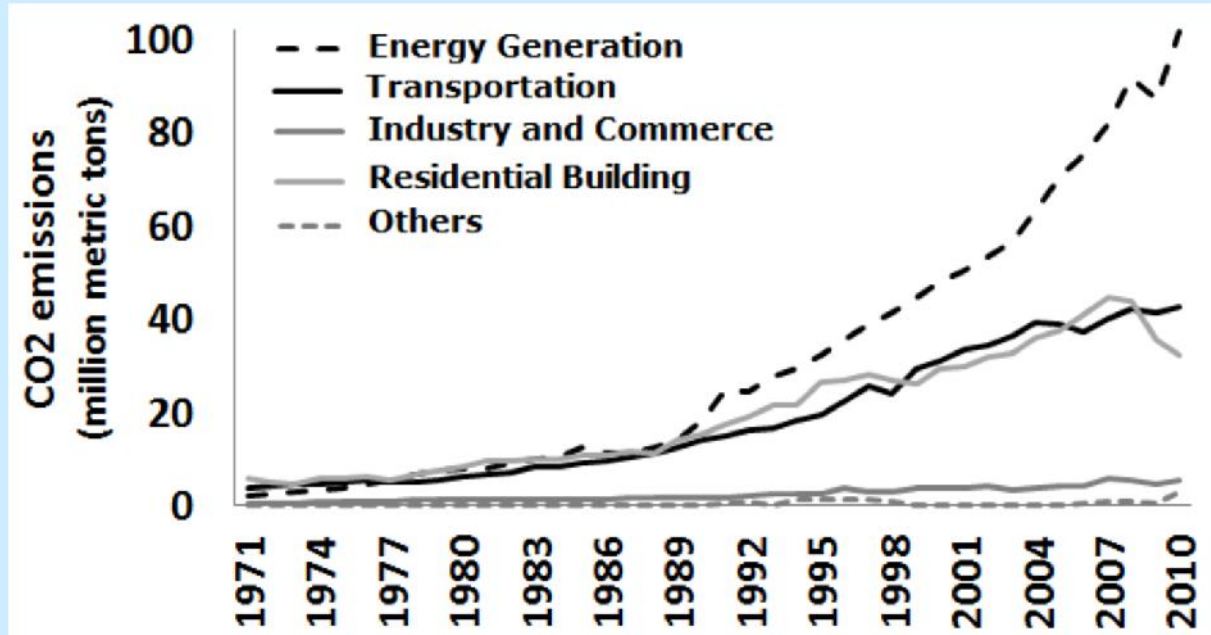
**New car
registrations
500,000/year**

Fleet ~ 15M



Example: Malaysia Emissions

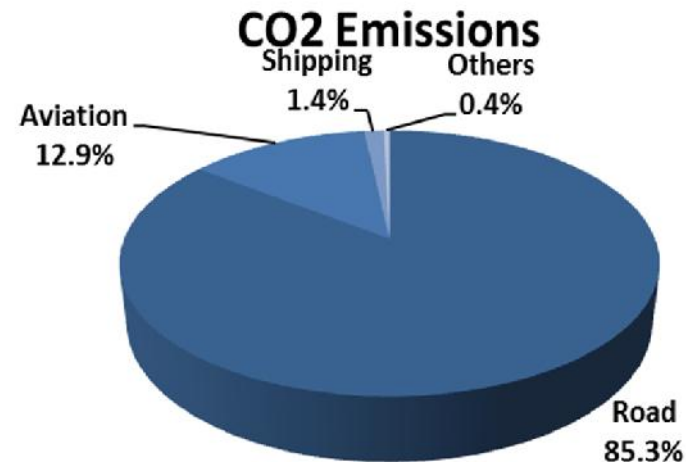
Emissions by Sector
Transport is ~25%



Transport Emission by
Mode

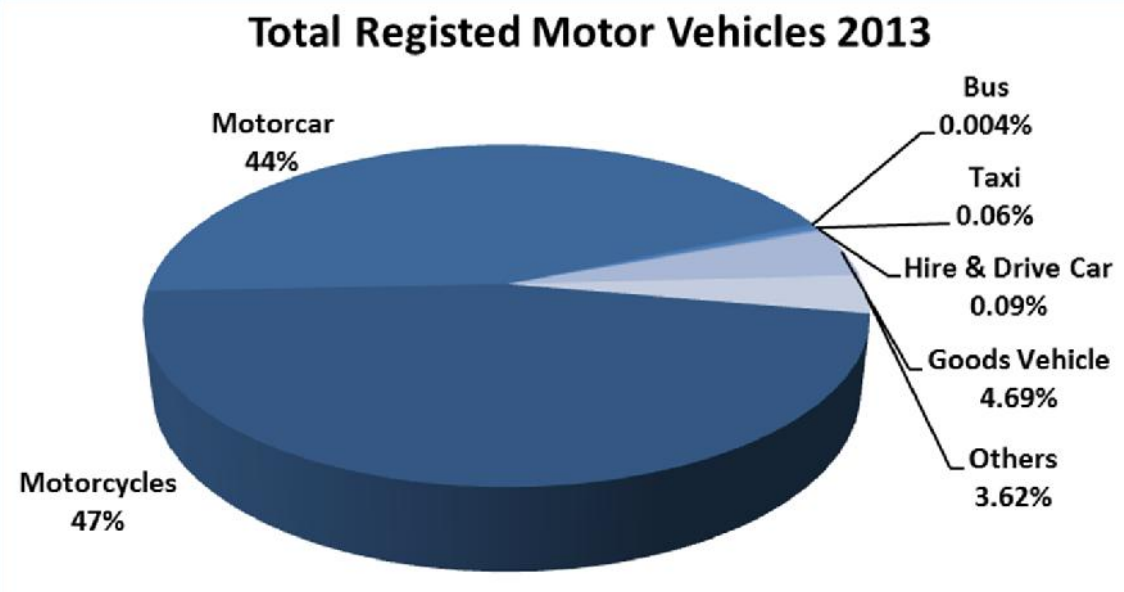
Most comes from
Road

Share of CO2 to Different Modes to Total

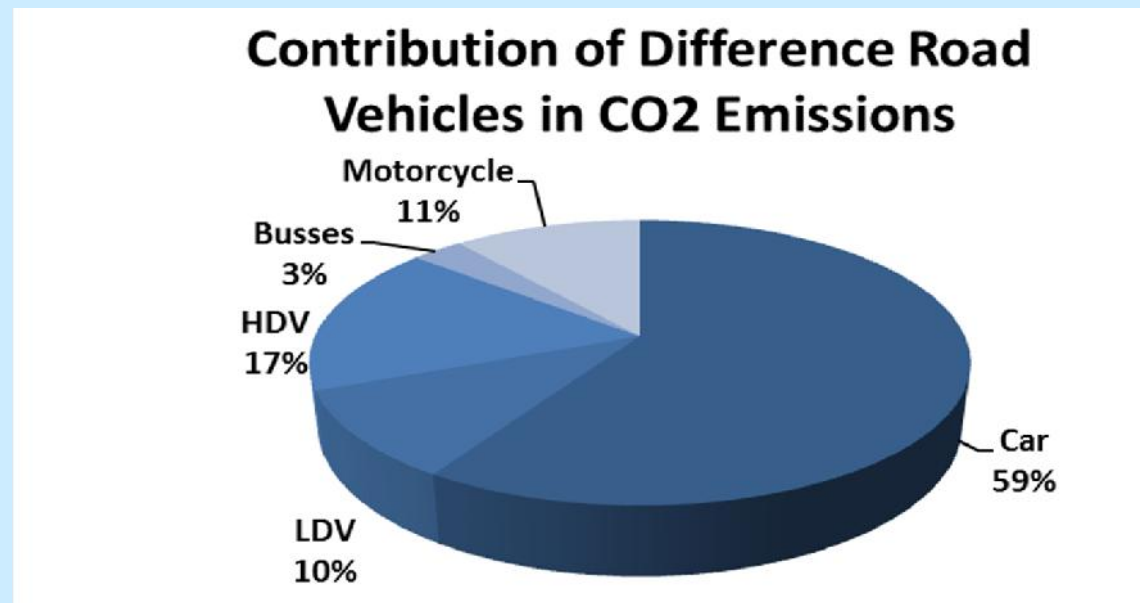


Example: Malaysia Road Emissions

Roughly equal number of motorcycle and cars



But cars consume the bulk of the fuel



Efficient 2-Wheeled Transport



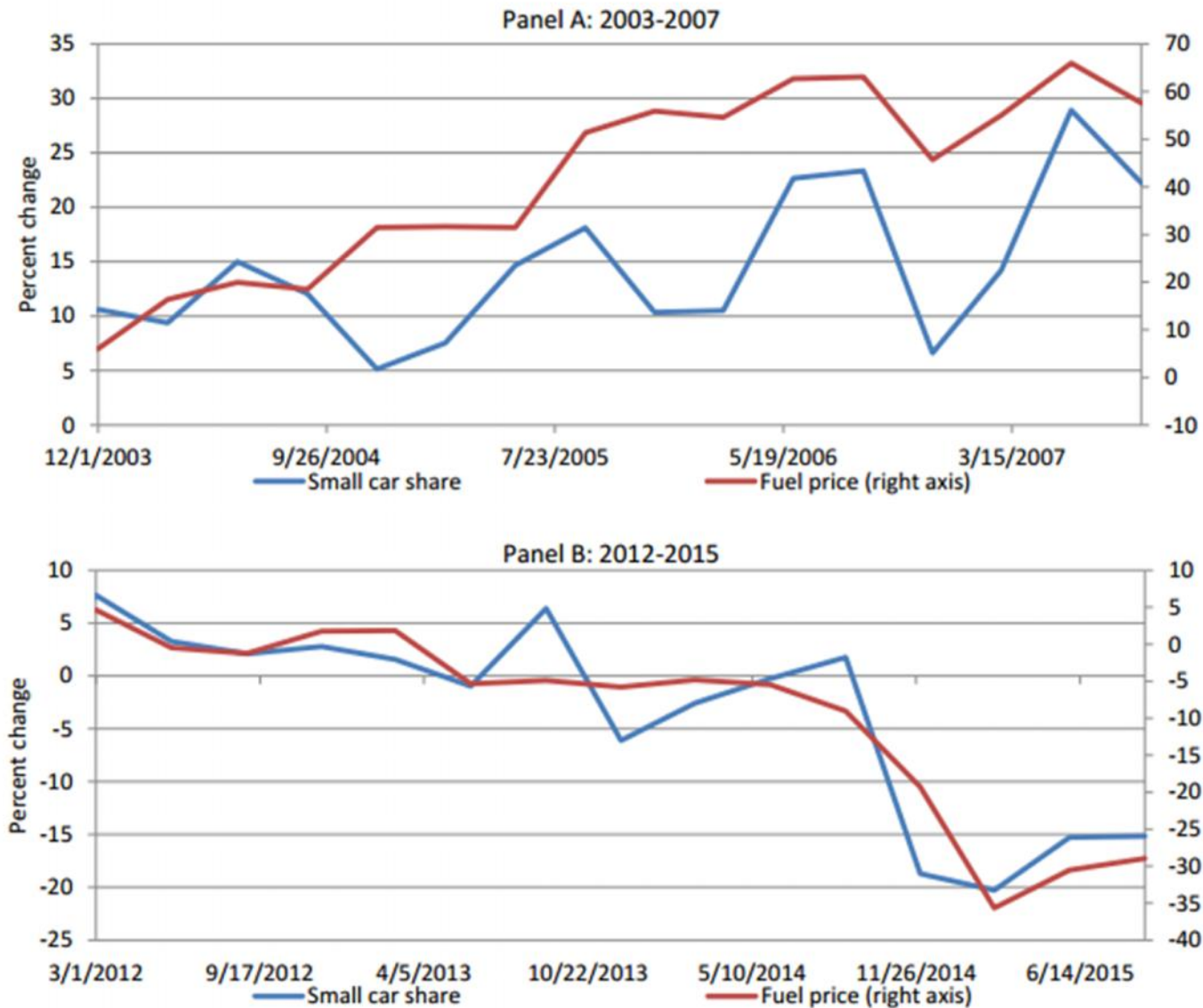
Electric Motorcycles are becoming very popular, raising concerns over their safety. The government is actively perusing safety and quality standards for this new class of vehicles.

	km/RM
Car:	6
Motorbike:	25
CNG Motor:	65
E-Moto:	100

Electric 2-Wheelers are a clean, efficient option for ASEAN



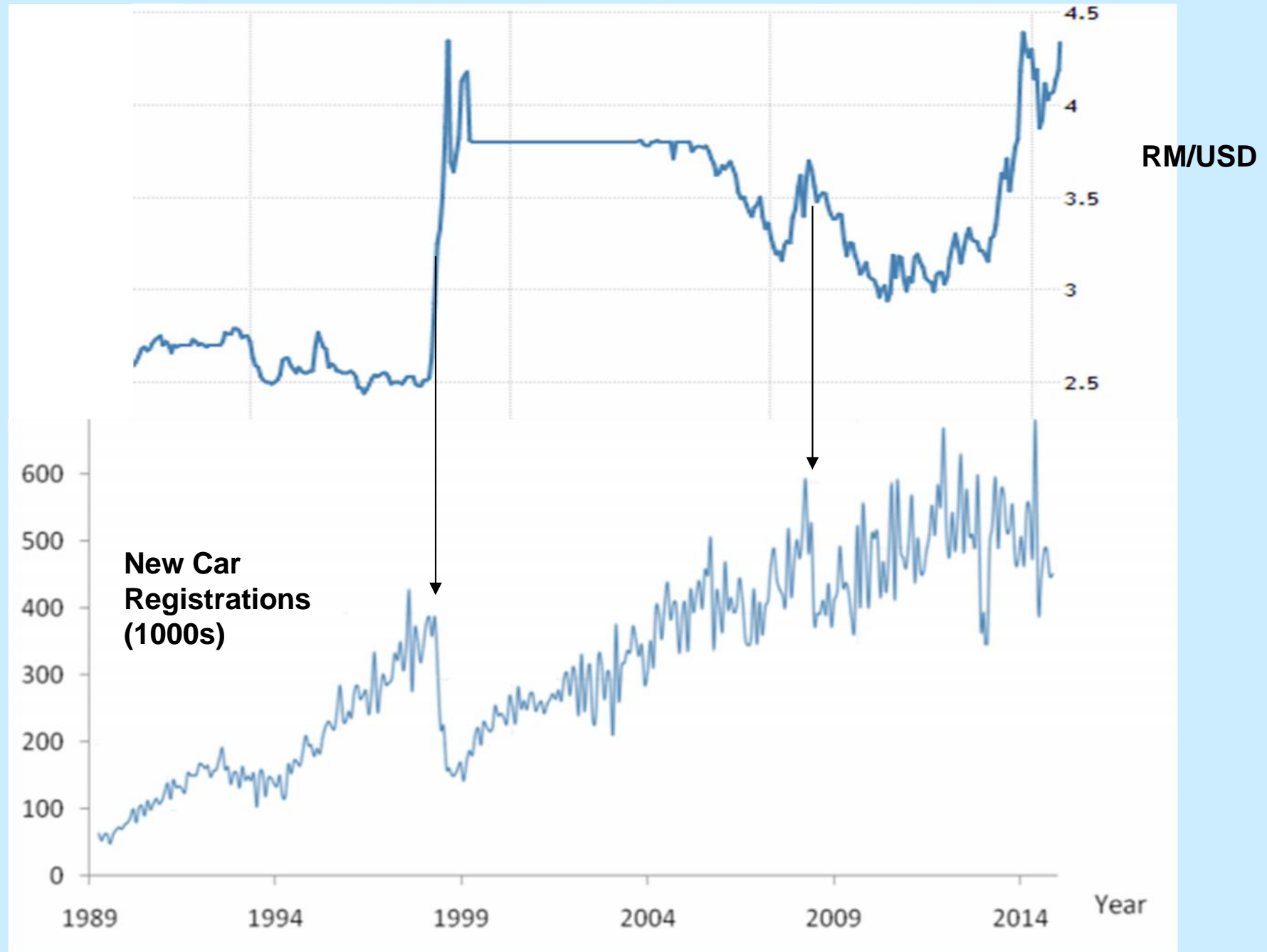
Figure 7. Market Share of Small Cars and Fuel Prices



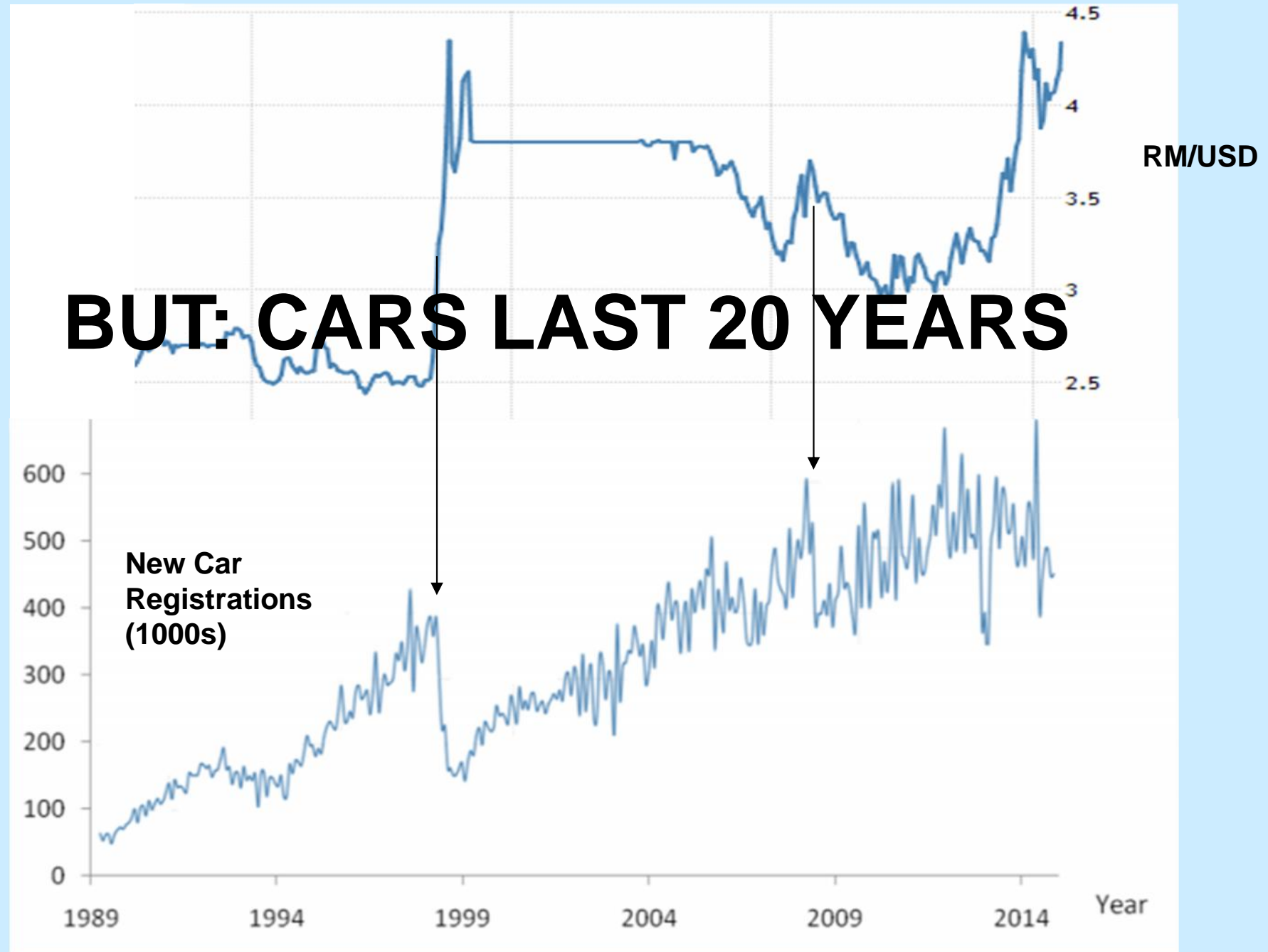
When fuel is cheap, people BIG cars

When fuel is expensive, they buy more small cars

When people have less money, they buy fewer cars



When people have less money, they buy fewer cars



Fuel Prices vs Automotive Technologies

Efficient options already exist, so *why aren't they more popular?*

Fuel prices do not **directly** effect Automotive Technologies, but they effect consumer choices (4 years after the vehicles technologies are designed).

Emissions and Fuel Consumption standards **directly** effect automotive technologies.

Consumer choice effects technologies a few ways:

With prosperity, people consume more, bigger vehicles.

When the economy is bad, people buy fewer cars.

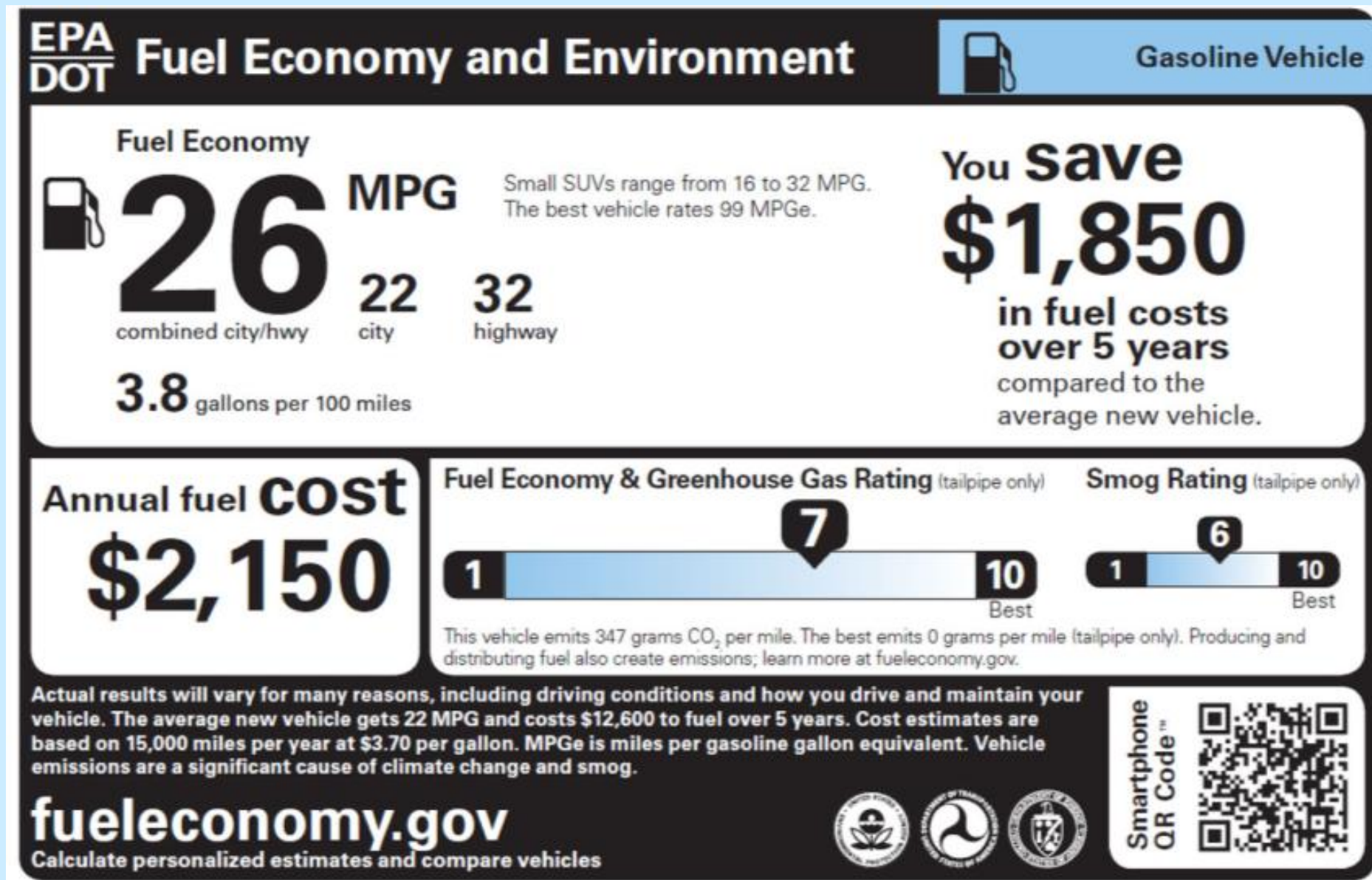
When fuel is expensive, people prefer smaller, more efficient cars.

Consumers are not good at considering future fuel costs.

That's why we have to help educate consumers on efficiency.

Fuel Prices vs Automotive Technologies

Combining Fuel Efficiency Standards with Efficiency Labeling for cars will help guide consumers towards more efficient vehicles.



Engine/Vehicle Efficiency Improvements

Potential Improvement

- 20% Over Expanded Cycles
 - 20% Gasoline Direct Injection
 - 20% Electro-mechanical valve “Camless” actuation
 - 10% Multi-Sparks per Cylinder
 - 5% Thermal Barrier Coatings
 - 2% Piston Offset
 - 2% Friction Reducing Materials
- Engines can **double** their efficiency!
- 10% Improved mild-hybridization
 - Electrical water pumps (remember belt-driven fan?)
 - Electric power steering
 - 10% Waist heat recuperation
 - 5% Weight Reduction (2-4% per 100kg according to EPA)
 - 5% Aerodynamics
 - 3% 48 V electrics

Cumulative effects could potentially **tipple** the efficiency of car.

Automotive Technology Adoption

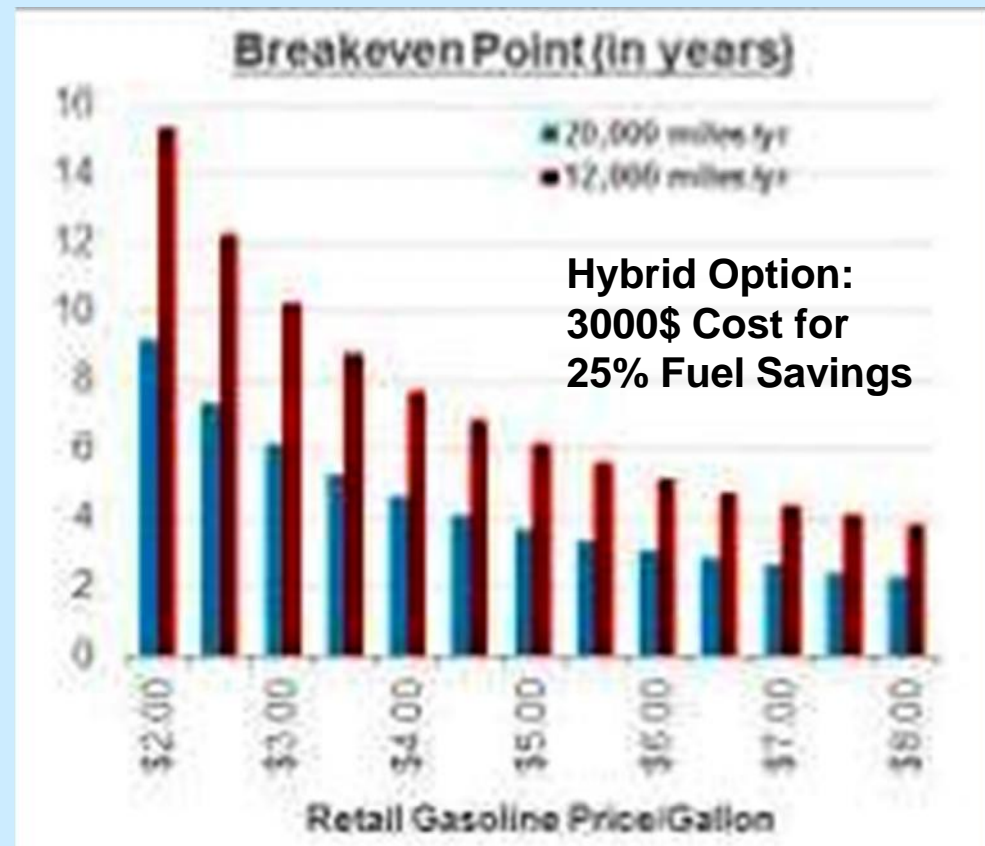
A wide range of automotive technologies is available for enhancing both efficiency and safety, **but**:

Anticipating consumer demands is difficult ahead of time.

Any potential improvement needs to be analyzed in terms of Cost/Benefit. Consumers are not very good at looking into the life time cost/benefit of various technological options.

Hybrid Technology in Malaysia:
ROI is 15 years.

Who keeps their car for 15 years?



ASEAN Automotive Market: 2W

Due to their low cost 2-wheelers dominate small transportation units in developing countries. Typical vehicle life spans are well over 20 years.

- Cost ~ 1,000\$
- Top speed 55-70 mph
- 130 mpg

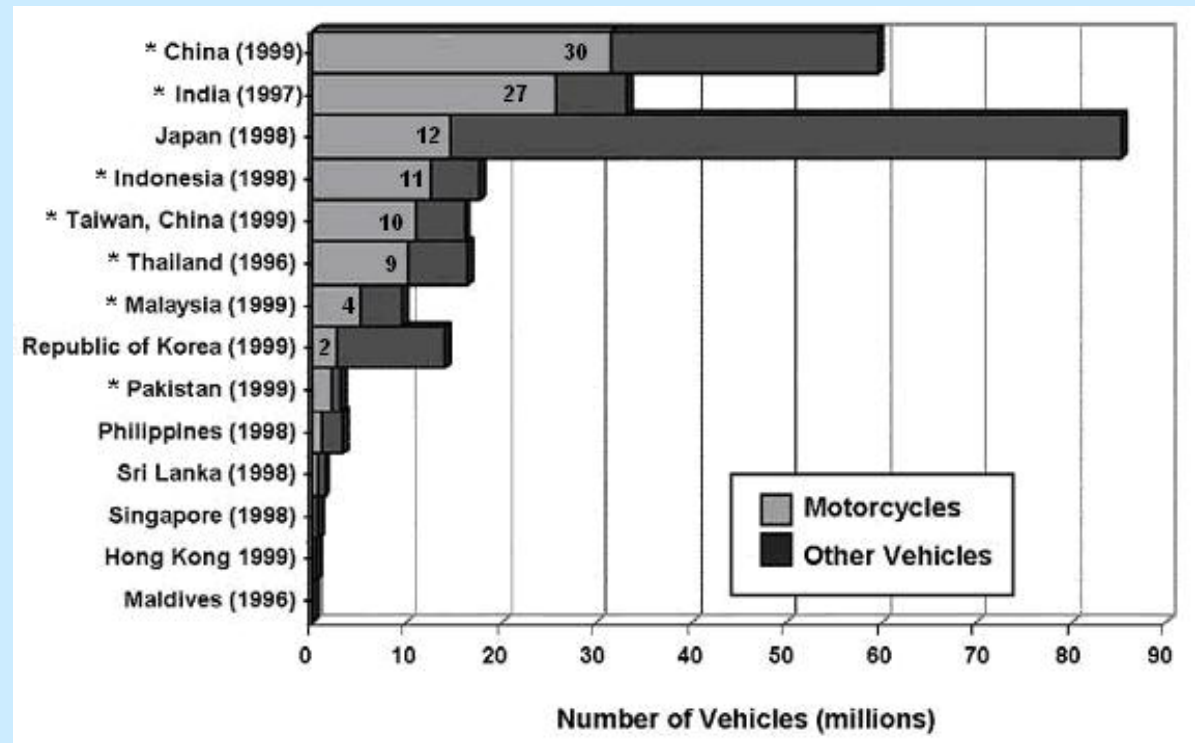
It is estimated that there are 200M units worldwide.

China: 1.2 Billion

India: 1.1 Billion

ASEAN: 650M

For about half of the world, 2-wheelers are the basic transport of choice.



Indonesia Parking lot: 250M people



Association of SE Asian Nations

Within SE Asia there are some unique environmental and socio-economic factors. ASEAN countries are homogenizing standards and regulations to have a greater impact by acting as a trading block of 650M people.

Malaysia



Vietnam



Cambodia

Want Efficiency? Make 2-Wheelers safer

One way to encourage efficiency is to make 2-wheeler riding safer.
Malaysia leads in Motorcycle Only Infrastructure.



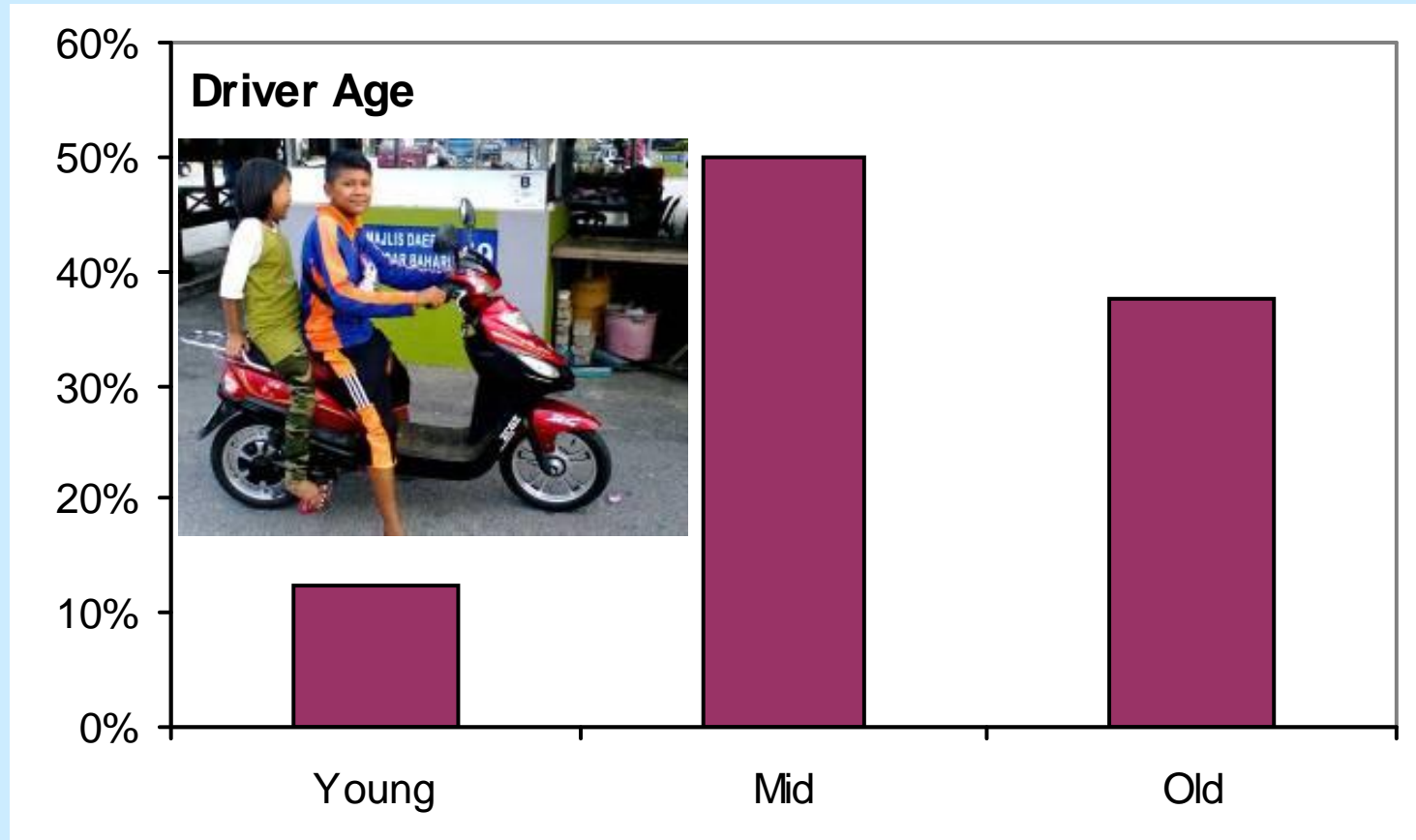
E-bikes: Rapidly Growing Market

Our estimates show that “E-bikes” went from ~0% to ~1.5% of the 2-wheeler population in Malaysian in the last 10 years.

They are clean, easy to operate, inexpensive and reliable (if well designed).



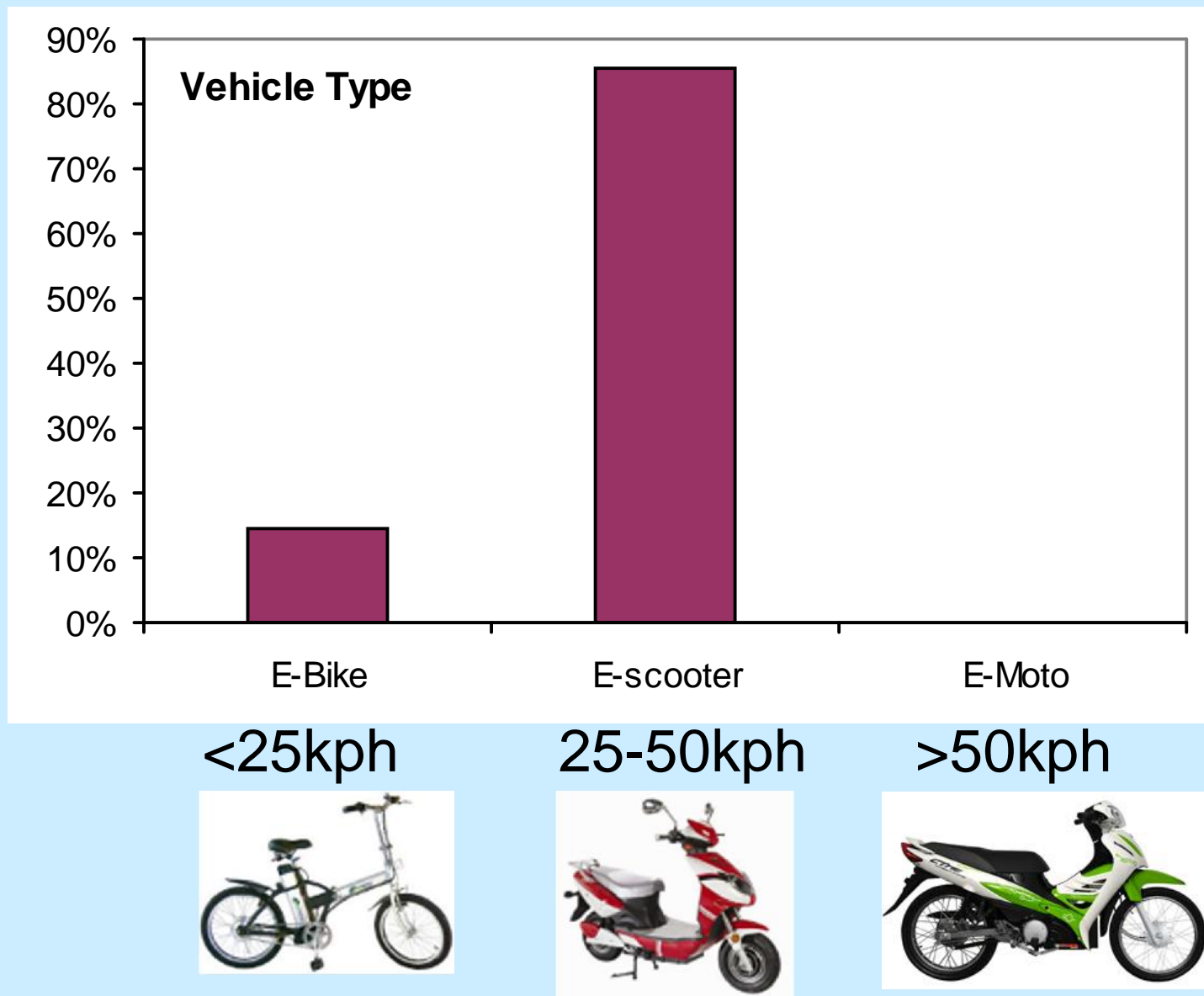
Important Local Data: E-Bikes



Older riders like that there is no kick starting, shifting or filling up with gasoline.

Important Local Data: E-Bikes

Malaysian has distinct Standards for these three categories



Quality Factors in Vehicles

What do customers care about? Just look at adverts:

Cost

Speed

Range

Power

Vehicle Life Span

Carrying Capacity

Our Malaysian Electric Vehicle Standards cover the highlighted areas above.

ONTARIO

ELECTRIC

1000W

MAX SPEED 35 KPH

UP TO 60 KILOMETERS RIDING DISTANCE

35Ah

60 Volts

MTR-027-M

FOR ONLY

***6 Months/ No Interest**

P333/Day

REGULAR PRICE P59,900

CASH / STRAIGHT

CHARGING TIME: 6-8 HOURS

UP TO 300 KILOS LOAD CAPACITY

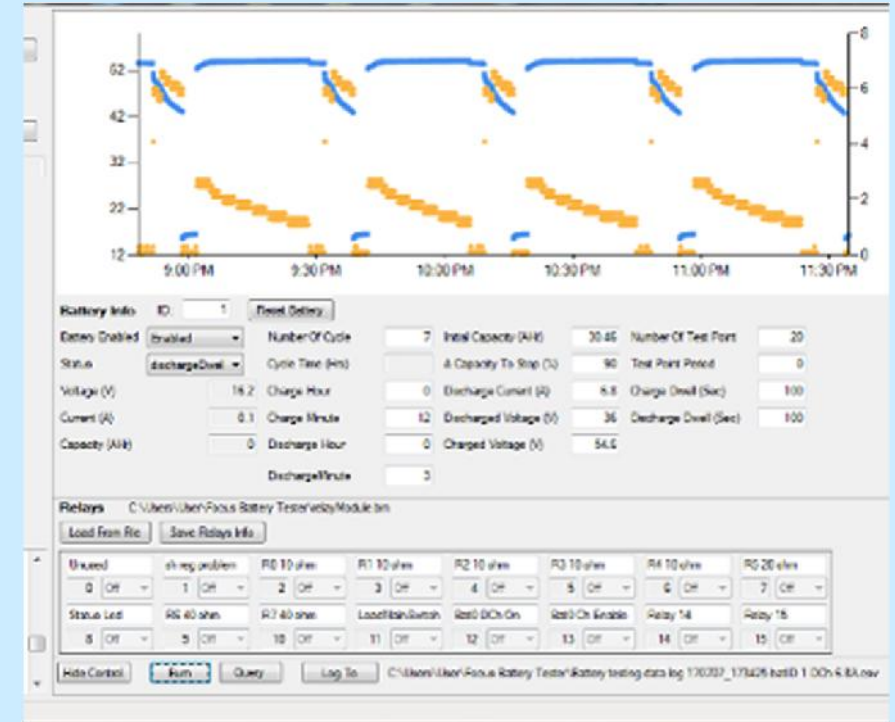
3 or 6 months

CALIFORNIA

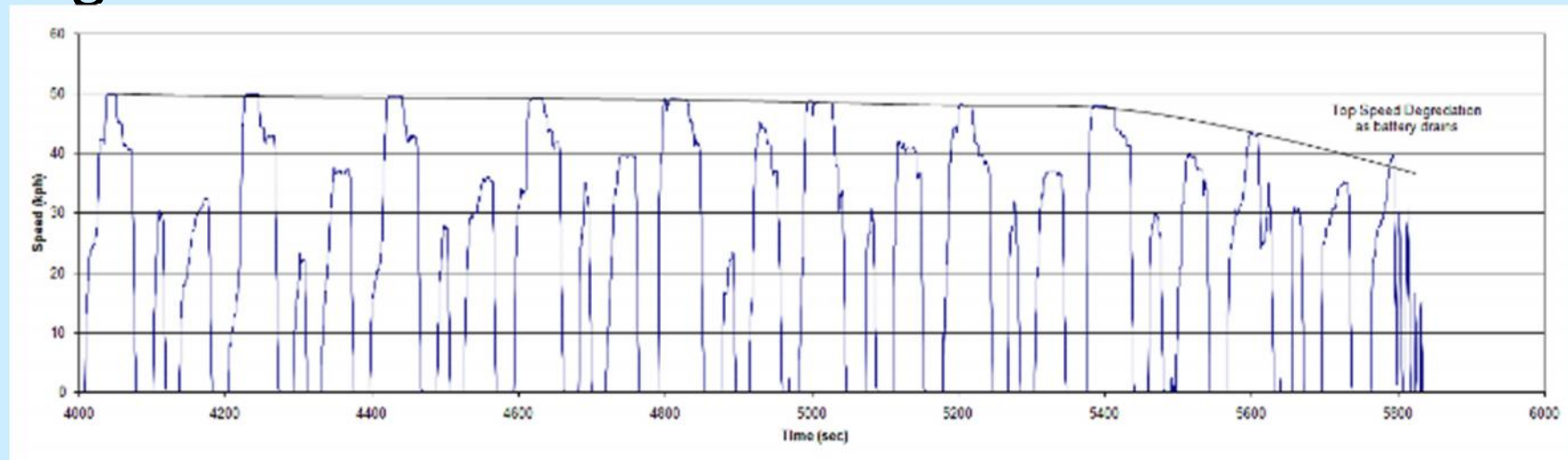
EV Standards Testing

Battery Life Test:

80% capacity for ≥ 300 cycles



Range Test: Automated as vehicles run >130km on ECER40



Recommendations to Government

- Better Urban Planning everywhere, not just KL
- Coordinate land use/urban planning on all municipalities
- Establish centralised authority for fuel efficiency and CO₂/km as unit
- Public education pertaining to sustainable transportation
- Better Interconnectivity of Transport Hubs: Park and Ride
- Expansion of the light-rail network
- Encouragement of non-motorised transport in urban areas
- Single passenger cars restriction @ peak transit hours: Car-pooling
- Efficiency label and standards

Example: Airport – City Transport

Sibu (or Melaka, or ...) has no bus from airport to city.

- 10 planes per day
- 100 passengers per plane
- 50RM per taxi to town

That's 50,000 being spent taxis per airport every day!

In 2 days you can buy a bus & charge 10RM per pax.

4 busses keeps you on 15 minute intervals, employ $\frac{1}{4}$ of the old taxi drivers as drivers, mechanics and etc.

Even if only 25% of the passengers use it you can still develop a functional transport system which reduces emissions by 90% AND save everyone money!

ASEAN level Integration

The Malaysian work highlighted several things that can be done at the ASEAN level to improve transportation sustainability:

1) Freight Exchange

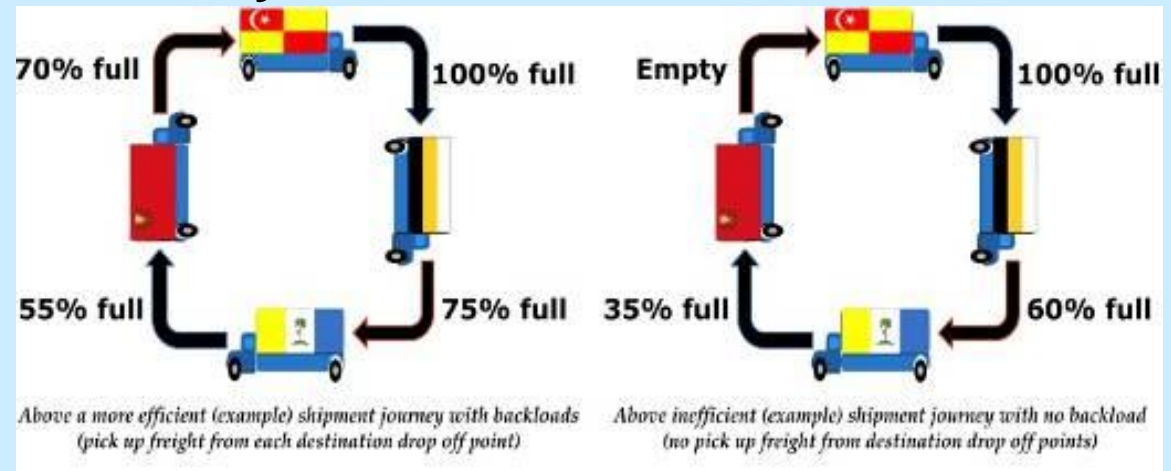
We need to have an international level “load share” to improve Freight efficiency.

2) Rail Commonality

Better to lay down common gage Rails for easier integration tomorrow.

3) Vehicle Standards Harmonization

Harmonized standards makes ASEAN the 3rd largest trading block in the world: 650M people!



Recommendations to Government

2 Wheelers:

Expansion of motorcycle-only infrastructure

Free, priority parking for motorcycles and helmet storage at all transportation hubs and government offices

Subsidised road usage fees and insurance

Continuing “Share The Road” public education underscoring the efficiency and vulnerability of two-wheelers

Freight:

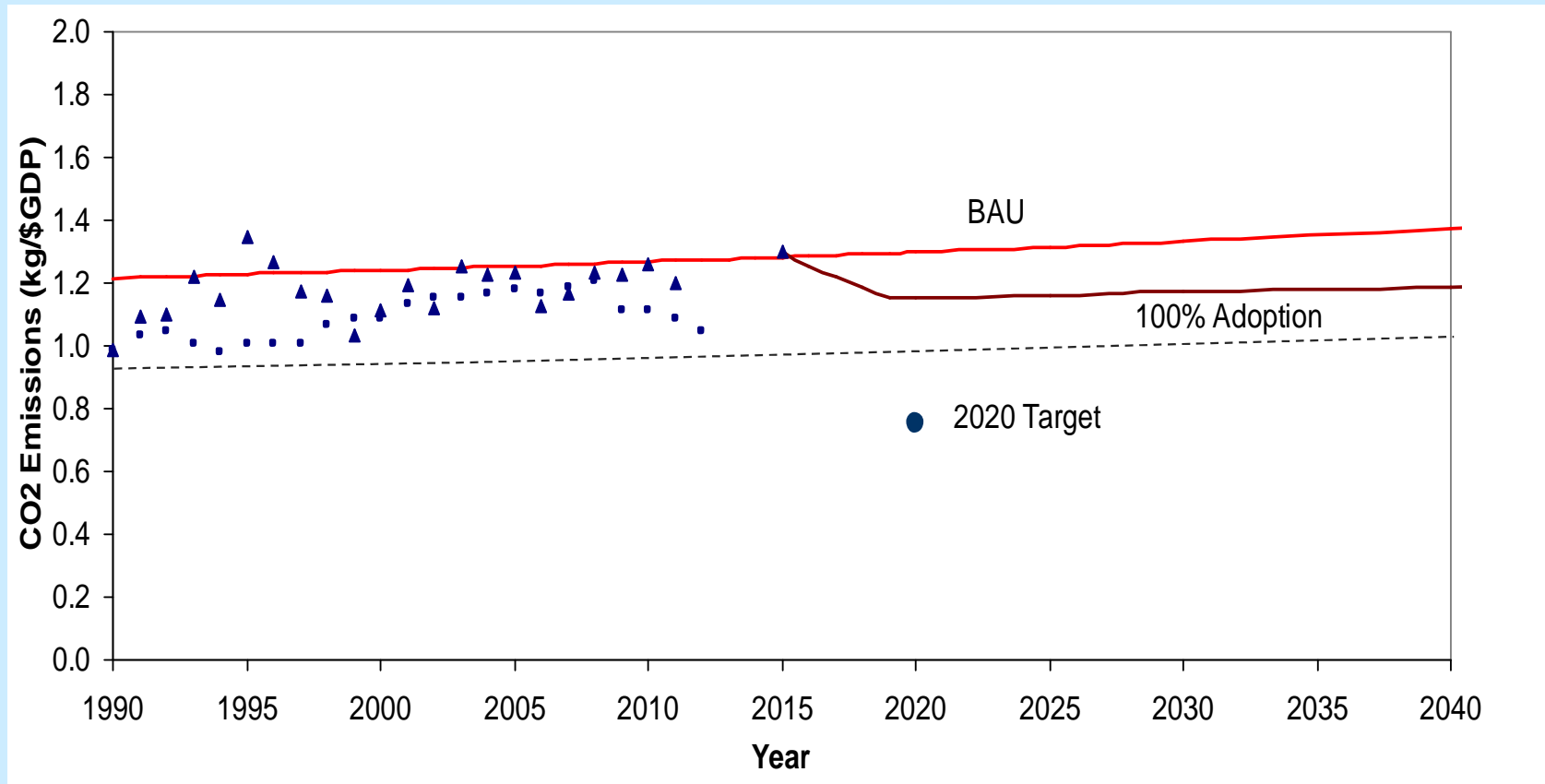
Freight Restrictions in Rush Hour

Regional Freight Exchange

Fleet inspection and maintenance and scrapping programme

Projection: Transport not enough!

Even with 100% adoption of these suggestions,
we won't make our CO₂/GDP goal!



NON-Transport: INSULATION!

It costs ~350RM to insulate the roof of a taman house.
This will reduce aircon costs by about 50RM/month.
The ROI is about 6 months.

Thermal Insulation is one of the cheapest, most efficient investments you can make, BUT Malaysian developers don't, as the cost (of electricity) is paid for by the customer, AND the customers are “kedikut”!



Conclusions

Efficient transport is a fight against human nature

We want the “convenience” of traffic jams, road accidents, tolls, expenses, and parking associated with individual cars.

Social competition demands bigger, fancier, more expensive vehicles than the neighbors have

The government needs to bias the playing field to reward efficient practice, and tax inefficiency:

Petrol should be expensive

Luxury, inefficient vehicles should be *exceptionally* expensive

Trains and busses should be cheap, clean and reliable

Conclusions

Interconnectivity to transport hubs is needs improvement
(Local Integration)

- There is a need for greater ASEAN integration

Why is there no bus from airport @ Melaka to Melaka?
Or Sibu?
Or between the Ipoh train station and bus station?

Consumers are financially “short sighted”, and need to have data in their face to help them make better decisions.

Conclusions

Hugging a tree is great!...

but it won't make a difference in the end.

Making wastage PAINFULLY EXPENSIVE will.

So keep on hugging trees, but work to bias the field towards more efficient technologies

And finally: INSULATE! We live in a tropical country!

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End of Main Presentation

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