A methodology for road transport sector;

How to identify the most effective actions and mitigation potentials for individual countries reflecting the domestic factors

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Wide range of diversity: a sector affected by domestic factors

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Road Transport sector could be understood….

- A sector which is deeply affected by domestic and external factors,

- A sector which is regulated by varieties of regulatory policy tools

- A sector which is difficult to "directly" control with CO_2 emission in a sense that in principally individuals (drivers) are responsible for the emission from their vehicles
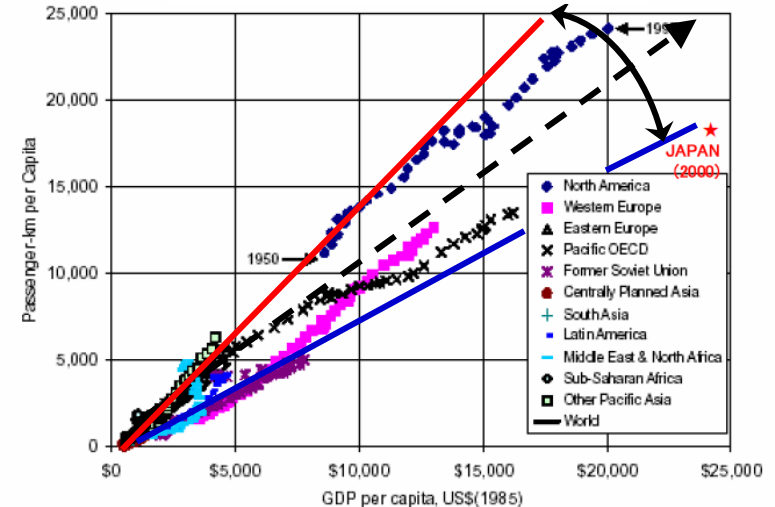
Passenger travel and GDP

JAPAN (2000)

- North America
- Western Europe
- Eastern Europe
- Pacific OECD
- Former Soviet Union
- Centrally Planned Asia
- South Asia
- Latin America
- Middle East & North Africa
- Sub-Saharan Africa
- Other Pacific Asia
- World

Passenger-km per Capita

GDP per capita, US$(1985)

Source: Updated data based on Schafer (1998), Mobility 2001 WBCSD

Travel mileage has a close linkage with GDP growth in general, however diversity with efficiency and necessary miles of travel is observed.

<Examples of affecting factors>

<Economic/Technical factors>
1) Economic activities and growth
2) Model mix in the market
3) Fleet age
 (Average age and Portion of new car)
4) Car price, Fuel price
5) Desirable **technical specifications** and
 available technologies

<Social/Geographical factors>
1) Climate (Temp, Snow, Dry/Wet)
2) Geographical specifications   (Residential density, etc)
3) Road and Public transport Infrastructure
4) Drivers' behavior/awareness/ favors
5) Political initiatives and existing regulations
  (air quality control, fuel efficiency, fuel quality…)

Mountainous area
(Pakistan)

Flat and low density
(San Diego, U.S.)

High density (Beijing, China)

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- In the North American countries, New Zeeland and Australia, people are largely dependant on cars in passenger transport.
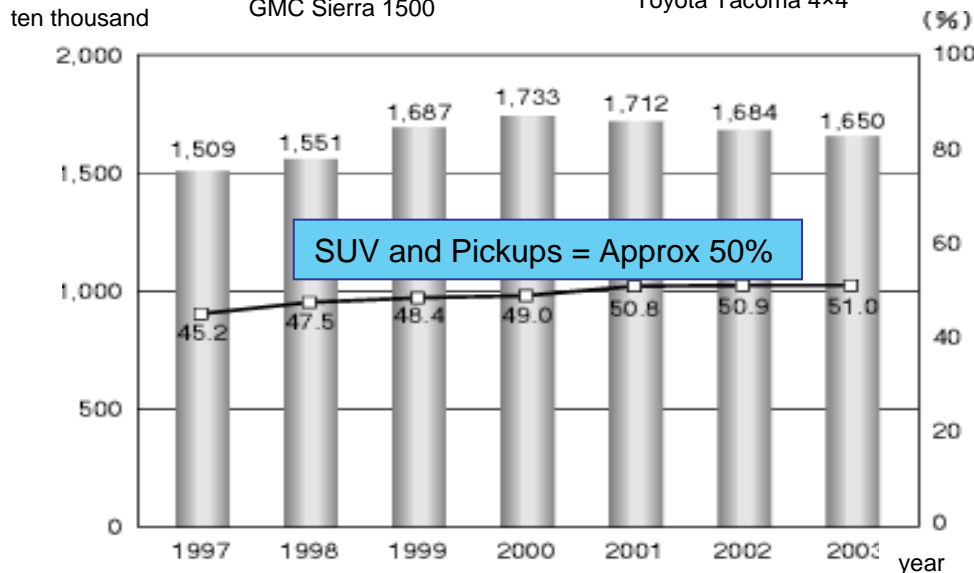
- These data show that we can understand the background of dependence on cars and big share of SUVs that they could be due to residential density (spreading city planning) and their according life style.
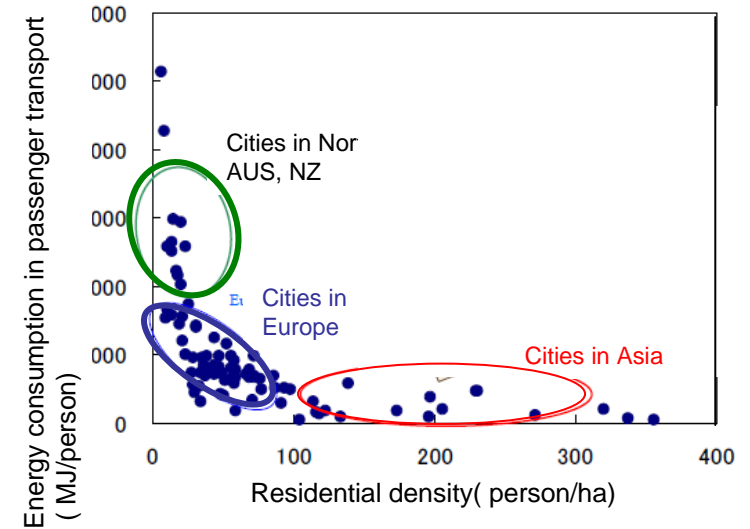
GMC Sierra 1500

Toyota Tacoma 4×4

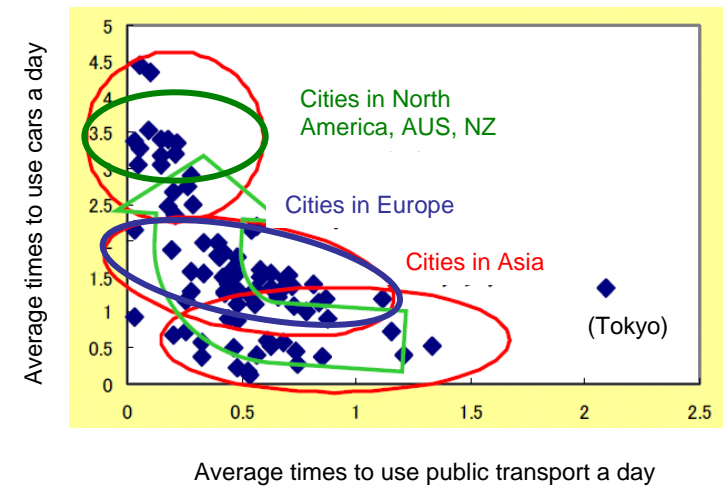SUV and Pickups = Approx 50%

U.S. Car Sales and market share of SUV and pickup trucks

Source: JAMA

Relation between energy consumption and residential density

Dependence on private cars (travel mileage and use of public transport)

Source: Minato,JARI and IEA

Indian market: Smaller cars, available only among high class

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TATA

RENAULT NISSAN
BAJAJ
Distinctly Ahead

"ULC" (2011-)

2,500 US$

Muruti 800
Approx. 5,000 US$

MARUTI SUZUKI

Nano
Approx. 2,800 US$

Tata Indica
Approx. 4,000 US$

10 thousand India Rupee

Car retail Price

Core market (80% market share)

Mercedes C class

Accord

Lancer

Sonata

Palio
Esteem

City

Sonata

Qualis

Accent Ambassador

Sonata
Indica
WagonR Icon

Murti800

Sumo
Scorpio

Altura
Boleno

Engine capacity (cc)

- Zen
- Baleno/Altura
- Octavia
- Multi Versa
- Santro
- Ikon
- Lancer
- Mercedes-Benz(C)
- Tata Safari

- Accent
- Ambassador
- Qualis
- Maruti 800
- Indica
- Accent
- Astra
- Sonata
- Multi Versa

- City
- Accord
- Tata Safari
- Wagon R
- Palio
- Esteem
- Ambassador
- Tata Sumo/Scorpio
- M&M Armada/Bolero

SIAM and Marklines 2001

- Almost 80%: Small cars
  : 800cc～1500cc: even smaller than Chinese market

-Their consumer price is distinctively lower
  : between 2,500$ and 10,000 $

- Even with lower market price, cars are affordable only among rich people
  :Only 6% of the citizens have annual Income more than 10,000 $

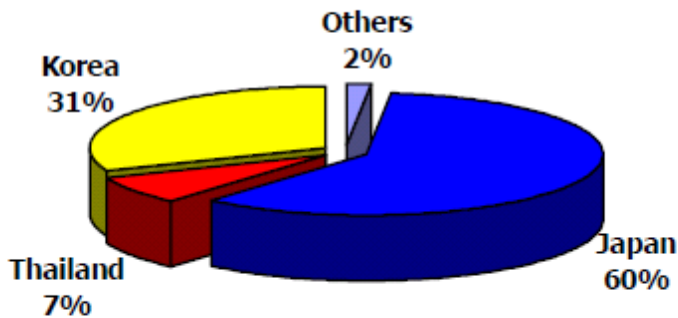- These factors limit applicable technologies in the country.

Narukawa: Tokyo Univ.

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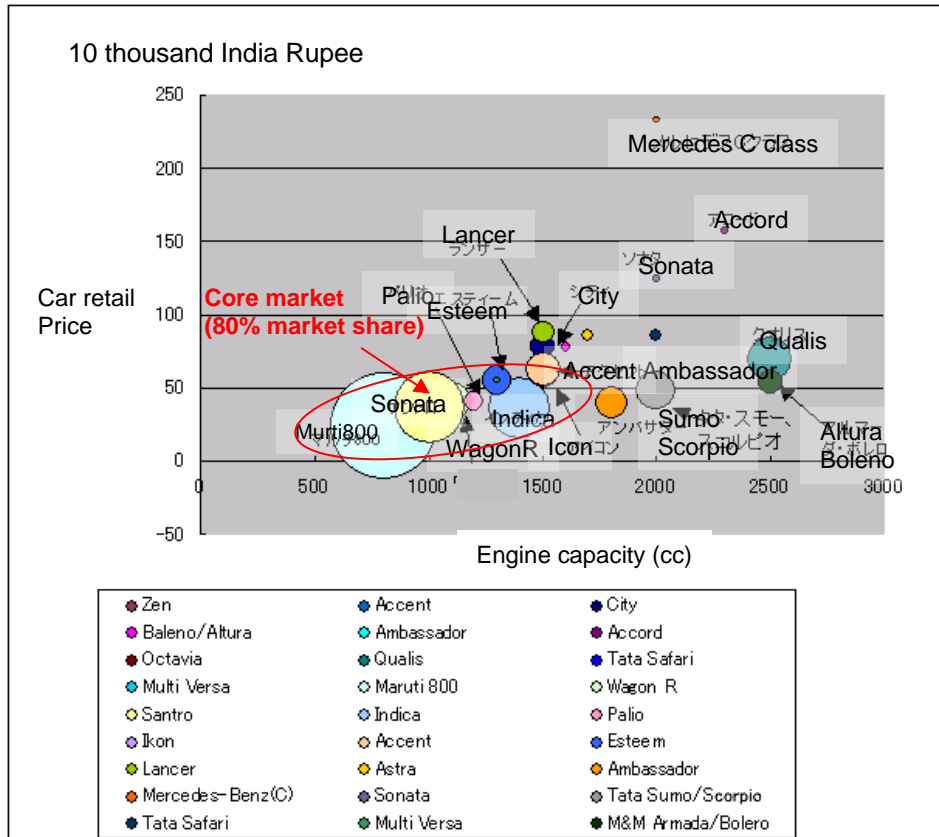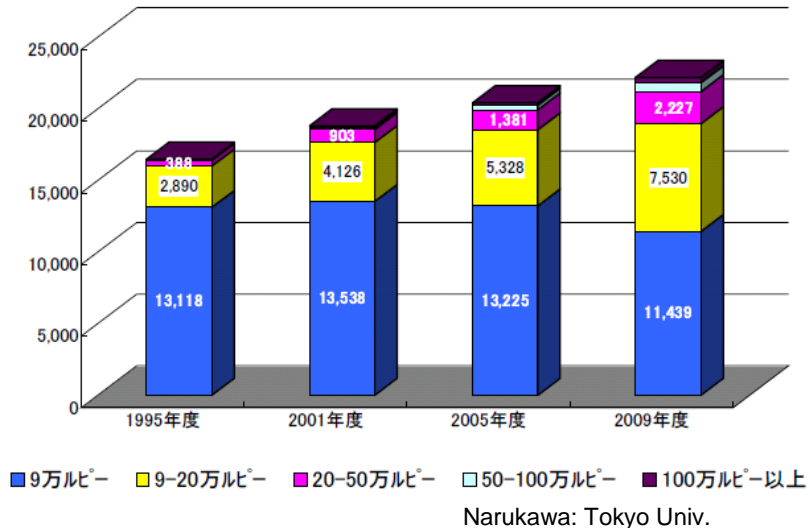
**Market share of imported used cars in Philippine**
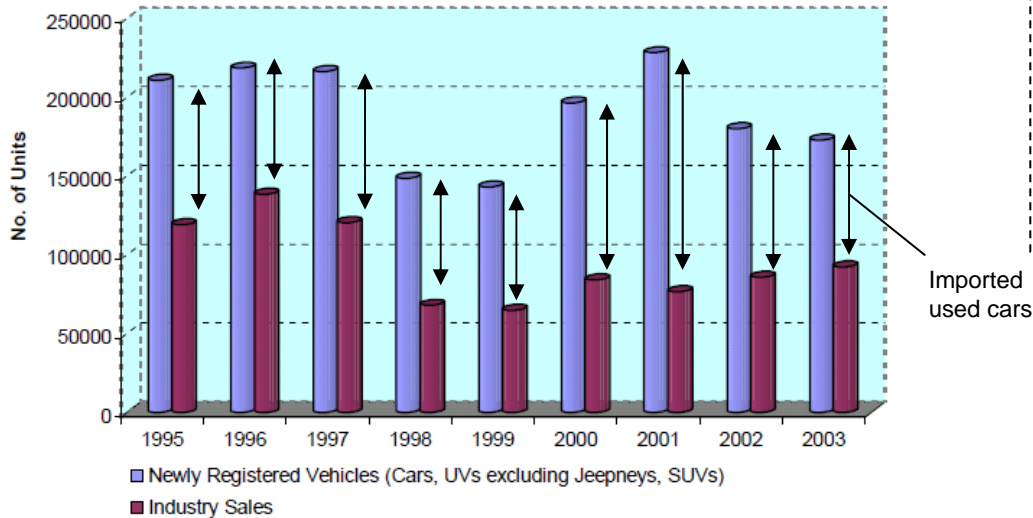
Source of data: New Vehicle Registration – Land Transportation Office
Industry Sales – Chamber of Automotive Manufacturers of the Phils. (CAMPI)

Imported used cars

-In many developing countries, large potion of market is composed by imported used vehicles.

- In these countries, the effect fuel efficiency regulation on new vehicles might be limited


Source of data: Bureau of Export Trade Promotion
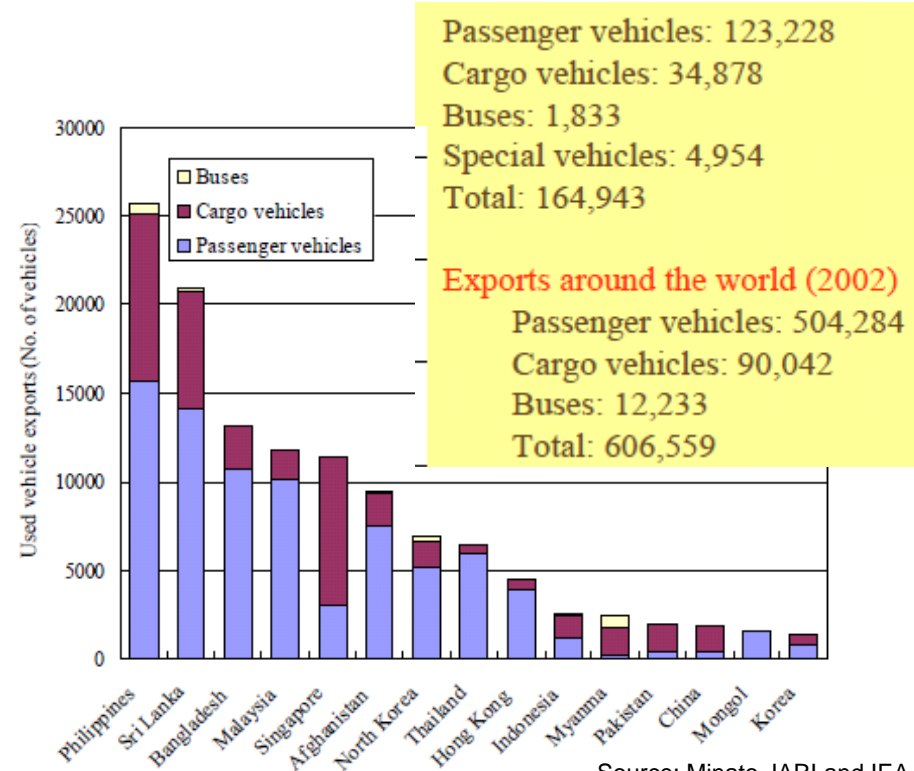
Passenger vehicles: 123,228
Cargo vehicles: 34,878
Buses: 1,833
Special vehicles: 4,954
Total: 164,943

Exports around the world (2002)
Passenger vehicles: 504,284
Cargo vehicles: 90,042
Buses: 12,233
Total: 606,559

Source: Minato,JARI and IEA

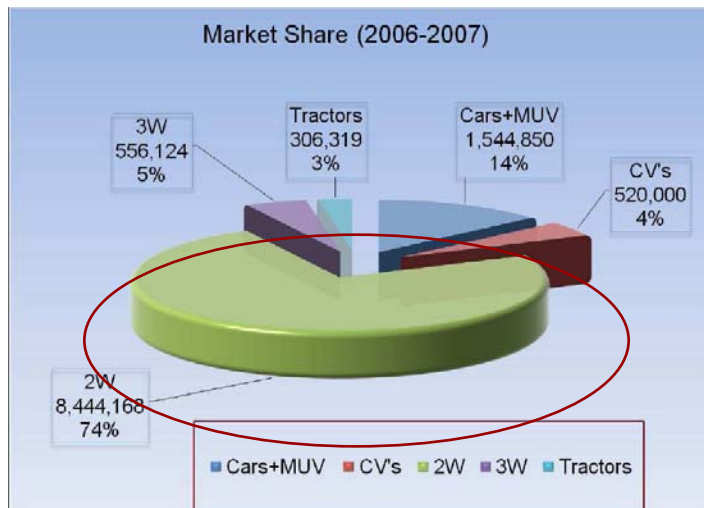Exports of Used cars from Japan to Asian countries(2002)

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-In developing countries, 2 or 3 wheelers takes large share in the markets.

- Fuel efficiency regulations for these vehicles would be one of the most effective option.
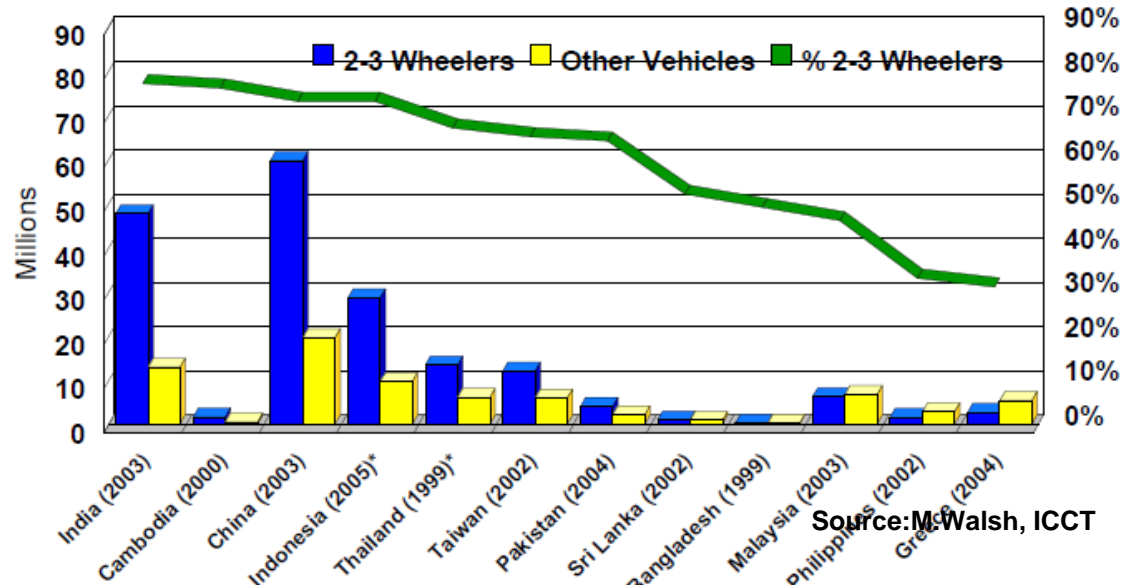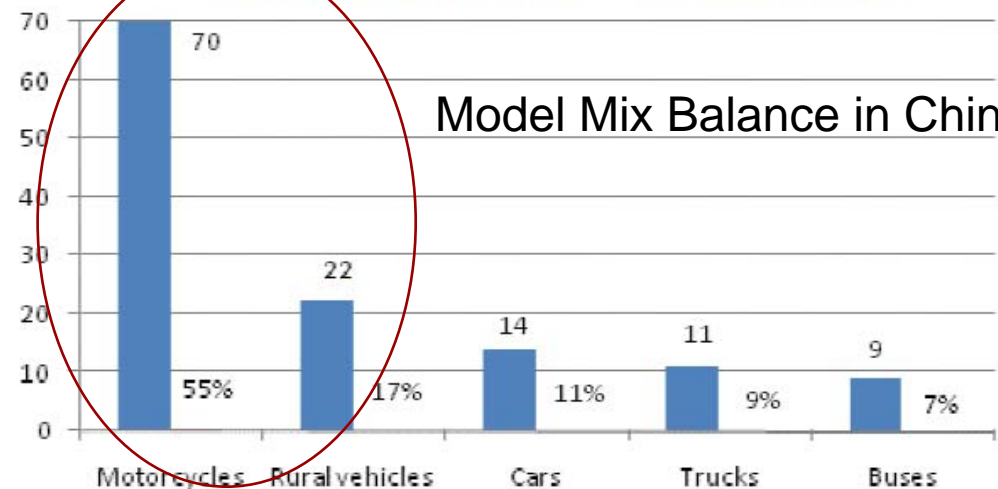

Source:M.Walsh, ICCT

Portion of 2-3 Wheelers in the world
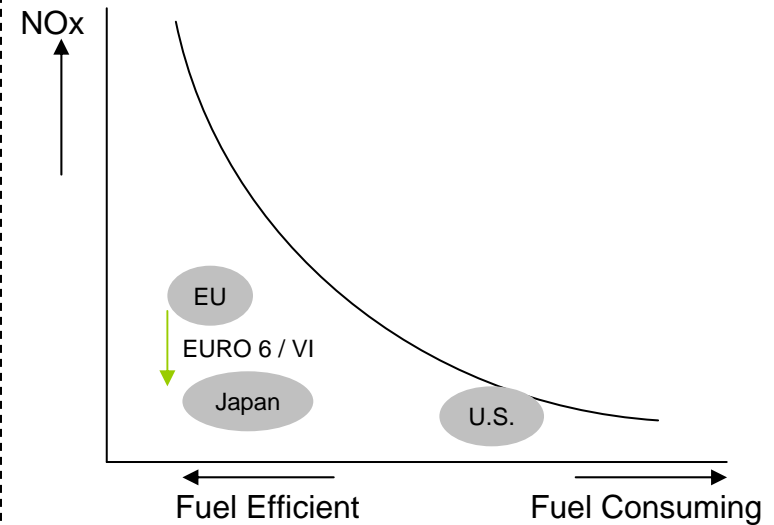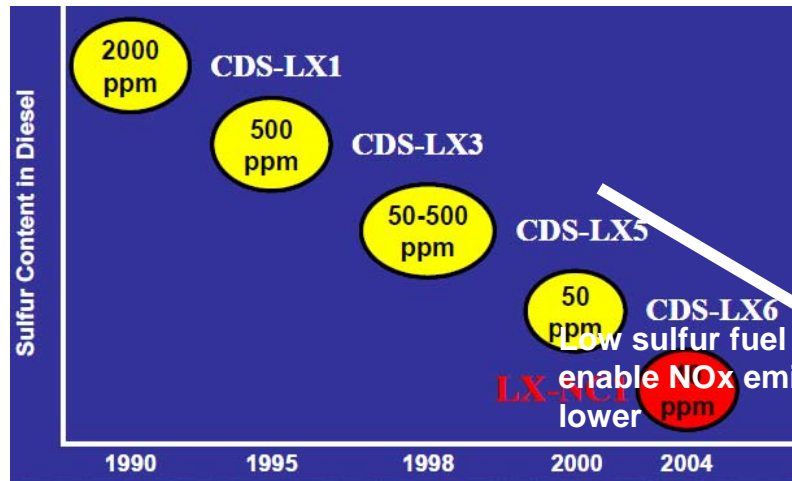
Model Mix Balance in India

Source: SIAM

Model Mix Balance in China

Source: The China Sustainable Energy Program

1) Political Priority
"Air quality" or "Fuel efficiency(CO2) ?"
(trade-off relation)

2) Fuel quality
Low sulfur fuel is essential to improve air quality and
fuel efficiency(CO2 emission)

3) Bio fuels
Policies and availability

4) Other factors on fuel

NOx

EU

EURO 6 / VI

Japan

U.S.

Fuel Efficient   Fuel Consuming

Trade off relations between NOx and Fuel Efficiency

2000 ppm   CDS-LX1

500 ppm   CDS-LX3

50-500 ppm   CDS-LX5

50 ppm   CDS-LX6

LX-NCF   ppm

Low sulfur fuel enable NOx emi lower

Sulfur Content in Diesel

1990   1995   1998   2000   2004

		Japan	U.S.	Europe
Fuels	Gasoline	99%	97%	50%
	Diesel	0.3%	3%	50%
Transmission	Automatic /CVT	93%	90%	11%
	Manual	7%	10%	89%

(2005　Global Insight)

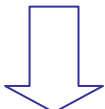Diesel engine is more efficient than Gasoline engine by 20%. MT is more efficient than AT by 10%

Considering these diversities….

It does not make sense to compare the reduction potentials/ efficiency of the transport sector in the individual countries with a simple index, like "fuel economy" (fuel consumption per transport volume).

How to tackle?

Individual countries should identify and develop all the effective policies and countermeasures in MRV(Measurable, Reportable, Verifiable) way, analyzing the markets in the individual countries in detail.

The best methodologies and common approach for this should be developed and shared by all the parties

Japanese experience in Kyoto could be one of the best proposals on the methodologies and MRV actions.

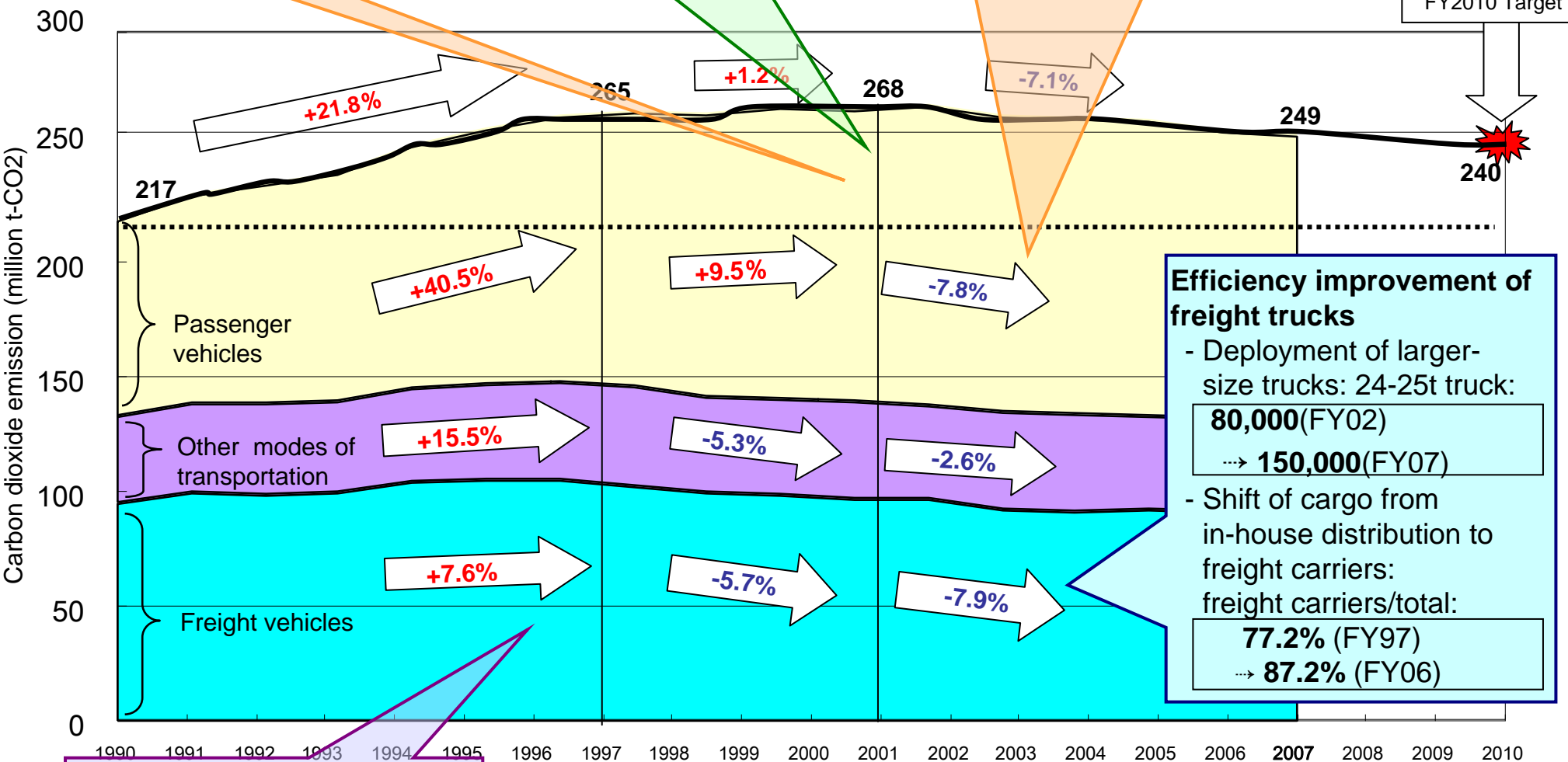# CO2 emission and reduction strategy toward Kyoto target in Japan

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Emissions from passenger vehicles peaked in FY2001.

Since FY2001, emissions from the transportation sector have been on a downward trend.

Improvement of mileage of passenger vehicles
- The Top-runner (Best-in-Class) Standard
- Vehicle Green Tax (Since FY2001)
  14.4mil./57.5mil. registered vehicles are GREEN

FY2010 Target

300

+21.8%

265   +1.2%   268   -7.1%   249

250

240

217

Carbon dioxide emission (million t-CO2)

+40.5%   +9.5%   -7.8%

200

Passenger vehicles

Efficiency improvement of freight trucks
- Deployment of larger-size trucks: 24-25t truck:
  80,000(FY02)
  ⋯▸ **150,000**(FY07)
- Shift of cargo from in-house distribution to freight carriers:
  freight carriers/total:
  77.2% (FY97)
  ⋯▸ **87.2%** (FY06)

150

Other modes of transportation   +15.5%   -5.3%   -2.6%

100

Freight vehicles   +7.6%   -5.7%   -7.9%

50

0

1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 **2007** 2008 2009 2010
(Preliminary Figures)

Emissions from freight vehicles peaked in FY1996

(Other transportation: bus, taxi, train, ship, and aircraft)

2

MRV actions for transport sector in Japan

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Vehicle traffic measures

Measures for vehicles and eco-friendly driving style
(▾27.6 – 29.6 mil. t-CO2)

- Top-runner fuel efficiency standards
- Promotion of energy-saving vehicles
- Promotion of eco-friendly driving styles
- Introduction of bio-fuel

Improvement of traffic flow
(▾5.5 mil. t-CO2)

- Improvement of traffic speed by alleviating traffic jams

Others

- **Technical Innovation of efficiency in railway/ aviation sector**

- **Promotion of teleworking**

(▾2.8 mil. t-CO2)

Transition to more efficient transportation system

Improvement of cargo transportation efficiency
(▾17.5 – 18.6 mil. t-CO2)

- Green Distribution Partnership
- Modal shift to railroads and shipping
- Use of efficient vehicles (ex. larger trucks, co-use of a single truck)

Promotion of use of public transportation
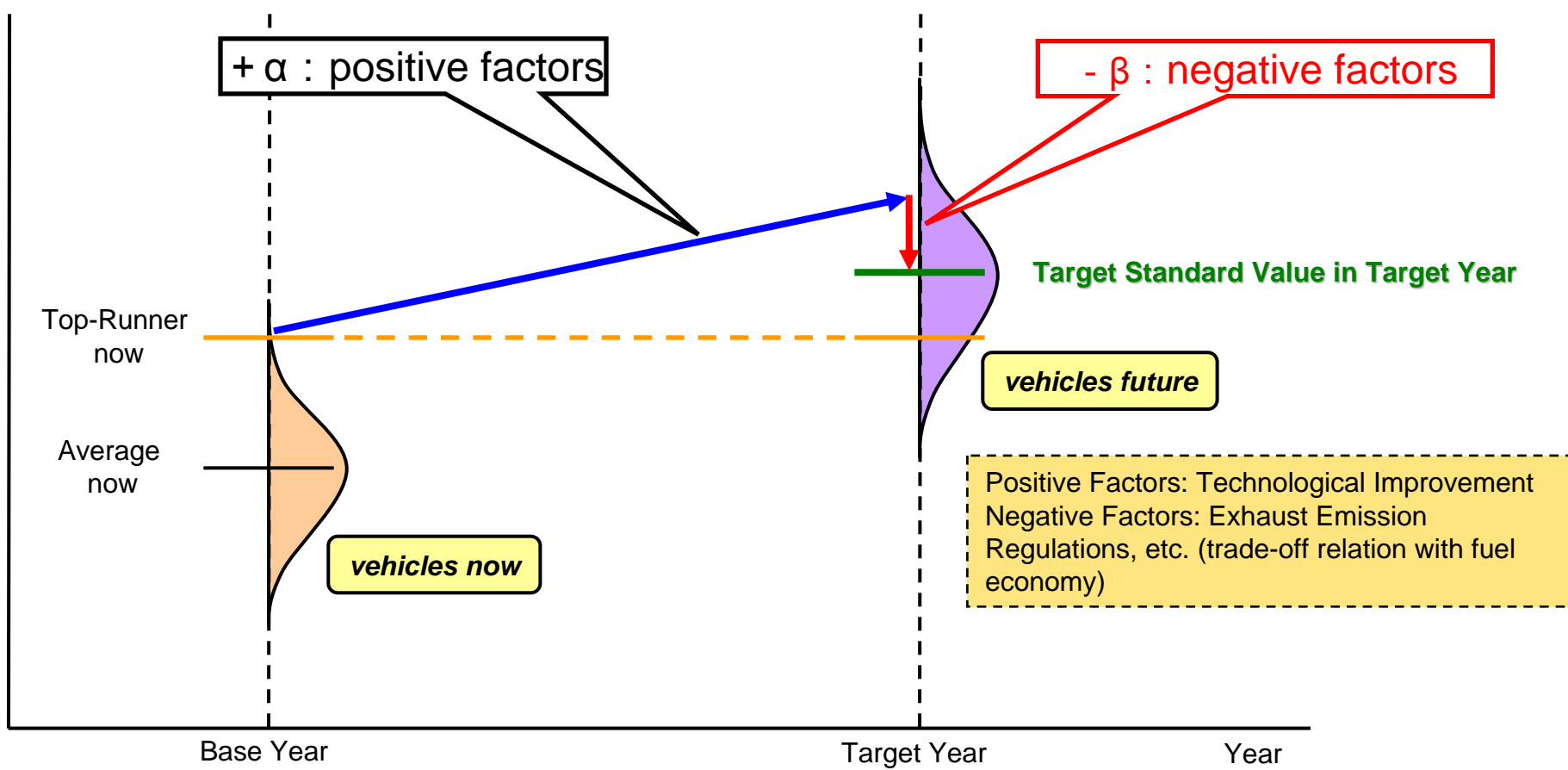(▾2.7 – 3.8 mil. t-CO2)

- Build new commuter lines, subways, LRTs, etc.
- Promotion through IC cards
- Traffic demand management

**Total:**
▾60 mil. t-CO2

3

Two good examples of MRV actions;

1) Top runner approach for fuel efficiency(CO2) regulation on vehicles

2) Traffic flow improvement by ITS (Intelligent Transport System) technologies

○ By target year, average fuel consumption must be higher than the best fuel efficiency in the base year.
○ Standard should be high but reachable because target values are already achieved by actual vehicles in the base year.

+ α : positive factors

- β : negative factors

Target Standard Value in Target Year

Top-Runner now

vehicles future

Average now

vehicles now

Positive Factors: Technological Improvement
Negative Factors: Exhaust Emission Regulations, etc. (trade-off relation with fuel economy)

Base Year   Target Year   Year

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Current Fuel Economy Performance and Level of 2015 Target Standard Values
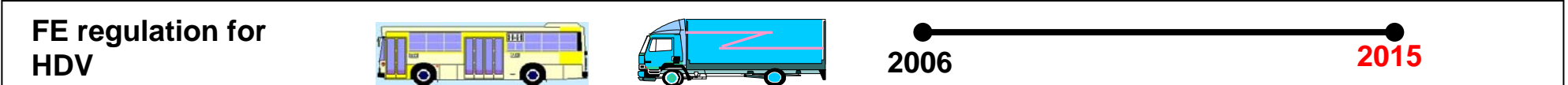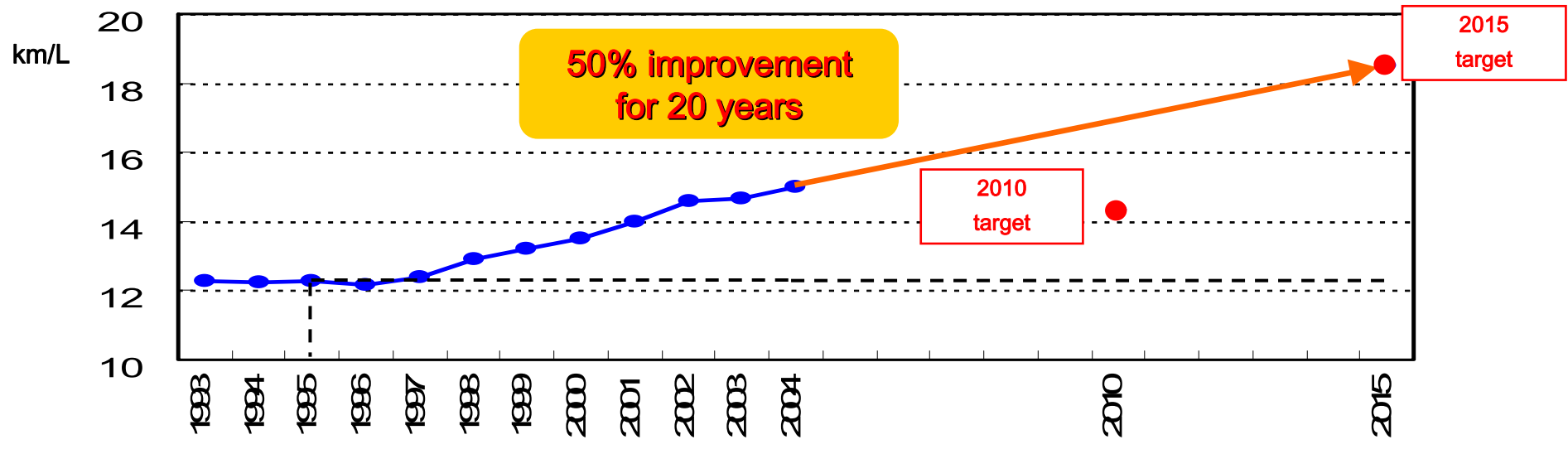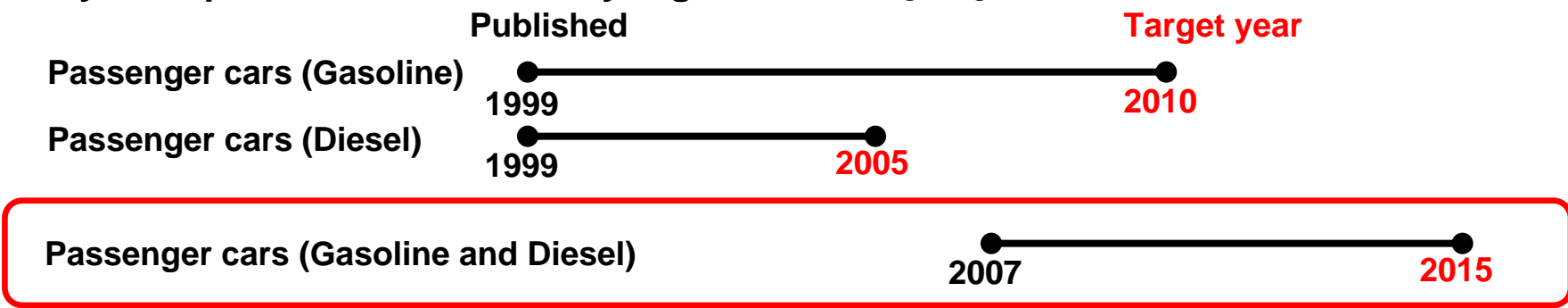## * Example (passenger vehicle: 4 weight categories between 971kg and 1420kg)
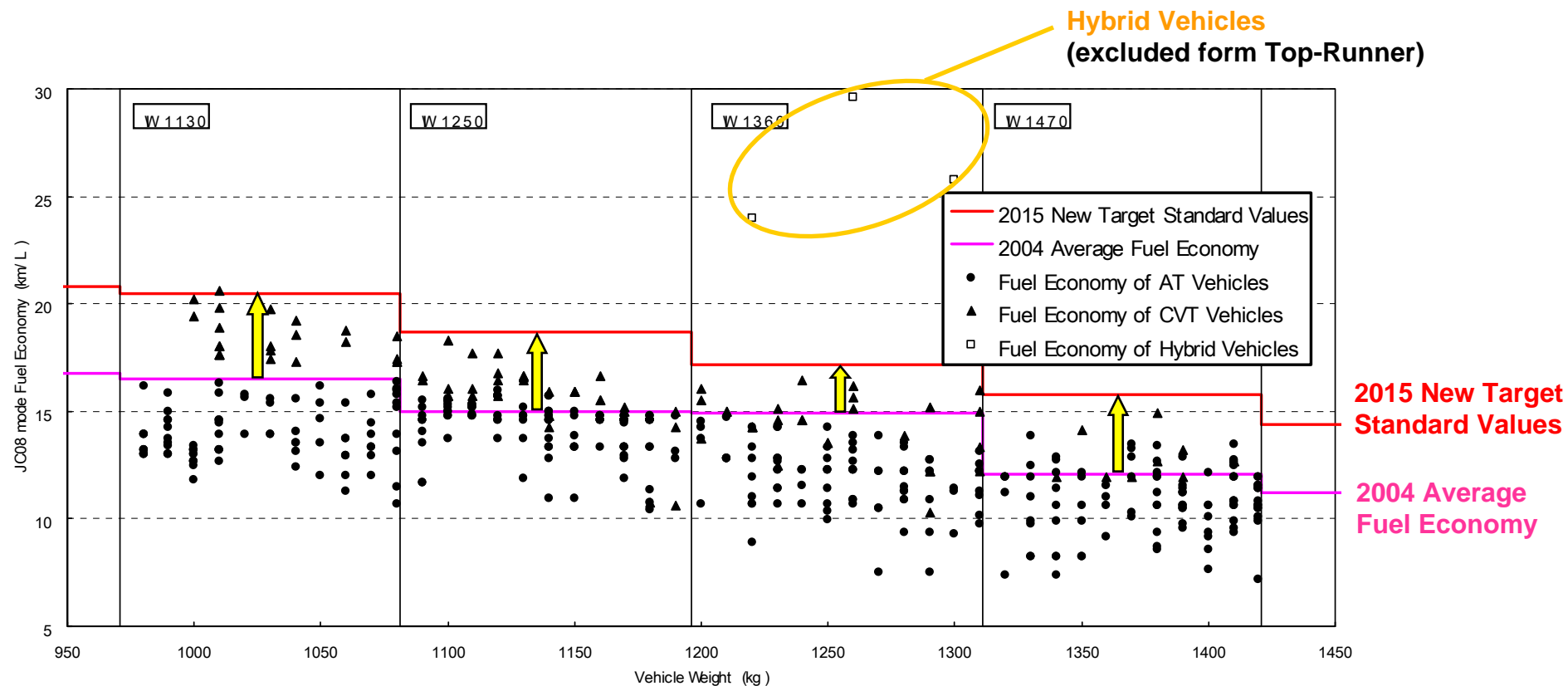

* Fuel economy values on this table are measured by JC08 mode.

1979 June: Energy conservation law was established.
1998 June: Top runner concept was introduced in the law

< History of Top runner fuel efficiency regulation>

Published   Target year

Passenger cars (Gasoline)
1999   2010

Passenger cars (Diesel)
1999   2005

Passenger cars (Gasoline and Diesel)
2007   2015

km/L

50% improvement
for 20 years

2015 target

2010 target

FE regulation for HDV
2006   2015

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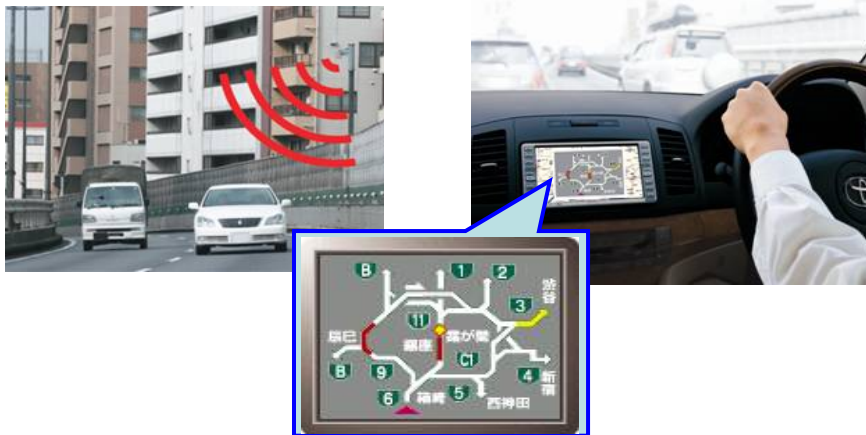## Trends in Average Fuel Efficiency of Gasoline Passenger Cars in Japan (including imported cars)
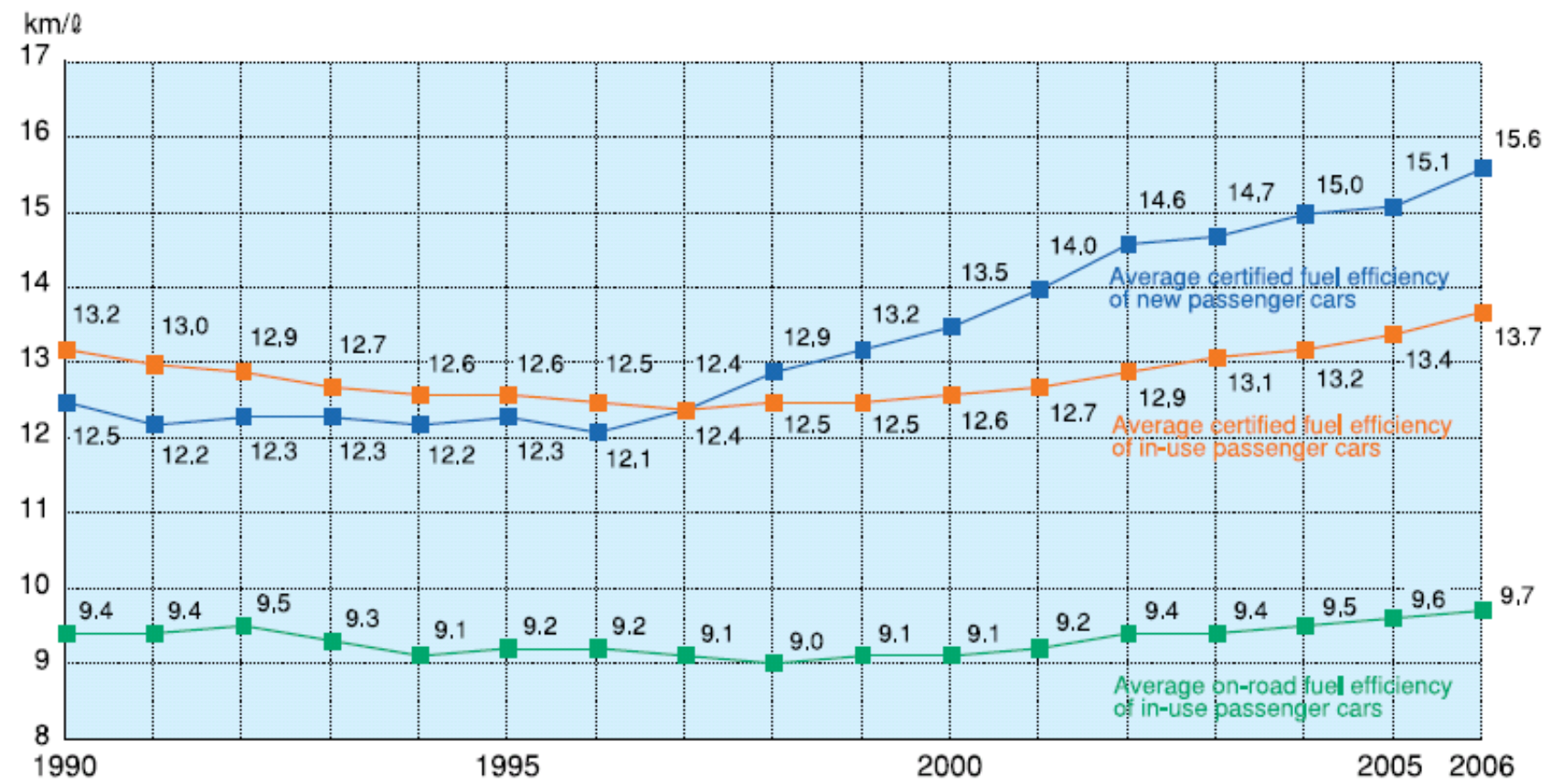
■VICS: Provides road traffic information in real time, realizing smooth traffic & higher travel speed, resulting in the improvement of actual fuel efficiency:
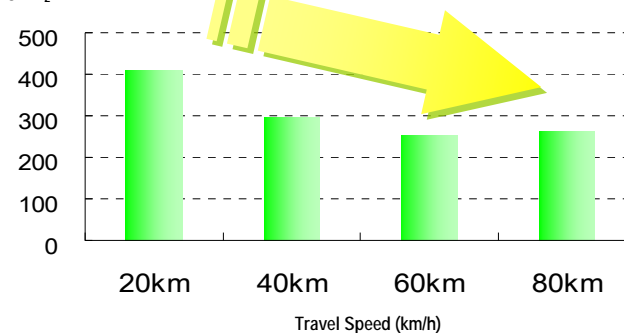
→ Reduce 2.4 Mt-CO$_2$ in 2010.

V I C S
（ Vehicle Information and Communication System ）

CO$_2$ Emissions per travel distance (g-CO$_2$/km)

500
400
300
200
100
0

20km　40km　60km　80km

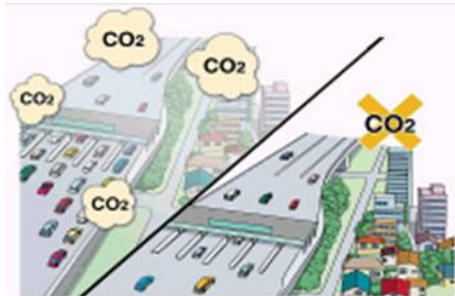Travel Speed (km/h)

In 2010

Reducing 2.4Mt-CO$_2$

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■ETC: Enables non-stop, cashless toll collection at expressway tollbooths, whose capacity shortage causes about a third of traffic jams on expressways:
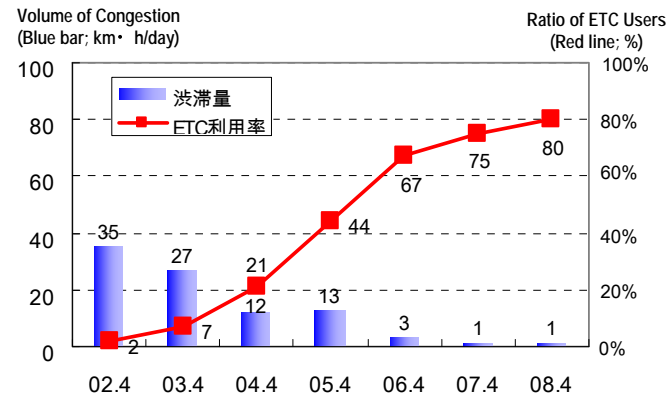
→ Reduce 0.2 Mt-CO$_2$ in 2010.

E T C
（ **Electronic Toll Collection System** ）

ETC Decreases Volume of Congestion:
(18 Tollbooths of the Metropolitan Expressways)

Volume of Congestion
(Blue bar; km・h/day)

Ratio of ETC Users
(Red line; %)

渋滞量
ETC利用率

35 27 21 12 2 7 13 3 1 1

44 67 75 80

02.4 03.4 04.4 05.4 06.4 07.4 08.4

In 2010

Reducing 0.2Mt-CO$_2$

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1. To enhance MRV actions by all the parties, it should be essential for developed countries, as well as International organizations and institutions, to transfer their know-how of policy development and experience on the relevant area (Examples of areas; Statistics on Transport, Fuel Efficiency regulations, Fiscal Incentives, efficient logistics), developing common approach to identify the best policy options.

2. Internationally cooperative actions should be taken by all the relevant authorities and stakeholders in the world, developing global/regional actions plans toward global significant reduction in the most effective way.

< Examples of governmental or G/I actions in progress in road transport sector>
- MEET (Ministerial Conference on Global Environment and Energy in Transport)
- Japan-ASEAN Transport Ministers Meeting
   An action plan on environment improvement measures in the transport sector will be developed
- Asian Pacific Partnership on Climate and Clean Development
   Establishment of Road transport Task Force is being proposed.
- OECD/ITF (International Transport Forum)
- APEC workshops
- Regional programs by development banks, like Asian Development Banks

Overview:

Date & Venue: January 14-16, 2009; Tokyo, Japan

Invitees: 21 countries & 9 int'l/regional organizations

G8 members, Australia, India, Korea, ASEAN10; ASEAN Secretariat, EC, UNFCCC Secretariat, World Bank, ICAO, IMO, UNECE/WP.29, IEA & ITF

Highlights:

- Participated by major countries and organizations, covering around 70% of the world's CO_2 emissions from the transport sector;

- Adopted the Ministerial Declaration, a strong political message of transport ministers to combat climate change and air pollution, which emphasizes:
  - ◆ Sharing the global long-term vision of realizing low-carbon & low-pollution transport systems;
  - ◆ Strengthening domestic transport policies, esp. facilitating developing countries' efforts with utilizing experiences and expertise of developed countries;
  - ◆ Boosting efforts for int'l aviation and maritime shipping; and
  - ◆ Continuing dialogue and enhancing int'l cooperation.

- Follow-up meeting for senior officials will be held in June 2009 in Japan;
- 2nd Ministerial Conference will be set around the end of 2009 in Italy.

- Based on the MEET Ministerial Declaration, Japan will enhance assistance to systematic and organized efforts of developing countries to address climate change and air pollution issues in the transport sector.

- Japan's multifaceted assistance includes:

  - Formulation of action plans (e.g. ASEAN-Japan Environmental Action Plan) ;

  - Design & implementation of measures for: automobiles, low-carbon logistics systems, public transport etc. ;

  - Development of statistical data.

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Considerable studies on the effective policies, such as Fuel Efficiency regulations of vehicles, fiscal incentives for low carbon vehicles, traffic flow improvement, are in progress by several research institutions and international agencies.

It would be useful for Individual countries to refer the outcome of these studies where necessary.

<Examples of studies in Progress>

- ICCT
  A climate change roadmap for the transportation sector
  http://www.theicct.org/
- IEA, UNEP, ITF, FIA Foundation

  Global Fuel Efficiency Initiative (GFEI)
- OECD/JTRC

  International Joint study on Climate Change and Transport Strategy
- Chinese Sustainable Energy Program
  http://www.efchina.org/
- TERI