



# **CO<sub>2</sub> Emissions Reduction in Japan's Road Transport Sector**

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# **Back Ground Introduction of international CO2 reductions**

# UNFCCC<sup>[1]</sup> Paris Agreement

**COP 21** in December 2015

*(21st Conference of the Parties of the UNFCCC in Paris)*



**United Nations**  
Framework Convention on  
Climate Change



## Key points of Paris Agreement

1. adopted by all of the 195 participating countries. (covers more than 99% of global emission)
2. set a goal of limiting global warming to less than 2 °C compared to pre-industrial levels.
3. "pursue efforts to" limit the temperature increase to 1.5 °C.
4. calls for zero net greenhouse gas emissions during the second half of the 21st century.



**PARIS2015**  
BY CLIMATE CHANGE CONFERENCE  
COP21-CMP11

[1] UNFCCC : United Nations Framework Convention on Climate Change

# UNFCCC<sup>[1]</sup> Paris Agreement

Next step

## Paris Agreement



- **Countries** that ratified the agreement are **required to set a target** for emission reduction or limitation, called a **"nationally determined contribution," by 2020** (the amount will be voluntary.)
- **Governments have to report every 5 years to each other and the public** on how well they are doing to implement their targets and set more ambitious targets. (first evaluation in 2023)

# INDCs (GHG reduction target)

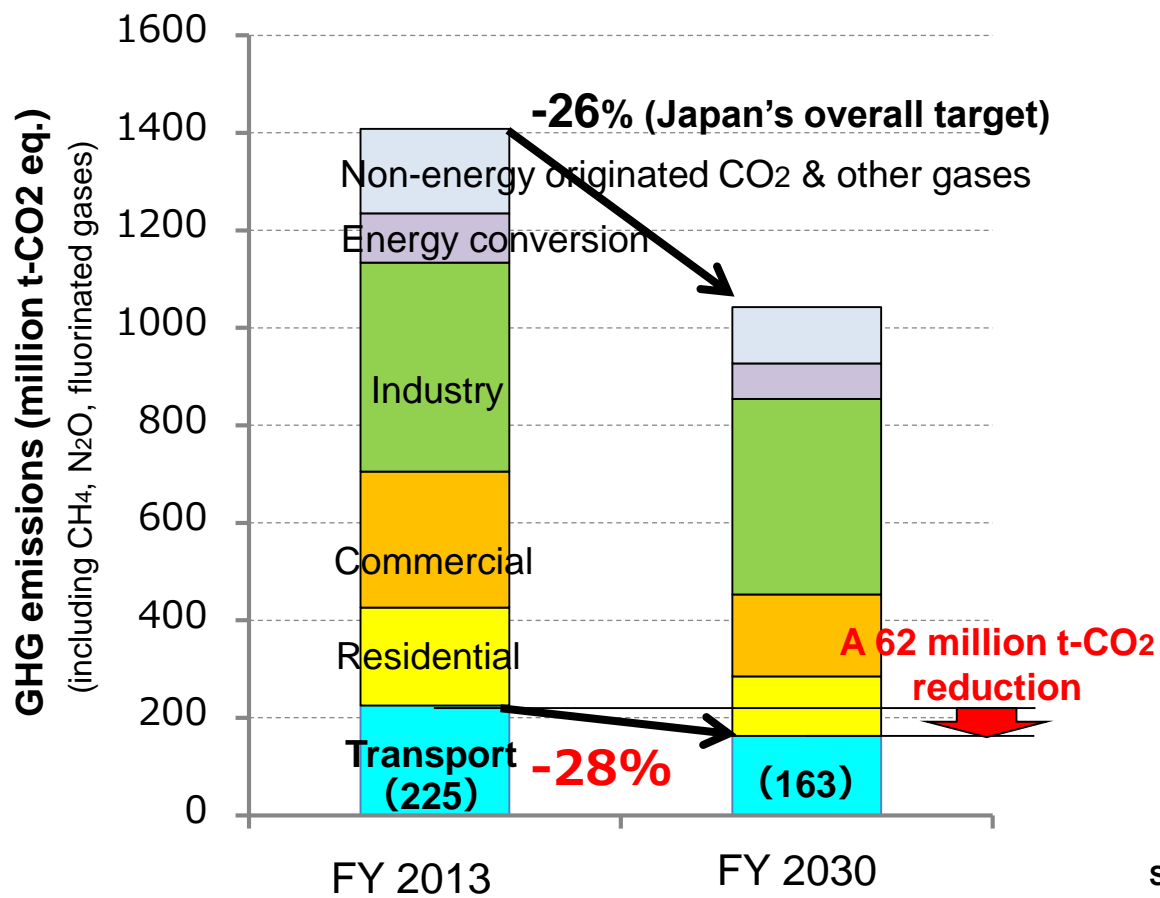
Country	Target	Year
Japan	26% reduction <i>from 2013</i>	2030
EU	40% reduction <i>from 1990</i>	2030
USA	26-28% reduction <i>from 2005</i>	2025
Thailand	20% reduction from BAU (25% with international support)	2030
Indonesia	29% reduction from BAU (41% with international support)	2030
Viet Nam	8% reduction from BAU (25% with international support)	2030
Philippines	70% reduction from BAU with international support	2030
Singapore	36% reduction of emissions Intensity <i>from 2005</i>	2030
Malaysia	45% reduction per GDP <i>from 2005</i>	2030
Cambodia	27% reduction in key sectors**	2030
Brunei, Myanmar, Lao	Mitigation Activities for Energy sector, Forestry, Renewable energy, Transport, etc.	2035 2030
China	60-65% reduction per GDP <i>from 2005</i>	2030
India	33-35% reduction per GDP <i>from 2005</i>	2030

\* BAU: Business As Usual \*\* Industries, Manufacturing, transport, Others "Philippine Manufacturing Summit 2019"  
3 December 2019

# CO<sub>2</sub> reduction target of Japan

# Japan's 2030 GHG Reduction Target & Transport Sector Target

A 28% reduction by 2030 compared to FY 2013 FY is required.



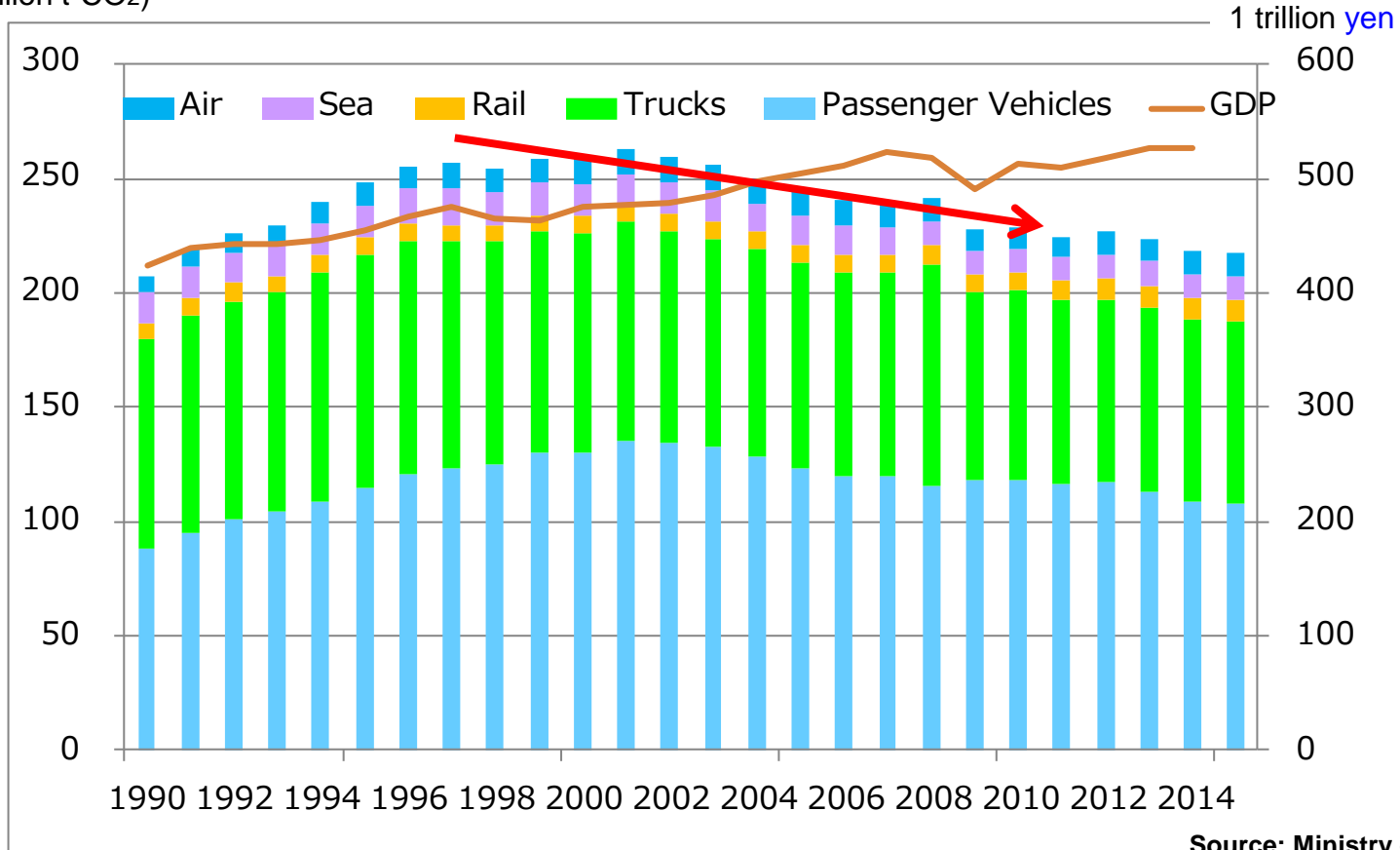
Source: Government of Japan



# Trends in Japan's Transport Sector CO<sub>2</sub>

**CO<sub>2</sub> emissions in Japan's transport sector have declined significantly since the early 2000s.**

(million t-CO<sub>2</sub>)

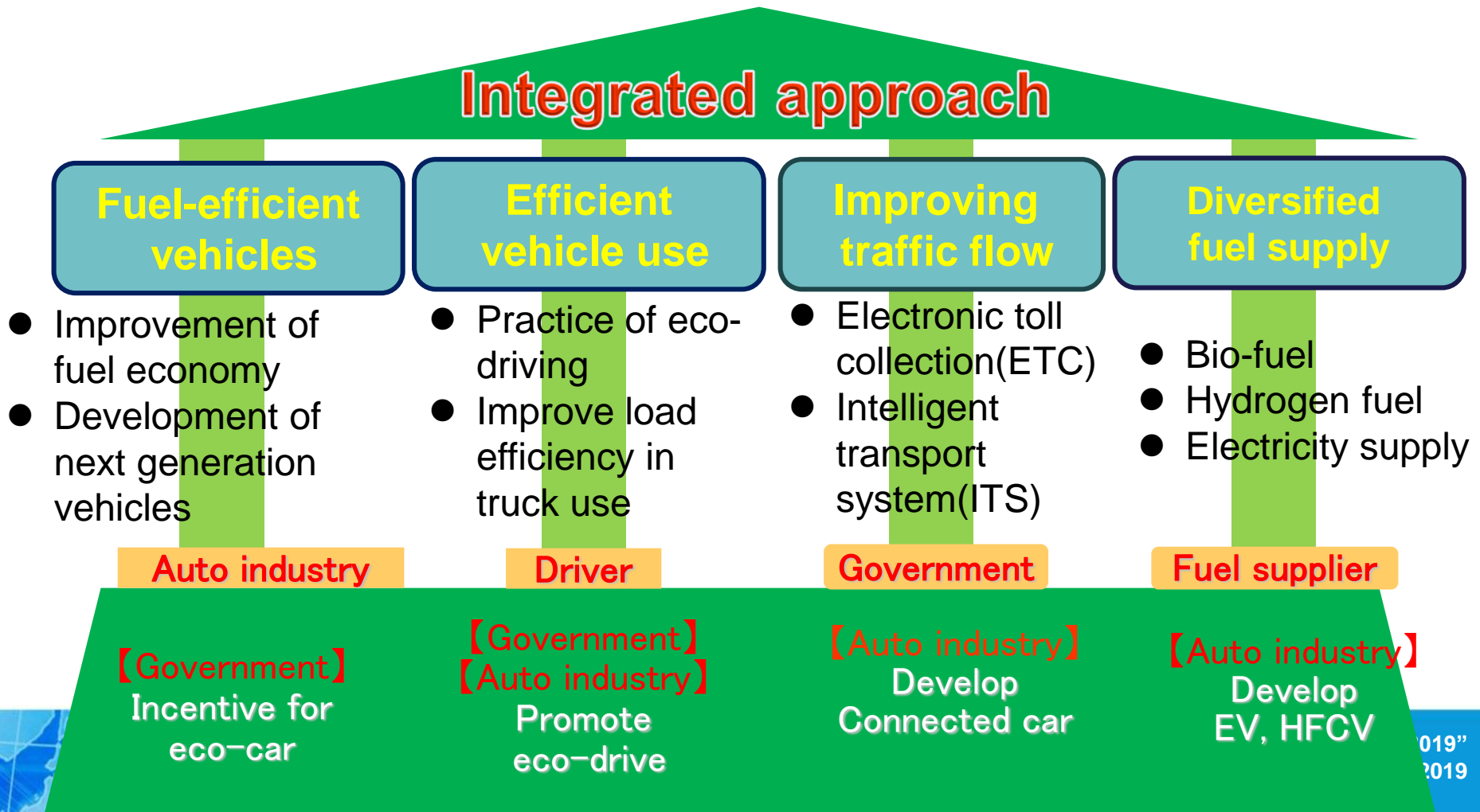


Source: Ministry of the Environment

# Integrated approach to reduce CO<sub>2</sub> emissions

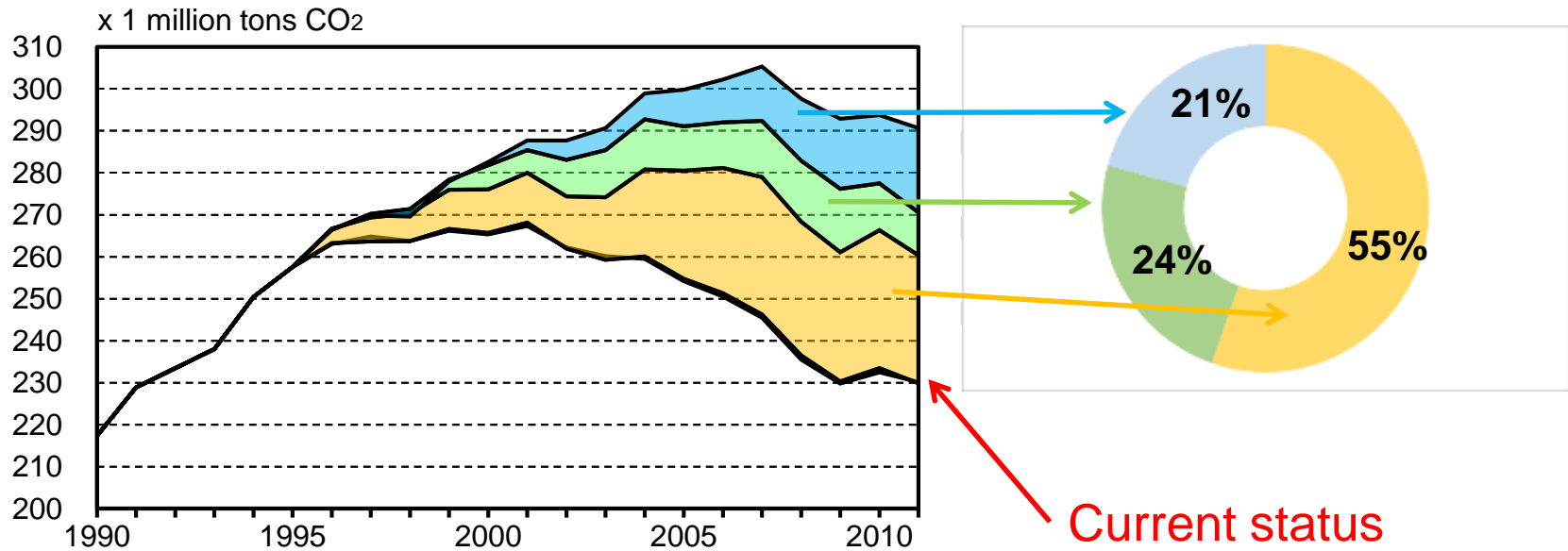
# Integrated approach by four pillar

Integrated approach is important action that is known well in ASEAN too. An effectiveness becomes bigger by participating many stakeholders with their effort. We have implemented this approach for long time on road transport sector.



# Factors Contributing of CO<sub>2</sub> Reduction by Integrated Approach

Main factors to reduce CO<sub>2</sub> in the road transport sector in Japan.



- Passenger cars
  - Improved vehicle fuel efficiency
  - Improved traffic flow (reduced congestion)

- Trucks
  - Improved load efficiency in truck use

- Trucks
  - Eco-driving
  - Improved traffic flow

# 1. Fuel-efficient vehicles

## Conventional Vehicles

- ◆ CVT (transmission)
- ◆ Idling Stop etc.

## Next Generation Vehicles

**Hybrid vehicles**



**Electric vehicles**

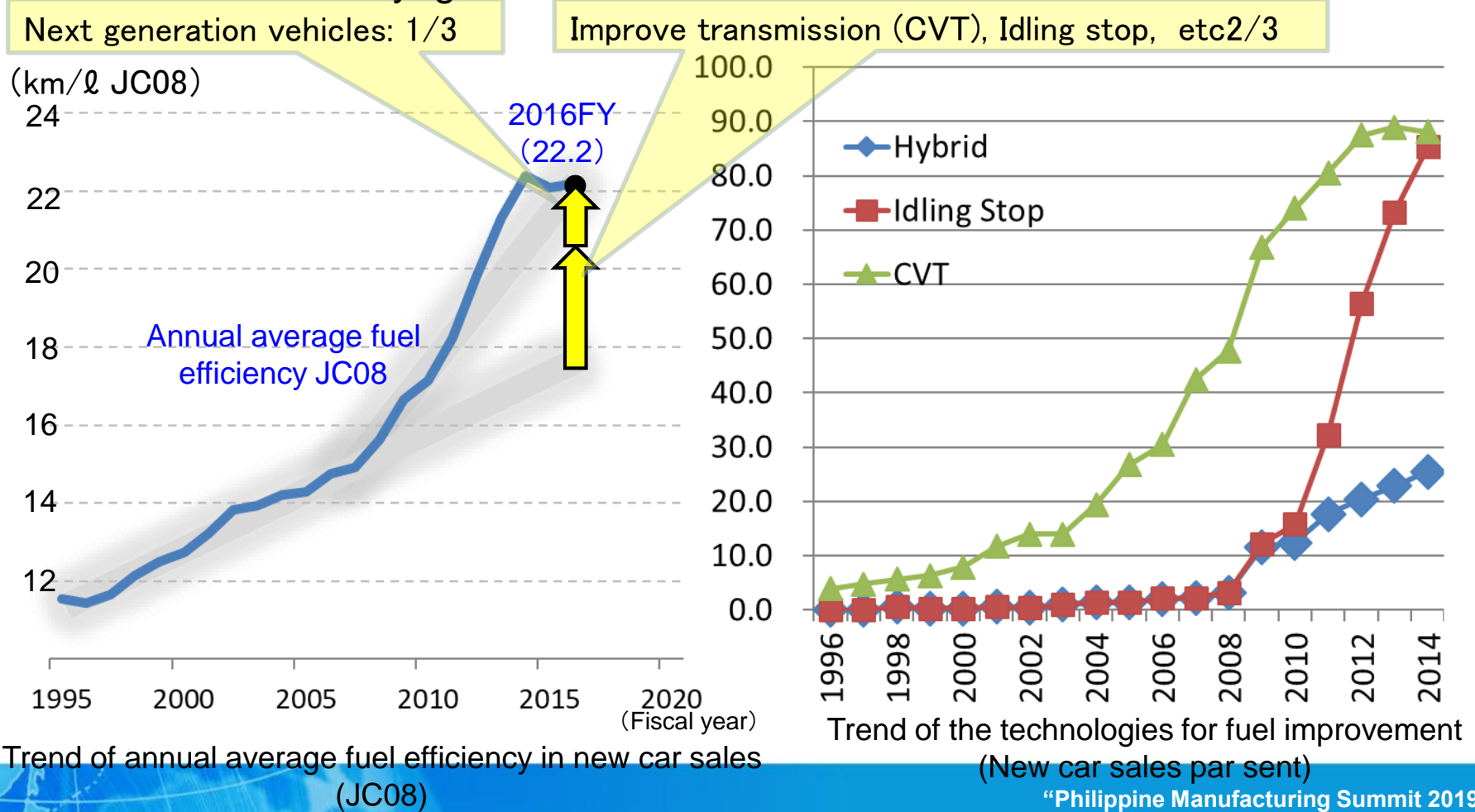


**Fuel-cell vehicles**



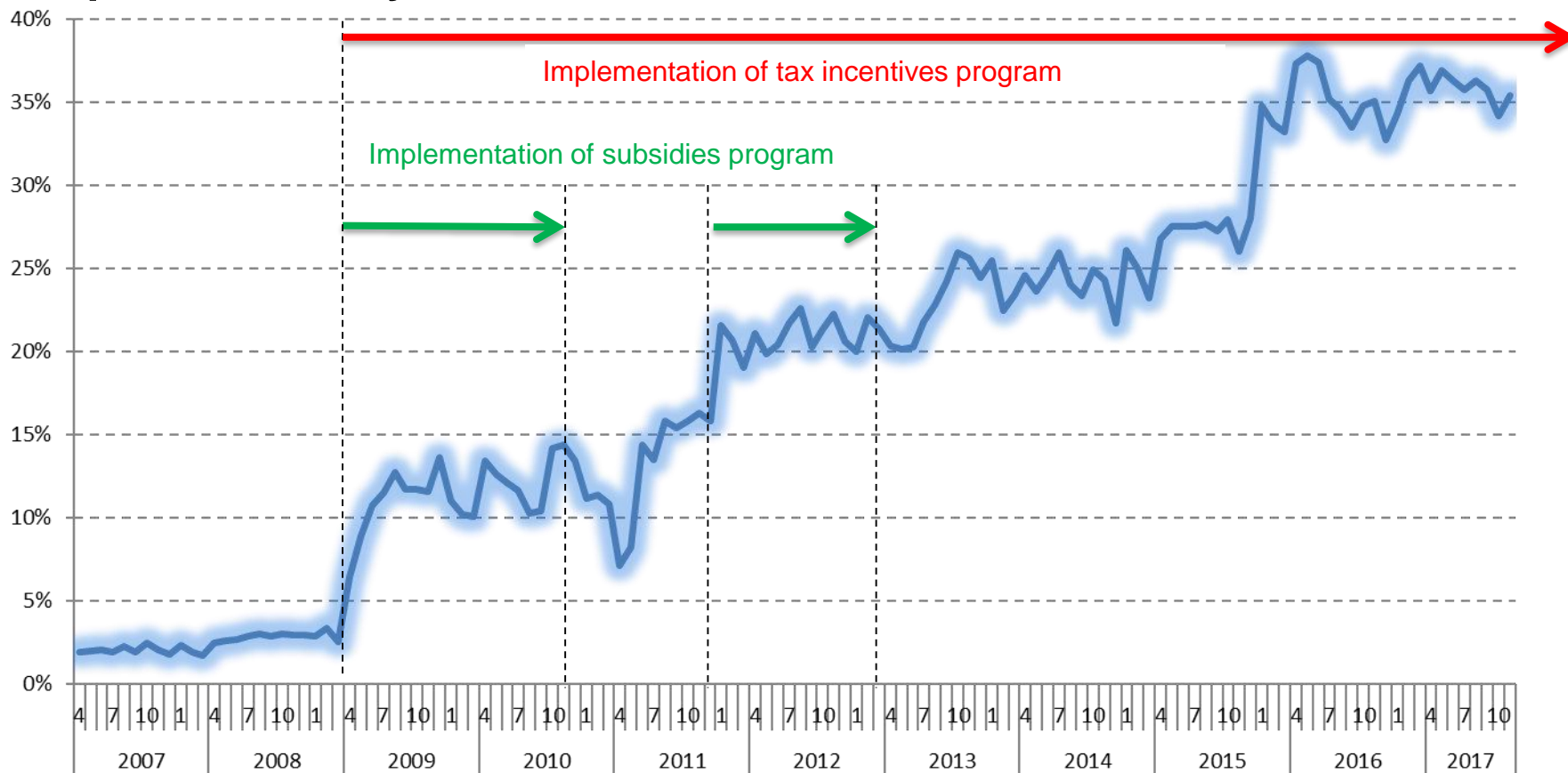
# Improve of the annual average fuel efficiency in Japan (new car sales)

- The fuel efficiency of the new car sales is being improved every year.
- The improve rate was accelerated by the incentive for fuel efficient vehicles that is introduced by government from 2009.



# Trend in the share of Next-Generation Vehicles in New Car Sales

Thanks to the government's incentives and subsidies programs, next-generation vehicles have held a 35% share of the new car market in Japan in recent years. Almost all those vehicles are HEVs.



Source: JAMA

“Philippine Manufacturing Summit 2019”  
3 December 2019



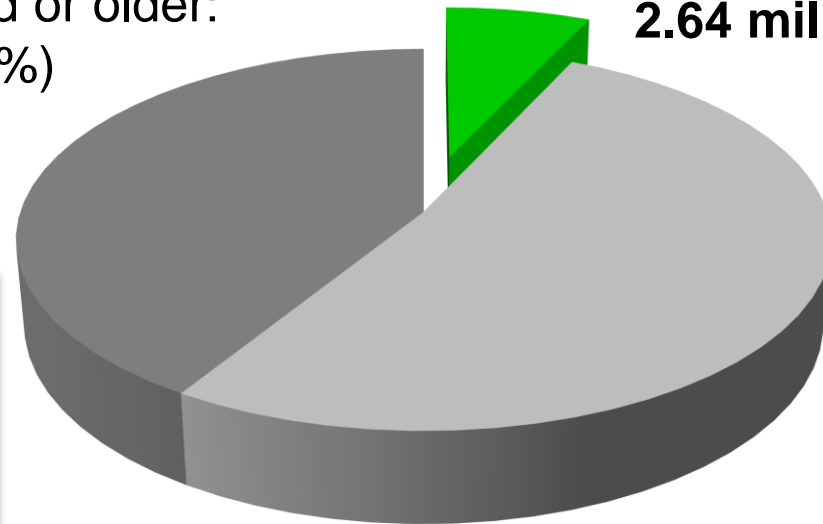
# Fleet Renewal

The fleet turnover rate (i.e., replacement with new cars) stands at less than 10% of the total fleet.

Government support (through tax incentives and vehicle purchasing subsidies) is necessary to promote, in particular, increased purchases of next-generation vehicles (EVs, PHVs, etc.).

Cars 10 years old or older:  
15.88 million (41%)

Newly registered cars:  
2.64 million (7%)



Cars 2-9 years old:  
20.05 million (52%)

Total no. of in-use  
passenger cars  
in Japan:  
38.57 million

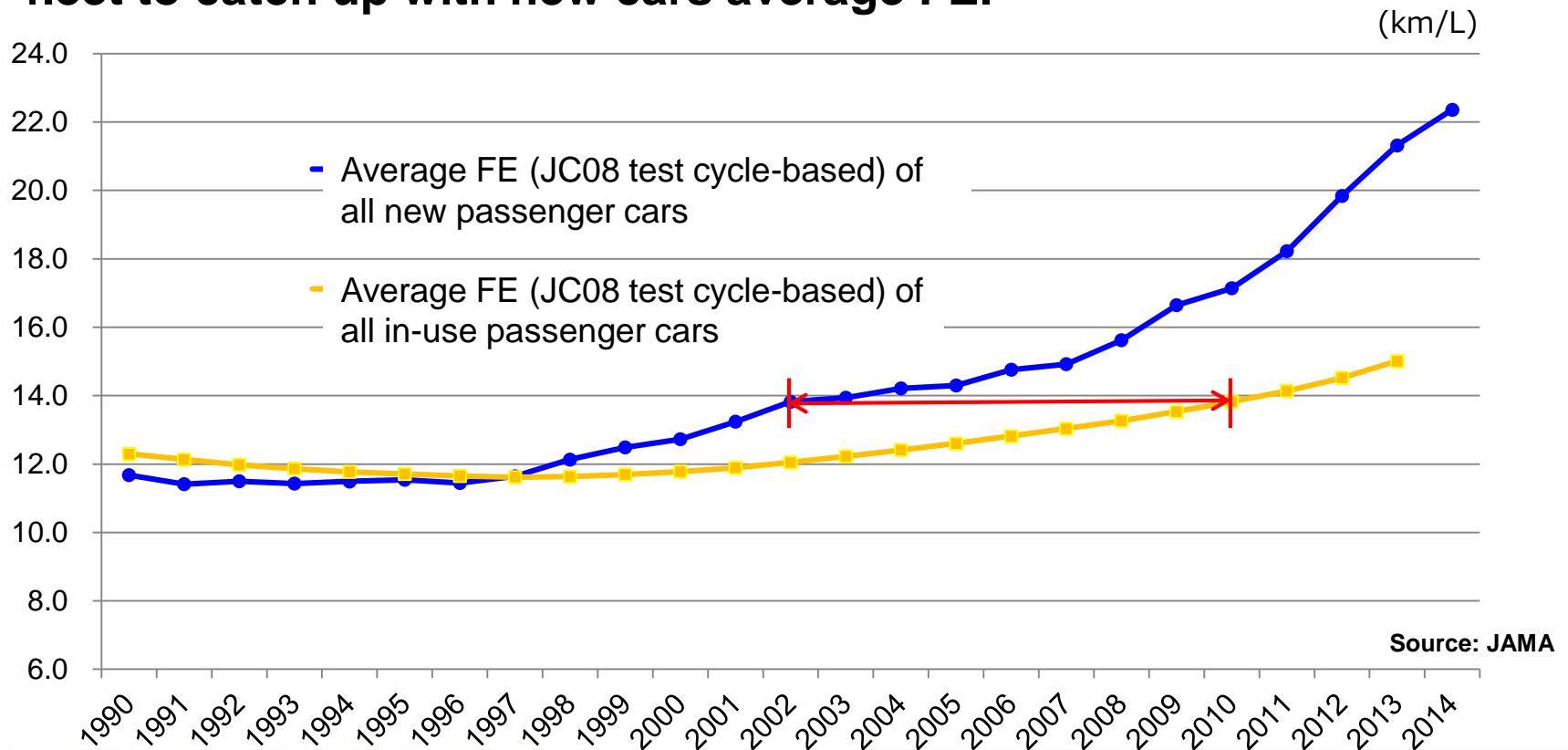
Note: 2015 data; mini passenger cars not included.

Source:  
Automobile Inspection & Registration Information Association,  
with data compiled by JAMA

# Increasing Vehicle Fuel Efficiency

**Average certified vehicle fuel efficiency is increasing yearly as a result of the efforts of the automobile manufacturers.**

**However, it takes about 8 years for the average FE of the total in-use fleet to catch up with new cars average FE.**



## 2. Efficient vehicle use

# Adopting Ecodriving: Japan's Green Eco Project (for Trucks)



Managing Better through Environmental CSR

## Green Eco Project

~What we can do for our future~

### paper-and-pencil project

Drivers go through training to improve their ecodriving skills.



Drivers record daily travel distances and refueling amounts in their monthly reports.

Drivers submit their monthly reports with their comments to an ecodriving manager.

The ecodriving manager checks and comments on all drivers' reports.

3,500 Companies are members of TTA



Currently **639** companies with **18,971** trucks

Source: Tokyo Trucking Association

# Adopting Ecodriving: Japan's Green Eco Project (for Trucks)

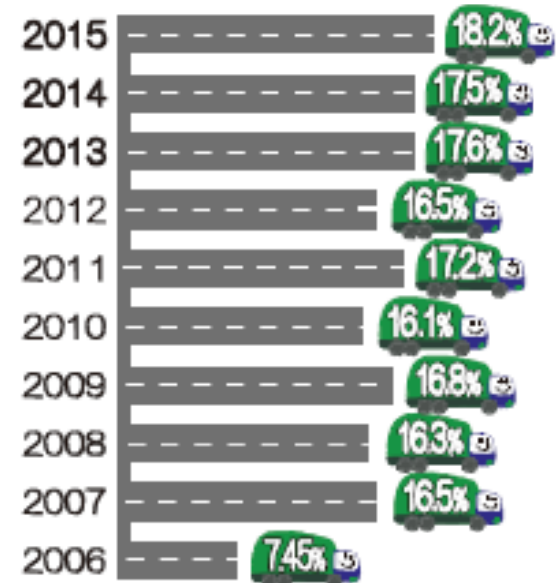
## Result of Ecodriving

### ◆ Improve fuel economy

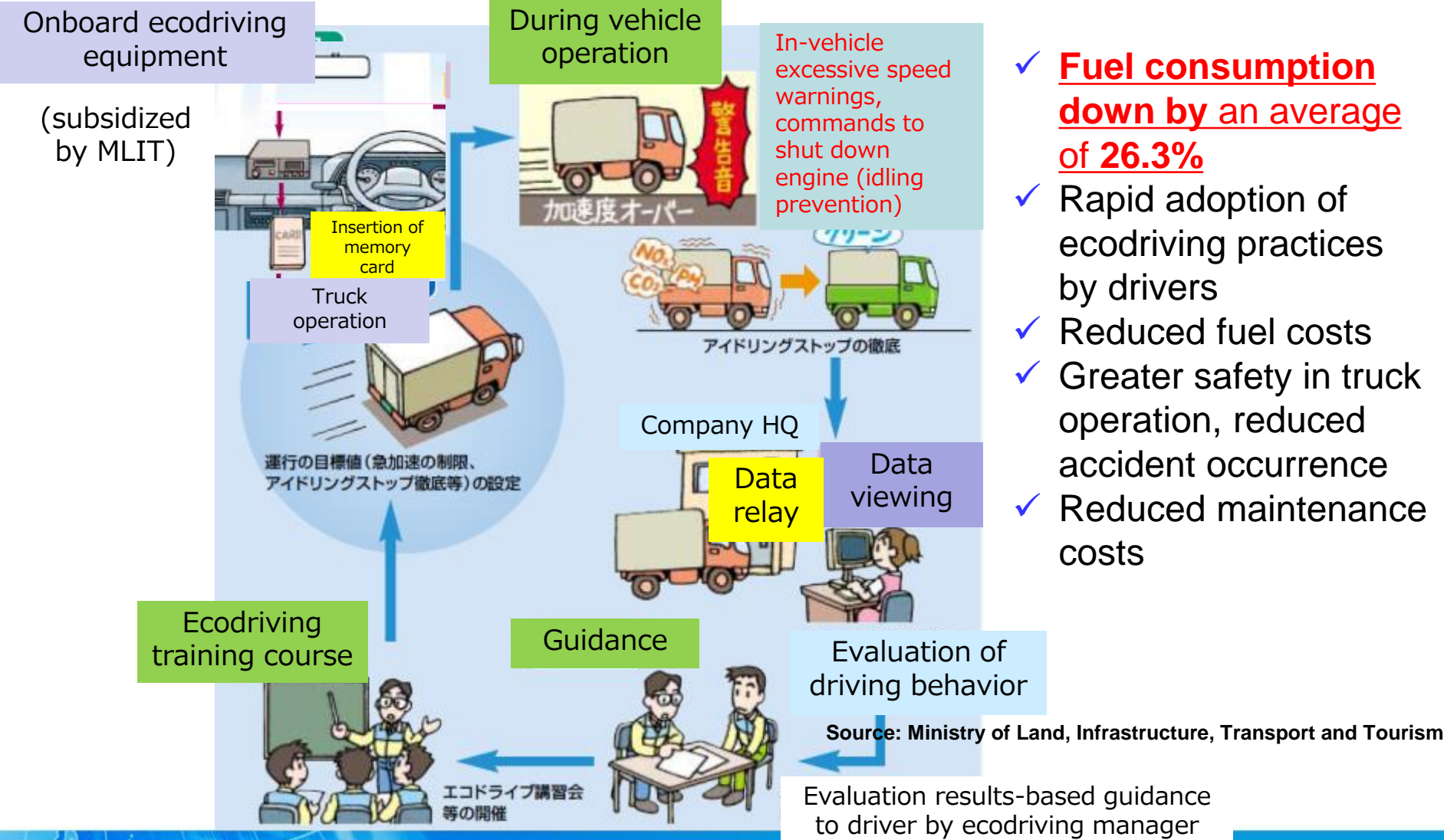
- Average fuel economy during 10 years is **16%** improve.
- Annual result is improving. This is a PDCA effect.

### ◆ Reduce traffic accidents

- Average traffic accidents by joining tracks during 10 years is **29%** reduce. Compare before/after this activity.

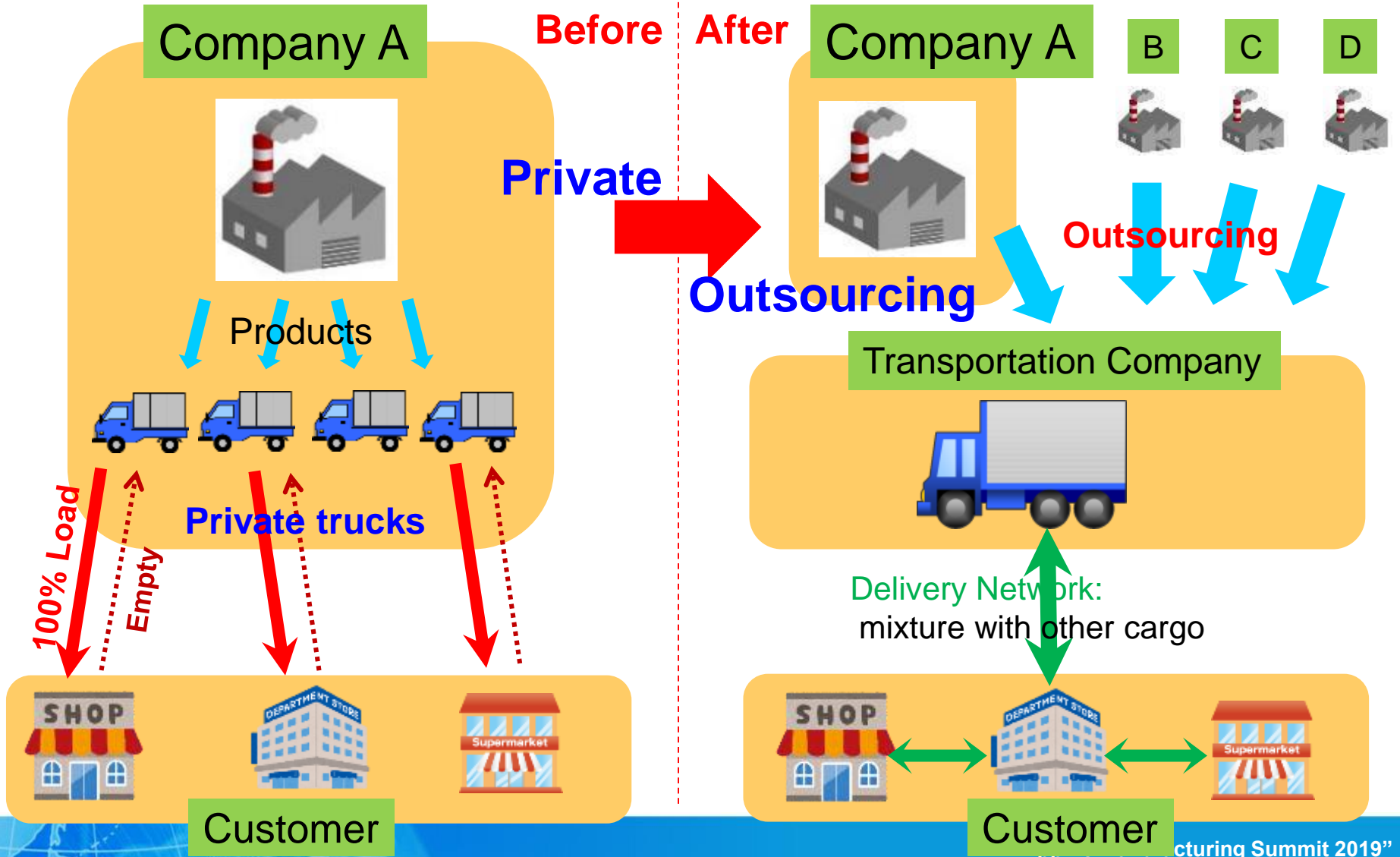


# Benefits of Implementing (Truck) Ecodriving Management Systems



- ✓ **Fuel consumption down by an average of 26.3%**
- ✓ Rapid adoption of ecodriving practices by drivers
- ✓ Reduced fuel costs
- ✓ Greater safety in truck operation, reduced accident occurrence
- ✓ Reduced maintenance costs

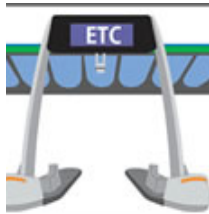
# Change in truck use from private to business



# 3. Improving traffic flow



# Electronic Toll Collection in Japan

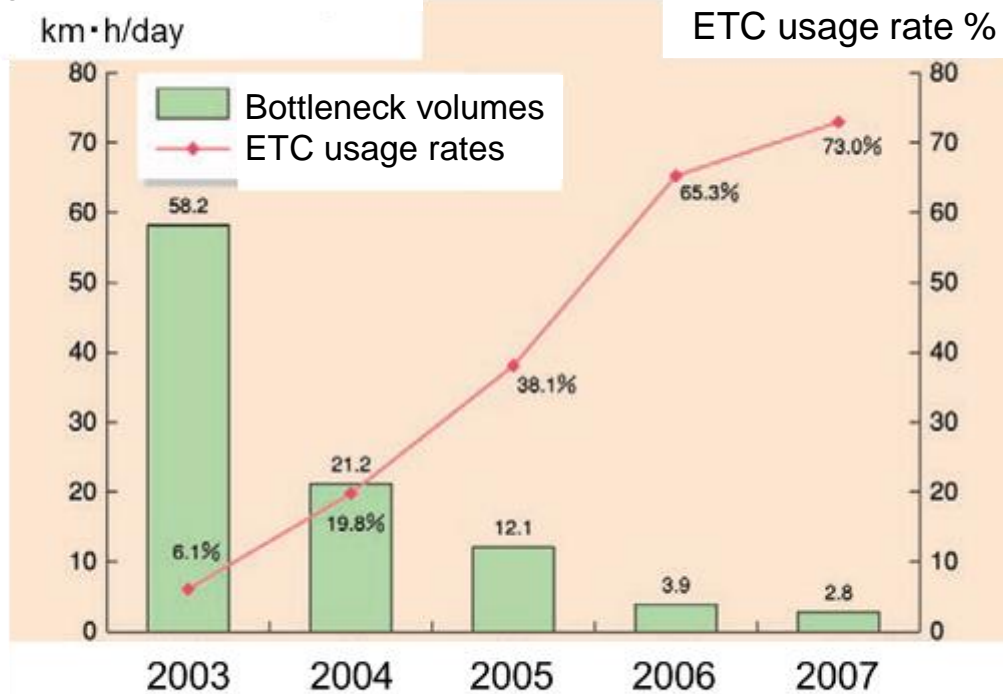


Electronic Toll Collection (ETC)



**ETC gates:  
Approx. 1,000 sites**

Tollgate bottleneck volumes



**Before ETC installation**



**After ETC installation**



Source: Ministry Land, Infrastructure, Transport and Tourism

# Intelligent Transport Systems (ITS)



Vehicle sensors,  
infrared beacons:  
Approx. 34,000 sites

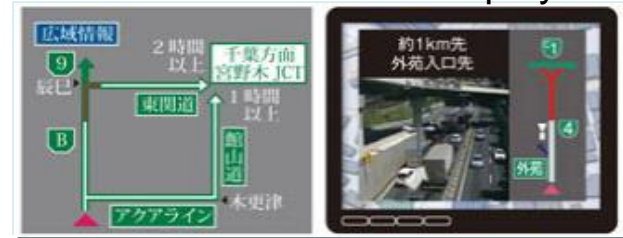


— Roads equipped with beacons

Real-time traffic information communication to drivers helps reduce road congestion.

ITS provide route guidance and real-time road traffic information.

Optimal route guidance to drivers via in-vehicle screen displays



Starting point

Congestion

Alternate route

Accident

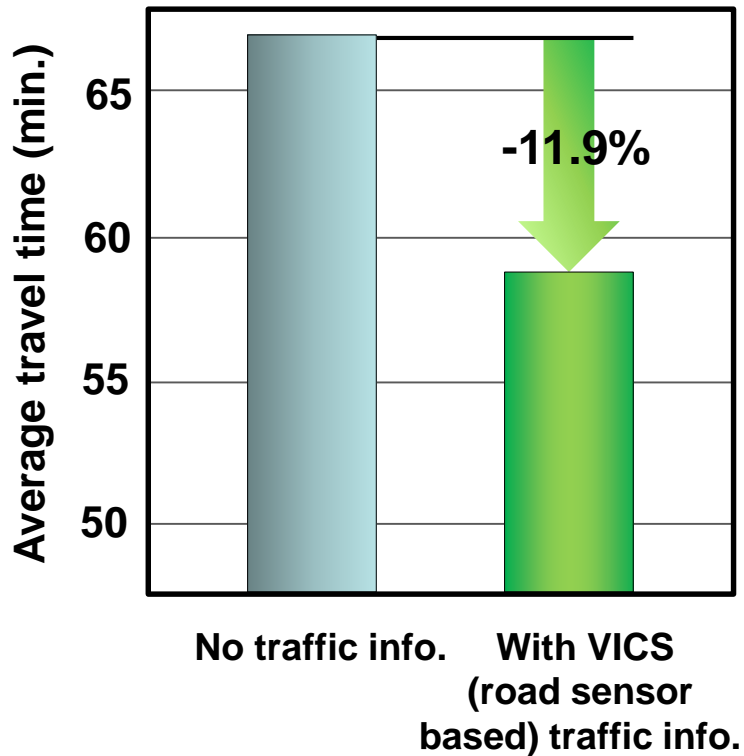
Destination

Source: Ministry of Land, Infrastructure, Transport and Tourism

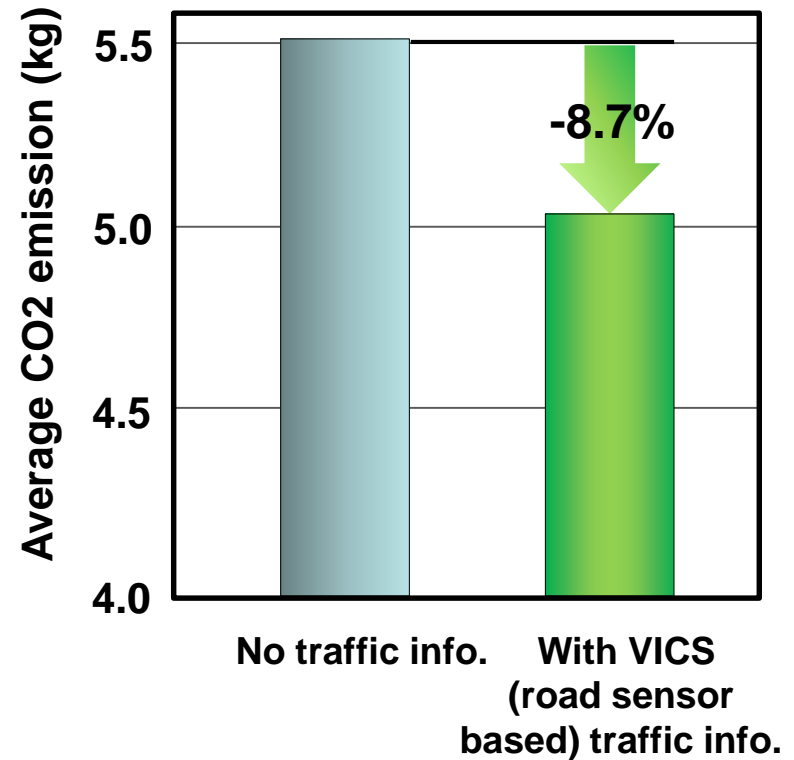
# Effect of ITS (case of Japan)

ITS contributes 12% time reduction, and 9% CO2 reduction.

### Time reduction



### CO2 reduction



# **4. Diversified fuel supply and next generation vehicles**

# Diversified fuel supply : Biofuels

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**JAMA has been in support of the use of bio-fuels complying with appropriate sustainability criteria as part of an integrated approach to the reduction of CO2 emissions.**

## **Conditions & Requirements for Ethanol-Blended Gasoline Fuel Use**

- **Maximum Ethanol concentration: Must not exceed 10%**

Ethanol-blended gasoline of more than 10% ethanol content is to be introduced, clear labeling of specific ethanol content at the fueling pumps is required.

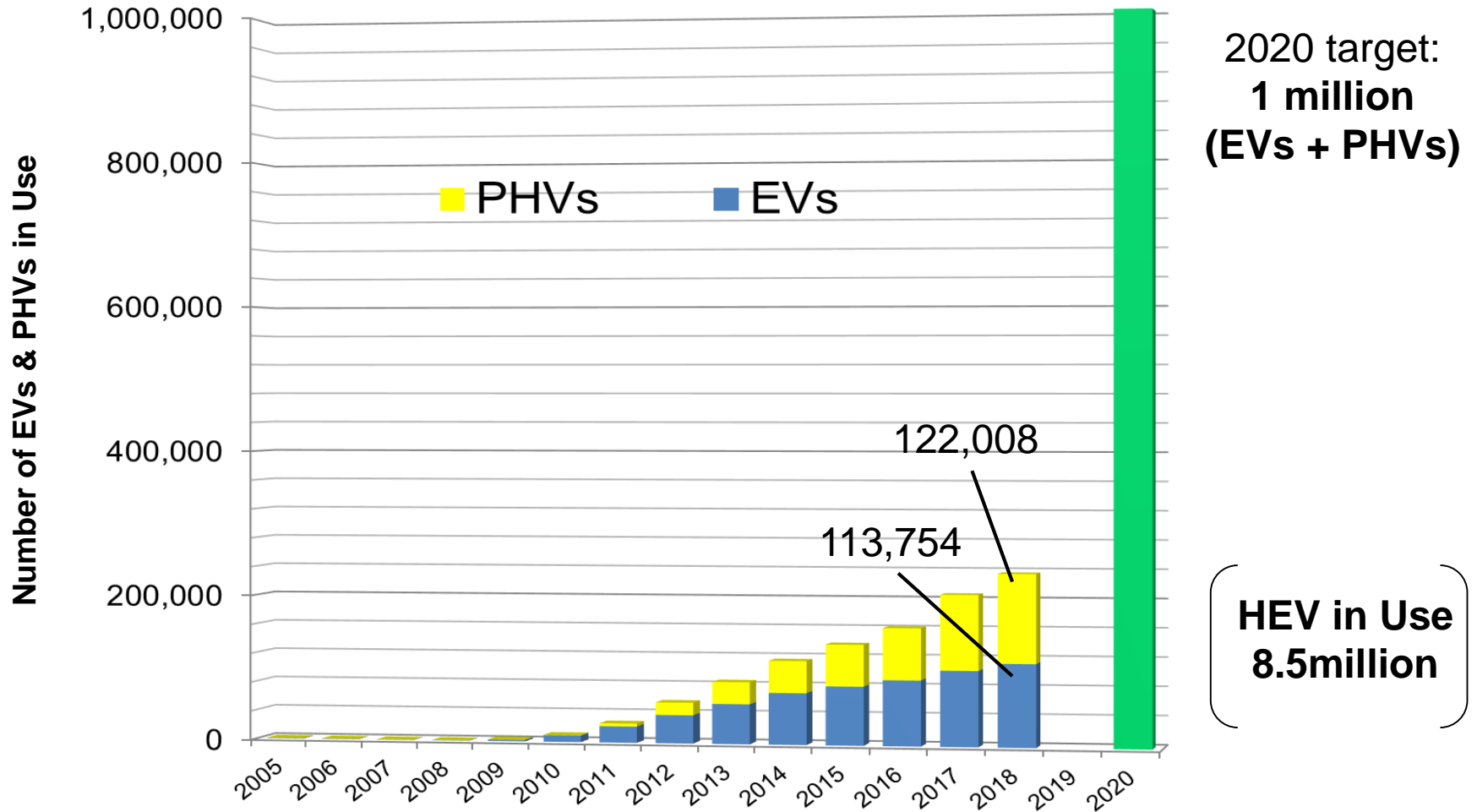
## Conditions & Requirements for **FAME-Blended Diesel Fuel Use**

- JAMA endorses the market supply of conventional diesel fuel blended with **a maximum of 5% FAME (B5)**, provided that specific quality requirements are met prior to its delivery at the pump.

In case of High-Ratio FAME-Blended Diesel Fuel Use (>5% FAME), conditions of use are

- Climatic conditions : Warm or hot climates
- Feedstock: PME (palm methyl ester) only
- Maximum FAME concentration: Must not exceed 20%
- Exhaust emission standards compliance level applicability: Vehicles complying with up to Euro 4/IV standards of R83/R49 in the UN regulations.

# Japan's Target for EV & PHV Fleet Share (in Units)

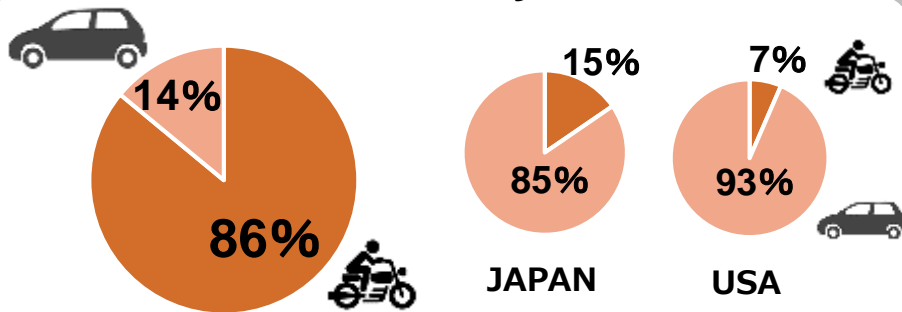


Source: Ministry of Economy, Trade and Industry

# Environment Surrounding Motorcycles (Philippines)



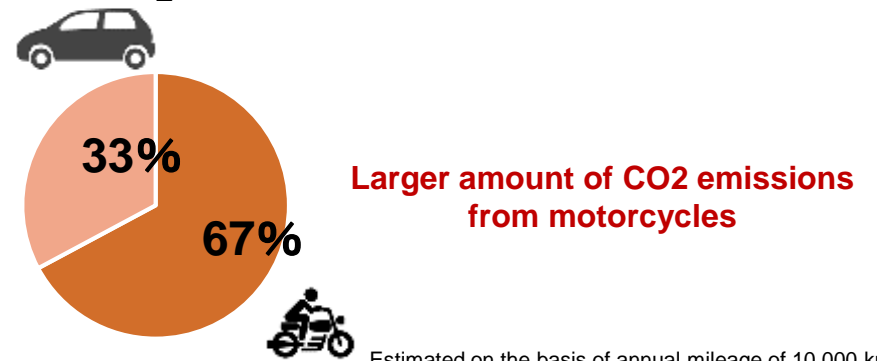
### Automobile/motorcycle UIO ratio



**Overwhelming motorcycle ratio**

Data source: JAMA, World Statistic for 2019 by the Statistics Bureau of Japan  
Passenger cars only for automobiles

### CO<sub>2</sub> emission ratio (rough estimate)



**Larger amount of CO<sub>2</sub> emissions from motorcycles**

Estimated on the basis of annual mileage of 10,000 km and fuel efficiency of top-selling models

**To counteract global warming, actions for motorcycles are important.**



# EV-BIKE Demonstration Experiments (Asia)

JAMA  
EV-BIKE Sample

 SUZUKI



 YAMAHA



Sales started  
in Taiwan  
in August 2019

 HONDA



INDONESIA



Started in August 2019



PHILIPPINES



Started in February 2019



EV demonstration experiments are in progress in various parts of Asia.

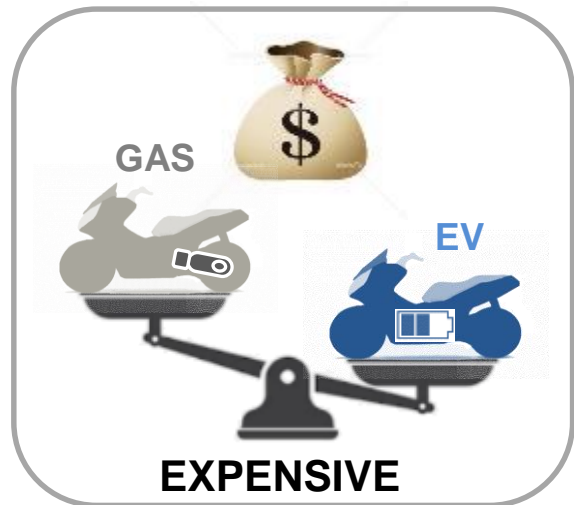
# Conclusions

- Implementation of **an integrated approach is the most effective way to reduce CO2 emissions** in road transport because of its adaptability to all countries/regions.
  - Integrated approach by four pillar -
    1. Fuel-efficient vehicles
    2. Efficient vehicle use
    3. Improving traffic flow
    4. Diversified fuel supply
  
- Next generation vehicles (HEV and EV) have huge impact to reduce CO2 emissions for mid- to long-term. As cost of next generation vehicles are relatively high, we believe the Government policy support including tax incentive/subsidy are indispensable factors.

# APPENDIX

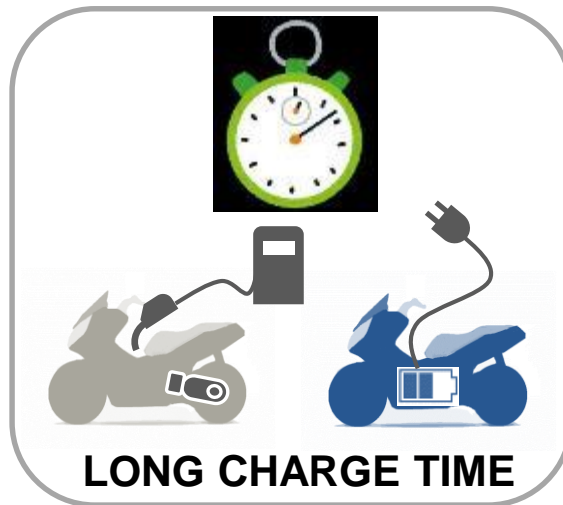
## PHILIPPINES

# Proposal for Resolving Issues for EV-BIKE



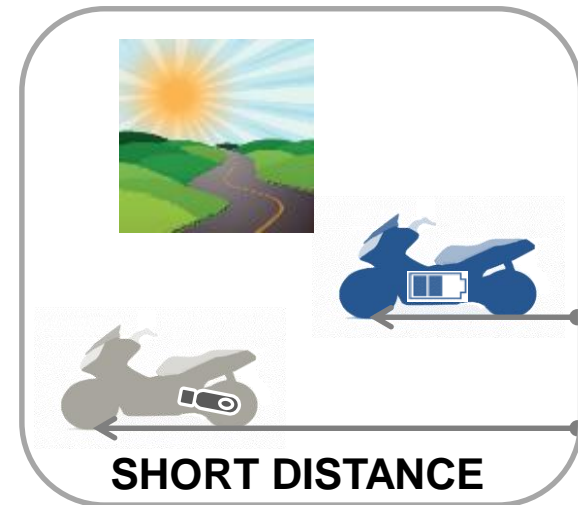
No burden on users for chargers  
Leased batteries

**AFFORDABLE**



No waiting time with  
battery exchange

**EASY/SHORT TIME**



Long-distance ride becomes  
possible through the battery  
exchange

**LONG DISTANCE**

**Issues for EV solved by detachable batteries**



**Demonstration experiments to be implemented to resolve issues for shift to EV**

# Outline of Demonstration Experiments: Philippines

## Romblon Island

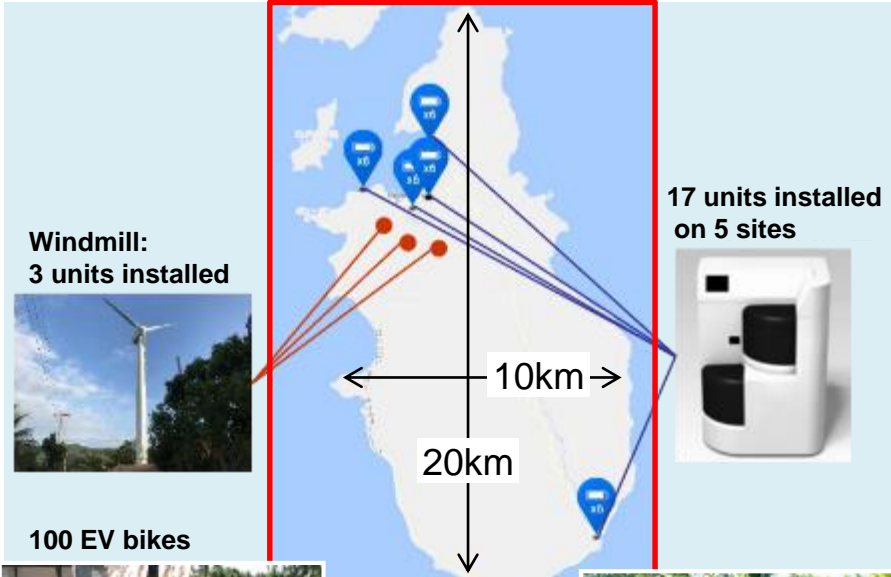
### Implementation structure

Representative company:

**KOMAIHALTEC Inc.**

Partner company: **Honda Motor Co., Ltd.**

Local partner: **Romblon Electric Cooperative (ROMELCO)**



Windmill:  
3 units installed



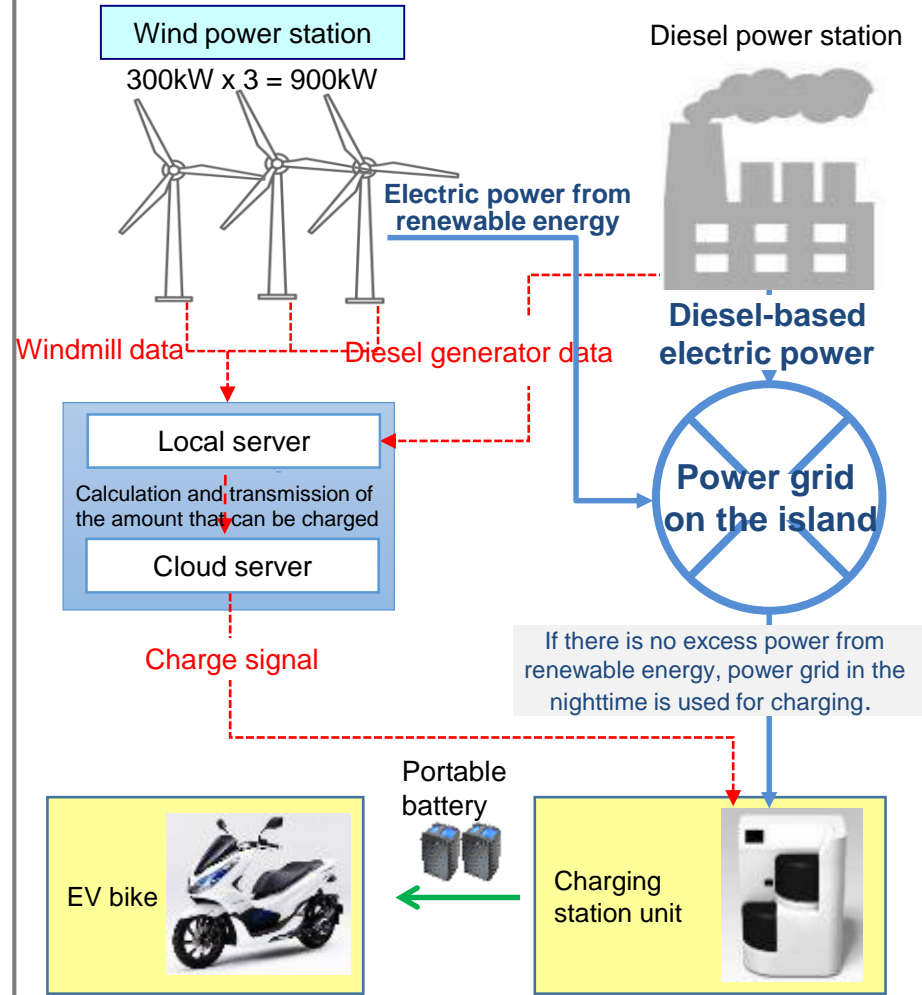
100 EV bikes



17 units installed  
on 5 sites



## Utilization of excess electric power generated by wind power



Wind power station

300kW x 3 = 900kW

Diesel power station

Electric power from  
renewable energy

Diesel-based  
electric power

Windmill data

Diesel generator data

Local server

Calculation and transmission of  
the amount that can be charged

Cloud server

Power grid  
on the island

Charge signal

If there is no excess power from  
renewable energy, power grid in the  
nighttime is used for charging.

Portable  
battery

EV bike

Charging  
station unit

With excess power from 3 windmills, up to  
2,400 EV bikes can run.

Study on eco-friendly business with the use of excess electric power

# User Evaluation and Future Issues

## High user evaluation

- ◆ Not worried about driving range: 67 out of 70 people
- ◆ Not dissatisfied about service cost: 61 out of 70 people
- ◆ Not dissatisfied about battery exchange: 50 out of 70 people  
Among the dissatisfied users:  
Dissatisfied about initial problems of charging system: 8 people  
Dissatisfied about heavy batteries: 3 people

\* Extracted from data of demonstration started in February 2019 in the Philippines



## Still many issues for popularization

- ◆ Business issues for popularization
  - Further reduction of **manufacturing cost** of EV bikes and batteries
  - Minimization of **operating cost** required for battery exchange
  - Preparation of **business environment** including system, laws and regulations toward the reduction of country risk
  - Burden of an enormous **investment** in charging **infrastructure**
- ◆ Stable supply of clean electric power
  - Expansion of stable supply from a limited region to the entire country is a big issue.

## Proposals for the future

- ◆ Preparation of related laws and regulations
  - Preparation of laws and regulations related to EV bikes and detachable batteries (vehicle category, Road Traffic Law, etc.)
- ◆ Promotion of normalization/standardization
  - Normalization for safety, etc.
  - Standardization of interface between battery and apparatus, etc.
- ◆ Support for installation of charging infrastructure
  - Provision of sites, etc.

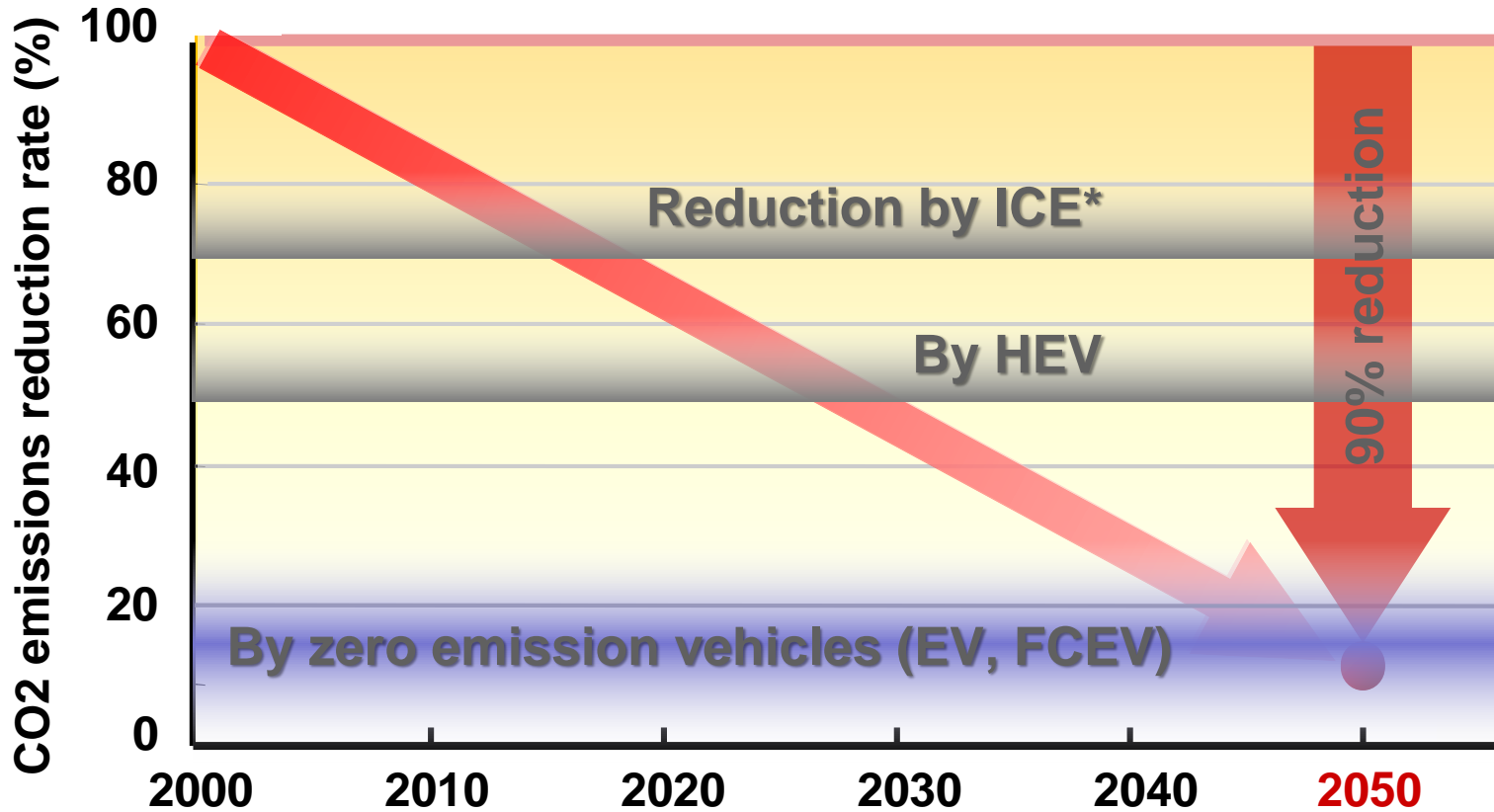
Consideration will continue on many issues.



# CO2 reduction by EV and FCEV

Zero emission vehicles are a must.

## CO2 emissions by new vehicles

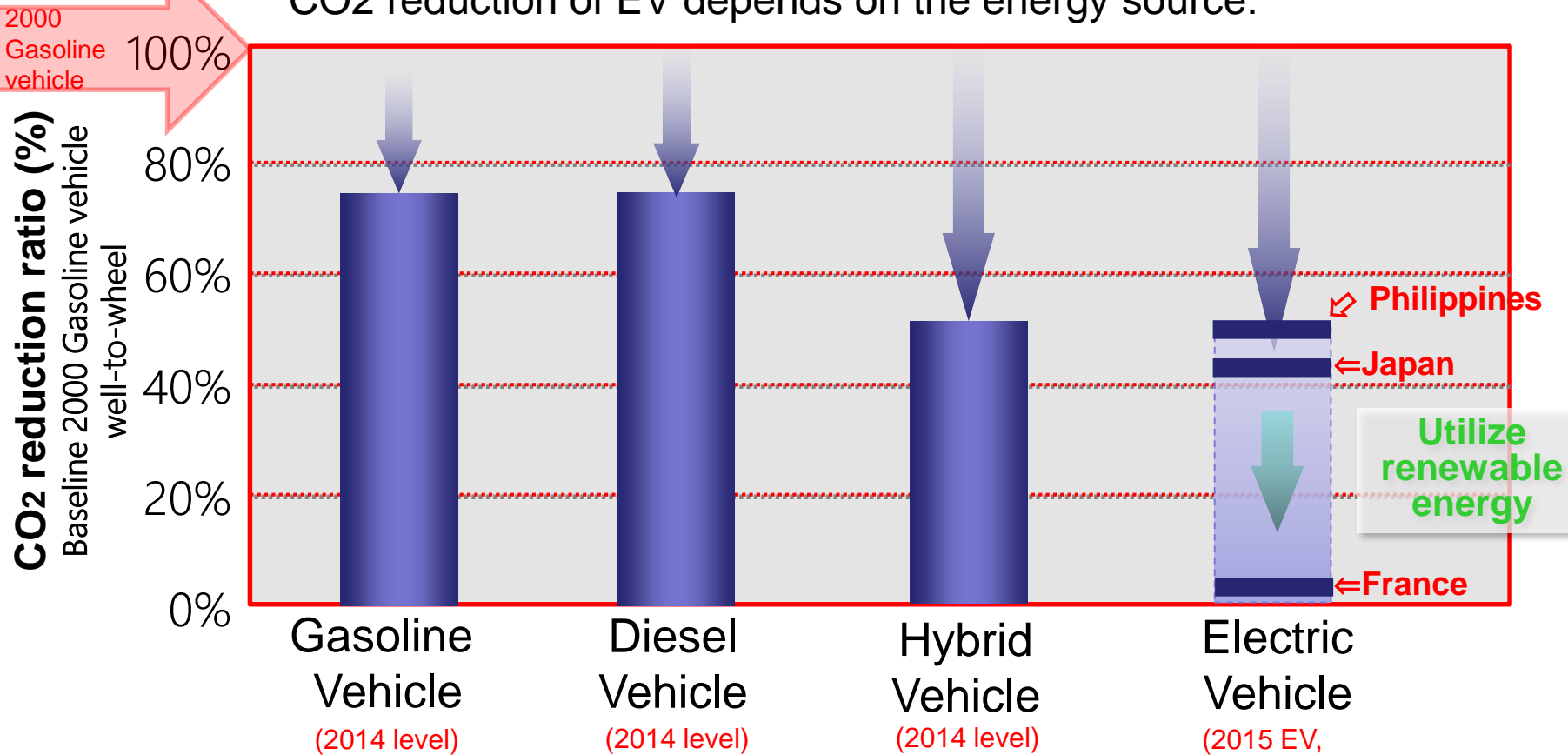


\*ICE: Internal Combustion Engine

# Next-generation vehicles

## Well-to-wheel CO2 emissions by vehicle type

HEV and EV have high potential to reduce CO2 emissions.  
CO2 reduction of EV depends on the energy source.



# Impact of Incentives on Next-Generation Vehicle Sales in Japan

Comparison table of Incentives for Fuel-Efficient and Low-Emission Vehicles between 2008-2009

## 2008 (partial listing)

	Fuel Efficiency Criteria and Emissions Performance Criteria	Incentive	
		Acquisition Tax 5% of purchase price	Tonnage Tax ¥6,300/ 0.5t/Year
Passenger cars			
Low emission Vehicles	Hybrid	36% reduction	No incentive
	Electric Natural gas	54% reduction	
Passenger Cars	Compliant +25% with 2005 fuel efficiency standards	¥15,000 reduction	No incentive
	Compliant +15% with 2005 fuel efficiency standards	¥7,500 reduction	No incentive

## 2009 (partial listing)

	Fuel Efficiency Criteria and Emissions Performance Criteria	Incentive		
		Acquisition Tax 5% of purchase price	Tonnage Tax ¥6,300/ 0.5t/Year	Eco-car subsidy
Passenger cars				
Next-Generation Vehicles	Electric Fuel-cell Hybrid Plug-in hybrid Clean diesel Natural gas	Exempt	Exempt	¥100,00/ Vehicle Or ¥250,000/ Vehicle With scrap vehicle which 13 years old or more
Passenger Cars	Compliant +25% with 2005 fuel efficiency standards	75% reduction	75% reduction	
	Compliant +15% with 2005 fuel efficiency standards	50% reduction	50% reduction	

# Impact of Incentives on Next-Generation Vehicle Sales in Japan

## Example (2009)

- Popular passenger car 1.5t>GVW(without incentives)

Car price	1,500,000yen
Acquisition tax	67,500yen
Tonnage tax	56,700yen
<hr/>	
Total	<b>1,624,200yen</b>

- Hybrid passenger car (with incentives)      Hybrid passenger car (without incentives)

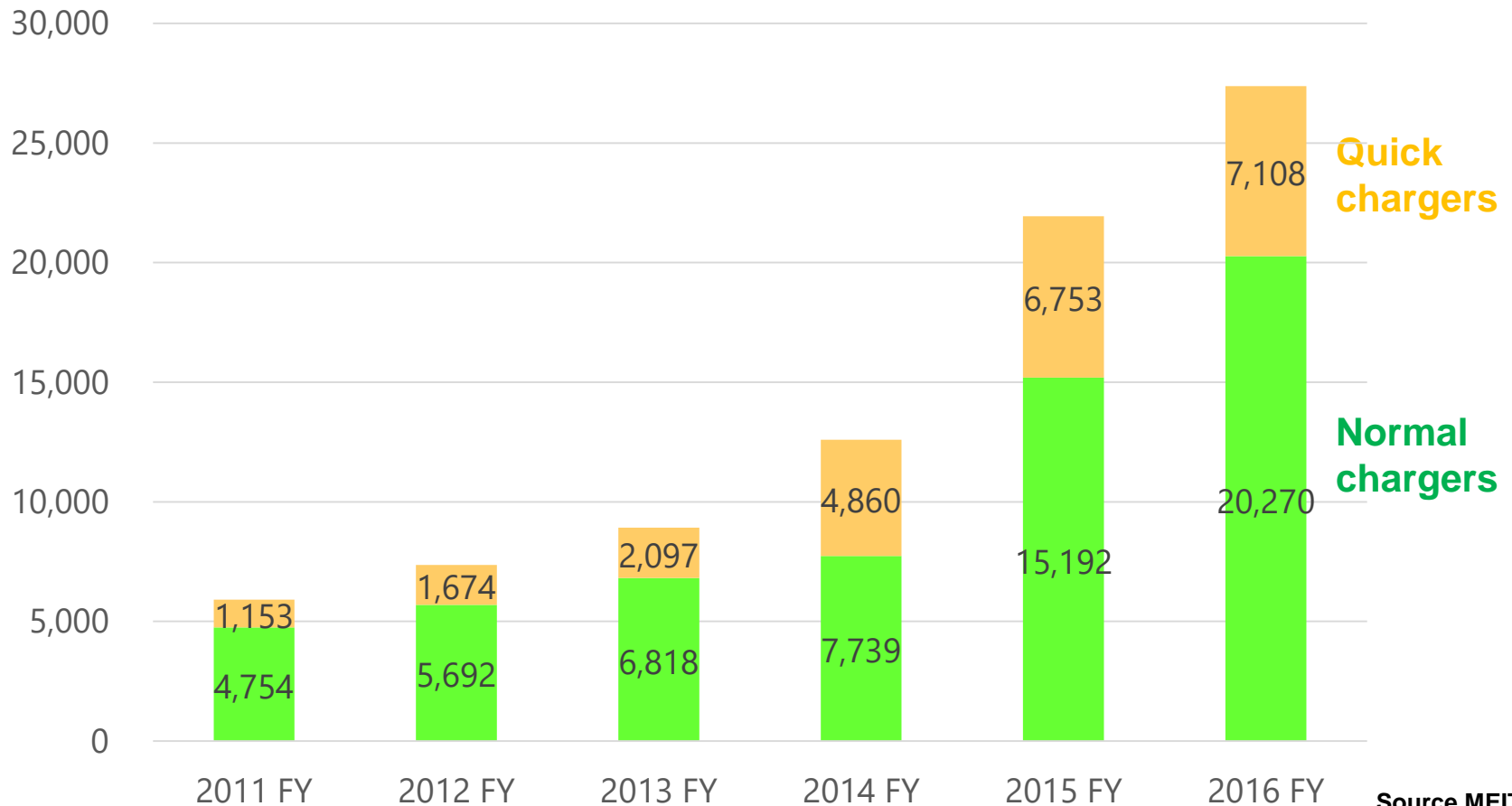
Car price	2,000,000yen
Acquisition tax	0yen
Tonnage tax	0yen
Subsidy	△250,000yen
<hr/>	
Total	<b>1,750,000yen</b>

Car price	2,000,000yen
Acquisition tax	90,000yen
Tonnage tax	56,700yen
Subsidy	0yen
<hr/>	
Total	<b>2,146,700yen</b>

Assuming scrapping a vehicle which is over 13 years old

# Current Status of Charging Access in Japan

As of 2016FY, the total number of public charging units (quick chargers and normal chargers) in Japan was 27,378.



Source MEIT