Reducing CO2 Emissions in the Global Road Transport Sector

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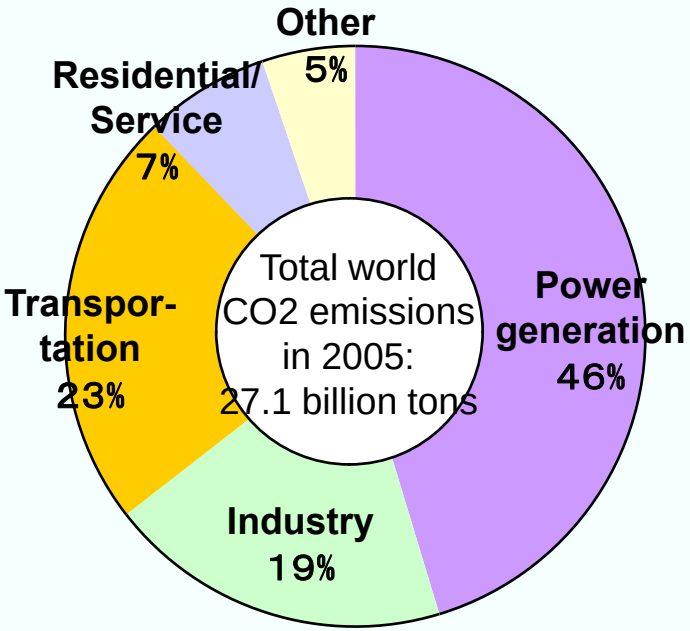
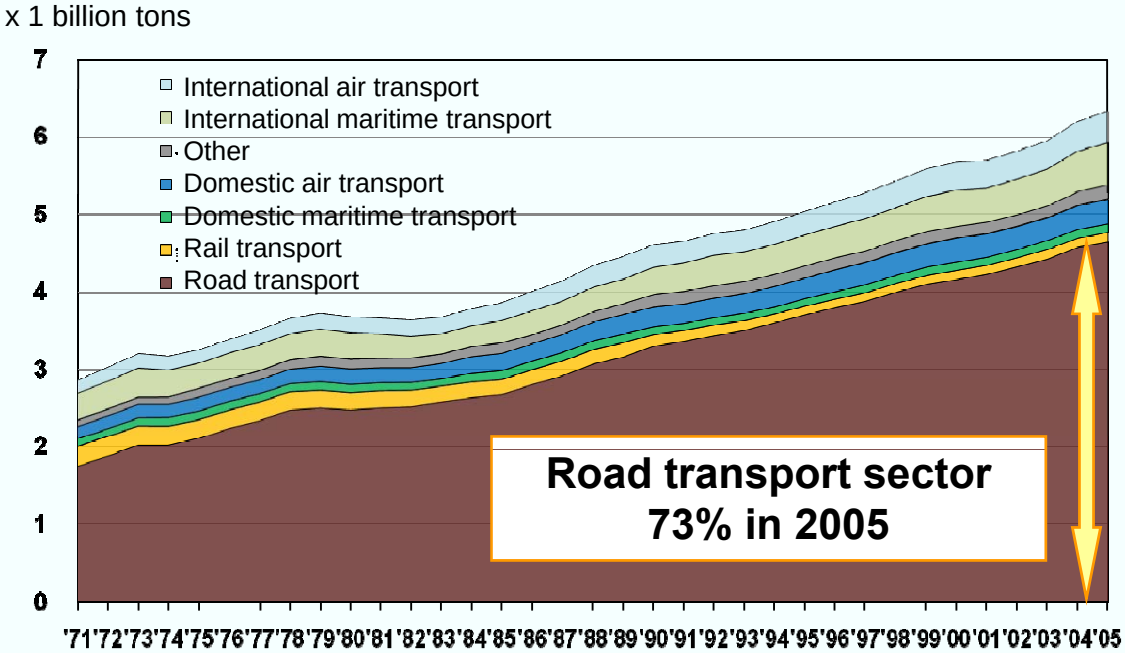
1. CO2 Emission in the Global Transport Sector

World CO2 Emissions by Sector



Source: World Energy Outlook 2007,
International Energy Agency

CO2 Emissions in the Global Transport Sector



Source: CO2 Emissions from Fuel Combustion 1971-2005,
International Energy Agency (2007)

2. Calculating CO2 Emission Volumes in the Road Transport Sector

CO2 emissions = Emissions intensity × Activity volume

= On-road fuel efficiency × CO2 emissions coefficient × Total distance travelled

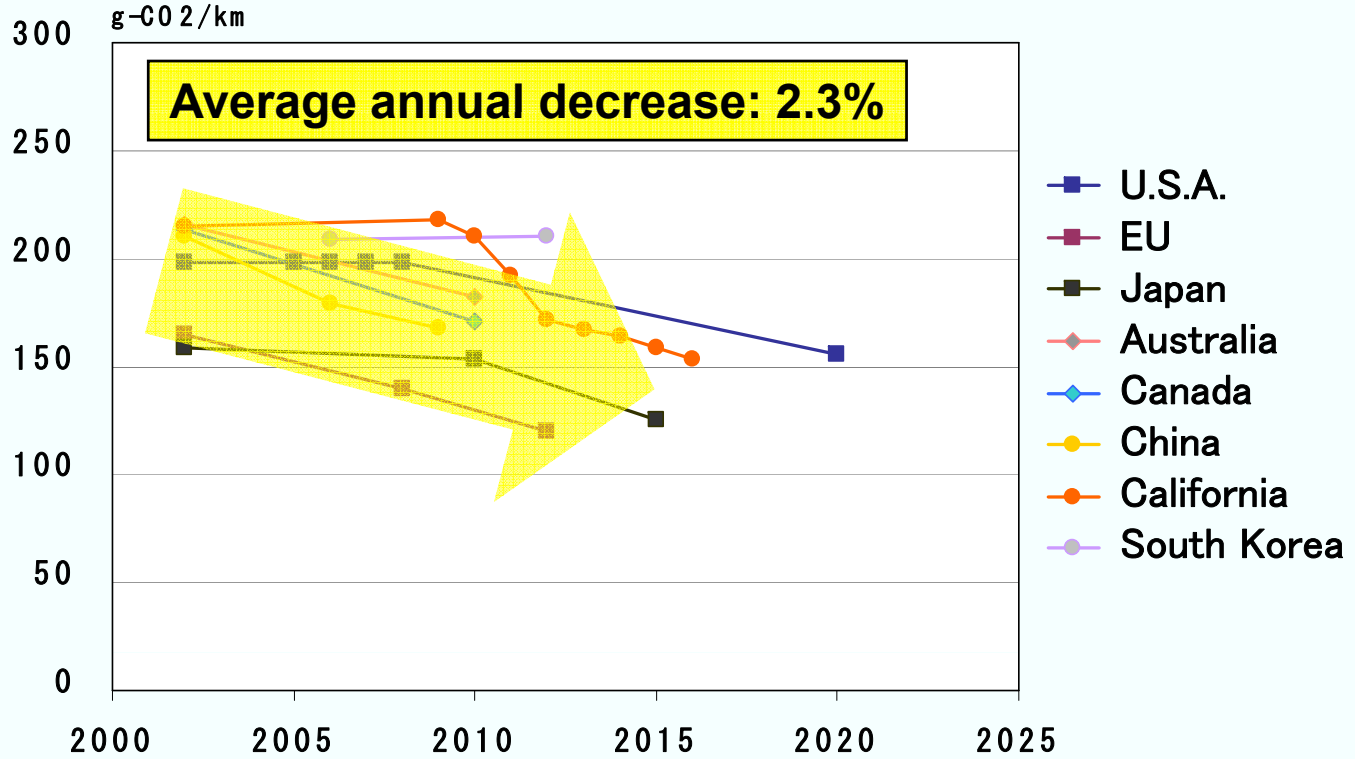
= Certified fuel Efficiency (km/ℓ)-1 × Travelling coefficient × CO2 emissions Coefficient (gCO2/ℓ) × Total distance Travelled (v-km)

- To be increased by automobile manufacturers
- To be reduced through congestion mitigation and ecodriving
- Lower coefficient in the case of biofuels
- To be reduced through modal shifts

3. Improving the Certified Fuel Efficiency of Passenger Cars Projected

Certified fuel Efficiency (km/ℓ)-1 × **Travelling coefficient** × **CO2 emissions Coefficient (gCO2/ℓ)** × **Total distance Travelled (v-km)**

Projected CO2 Emissions for New Passenger Cars in Selected Countries/Regions



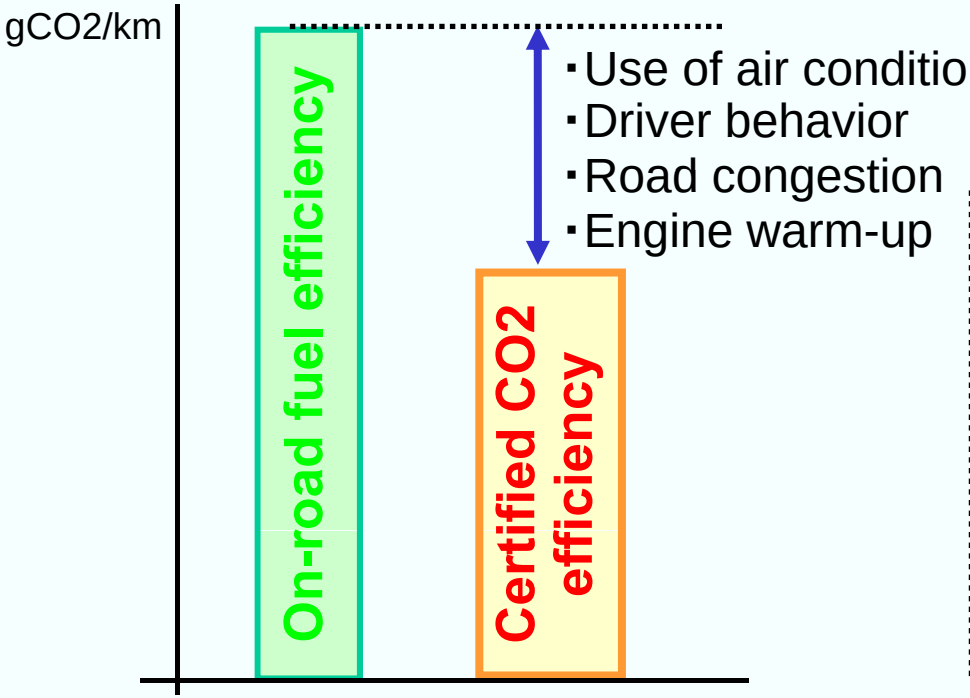
Source: Adapted from Comparison of Passenger Vehicle Fuel Economy and Greenhouse Gas Emission Standards Around the World *by Feng An and A. Sauer, Pew Center on Global Climate Change (2004)*

4-1. Reducing CO2 Emissions through Increased On-Road Fuel Efficiency

Certified fuel Efficiency (km/ℓ)-1	×	**Travelling coefficient**	×	CO2 emissions Coefficient (gCO2/ℓ)	×	Total distance Travelled (v-km)

Travelling Coefficient

A discrepancy exists between Certified CO2 efficiency and on-road CO2 efficiency.



$$\text{Traveling coefficient} = \frac{\text{On-road CO2 efficiency}}{\text{Certified CO2 efficiency}}$$

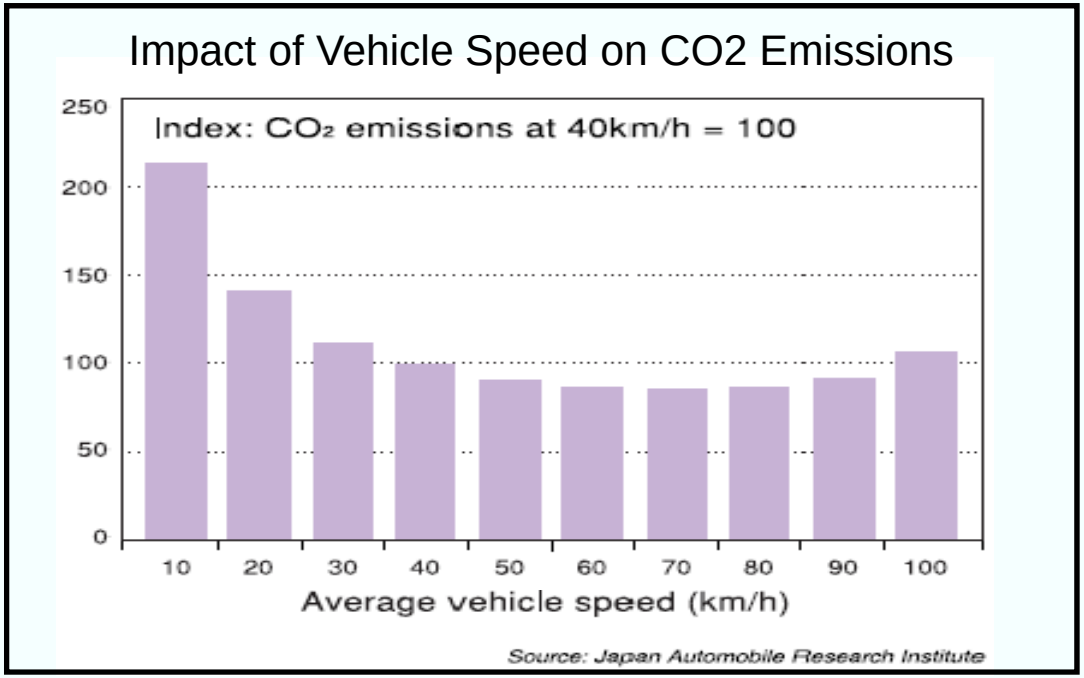
The travelling coefficient increases in numerical value the greater the discrepancy between on-road fuel efficiency and certified fuel efficiency.

4-2. Upgrading Road Infrastructure

Certified fuel Efficiency (km/ℓ)-1	×	**Travelling coefficient**	×	CO2 emissions Coefficient (gCO2/ℓ)	×	Total distance Travelled (v-km)

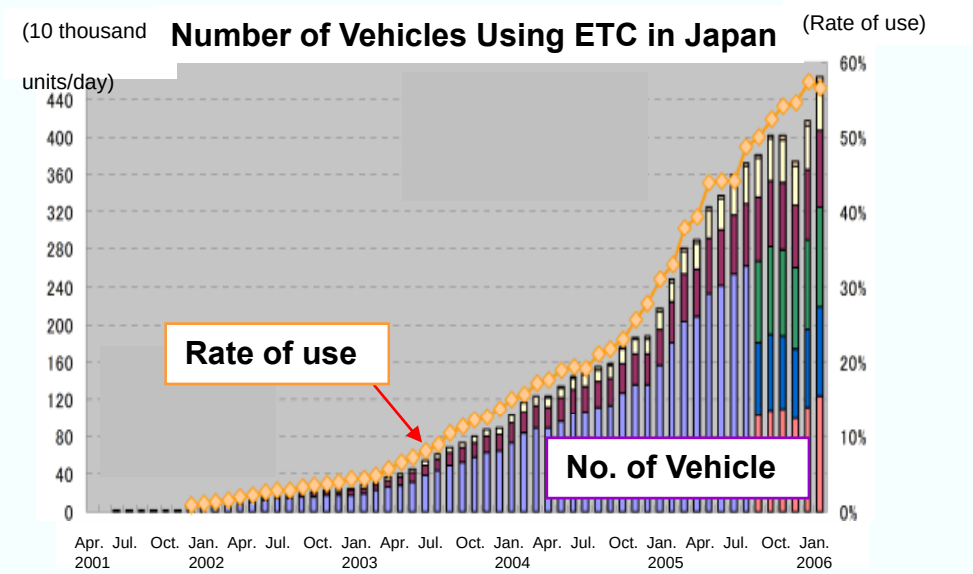
Improvement measures for traffic flow ➡ mitigation of traffic jams ➡ Increase of **average vehicle speed** ➡ Improvement of actual fuel economy ➡ CO2 reduction

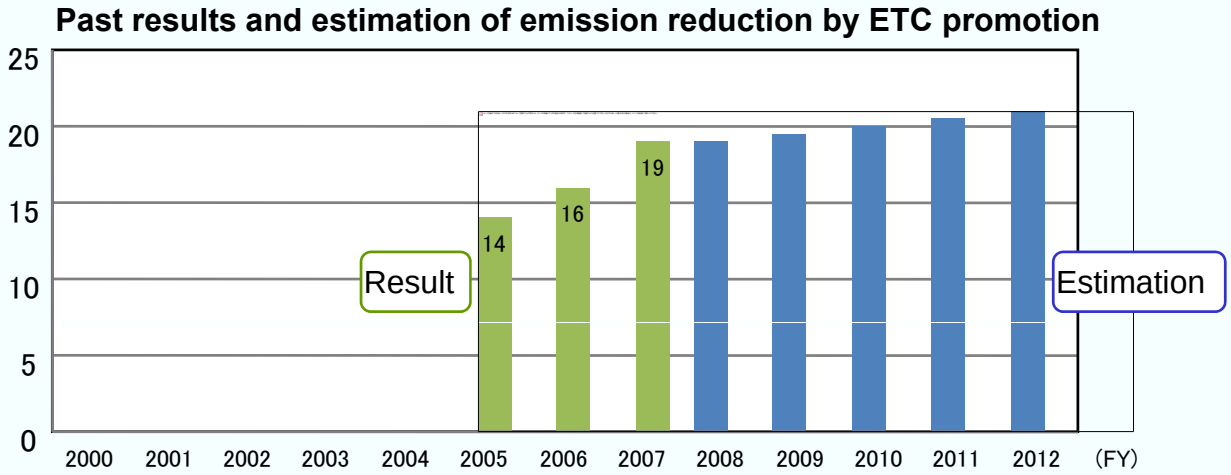
Key indicator



4-3. CO2 Reduction through ETC Promotion

ETC; Electric toll collection

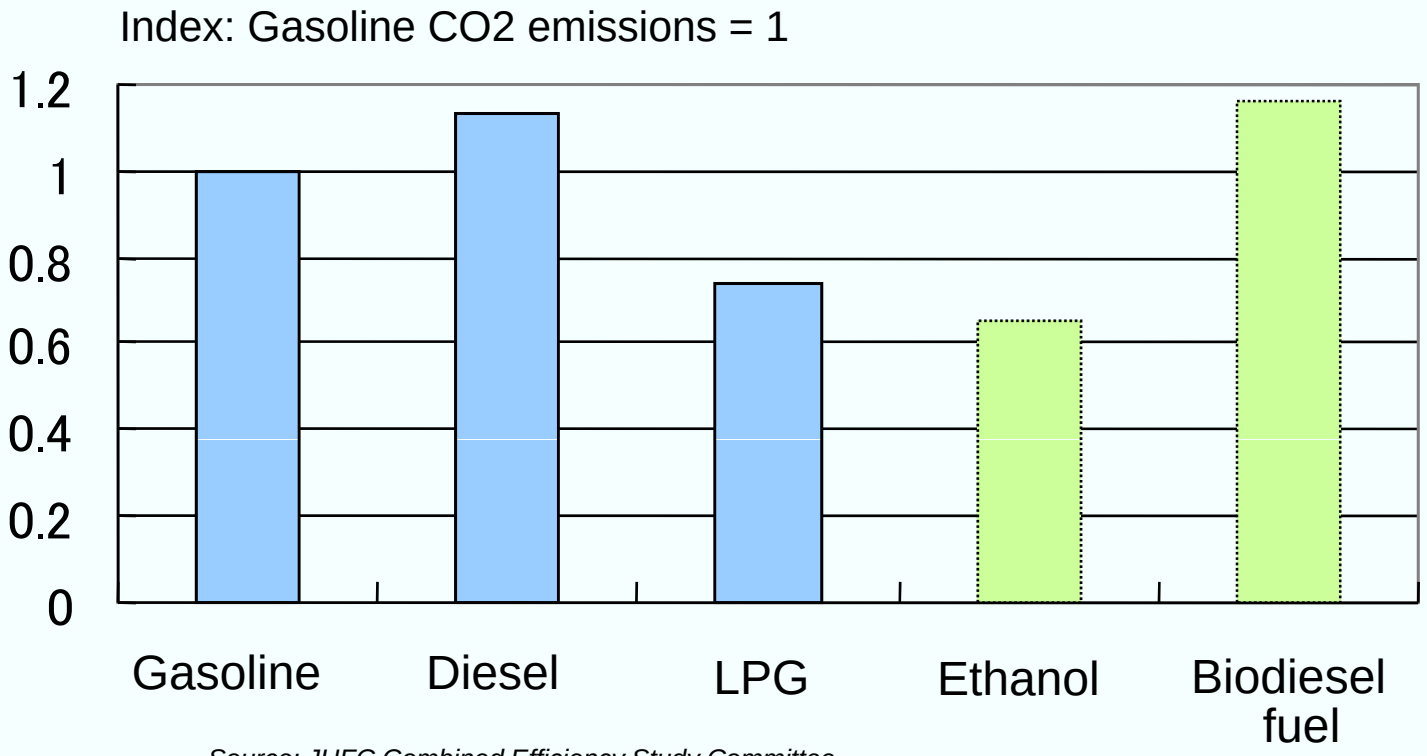




5. Automotive Fuels Have Different CO2 Coefficients

Certified fuel Efficiency (km/ℓ)-1	×	Travelling coefficient	×	**CO2 emissions Coefficient (gCO2/ℓ)**	×	Total distance Travelled (v-km)

The co2 Emission Coefficients of Automotive Fuels

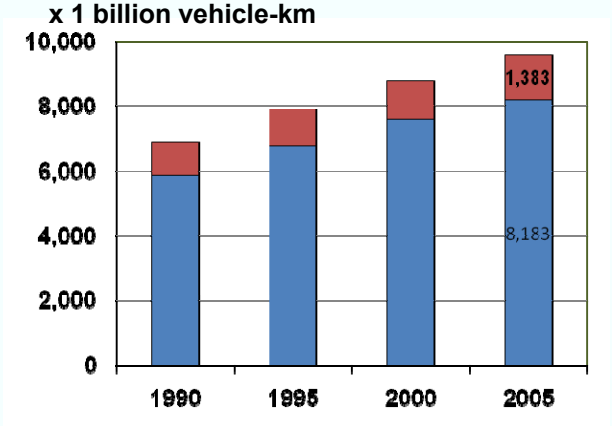


Source: JHFC Combined Efficiency Study Committee

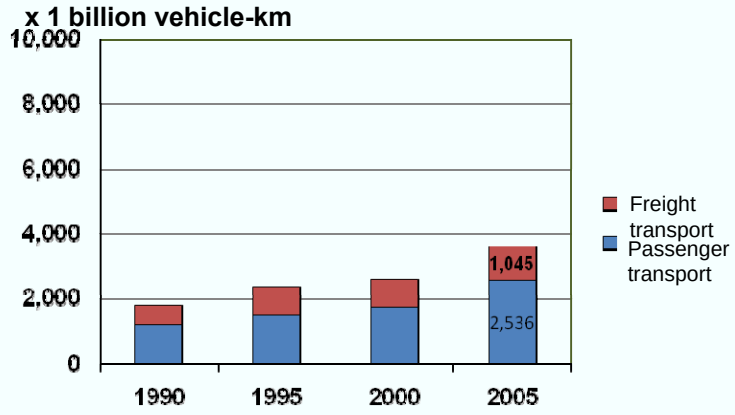
6. The Total Distance Travelled by Automobiles Worldwide

Certified fuel Efficiency (km/ℓ)-1	×	Travelling coefficient	×	CO2 emissions Coefficient (gCO2/ℓ)	×	**Total distance Travelled (v-km)**

OECD Member Countries, 2005 (73% of global v-km)



OECD Non-Member Countries, 2005 (27% of global v-km)



Note: Figures are JAMA estimates, based on the following sources: Environmental Data Compendium (for 2006-2007), *OECD*; Energy Balances of Non-OECD Countries (for 2004-2005), *OECD-International Energy Agency*; World Motor Vehicle Statistics (Vol. 7, 2008), *JAMA*; Yearbook of Survey on Motor Vehicle Transport (Vol. 44, No. 13, 2007), *Ministry of Land, Infrastructure and Transport (Japan)*.

<Efficient use>

Improvement of **transport efficiency** → Reduction of total travel distance → CO2 reduction

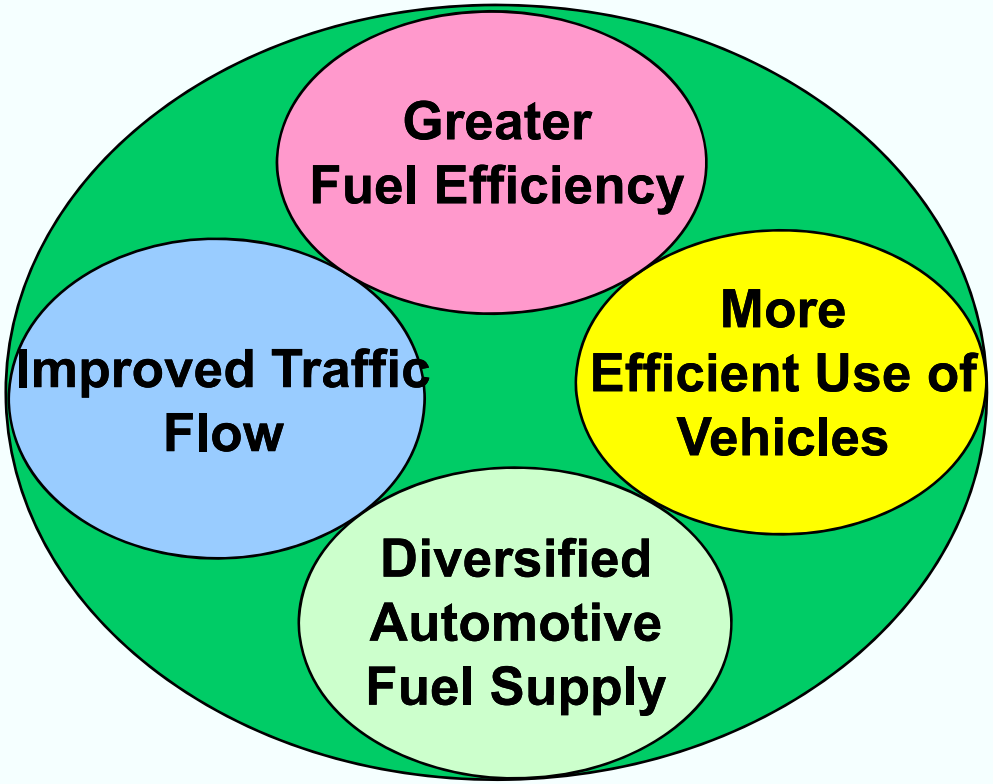
Key indicator

Transport efficiency (passengers/vehicles, tons/vehicles) = **Traffic volume** (passengers-km, tons-km) / **Run volume** (vehicles-km)

7. Integrated Measure for Reducing CO2 Emissions in the Global Road Transport Sector

Improved Engine Efficiency, Aerodynamics, Drive System
Reduced Vehicle Weight, Rolling Resistance
Next-Generation Vehicles (HV, PHV, EV, FC etc)

ITS technologies
VICS,
Electric toll collection,
Advanced signal
control system

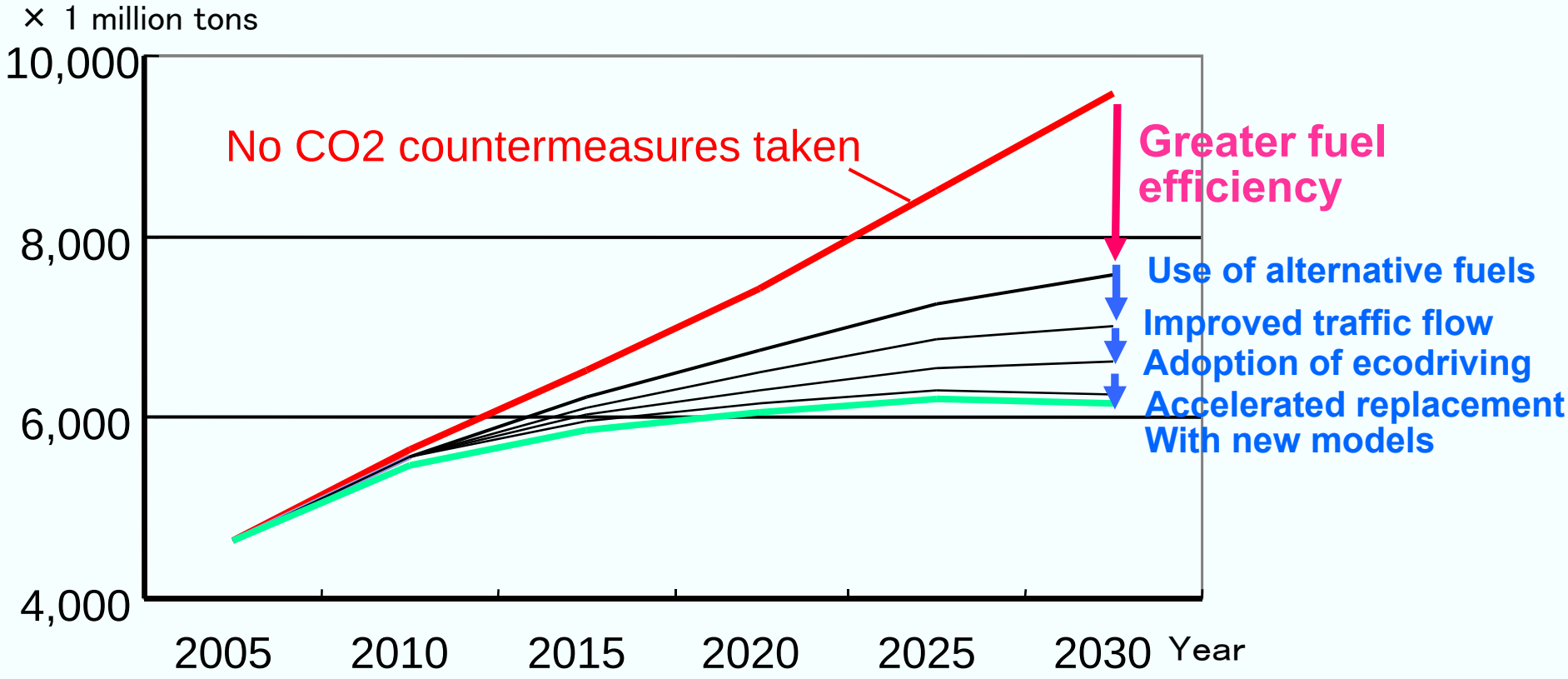


Eco driving
Modal shifts

High-Quality Fuels, Biofuels, Electric power

8. Greater reduction of CO2 emissions

CO2 Emissions in the Global Road Transport Sector
(assuming the implementation of recommended measures)



9. Data Compilation Statuses of Countries

			Japan	US	Europe	China	India
Fuel Economy (efficiency)	①New fleet fuel economy (efficiency)	km/L mpg gCO2/km etc.	JAMA [10-15 test mode, JC08test mode]	NHTSA [LA-4, Highway]	ACEA/JAMA [NEDC]	NDRC [NEDC]	ND (SIAM under investigation)
	②Stock fleet fuel economy (efficiency)	km/L mpg gCO2/km etc.	JAMA	Computable	Computable	ND	ND
	③Actual (on-road) fuel economy (efficiency)	km/L mpg gCO2/km etc.	JAMA	Computable	Computable	ND	ND
Amount of Car	④Sales amount of new car	vehicle unit	JAMA, JAIA, JMVA	JAMA *World Motor Vehicle Statistics*	JAMA *World Motor Vehicle Statistics*	NBSC *China Statistical Yearbook*	SIAM
	⑤Stock amount of car	vehicle unit	MLIT *Survey on Motor Vehicle Transport*	JAMA *World Motor Vehicle Statistics*	JAMA *World Motor Vehicle Statistics*	NBSC *China Statistical Yearbook*	MSRTH *Motor Transport Statistics* JAMA *World Motor Vehicle Statistics*
	⑥Scrappage (residual) rate of car	%	AIRIA, JAMA (estimated by JAMA for mini (K) vehicles)	ND	ND	ND	ND
Run volume	⑦Run volume	vehicle-km	OECD OECD Environmental Data Compendium MLIT Survey on Motor Vehicle Transport	OECD *OECD Environmental Data Compendium* *RITA Natioal Transportation Statistics*	OECD *OECD Environmental Data Compendium* *EEA Climate for a transport change. TERM 2007: indicators tracking transport and environment in the*	ND	ND
	⑧Traffic volume	passenger-km ton-km				NBSC China Statistical Yearbook	ND
Fuel consumption	⑨Amount of fuel consumption	L	ANRE/METI *Energy Balance Table* IEA/OECD *Energy Statistics of OECD countries*	IEA/OECD *Energy Statistics of OECD countries*	IEA/OECD *Energy Statistics of OECD countries*	IEA/OECD *Energy Statistics of non-OECD countries*	IEA/OECD *Energy Statistics of non-OECD countries*
Vehicle speed	⑩Average travel velocity of vehicles on road	km/h	MLIT *Road Traffic Census*	ND	ND	ND	ND

10. Conclusions

- The quantification of energy saving and CO2 reduction in the road transport sector helps promote more effective measures.

Important Indicators for energy saving & CO2 reduction

1. Improvement of Fuel Economy ;Fuel Economy (L/km,g/km)

2. Improvement of traffic flow;Vehicle speed (km/h)

- The road transport sector's energy conservation and CO2 reduction activities can be expanded on a world scale by sharing the methods of data investigation and calculation among countries.

APP Asia-Pacific Partnership on Clean Development and Climate

Summary of the Road Transport Sector Workshop (provisional)

September 18-19, 2008

＜APP Road Transport Sector Workshop Summary＞

- Survey of penetration of statistical data/best practices, where applicable
- Sharing of best practices and picking up some items in which participants are interested.

A. Mode Efficiencies
- Fuel efficiency improvement
- Diversification of fuels
- Efficient use of vehicles

B. System Efficiencies
- Public transportation
- Logistics
- Traffic flow improvement

- Collecting of best practices
- Sharing of best practices
- Survey of penetration of best practices, where applicable

(Example of Measures)
- Fuel efficiency standards setting method
- Fuel efficiency improvement technologies
- Fuel-thrifty vehicles promotion(incentives)
- Cellulosic bioethanol development policy
- Eco-driving systems/education program

(Example of Measures)
- Development of bus operating scheme
- Development of a business friendly mechanism to reduce CO2 from supply chains
- System efficiency /development including ITS

Analyze the applicability of policy options

C. Statistical Data Collection

- Introduction of indicators for energy saving/CO2 reduction effect
- Survey of penetration of statistical data and sharing data taking and calculation methods

(Example of Measures)
- Introduction of unit requirement indicators
- Survey of penetration of statistical data and sharing data taking and calculation methods
- Evaluation of potentialities for energy saving/ CO2 reduction through best practices promotion

(Examples of Unit Requirement)
* g/km, km/L (fuel efficiency)
* g/ton km, g/person km (payload vs fuel efficiency)
* km/h (average speed)
* g-CO2/MJ (fuel carbon content)

(Examples of Statistical Data)

All data divided between cars and commercial vehicles
* Number of vehicles (new/in-use by fuel type)
* Number of in-use vehicles by vehicle age (service ratio)
* Fuel efficiency (new vehicles, performance on road)
* Payload (person km, ton km)
* Running distance (no. of vehicles, km)
* Average running speed (km/h)
* Fuel consumption (gasoline/diesel/others)

Enhance these basic work

Japan are planning the model project of statistical data investigation in India.