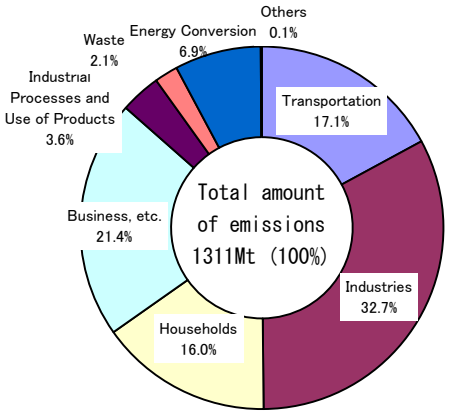
3-1 Mitigation / Adaptation of Climate Change

Associate Professor, Interdisciplinary Graduate School of Science and Technology, Tokyo Institute of Technology
Yasunori Muromachi

Total GHG emissions for FY 2013 in Japan were 148 Mt, which increased by 1.2% from FY 2012 and by 10.8% from FY 1990. The share of CO_2 emissions from transportation sector is 17.1% on a downward trend. Japanese government submitted Japan's Intended Nationally Determined Contribution to Reduction in GHG emissions after 2020. The target of the total emissions is -26.0%, and that of transportation sector (from fuel combustion) is -27.6% from the base year of FY 2013.

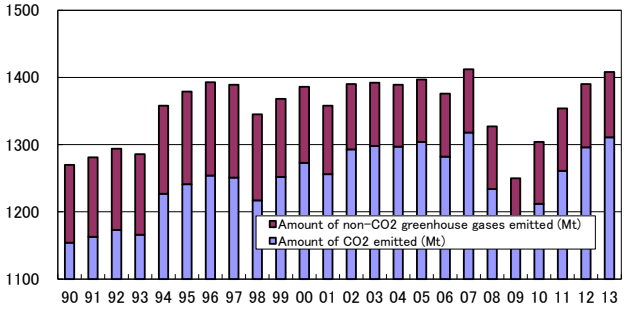
Fig. 1 Breakdown of CO_2 emissions by sectors (FY 2013)

■About 17.1% of the total emissions derived from the transportation sector.



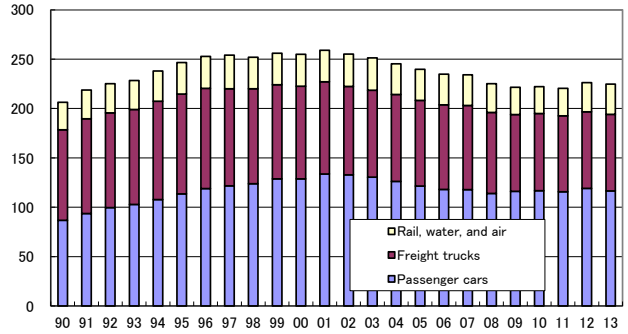
Source: Ministry of the Environment, https://www.env.go.jp/press/files/jp/26800.pdf, 2015

Fig. 2 Changes in the amounts of greenhouse gas and CO_2 emissions in Japan (Mt)



Source: Ministry of the Environment, https://www.env.go.jp/press/files/jp/26800.pdf, 2015

Fig. 3 Changes in the amount of CO_2 emitted from transportation sector (Mt)



Source: National Institute for Environmental Studies, http://www-gio.nies.go.jp/index-j.html, 2015

Table 1 Japan's 2020 target for GHG emission reduction, and sink by sector and category

(Mt-CO2)	Base Year (FY 2005) A	Target for Each Sector in FY 2020 B	Difference from Base Year Emission B-A	Ratio to Base Year Emission (B-A)/A
CO2 from fossil fuel combustion	1203	1208	5	0.4%
(Industries)	459	484		5.4%
(Business, etc.)	236	263		11.4%
(Households)	174	176		1.1%
(Transportation)	254	190		-25.2%
(Energy Conversion)	79	95		20.3%
CO2 from non-fossil fuel combustion	80	70	-10	-12.5%
Methane	23	18	-5	-21.7%
N2O	24	22	-2	-8.3%
HFC, PFC, SF6, NF3	22	46	24	109.1%
Greenhouse gas sink			-38	
Bilateral Offset Crediting Mechanism	-	-	-	-
Total	1351	1300	-51	-3.8%

*1)The reduction of greenhouse gas emissions by nuclear power generation is not counted.
*2)The amount of reduction by Bilateral Offset Crediting Mechanism is not indicated.

Source: Ministry of the Environment, Measures against global warming for implementing Cancun Agreement, 2013

Table 2 GHG reduction targets in 2020 and 2050 by countries (as of 2009 except Japan's 2020 as of 2014)

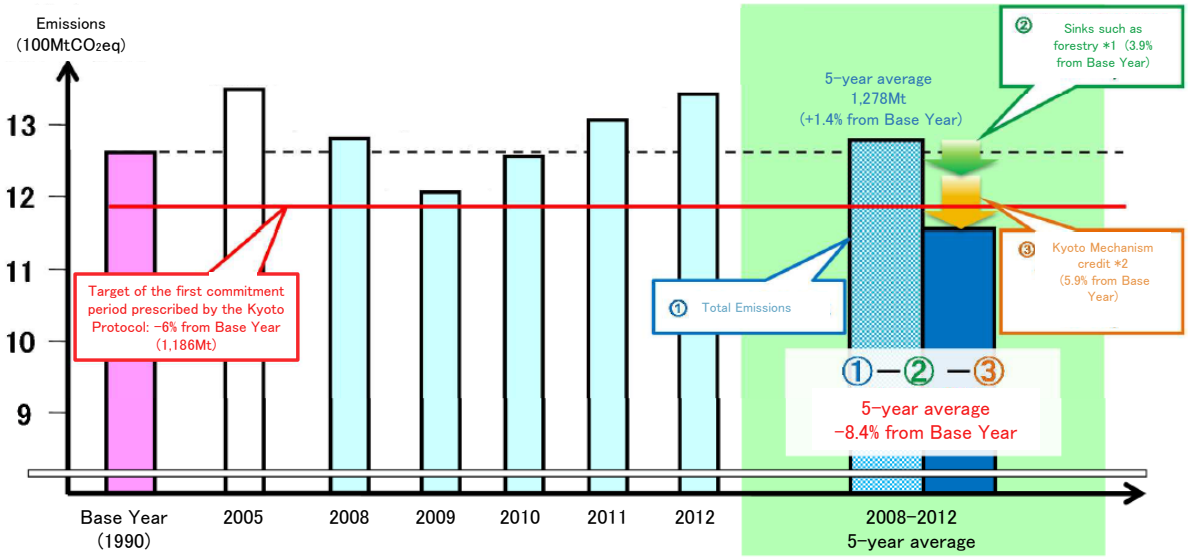
	2020		2050	
	Base Year	% of reduction	Base Year	% of reduction
Japan	2005	3.8%	Current	60 to 80%
EU (27)	1990	20%(*1, 2)	-	-(*3)
UK	1990	26% or more (*4)	1990	80% or more
Germany	1990	40%	-	-
France	1990	20%	1990	75%
US	2005	14%(*2)	2005	83%
Canada	2006	20%	2006	60 to 70%
Australia	2000	5%(*5)	2000	60%
Norway	1990	30%(*6)	-	-(*7)

*1) 30% provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries adequately contribute according to their responsibilities and respective capabilities
*2) The reduction ratio to 2005 is 14% for both EU and US.
*3) The EU environmental council agreed on the 60 to 80% reduction from its 1990 level by developed countries as a whole.
*4) The Committee on Climate Change proposed 34 to 42% reduction on December 2008
*5) Maximum 15% provided that all the major economic countries reduce emissions considerably and developed countries agree on comparable emission reduction by international negotiations
*6) 10% reduction by 2012
*7) The carbon neutral will be accomplished by 2050.

Source: Ministry of the Environment, https://www.env.go.jp/earth/ondanka/mid-target/exam_prog/countries.pdf, 2014

Fig. 4 The Status of the Achievement of the Target for the First Commitment Period of Kyoto Protocol (FY 2008 to 2012)

- Total GHG emissions in FY 2012 of Japan is 1,343Mt (+6.5% from Base Year, +2.8% from FY 2011)
- The average emissions from 2008 to 2012 including sinks such as forestry and Kyoto Mechanism credit in addition to the total emissions decreased by 8.4% from base year, which met the target of Kyoto Protocol (−6% from base year).



*1) Sinks such as forestry: The sink such as forestry (measures for forestry sink and urban tree-planting) which can be counted for meeting the target. In relation to the sink by the measure for forestry sink, since the amount of the five-year forestry sink exceeded the maximum allowable amount, the amount is set to the annual average of the maximum allowable amount.

*2) Kyoto Mechanism credit: Governmental Obtainment: Total credit obtained by Kyoto Mechanism credit project at the end of FY 2013 (97.493Mt)
Private Obtainment: The credit by the Federation of Electric Power Companies Japan (Source: Environmental Action Plan by the Japanese Electric Utility Industry (FY 2013))

*3) The amount of emissions and sinks will be established after the inspection under the UNFCCC and the Kyoto Protocol in 2014. Kyoto Mechanism credit will also be established after the adjustment period of the first commitment period in prospect of the latter half of 2015.

Source: Global Warming Prevention Headquarters,
https://www.kantei.go.jp/jp/singi/ondanka/kaisai/dai28/siryou.pdf, 2015

Fig. 5 Japan's Intended Nationally Determined Contribution to Reduction in GHG after 2020

Base Year
-While the Base Year is set to be FY 2013 mainly, FY 2005 is also registered as the Base Year.
Target Year: FY 2030
Commitment Period: 1 April 2021 to 31 March 2031
Target Sectors, Target Gases
-Target Sectors: All sectors (Energy (Fuel Combustion (Energy Industry, Manufacturer, Construction, Transportation, Business, Households, Agriculture, Forestry and Fisheries, Others), Leakage from Fuel, CO2 Transportation and Storage), Industrial Processes and Use of Product, Agriculture, Land Use, Land Use Change and Forestry, and Waste)
-Target Gases: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3
CO_2 from Fuel Combustion

(Mt-CO_2)	Target Emissions for each Sector in FY 2030	FY 2013 (FY 2005)
CO_2 from Fuel Combustion	927	1235 (1219)
Industries	401	429 (457)
Business etc.	168	279 (239)
Households	122	201 (180)
Transportation	163	225 (240)
Energy Conversion	73	101 (104)

Basic measures for accumulatively meeting the GHG emission reduction target: Transportation Sector

- Improvement of fuel efficiency
- Promotion of the next generation automobile
- Other measures for transportation sector (Promotion of the measures for traffic flow, Promotion of public transportation use, Modal shift to freight rail, Comprehensive measures for greening maritime, Reduction of land freight transportation distance by optimal port choice, Comprehensive de-carbonization of ports, Increase in efficiency of truck transportation, Improvement of energy efficiency of rail, Improvement of energy efficiency of air, Promotion of the ships contributing to energy-saving, Greening transportation business by the promotion of the use of environmentally friendly automobiles, Promotion of cooperative delivery system, Promotion of Intelligent Transport System (ITS) (centralization of the control of traffic signals), Construction and maintenance of traffic safety facilities (upgrading of traffic signals, promotion of LED traffic signals), Promotion of automated driving, Promotion of eco-driving and car-sharing)
- Utilization of Structural Reform Special Zone for the measures against global warming
- Planning of promotion of coordinated actions among the Ministries by the roadmap for the measures against global warming

Source: Global Warming Prevention Headquarters,
https://www.kantei.go.jp/jp/singi/ondanka/kaisai/dai30/yakusoku_souan.pdf, 2015

3-2 Current Status and Challenges of road traffic noise and air pollution

Professor, Tokyo Metropolitan University
Hiroyuki Oneyama

With the implementation of automobile exhaust emissions regulations and Automobiles NOx and PM Control Law, the achievement rate of environmental quality for nitrogen dioxide (NO2) and suspended particulate matter (SPM) has been greatly improved. On the other hand, the achievement rate of environmental standards for fine particulate matter (PM2.5) is still low. Since road traffic is one of the main causes of PM2.5,, it is necessary to conduct various measures to tackle this issue.

Regarding noise, although the achievement rate has been on a moderately improving trend for the past few years; however, the achievement rate still stays flat on the roads with special road conditions such as multiple cross-section roads. To solve the road traffic noise problem, it is necessary to implement comprehensive measures such as source measures, traffic flow measures, road structure measures and roadside measures.

Figure 1 Environmental Quality Standard Compliance of Nitrogen Oxides (NOx)

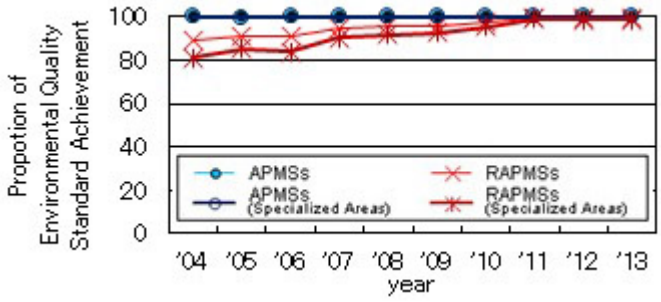
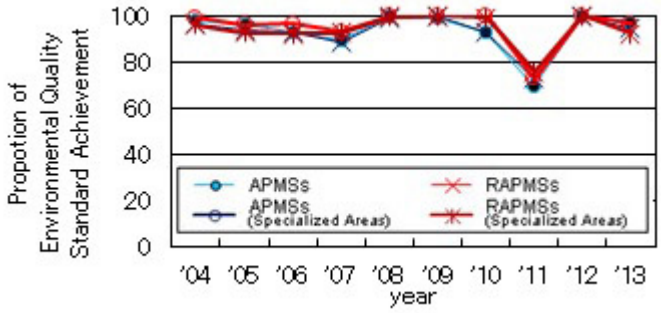


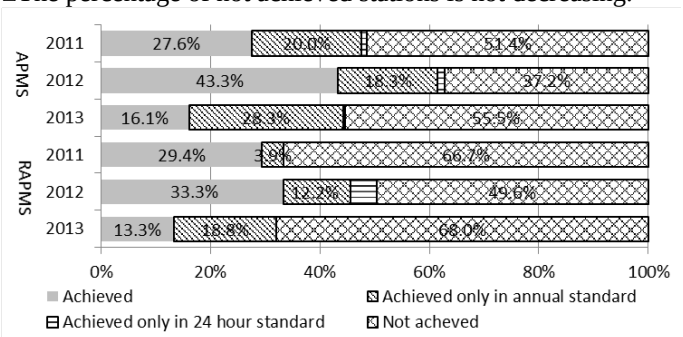
Figure 2 Environmental Quality Standard Compliance of Suspended Particulate Matter (SPM)



Note: APMS: Air Pollution Monitoring Station. RAPMS: Roadside Air Pollution Monitoring Station. Specialized Area is designated for NOx and PM measures in "Automobile NOx and PM Act", namely, a part of Tokyo, Kanagawa, Saitama, Chiba, Aichi, Mie, Osaka, Hyogo Pref.

Figure 3 Environmental Quality Standard Compliance of fine particulate matter (PM2.5)

□The percentage of not achieved stations is not decreasing.



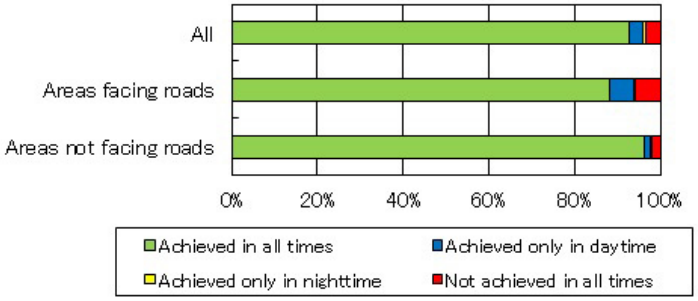
Note: The annual standard for $PM_{2.5}$ is less than or equal to 15.0 μg/m^3. The 24 hour standard, which means the annual 98th percentile values at designated monitoring sites in an area, is less than or equal to 35μg/m^3.

Source of Figure 1, 2 and 3 : "Status of Air Pollution", Ministry of Environment

Figure 4 Environmental Quality Standard Compliance of Traffic Noise (2013)

□The achievement rate of environmental quality standards on mixed road sections is much lower than in total road section.

(Total)



(Mixed Road Section)

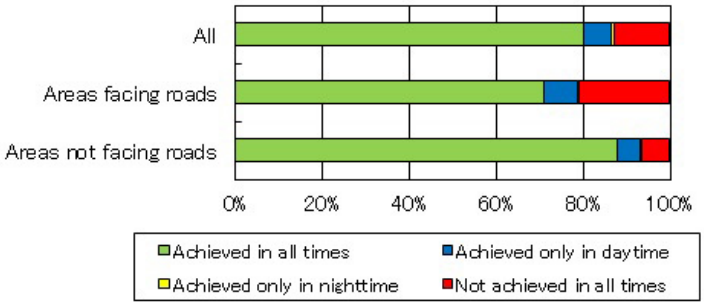
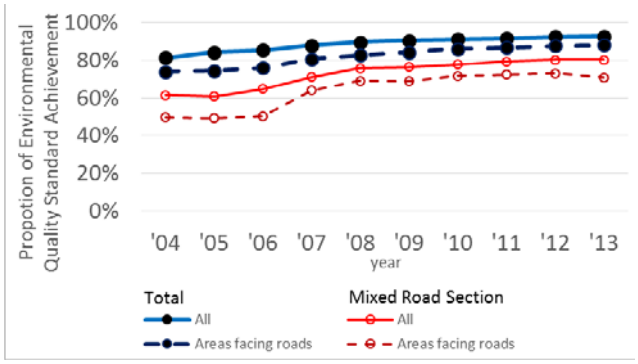


Figure 5 Trend in Proportion of Environmental Quality Standard Achievement

□Achievement is improving gradually, but the improvement on mixed road sections is stagnating.



Source of Figure 4 and 5 : "Status of Motor Vehicle Traffic Noise", Ministry of Environment

Table 1 Roadside Traffic Noise Measures

Classification of measures	Measures	Overview
Source measures	Vehicle exhaust noise measures	Reduction of vehicle exhaust noise by Improvement of vehicle structures
Traffic flow measures	Traffic control	Sophistication of the traffic signal control, Effective traffic regulation, Traffic guidance crackdown
	Development of the bypass	Reduction of inner city heavy vehicles and dispertion of traffic by development of circular roads or bypass etc.
	Development logistics Centers	Reduction of inner city heavy vehicles by proper placement of logistics facilities, rationalization of logistics such as joint transport and delivery.
Road structure measures	Installation of low-noise pavement	Installtion of low-noise pavement with a lot of voids.
	Installation of noise barriers	Installation of high noise barrier with high sound insulation effect. This is effective in motorways with limited access.
	Installation of environmental buffer zone	Securing of the buffer space for noise reduction of 10 or 20m between the roadside and roadway.
Roadside measures	Development of roadside district plan	A roadside district plan is established in urban planning to promote the prevention of disorder caused by road traffic noise and the proper and reasonable land use. It promotes urban development worthy of the roadside of the main road.
Impact prevention measures	Implementation of the grant of residential soundproofing	A reduction of the impact of road traffic noise by the soundproofing subsidies of housing such as emergency measures
Development of promotion organization	Creating organization for road traffic pollution measures promotion	In order to solve road traffic noise problem, a close cooperation among relevant organizations should be made.

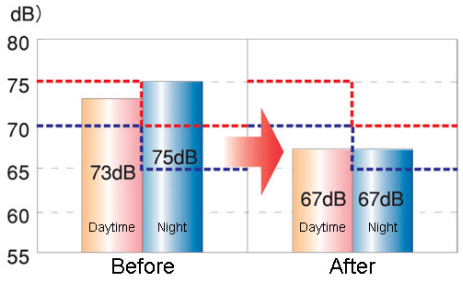
Source: White paper 2015, Ministry of Environment (Modified)

Table 2 Roadside Air Pollution Measures

Classifications	Measures
Low-pollution of automobiles	- Support of introduction of the DPF and oxidation catalyst. - Low-sulfur diesel fuel - Crackdown on illegal diesel - Limitation of high emission vehicle - Development of low emission vehicles - Support of installation of low emission vehicles
Reduction of automobile traffic demand	- Road pricing - Traffic regulation - Park & Ride - Installation of walkway and bikeway - Development of station squire - Off-peak and flextime commuting - Development of public transport such as LRT and tram - Promotion of effective imformation provision to drivers using VICS and ETC2.0 - Development of effective logistics - Promotion of multi-modal logistics using trains and ships - Idling stop - Eco-drive - Promotion of re-routing
Road Network and Capacity Measures	- Development of road network such as circular road and bypass - Bottleneck measures such as grade separation and elimination of rail crossing - Appropriate management or roadworks - Crackdown on illegal parking - Sophistication of the traffic signal control - Development ITS and UTMS
Roadside environmental Measures	- Air purification technology such as low concentration denitration and soil denitration - Road greening such as planting strips - Environmental buffer zone

Figure 6 Traffic Noise Measures utilizing the framework in the Roadside Act (Route 23)

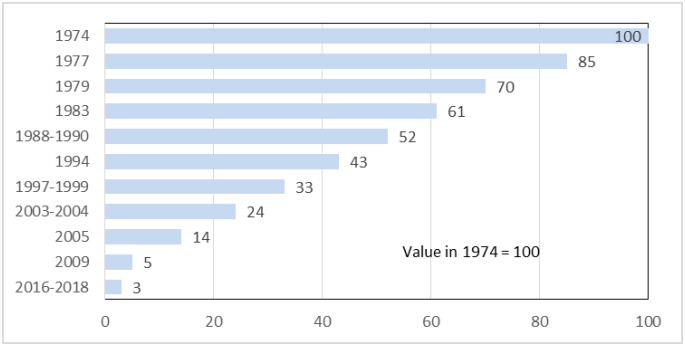
□Along the Route 23 at Yokkaichi, Mie pref., the roadside area development plan based on the Roadside Act has been established including various noise reduction measures. As a result, the roadside environment has been greatly improved.



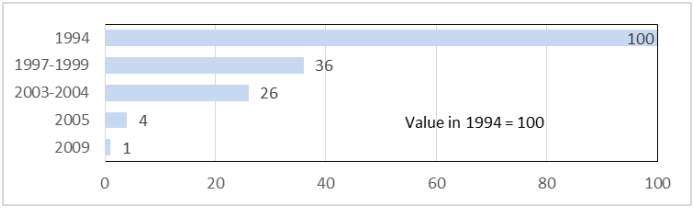
Source : HP, Chubu Regional Development Bureau, MLIT (http://www.cbr.mlit.go.jp/road/doro_sozo/detail01.htm)

Figure 7 Trend in Regulation of Exhaust Gas of Heavy Duty Vehicles (GVW is over 3.5 ton)

□Nitrogen Oxides (NOx)



□Particulate Matter (PM)



Source : White paper 2015, Ministry of Environment

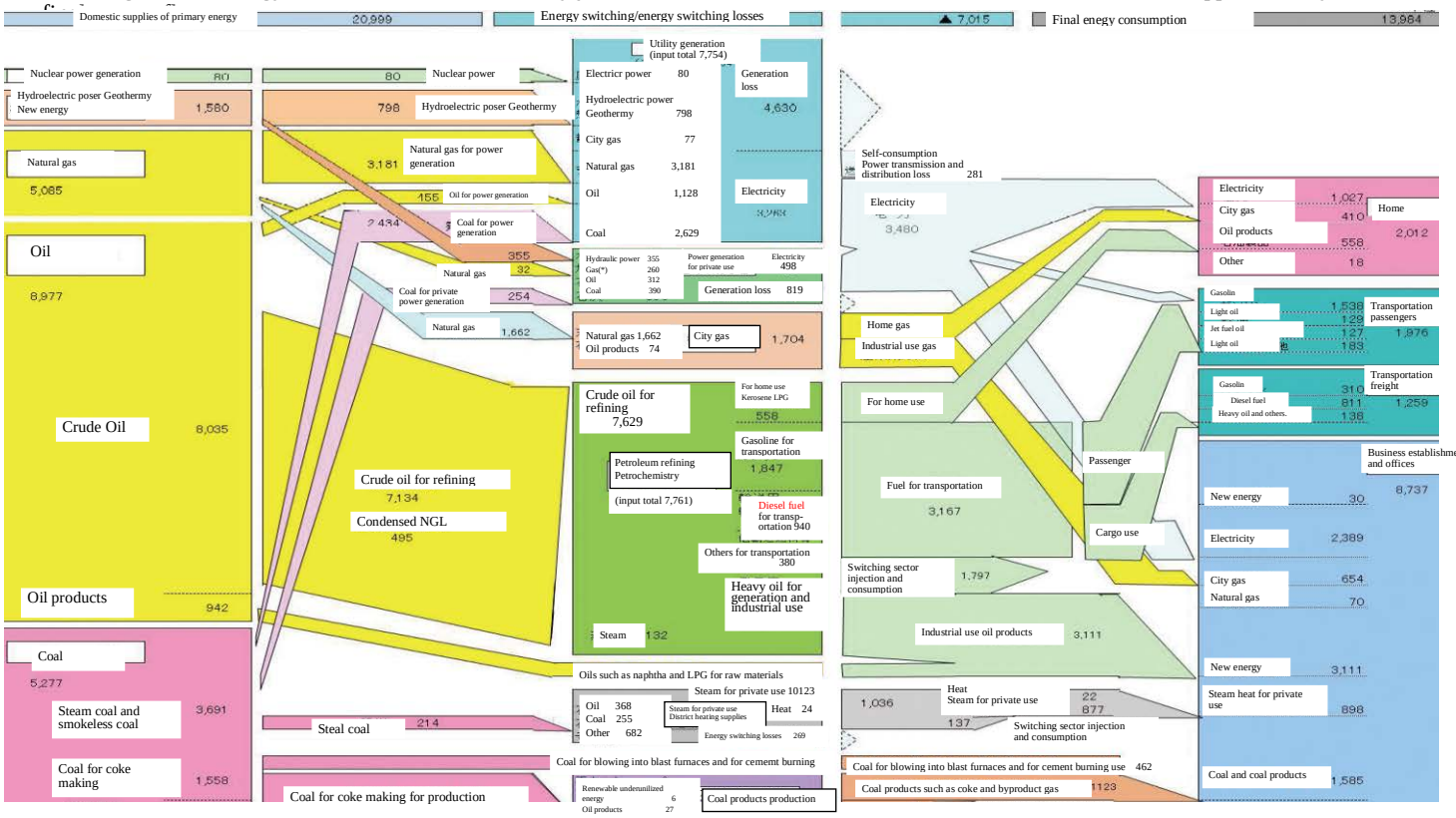
3-3 Improving Energy Efficiency

Japan Automobile Manufacturers Association,
Director General, Environment Department
Tadashi Kotake

Consumers can eventually use approximately 67% of the primary energy. Gasoline and Diesel fuel account for 86.1% of the energy consumed by the transport sector.
In formulating greenhouse gas reduction target for 2030, the government's trial calculations showed potential energy savings of around 50.3 million KL (crude oil equivalent) based on thoroughgoing energy-saving policies in each sector. Measures in the transportation sector, including improvements in fuel efficiency and traffic flows, as well as the promotion of next-generation vehicles, will achieve a reduction of 16 million KL.

Figure 1: Outline of Japan's Energy Balance Flows（FY 2013, Unit: 10^{15}J）

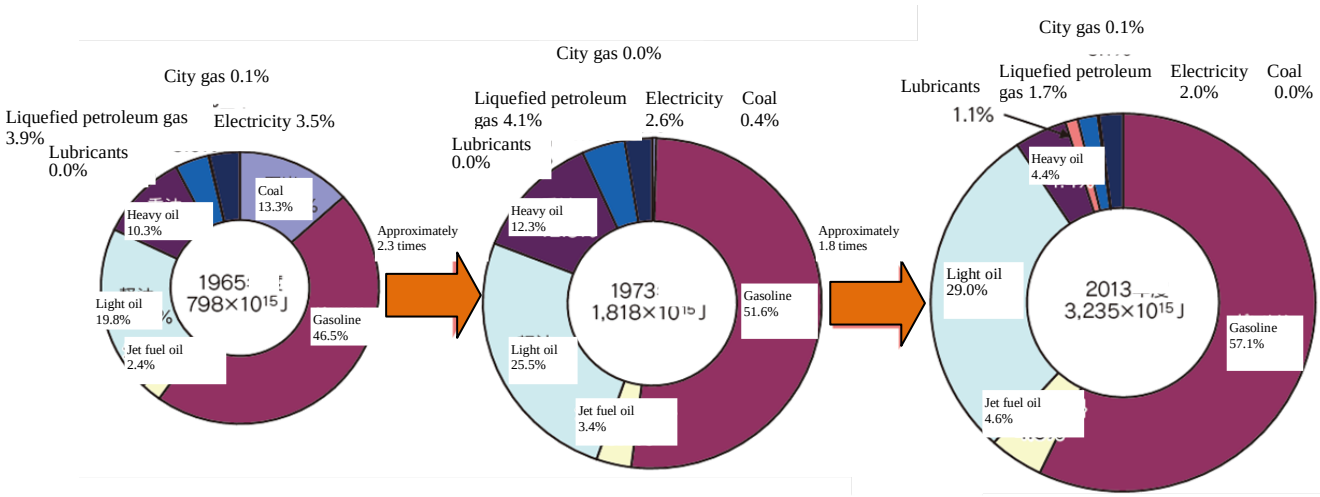
■ Before energy is supplied to end-consumers, there are losses due to generation and transportation as well as self-consumption in generation and switching. So, the energy that can be used decreases by just that amount of losses. In FY 2013, such losses amounted to approximately 27% of



Source: Agency for Natural Resources and Energy "Annual Report on FY 2014 Energy" (Energy White Paper 2015)

Figure 2: Transportation Sector Energy Consumption by Energy Source

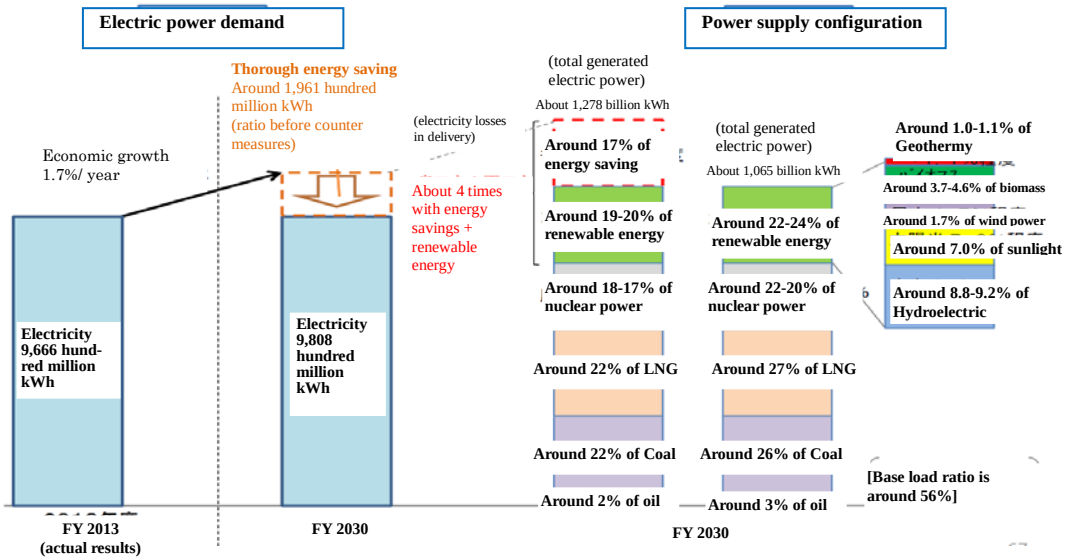
■ The transport sector consumed 4.1 times as much energy in FY 2013 compared to 1965. The oil-based energy such as gasoline, light oil, LP gas, and lubricants accounted for 97.9% of this consumption.



Source: Agency for Natural Resources and Energy "Annual Report on FY 2014 Energy" (Energy White Paper 2015)

Figure 3: Long-term Energy Supply and Demand Outlook

■ Moving ahead with the introduction of thoroughgoing energy saving policies and renewable energy (22-24%), while at the same time achieving specific policy goals related to S (Safety) +3E (stable supplies of Energy, Economy, and Environmental protection).



Source: Advisory Committee for Natural Resources and Energy, Basic Policy Subcommittee, Materials (10th session) of Working Party on Long-term Energy Supply and Demand Outlook

Figure 4: Energy-saving Policies

■ By 2030, the government plans to achieve energy savings of 50.3 million KL by combining energy-saving measures in each sector, including industry, the home, work, and transport.

■ In the transport sector, trial calculations show a reduction of 16.07 million KL due to simple measures such as fuel efficiency improvements and the spread of next-generation vehicles as well as other measures such as improving traffic flows and promoting eco-driving.

Industrial sector: about -10,420,000 KL

Work sector: about -12,260,000 KL

Home sector: about -11,600,000 KL

Transportation sector: about -16.07 million KL

- The spread of next-generation vehicles, fuel efficiency improvements
  => One of two vehicles is next-generation; fuel cell-powered vehicles: annual sales of more than 100,000 units
- Traffic flow measures
  => ITS, automated driving (trucks running in convoys), eco-driving promotion

Users	Names of energy-saving measures	Actual results of introduction 2012FY	Forecasts for introduction and spread 2030FY	Amount of energy-savings in KL10,000 2030FY	Breakdown: Within electric power	Breakdown: Within fuels	Outline
Single measures	Fuel efficiency improvements The spread of next-generation	HEV 3%	29%	938.9	-100.1	1039.0	Support for the introduction and spread of next-generation vehicles that have outstanding energy efficiency (hybrid electric vehicles (HEV)), electric vehicles (EV), plug-in hybrid electric vehicles (PHEV), and clean diesel vehicles (CDV), etc.) In addition, continuing the goal of enhancing vehicle performance by focus on fuel economy (top runner standards) standards, etc.
		EV 0% PHEV 0%	16%				
		FCV 0%	1%				
		CDV 0%	4%				
Other	Other transportation sector measures	–		668.2	62.4	605.8	・Measures to improve traffic flows ・Promotion of public transport ・Modal shift to rail freight transportation ・Upgrade trucking efficiency ・Comprehensive measures for eco-friendly marine transportation ・Reduction of the land transportation freight distance by choosing the nearest port ・Comprehensive low carbon emissions in ports ・Improvement of railway energy efficiency ・Improvement of aviation energy efficiency ・Promotion of energy-saving ships ・Eco-friendly trucking by promoting eco-friendly vehicles ・Promotion of collective shipments ・Promotion of Intelligent Transport Systems ITS (centralized control of traffic signals) ・Development of traffic safety facilities (improvement of traffic signals, and promotion of the use of LED traffic lights) ・Promotion of automated driving ・Promotion of eco-driving ・Car sharing
	Transportation sector total			1,607.1	-37.7	1,644.8	

Source: The figure reproduced by the author based on Materials (10th session) of Working Party on Long-term Energy Supply and Demand Outlook, Advisory Committee for Natural Resources and Energy, Basic Policy Subcommittee

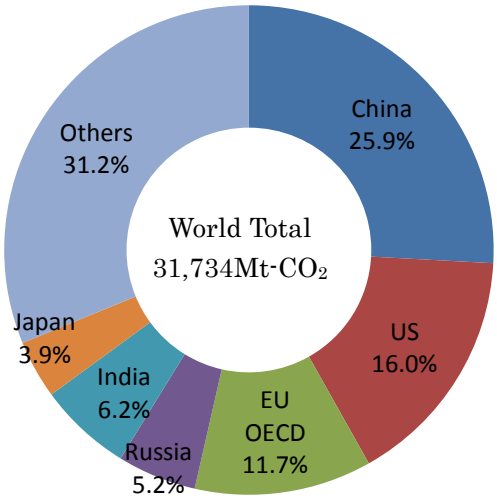
3-4 Actions for Sustainable Transport

Associate Professor, Interdisciplinary Graduate School of Science and Technology, Tokyo Institute of Technology
Yasunori Muromachi

Worldwide CO_2 emissions amount to 31.7 billion tons, and while the share of US decreases that of China and India increases. The GHG emissions from transportation sector in some developed countries have been stabilized since the late 2000s, which leads discussions on the cause and effect of the phenomena. In Japan, guidelines for carbon-offset programs are introduced, which is supposed to promote carbon initiatives.

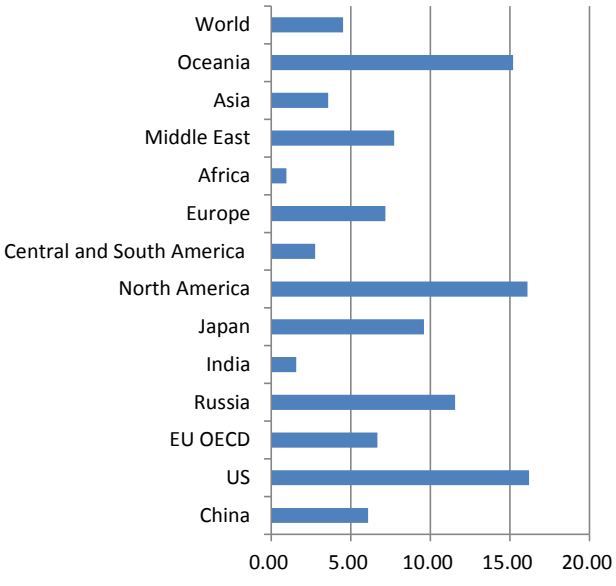
Fig. 1 The share of CO_2 emissions from fuel combustion in major countries and regions (2012)

■While the share of CO_2 emissions from US decreases, that from China and India increases.



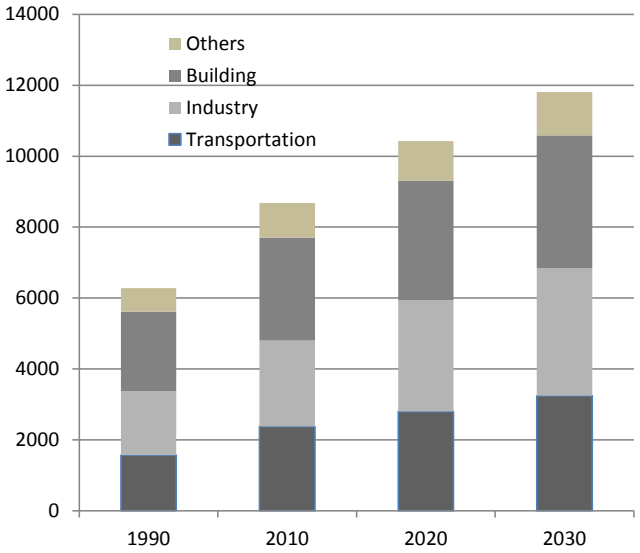
Source: Ministry of the Environment, Environmental Statistics 2015, 2015

Fig. 2 CO_2 emissions per capita in major countries and regions (2012, t-CO_2)



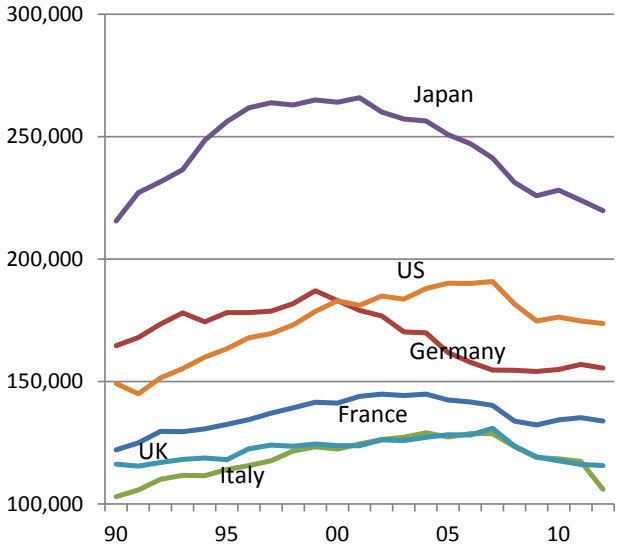
Source: Ministry of the Environment, Environmental Statistics 2015, 2015

Fig. 3 Trend and forecast of world final energy consumption by sector (reference case, Mtoe)



Source: IEA, World Energy Outlook 2012, 2012

Fig. 4 Trend of GHG emissions from transportation sector in major countries (1,000t-CO_2, except for US, 10,000t-CO_2)



Source: UNFCCC, http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3814.php, 2015

Fig.5　Introduction of Carbon Offset Guideline

The objective of this guideline is mainly to explain the practice and procedure of carbon offset program particularly for practitioners who take initiative in the program. The guideline explains the voluntary carbon offset or carbon neutral program not necessarily prescribed by law and regulation which is indicated in 'The State of Carbon Offset in Japan (Guideline) Ver.2.'

Method for estimating emissions from travel

Since it is difficult to collect information on general travelers, the data on true travel distance for each traveler might not be obtainable. The method for estimating travel distance is illustratively introduced for a case.

An example of a meeting event with 1,000 participants in the city center of Tokyo
(Assuming that all the participants come from Tokyo or neighboring prefectures)
The method assumes that one-way travel time by rail is about one hour and the participants can freely choose the nearest station to the event and major rail stations.

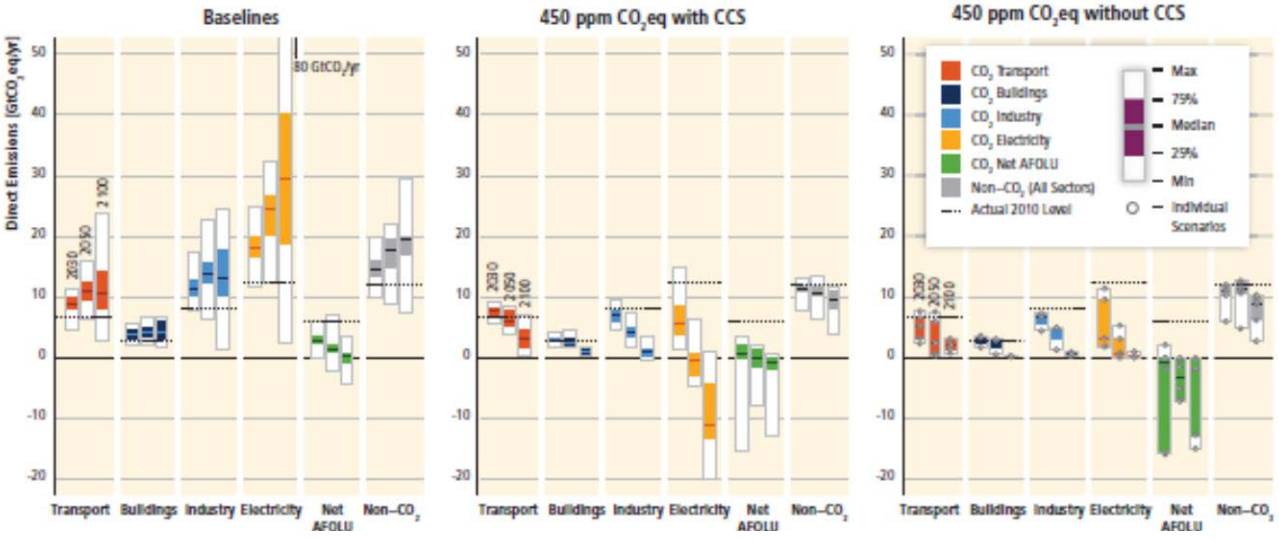
Greenhouse gas emissions from the travel by the participants
= Origin (Hachioji: suburban area) <-> destination (the city center)
* Fuel efficiency * emission factor * 1,000
(About 1 hour from the origin to the destination, one-way is 48.2km)

If the origin of the travel by each participant can be identified as Tokyo or a neighboring prefecture according to the characteristics of the meeting event, the origin can be easily assumed. For the above example, while many participants are assumed to come from the origin in Tokyo, the method estimates emissions conservatively in order to avoid underestimation by assuming a longer travel distance. (In case of rail travel, the true amount of emissions can be estimated with the margin of error less than 1 ton even when the travel distance is half actually.)

Source: Ministry of the Environment, Carbon Offset Guideline Ver.1.0, 2015

Fig. 6　Direct emissions of CO_2 by sector and total non-CO_2 GHGs (Kyoto gases) across sectors in baseline (the left panel), and mitigation scenarios that reach around 450 (430 - 480) ppm CO_2eq with CCS (Carbon dioxide Capture and Storage) (the middle panel), and without CCS (the right panel)

■The numbers at the bottom of the graphs refer to the number of scenarios included in the range which differs across sectors and time due to different sectoral resolution and time horizon of models. Note that many models cannot reach 450 ppm CO_2eq concentration by 2100 in the absence of CCS, resulting in a low number of scenarios for the right panel.



Source: IPCC, Summary for Policymakers, In: Climate Change 2014, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the IPCC, 2014

3-5 Environmentally Friendly Institutional Measures

Associate Professor, Interdisciplinary Graduate School of Science and Technology, Tokyo Institute of Technology
Yasunori Muromachi

Since 2010, the Clean Development Mechanism has been applied for real in transportation sector; however, from 2013 onward, only one project has been registered. The Joint Crediting Mechanism has also been promoted to contribute to the development of low carbon society in developing countries. In Japan, Location Adjustment Plan has been introduced to promote the formulation of compact cities. Local Governments have been developing their plans.

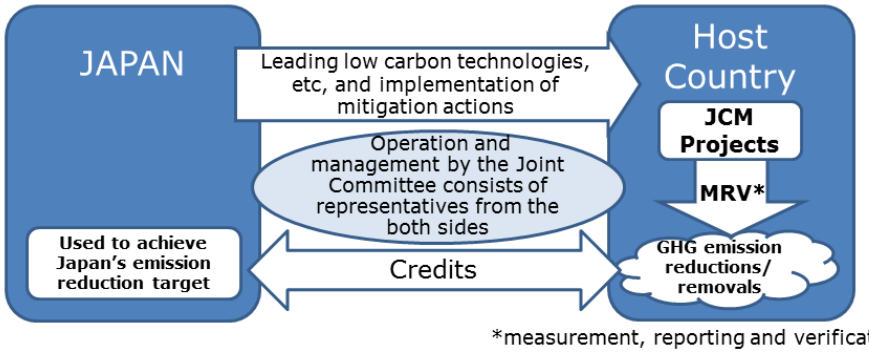
Table 1 The current status of Clean Development Mechanism in transportation sector

Registered	Title	Host Parties	Other Parties	Reductions (t/yr)	Registered	Title	Host Parties	Other Parties	Reductions (t/yr)
7-Dec-06	BRT Bogotá, Colombia: TransMilenio Phase II to IV	Colombia	Switzerland Netherlands	246563	12-Mar-12	MIO Cali, Colombia	Colombia	Netherlands	242187
					13-Mar-12	BRT Metroplus Medellin, Columbia	Colombia	Switzerland	123479
29-Dec-07	Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system	India	Japan	41160	3-Jul-12	Bus Rapid Transit (BRT) in Guatemala City	Guatemala		536148
26-Apr-10	Cable Cars Metro Medellín, Colombia	Colombia	Switzerland	17290	23-Jul-12	Lanzhou Bus Rapid Transit (BRT) Project	China	Sweden	12621
19-Oct-10	BRT Chongqing Lines 1-4, China	China	Switzerland Germany	218067	10-Aug-12	MEGABUS, Pereira, Colombia	Colombia	Netherlands	33956
					12-Sep-12	Metro Line 12, Mexico City	Mexico	Switzerland	136983
17-Dec-10	Plant-Oil Production for Usage in Vehicles, Paraguay	Paraguay	Switzerland	17188	24-Sep-12	BRT Metrobus 2-13, Mexico	Mexico	Switzerland	134601
4-Feb-11	Modal Shift from Road to Train for transportation of cars	India		23001	27-Sep-12	EKO electric vehicles, India	India	Switzerland	24563
30-May-11	BRT Lines 1-5 EDOMEX, Mexico	Mexico	Switzerland Portugal	145863	27-Sep-12	Hero Electric Vehicles, India	India	Switzerland	37647
					28-Sep-12	Nittsu Fuel Efficiency Improvement with Digital Tachograph Systems on Road Freight Transportation CDM Project in Malaysia	Malaysia	Japan	239
7-Jun-11	BRT Zhengzhou, China	China	Switzerland Portugal	204715	2-Nov-12	Electrotherm Electric Vehicles, India	India	Switzerland	36175
					2-Nov-12	Lohia Auto Industries Electric Vehicles, India	India	Switzerland	25518
30-Jun-11	Metro Delhi, India	India	Switzerland	529043	22-Nov-12	Mode-shift of passengers from private vehicles to MRTS for Gurgaon metro	India	Switzerland	105863
10-Aug-11	BRT Metrobus Insurgentes, Mexico	Mexico	Spain	46544	19-Dec-12	LRT System in Tunis	Tunisia		29193
4-Oct-11	Mumbai Metro One, India	India	Switzerland	195547	31-Jan-13	Demonstration project for annual production 4, 000, 000 m3 biogas from organic waste in Anyang City	China	United Kingdom of Great Britain and Northern Ireland	50739
16-Dec-11	BRT Transmetro Barranquilla, Colombia	Colombia	Spain	55828	25-Feb-13	Guiyang MRTS Line I Project	China		335188
10-Feb-12	BRT Macrobus Guadalajara, Mexico	Mexico	Spain	54365	6-Nov-14	Landfill Closure and Gas capture CDM project by GAIL at Ghazipur, India	India		9337

Source: UNFCCC, http://cdm.unfccc.int/Projects/projsearch.html, 2015

Fig. 1 Development of the Joint Crediting Mechanism (JCM)

■The Joint Crediting Mechanism (JCM) facilitates the diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as the implementation of mitigation actions, and contributes to the sustainable development of developing countries.



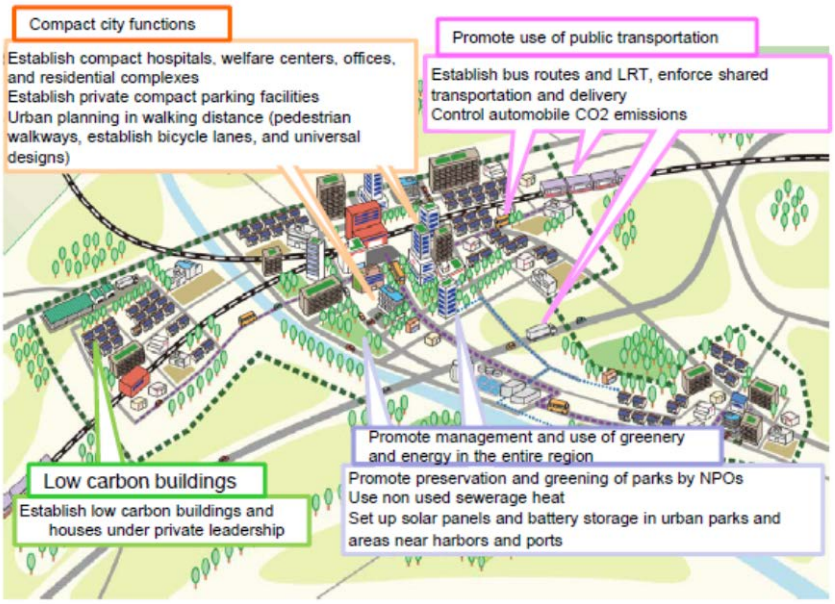
Host Countries: Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia, and Chile as of May, 2015

Transportation Project Example:
Eco-Driving by Utilizing Digital Tachograph System in Vietnam

Source: The Joint Crediting Mechanism (JCM), https://www.jcm.go.jp/, 2015

Fig.2 The Act on the Promotion of Low Carbon in Cities

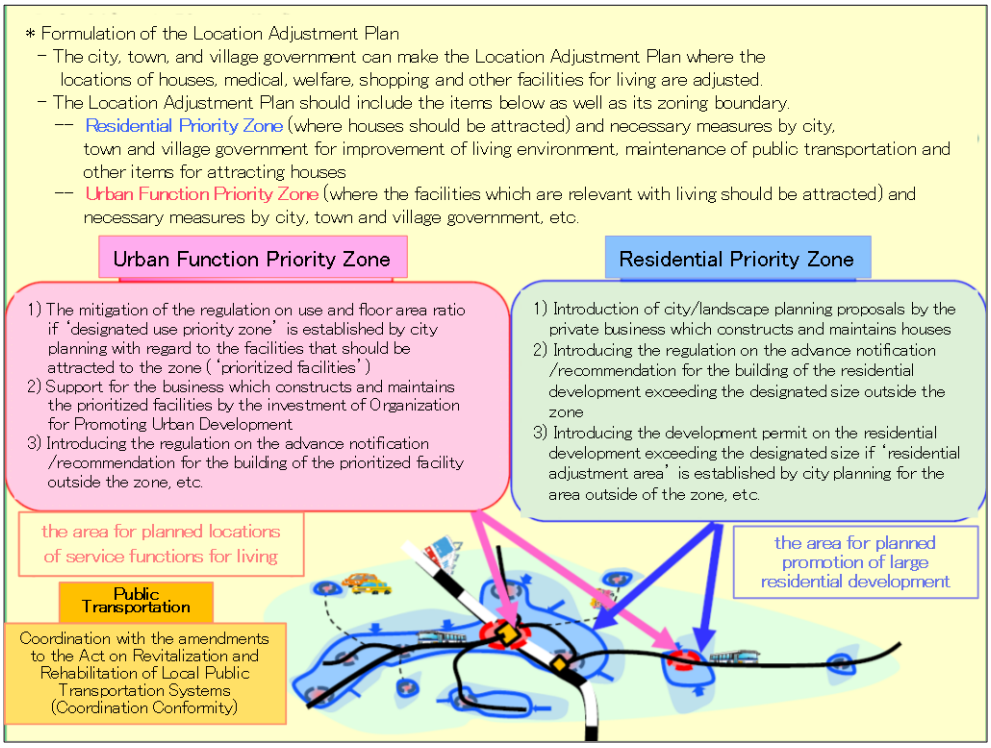
■With the change in energy demand due to the Great East Japan Earthquake and based on the uplift of consciousness among the people on energy and global warming, it is necessary to promote private investments in city areas, to create success stories on the rationalization of low carbon cities and transportation and energy use to spread these concepts to activate housing markets and regional economy.



Source: Ministry of Land, infrastructure, Transport and Tourism, http://www.mlit.go.jp/common/000996976.pdf, 2013

Fig.3 Introduction of Location Adjustment Plan

■In order to adjust the locations of houses, medical, welfare, shopping and other facilities for living, the amendments to the Act on Special Measures concerning Urban Reconstruction has required the development of Location Adjustment Plans of Local Governments(city, town and village) to attract the facilities to designated zones. The Location Adjustment has established floor area ratios and the relaxation of restrictions for the residential facilities.



Source: Ministry of Land, infrastructure, Transport and Tourism, http://www.mlit.go.jp/report/press/toshi07_hh_000079.html, 2014

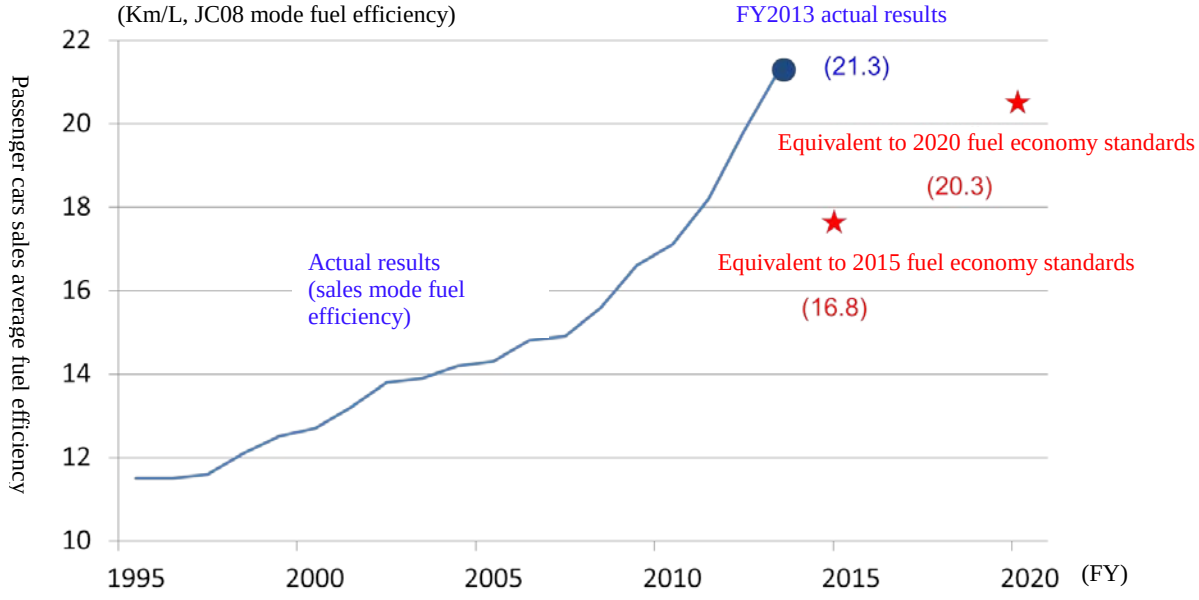
3-6 Development and Popularization of Eco-Vehicles

Japan Automobile Manufacturers Association,
Director General, Environment Department
Tadashi Kotake

To combat global warming, automakers continue efforts to improve fuel efficiency by introducing a wide range of fuel efficiency enhancing technologies while promoting the development and popularization of next-generation vehicles. They also are working on the recycling of vehicles to construct a recycle-based society.

Figure 1 Average fuel efficiency of passenger cars sold

■ The fuel efficiency of passenger cars is improving quickly. The fuel efficiency of new passenger cars is expected to improve continuously through implementing fuel efficiency improvement technologies and the development and commercialization of next-generation vehicles.



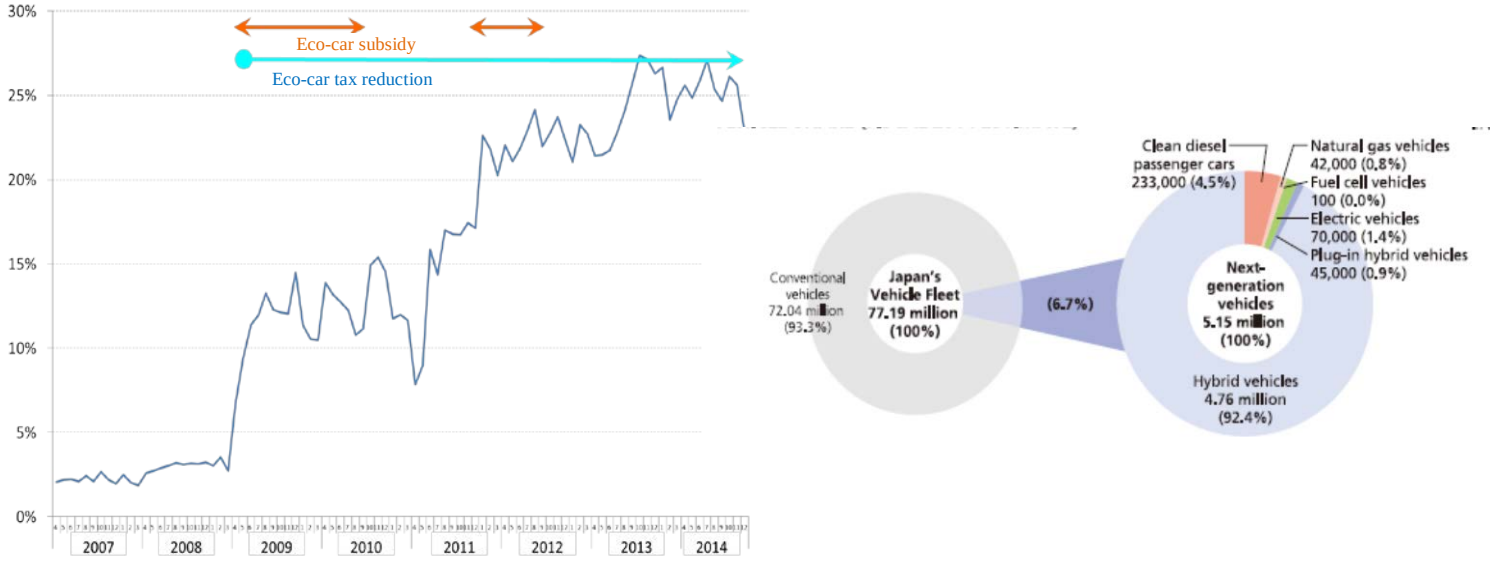
Note: Values of past results are converted into JC08 mode to display fuel efficiency results. Applies only to domestic vehicles.

Source: Japan Automobile Manufacturers Association

Figure 2 Next-generation Vehicles: Unit sales ratio and the number of vehicles owned

■ The sales of next-generation passenger cars have grown to account for about 25% of total sales. This growth is the result of measures such as the creation of initial demand and the introduction of eco-car subsidies as well as the reduction of taxes on eco-cars.

■ As of 2014, the number of next-generation vehicles owned was estimated at about 5,150,000. Though, the number is only approximately 6.7% of the total number of currently owned cars, but it has grown rapidly in recent years. Such next-generation vehicles are expected to contribute greatly to the reduction of CO_2 emissions in the future.



Source: Japan Automobile Manufacturers Association

Table 1 The dissemination goal and strategy for next-generation vehicles in "Next Generation Vehicle Strategy 2010" (Ministry of Economy, Trade and Industry)

- To accelerate the spread of next-generation vehicles, the government has set the following desirable targets in terms of car model percentage in the unit sales of new cars. To achieve these targets will require government-led pro-active incentive measures (aid for development, assistance with purchases, benefits in the taxation system, construction of infrastructure, and so on).
- The "Next Generation Vehicle Strategy 2010" includes action plans for each of six strategies to encourage the spread of next-generation vehicles.
- In addition, the global strategy of "Automobile Industrial Strategy 2014 " specifies the areas to be addressed to achieve the targets for the spread of next-generation vehicles.

Targets for next-generation vehicles

	2020	2030
Conventional vehicles	50~80%	30~50%
Next-generation vehicles	20~50%	50~70%
Hybrid vehicles	20~30%	30~40%
Electric vehicles Plug-in hybrid vehicles	15~20%	20~30%
Fuel cell-powered vehicles	~1%	~3%
Clean diesel-powered vehicles	~5%	5~10%

Six strategies

① Overall strategy
Japan to develop and produce next-generation vehicles in its production facilities
Targets for the spread of next-generation vehicles
Up to 50% by 2020
・Advanced environmental vehicles (next-generation vehicles + conventional vehicles with superior environmental performance)
Up to 80% by 2020
・Fuel diversification

② Battery strategy
Ensuring the world's most advanced battery R&D and technology

③ Resources strategy
Securing supplies of rare metals + building of resource recycling system

④ Infrastructure construction strategy
Two million standard battery chargers
Five thousand units of quick chargers

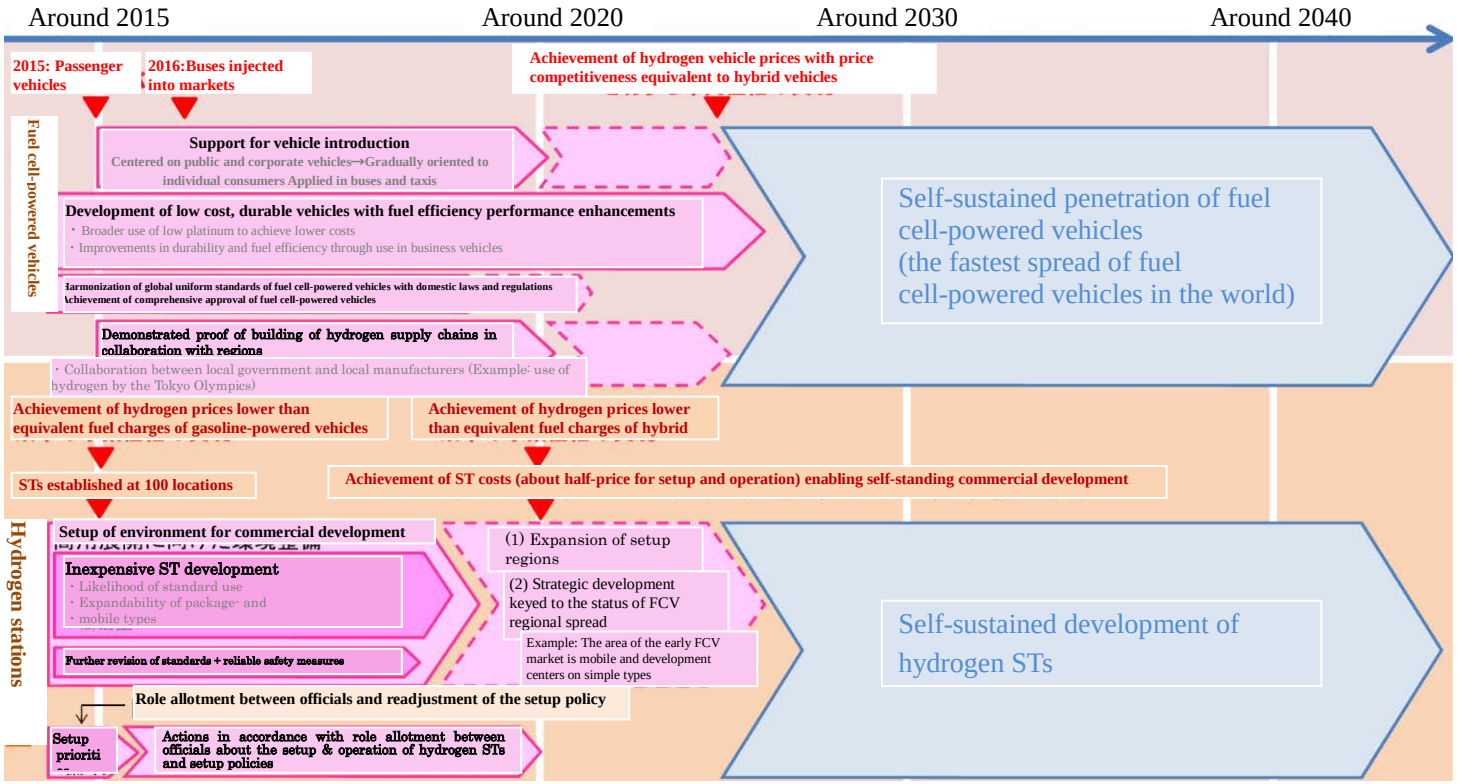
⑤ System strategy
Systemized vehicle exports (smart grids)

⑥International standardization strategy
Strategic international standardization led by Japan

Source: Next Generation Vehicle Strategy 2010

Figure 3 Road Map for Hydrogen and Fuel Cell Strategy

- In December 2013, the Ministry of Economy, Trade and Industry established the "Hydrogen/Fuel Cell Strategy Council." In collaboration with the government, industry, and academia, the Council reviewed the most useful applications of hydrogen energy in the future. On June 23, 2014, it released the "Hydrogen/fuel Cell Strategy Roadmap." This Roadmap highlighted official initiatives leading to the achievement of a future society based in part on hydrogen power.
- Besides including applications of hydrogen, the Roadmap specified desirable targets for each stage of production, transportation, and storage as well as initiatives for collaborating between government, industry, and academia leading to implementation. It also clearly stated a time-base (schedule). The major new contents are as follows.
  (1) Target prices of fuel cell-powered cars（equivalent to hybrid vehicles of the same vehicle rank around 2025）
  (2) Hydrogen price targets ((lower than fuel charges of the equivalent gasoline-powered vehicles in the year 2015 and lower than fuel charges of the equivalent hybrid vehicles around 2020).
  (3) Global uniform standards of fuel cell-powered vehicles and harmonization of Japanese domestic laws and mutual recognition of approvals.



Source: Ministry of Economy, Trade and Industry

Figure 4　Establishment of charging and supply infrastructures in Japan

■ The establishment of charging and supply infrastructures has become indispensable in order to popularize electric car and fuel cell-powered vehicles.

Automakers:

Electric vehicles: Production vehicles were introduced into the domestic market in the year 2009 and unit sales have greatly increased in recent years.

Fuel cell-powered vehicles: Production vehicles were introduced into the domestic market in 2014 and sales were begun to general users.

Businesses providing charging and supplies:

Electric vehicles : As of July 2015, approximately 5,400 quick-chargers had been installed in Japan.

Fuel cell-powered vehicles: To create markets for the beginning of sales of such vehicles, the goal is to install preparatory hydrogen supply infrastructure in four metropolitan areas (Tokyo, Nagoya, Kyoto, Osaka and Fukuoka).

Automakers and businesses providing charging and supplies:

・Introduction and expansion of vehicles nationwide and joint initiatives to establish the charging and supply infrastructure networks.

・Requests to the government to devise a joint public-private strategy for the spread of such vehicles.

An electric vehicle during quick charging

A hydrogen station for fuel cell-powered vehicles

Sources: **Electric vehicles:** CHAdeMO Association and other materials
Fuel cell-powered vehicles: Japan Automobile Manufacturers Association

Table 2 The number of vehicles in use and trend of the average age of vehicles

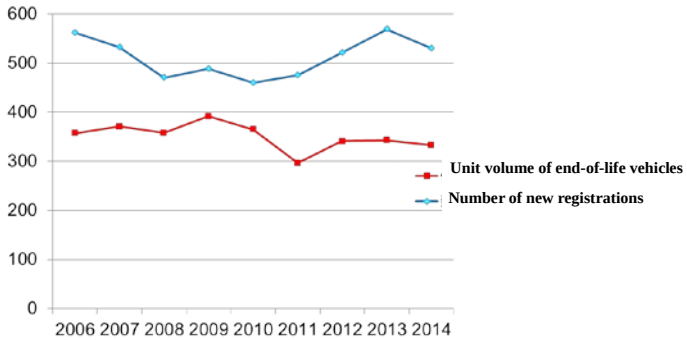
■ The average years of use tends to lengthen in step with the growth of the number of vehicles owned.

FY	2006	2007	2008	2009	2010	2011	2012	2013
Japan's vehicle fleet	7551	7568	7547	7514	7502	7499	7544	7654
Average years of use	12.4	12.9	13.0	13.5	13.4	13.7	14.1	14.3

Source: Automobile Inspection & Registration Information Association and Japan Automobile Recycling Promotion Center

Figure 5 The trend of number of End of Life Vehicles recovered

■ The number of ELVs in FY 2011 was less than 3 million for the first time since the End-of-Life Vehicle Recycling Law went into force, but it increased to 3.4 million after 2012.



Source: Japan Automobile Dealers Association and Japan Automobile Recycling Promotion Center

Table 3 Automakers' recycling rates

■ Targets for shredder dust and air bags have already been achieved.

	Recycling rate (%)	
	Shredder dust	Air bags
Targets	30 (2005~) 50 (2010~) 70 (2015~)	85
FY 2011	92～94	93～100
FY 2012	93～96.8	93～95
FY 2013	96～97.7	93～100

Source: Materials from METI Industrial Structure Council and Central Environment Council