

A photograph of a rice paddy field in Japan. In the foreground, several farmers are bent over, working in the shallow, reflective water. They are wearing traditional hats and colorful clothing. In the background, a line of snow-capped mountains stretches across the horizon under a clear blue sky. A few cars are visible on a road in the distance.

**Research drifts  
in the time of political transition:**

**Japan's case**

**The 2<sup>nd</sup> Annual Meeting  
20-21 September, 2010 Berlin  
Shuzo Nishioka, NIES**

**Can you feel the blessings of mother nature?**

# Progress of Japan's Climate Policy and Research integration toward Low Carbon Society

	<i>Mid/ long- term GHG reduction policy making</i>	<i>Contribution from Research Society</i>
-2005	More focus on Kyoto	<b>Researchers' paradise</b>
2005-	G8 Glen Eagles Pr	
2007.6	G8 Heiligendamm: 50% reduction globally (PM. Abe)	Technological innovation scenario to 2050 (METI)
2008.6	Kobe propo	<b>Liberal Democratic Party</b>
.7	G8 T Low	
2008.12-2009.4	Cabinet's Consultative Committee (Chair: Fukui) for 2020 target to Copenhagen	6 modeling institutions (NIES, IEEJ, RITE, JCER, Keio U.) invited. Discussed tech. feasibility, economic impact of policies, burden-sharing, international equity
.6	G8 L'aquila: Japan's base) PM.Aso	<b>Transition</b>
2009.9	UN Climate Summit: Japan's target 2020:25%, 2050 80% (1990 base) (PM. Hatoyama)	
.12	Re-examination of Fukui Committee for new target	(Chair: Ueta) Same institutions invited as Fukui Com.
2010.3	'Basic Law agreed by Ca	<b>Democratic Party</b>
2010.4	Envir. Minis	
.4	Roadmap Sub-committee (Chair: Nishioka) under Central Council of Environment started	More than 60 researchers (Univ. ,Research institution, Industry ) engaging under 8 working groups. Will conclude Dec. 2010
.6	Draft Law abandoned, due to election of House of Councilors	METI :Basic plan of Energy opened, 2030:>30% reduction (1990 base) Energy related research institutions participated

## Progress of Japan's Climate Policy and Research integration toward Low Carbon Society

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-2005	More focus on Kyoto target	
2005-	G8 Glen Eagles Process set	70% reduction scenario research project (04-08, NIES/ Kyoto U., MOE + 50 researchers), Japan/UK-Joint RP
2007.6	G8 Heiligendamm: 50% reduction globally (PM. Abe)	Technological innovation scenario to 2050 (METI)
2008.6	Kobe G8+ Environmental Minister's Meeting: <b>LCS RNet</b> proposed	Environmental Energy Innovation Plan published by CSTP (Central Council for S&T Policy, Chair: PM)
.7	G8 Toyako: Japan 2050 target 60-80% reduction towards <b>Low Carbon Society</b> (PM. Fukuda)	Low Carbon Model Cities (Local base)
2008.12-2009.4	Cabinet's Consultative Committee (Chair: Fukui) for 2020 target to Copenhagen	6 modeling institutions (NIES, IEEJ, RITE, JCER, Keio U.) invited. Discussed tech. feasibility, economic impact of policies, burden-sharing, international equity
.6	G8 L'aquila: Japan's 2020 target of 8%reduction (1990 base) PM.Aso	
2009.9	UN Climate Summit: Japan's target 2020:25%, 2050 80% (1990 base) (PM. Hatoyama)	<b>LCRNet Bologna Meeting (Oct.)</b>
.12	Re-examination of Fukui Committee for new target	(Chair: Ueta) Same institutions invited as Fukui Com.
2010.3	' <b>Basic Law on Global Warming Countermeasures</b> ' agreed by Cabinet, passed House of Repres. (June)	'Center for Low Carbon Society Strategy' established by JST/ MEXT(2009 Dec.) with 30 researchers
2010.4	Envir. Minister Ozawa's draft of 25% reduction	
.4	Roadmap Sub-committee (Chair: Nishioka) under Central Council of Environment started	More than 60 researchers (Univ. ,Research institution, Industry ) engaging under 8 working groups. Will conclude Dec. 2010
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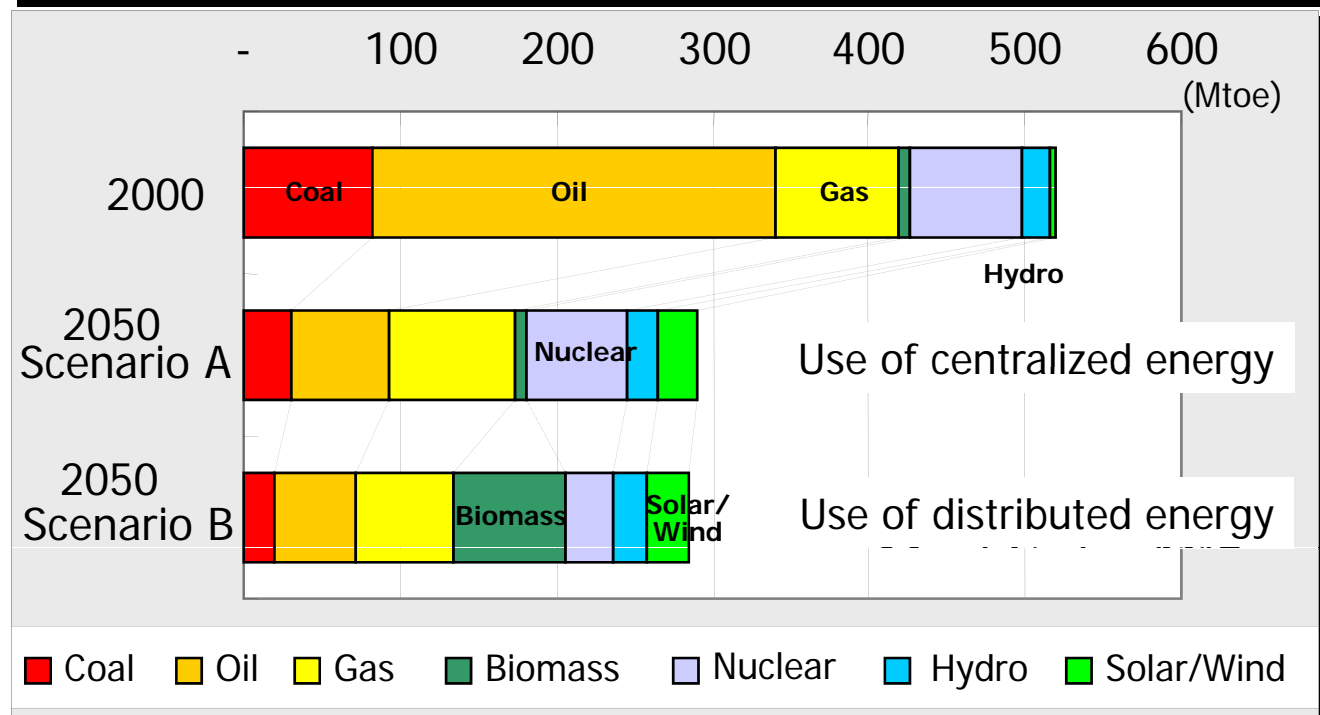
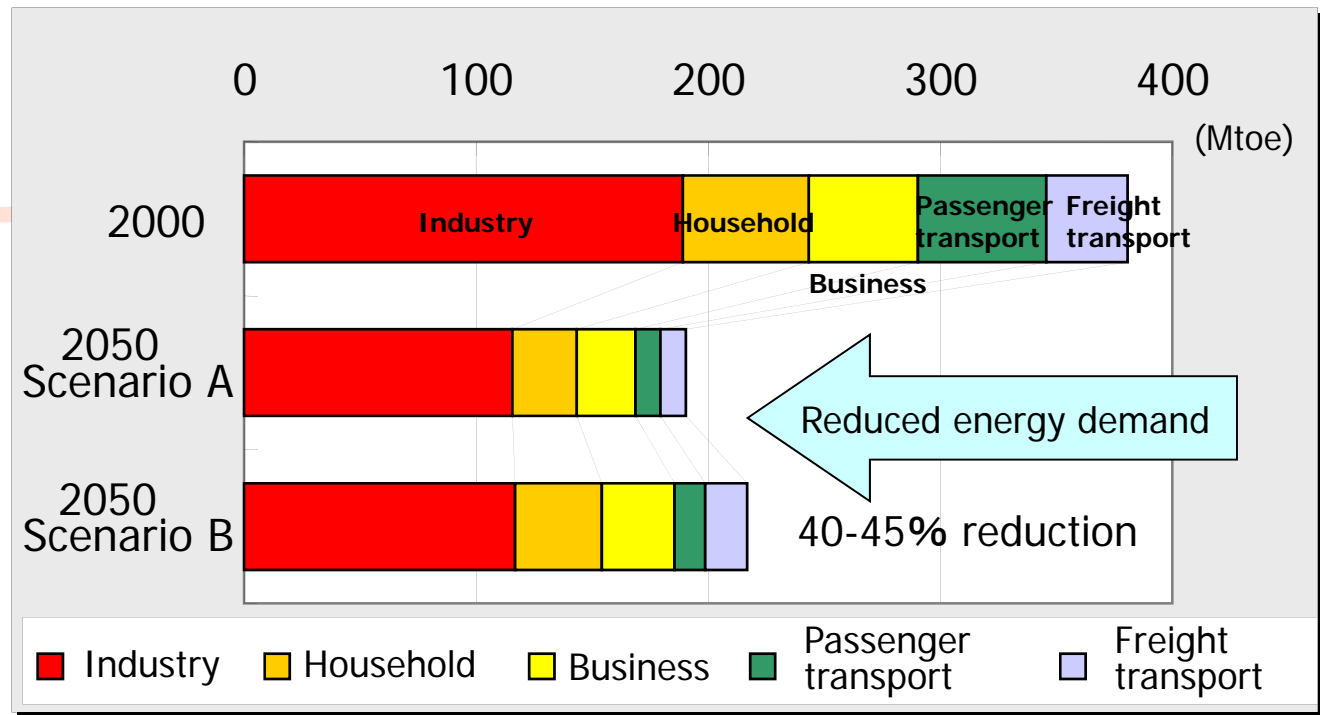
70% CO<sub>2</sub> reduction can be attained by

Eco-efficient product and consumers' smart choices can reduce energy consumption by as much as 40-45%

Equal effort by demand & supply side

Low carbon shift in primary energy sources via introduction of renewable energies

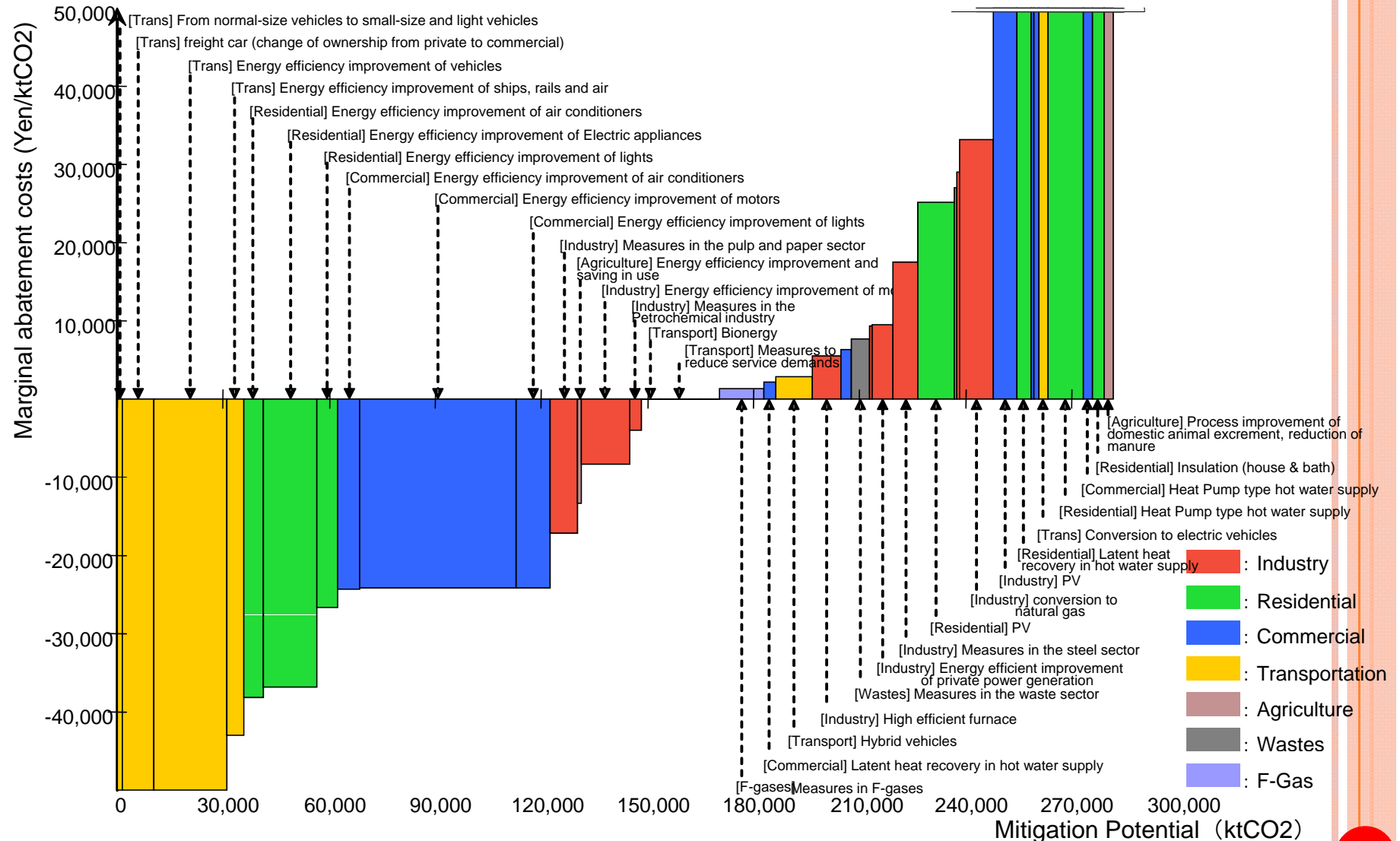
AIM Backcasting Model



# Deployment policy of LC technology

## Reduction potential and cost of Technologies

### Marginal Abatement Cost to Reduce GHG emissions in 2020

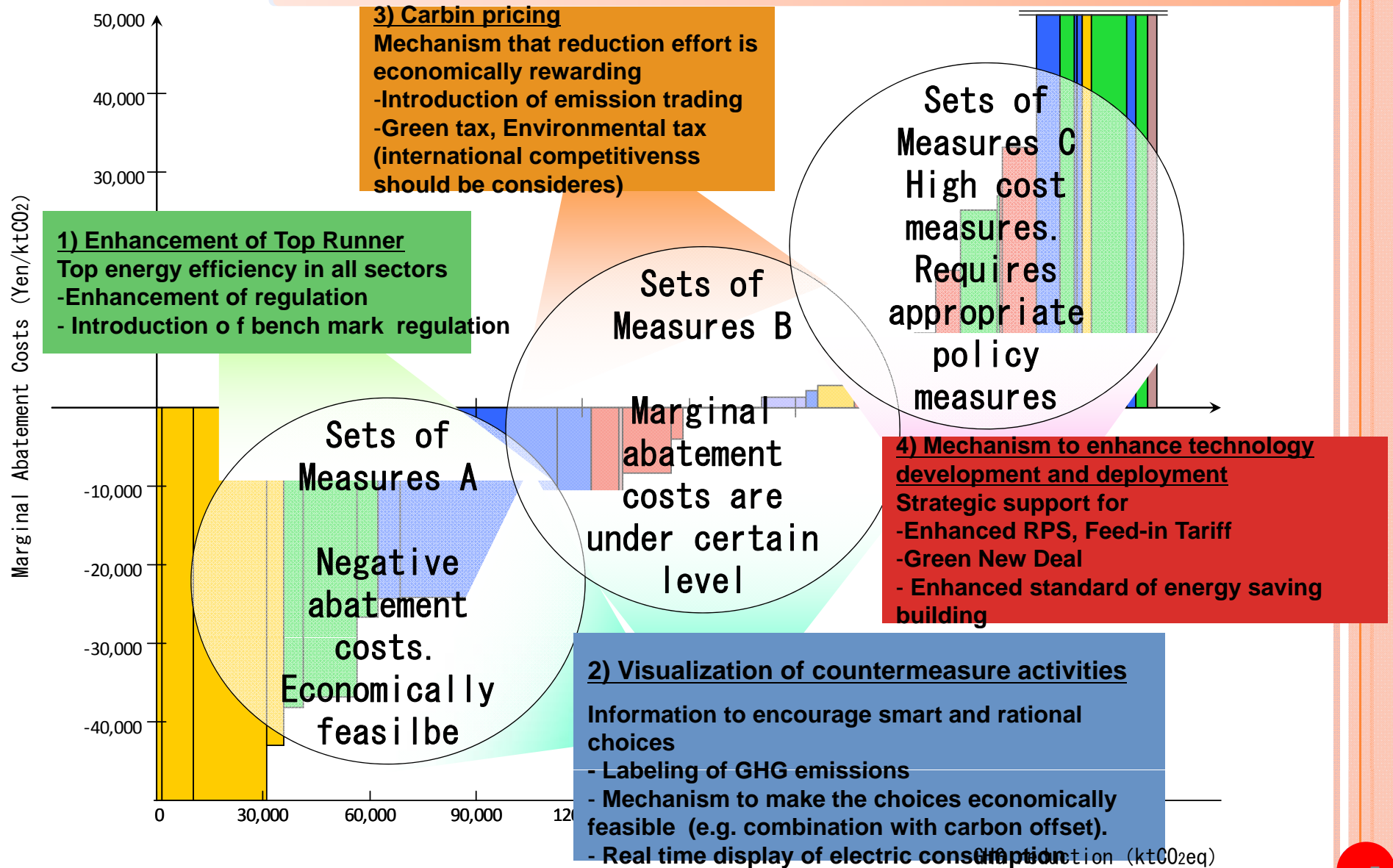


Note: MCII, Payback time is 3 years except 10 years in Insulation and PV. Mitigation potential is compared to the emissions in Frozen Case



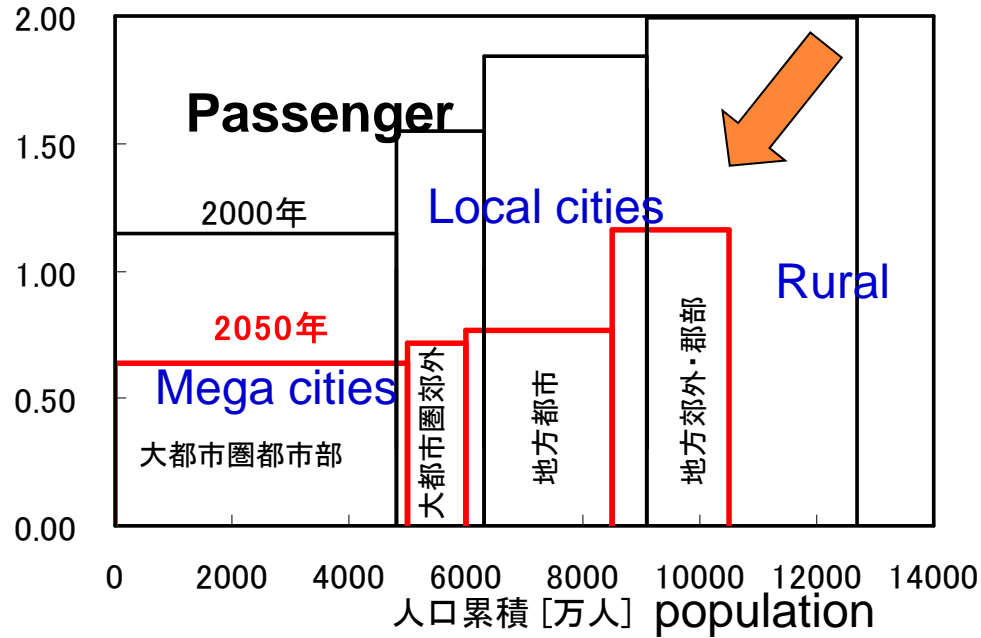
# Countermeasures to implement technologies

Feasible with Four sets of countermeasures to achieve the target of 2020

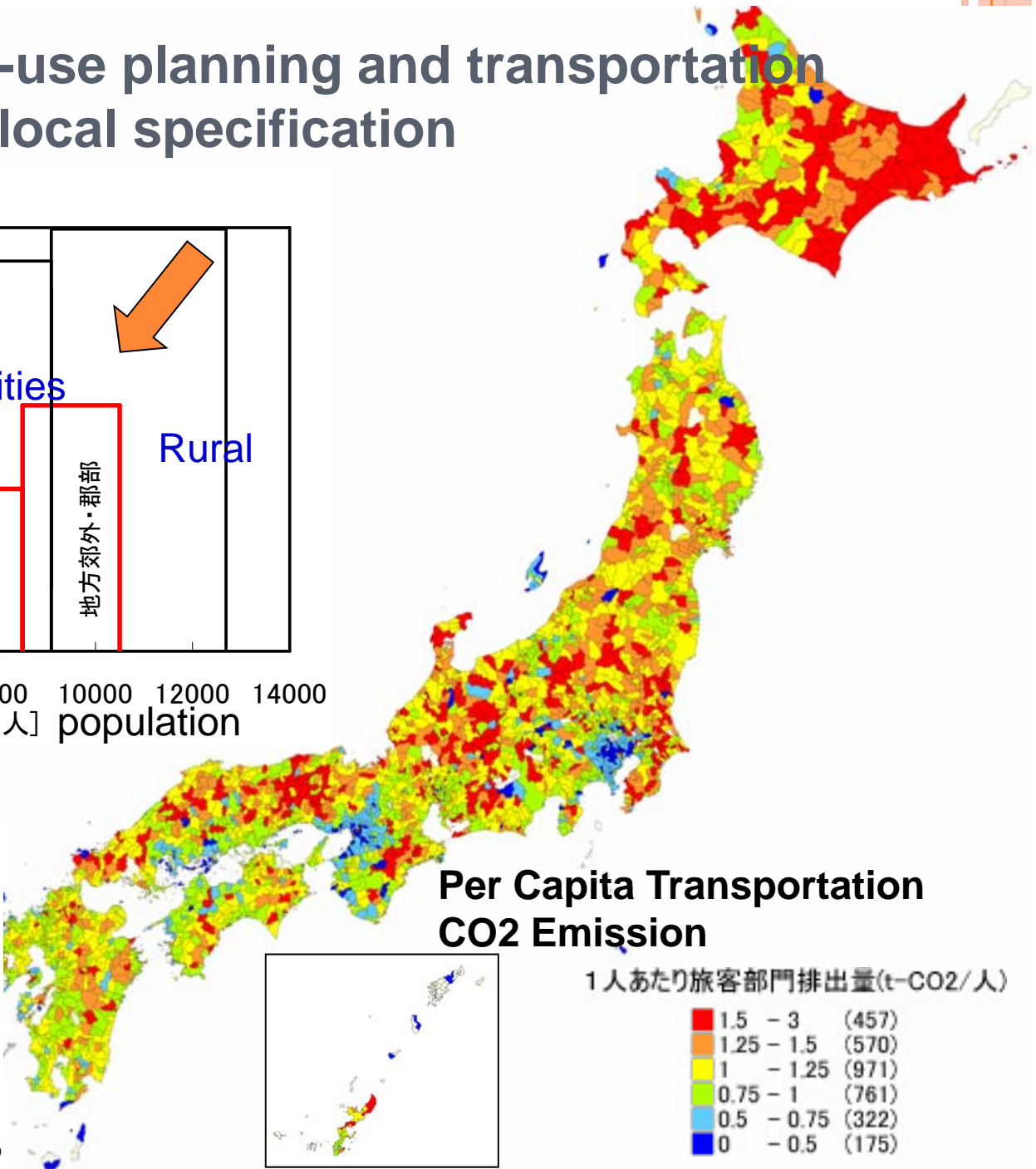
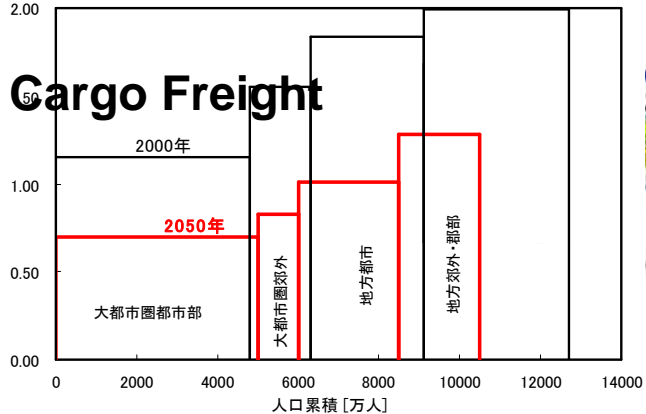


# Infrastructure: Land-use planning and transportation strategy depend on local specification

1人あたりCO2 [t/年]



1人あたりCO2 [t/年]

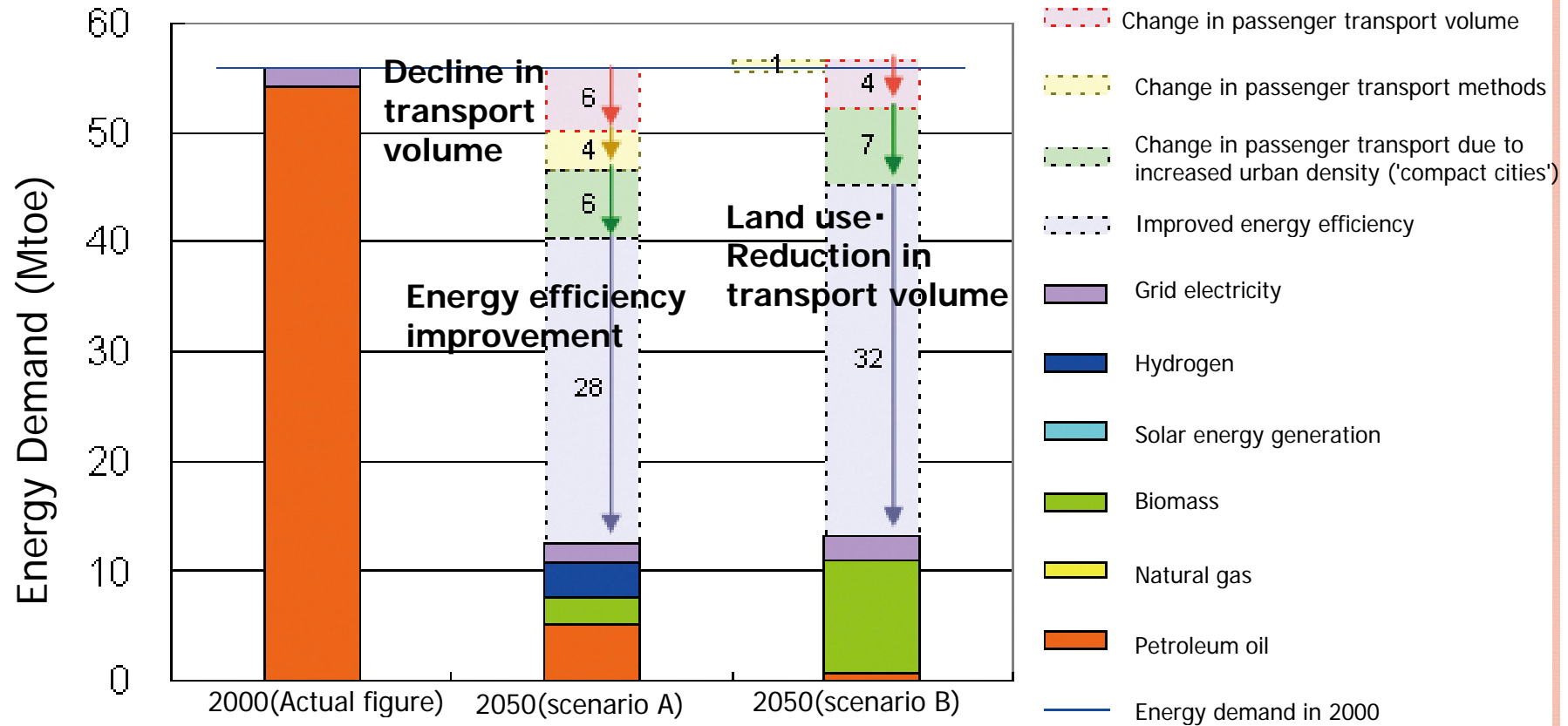


Per Capita Transportation CO2 Emission

1人あたり旅客部門排出量(t-CO2/人)

1.5 - 3	(457)
1.25 - 1.5	(570)
1 - 1.25	(971)
0.75 - 1	(761)
0.5 - 0.75	(322)
0 - 0.5	(175)

## Example: Passenger transport sector can achieve 80% reduction in energy demand via suitable land use & improved energy efficiency



Change in passenger transport volume: reduction in total movements due to population decline

Change in passenger transport methods: modal shift using public transport system (LRT etc.)

Change in passenger transport due to increased urban density ('compact cities'): reduced travel distance due to proximity of destination

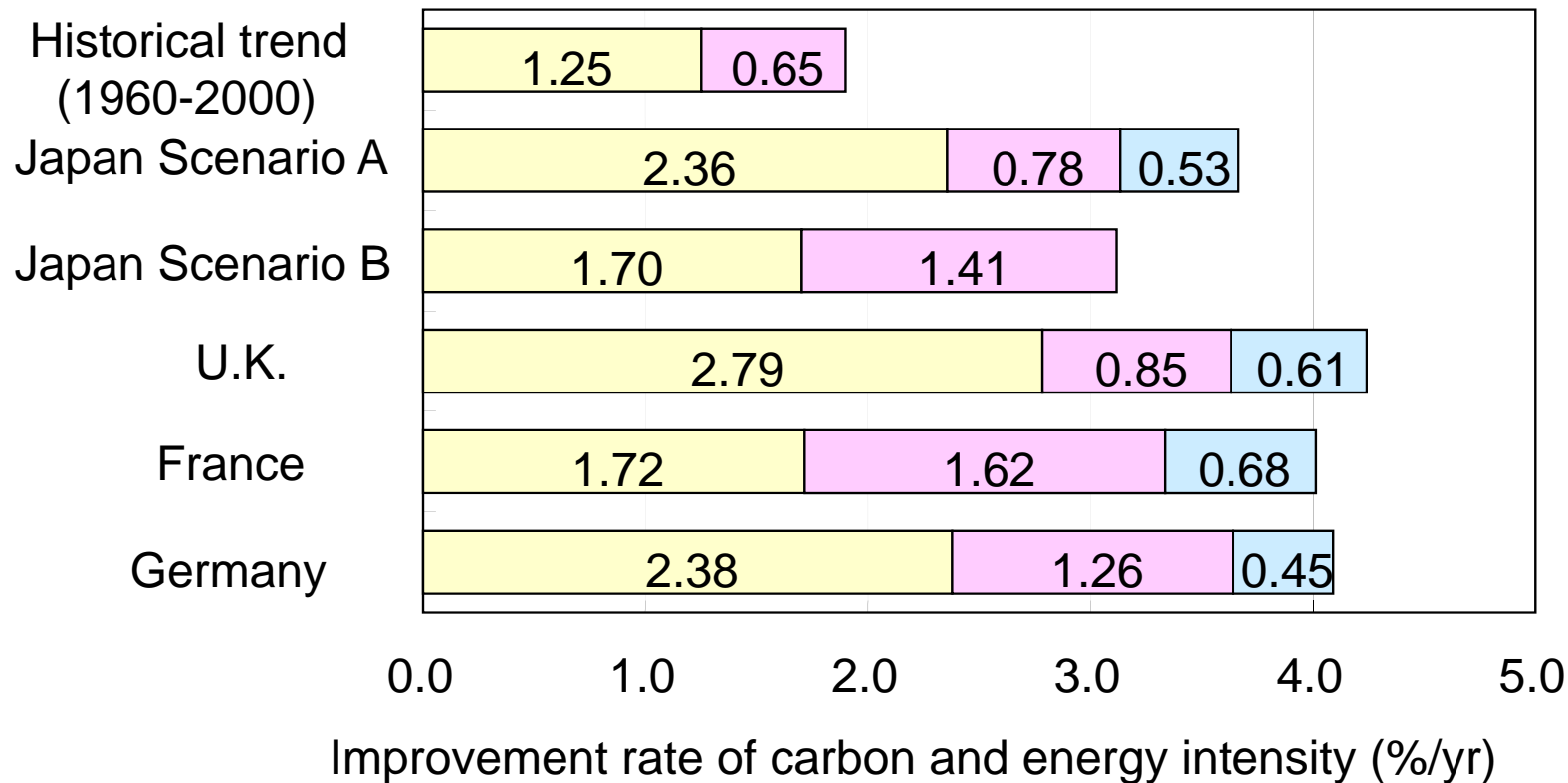
Improved energy efficiency: improvements in automobiles & other passenger transport devices (hybrids, lightweight designs etc.)





## **Technology:** Need acceleration of improvement in energy and carbon intensity to achieve low carbon society by 2050

Energy intensity
  Carbon intensity (w/o CCS)
  Carbon intensity (CCS)



Chinese Energy efficiency improvement:  
 4.3%/year as of target by 2010, 1.6%/year in 2006, 3.7% in 2007

Huge opportunity  
of Innovation



**(ELICA) 4 PASSENGER SEDAN**  
**370km/h MAX.SPEED**

Prof. Hiroshi SHIMIZU, Keio Univ.



# Side effects and creation of new industries

## Making manufacturing low-carbon to become a pillar for Japan's growth

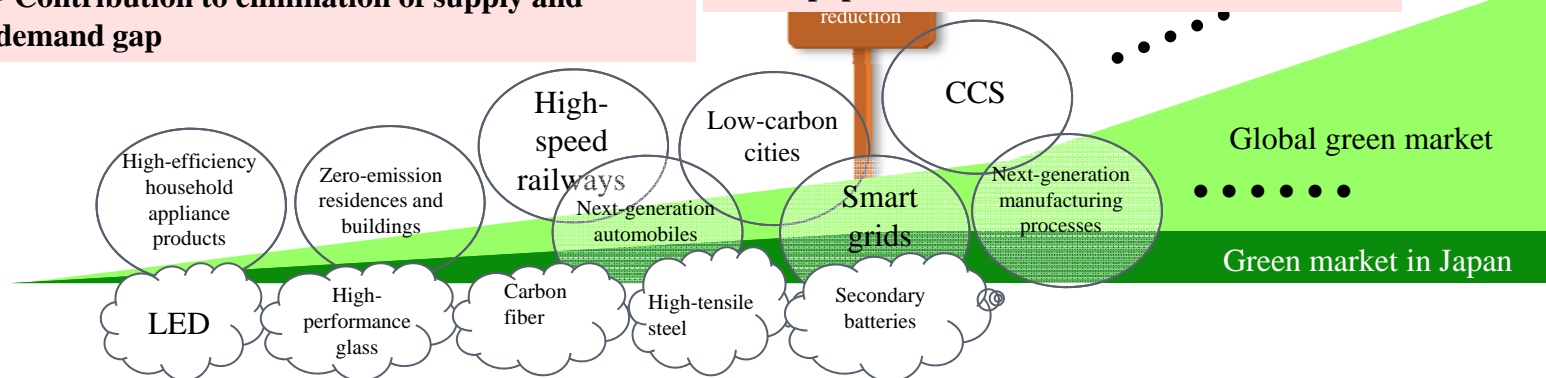
### Now to 2020

- Contribution of global warming measures to domestic measures
- Strengthening of sophistication and versatility of technologies
- Research and development of revolutionary technologies
- Contribution to elimination of supply and demand gap

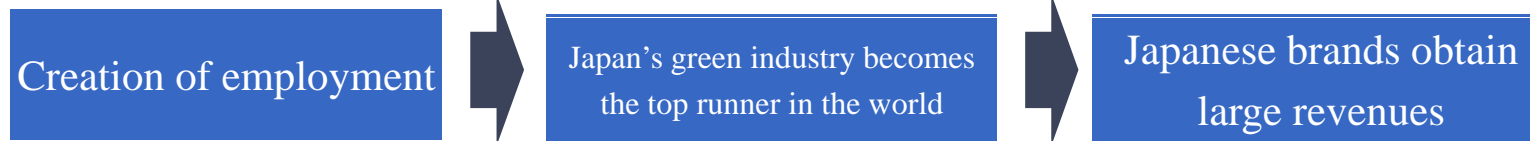
### 2020 to 2050

- Large contribution to global reduction in emissions
- Spread of revolutionary technologies
- Increased dependence on income from overseas accompanying the domestic decrease in the population of workers

Japan: 80% reduction  
World: 50% reduction



Japan's high-quality materials and products give underlying support for the development of low-carbon products



Building mechanisms to promote low-carbon investment in a concentrated manner



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## Techno-Economic Models Applied for Analysis

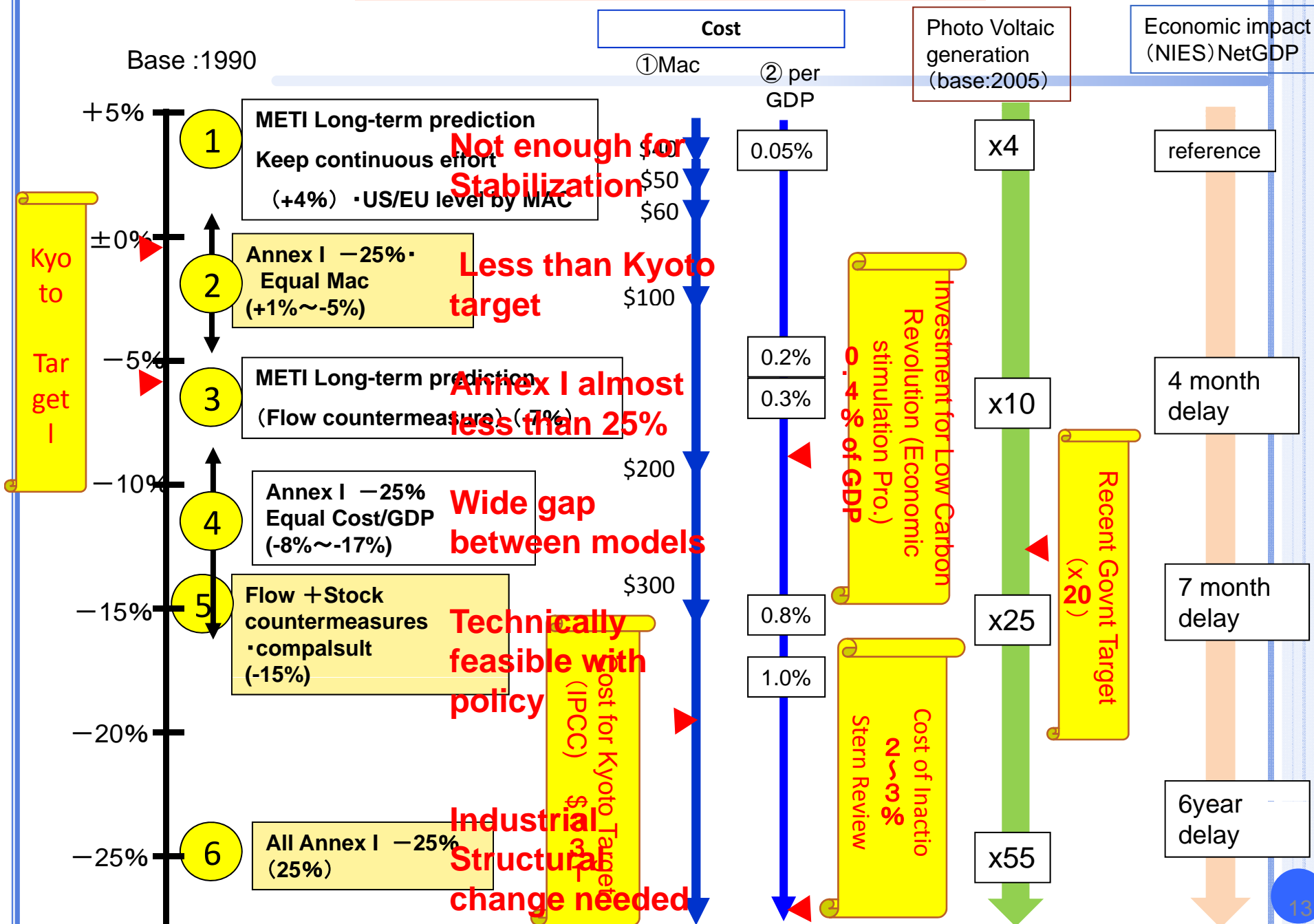
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- International Comparability: MAC (marginal abatement cost) and Cost/GDP analysis models by:
  - National Institute for Environmental Studies (NIES)
  - Research Institute of Innovative Technology for the Earth (RITE)
- Domestic Reduction: Bottom-up technology-based analysis models by:
  - National Institute for Environmental Studies (NIES)
  - Institute of Energy Economics Japan (IEEJ)
- Economic Evaluation: General Equilibrium / Macro-economic models by:
  - Japan Center for Economic Research (JCER)
  - National Institute for Environmental Studies (NIES)
  - Keio University



# Evaluation of Options



# Economic Evaluation of Six Options for Mid-term Target

	Impacts on Economy (as deviations from reference case in 2020)				
	Percent GDP on a cumulative basis by 2020	Private investment in 2020	Unemployment rate in 2020	Disposable income per household in 2020	Lighting and heating expenses per household in 2020
1	1.3%/y Growth Reference Case				
2	/				
3	-0.6 ~ -0.5%	-0.8 ~ +3.4%	+0.2 ~ +0.3%	-150 ~ -40 thousand JPY (-3.1 ~ -0.8%)	+20 ~ 30 thousand JPY (+13 ~ 20%)
4	/				
5	-2.1 ~ -0.8%	-0.2 ~ +7.9%	+0.5 ~ +0.8%	-390 ~ -90 thousand JPY (-8.2 ~ -1.9%)	+60 ~ 80 thousand JPY (+35 ~ 45%)
6	-6.0 ~ -3.2%	-11.9 ~ +12.5%	+1.3 ~ +1.9%	-770 ~ -220 thousand JPY (-15.9 ~ -4.5%)	+110 ~ 140 thousand JPY (+66 ~ 81%)

Financial stimulus packages such as "Green New Deal" are not included in the model analyses.

Cost of inaction should be considered as well.

# International Comparability of Six Options for Japan's Mid-term Target (2)

		Comparability (Reduction in 2020)							
		% above / below 1990				% above / below 2005			
Allocation approach		All Annex I Parties	Japan	U.S.	EU	All Annex I Parties	Japan	U.S.	EU
1	Equivalent in marginal abatement cost	-18 ~ -9%	+4%	-5 ~ +6%	-19 ~ -14%	-14 ~ -6%	-4%	-18 ~ -7%	-14 ~ -9%
2	Equivalent in marginal abatement cost	-25%	-5 ~ +1%	-24 ~ -19%	-27 ~ -23%	-23 ~ -22%	-12 ~ -6%	-33 ~ -30%	-23 ~ -18%
3	Equivalent in marginal abatement cost	-29 ~ -25%	-7%	-24 ~ -23%	-27 ~ -26%	-26 ~ -23%	-14%	-34 ~ -33%	-23 ~ -21%
4	Equivalent in abatement cost per Total GDP	-25%	-17 ~ -8%	-18 ~ -7%	-31 ~ -30%	-23 ~ -22%	-23 ~ -13%	-28 ~ -19%	-27 ~ -25%
5	Equivalent in marginal abatement cost	-39 ~ -29%	-15%	-39 ~ -29%	-33 ~ -29%	-36 ~ -27%	-22 ~ -21%	-47 ~ -38%	-28 ~ -25%

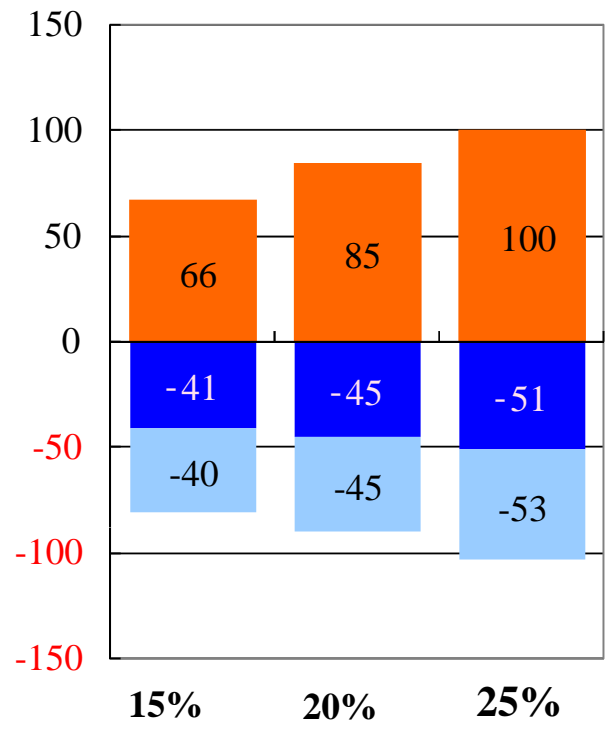
# Investment & Burden-sharing

## Investment for transition: 1-2% of GDP

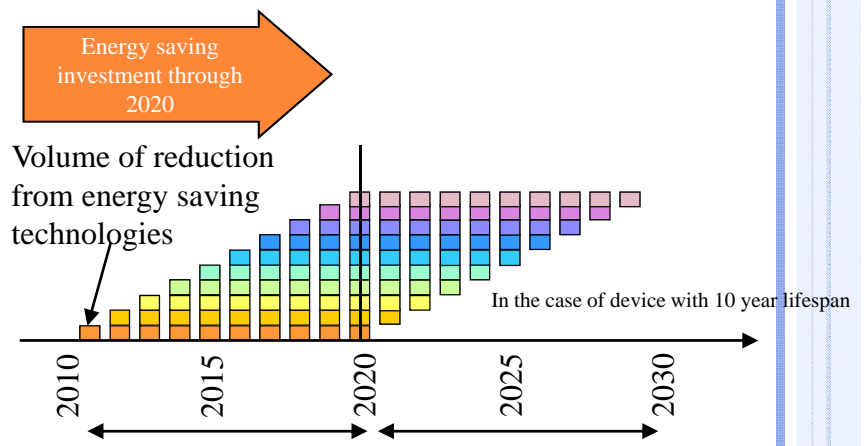
### Fully collected by energy expense reduction

- Half of the overall investment is recollected by 2020 and an amount equal to the investment will be collected by 2030 based on energy expenses that can be saved through technologies introduced.

<Low-carbon investment amount and energy reduction expense>



- Additional investment ('11 - '20 total)
- Energy expense reduction ('11 - '20 total)
- Energy reduction expense ('21 - '30 total)



Energy expense reduction from energy saving investment = approx. 51 trillion yen (25% reduction (3))

Energy expense reduction from energy saving investment = approx. 53 trillion yen (25% reduction (3))

!!



## **Target setting      policy & measures**

# **Overview of the Basic Law on Global Warming Countermeasures**

### **Mid- and Long-term Goals**

#### **Greenhouse gas emissions reduction targets:**

**25% reduction below 1990 level by 2020**

•\*premised on the establishment of a fair and effective international framework by all major economies and agreement on their ambitious targets

**80% reduction below 1990 level by 2050**

\*striving to share with all economies the vision of the goal of achieving at least 50% reduction of global emissions by 2050

#### **Renewable energy target:**

**Raising the share of RE out of total primary energy supply to 10% by 2020**

### **Basic Measures**

#### **Emission Trading System:**

- Establishment of domestic emission trading scheme
- Consider a formula of setting limits of emission as absolute amount of GHG emissions

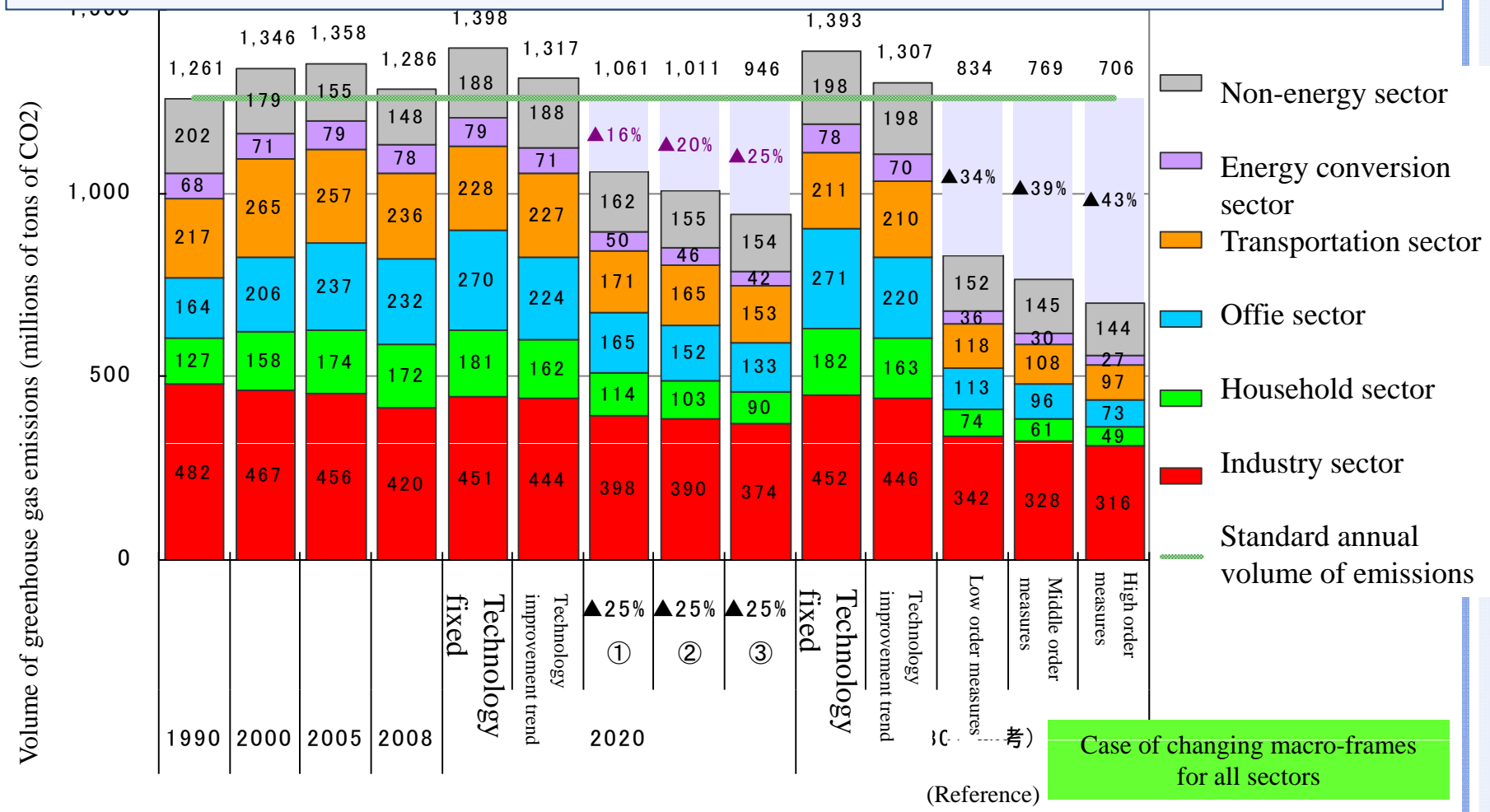
#### **Tax for Measures against Global Warming:**

- “Greening” of the tax system overall, including the consideration of a tax for measures against global warming to be implemented from fiscal year 2011

#### **Feed in Tariff applying all renewable energies**

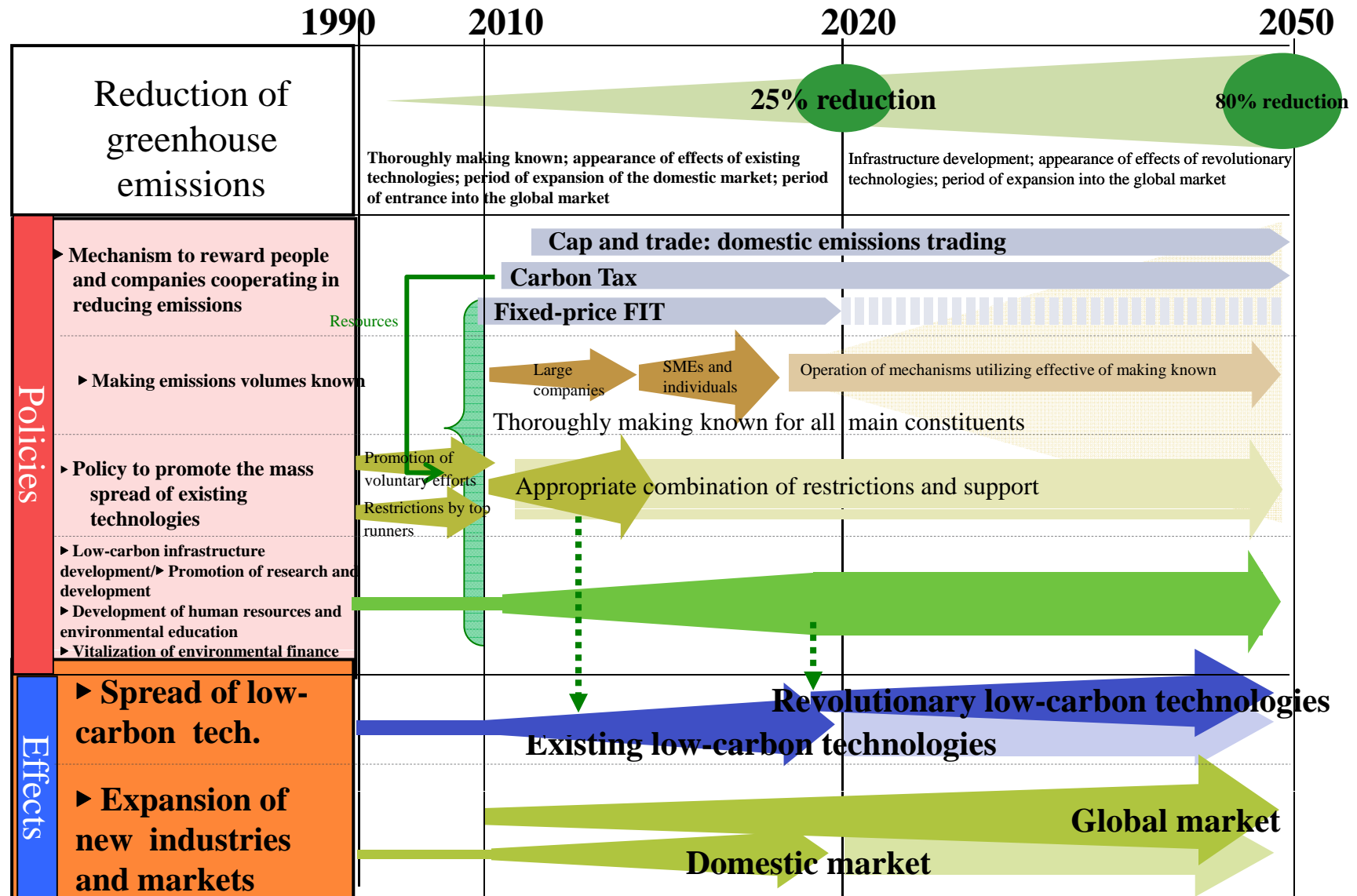
# Projected greenhouse gas emissions [2020/2030]

- 25% reduction of GHG in 2050 is technically possible
- Demand side (household, office, transportation) reduction is the key



Note: 2020 25% (1): case including around 10% of international contribution and sinks; 25% (2): case including around 5% of international contribution and sinks. 2030 lower order to high order measures: the emissions volume for 2030 is done assuming that the measures that have been carried out in order to reduce emissions toward the 25% reduction in 2020 will continue to be carried out in 2012 through 2030.

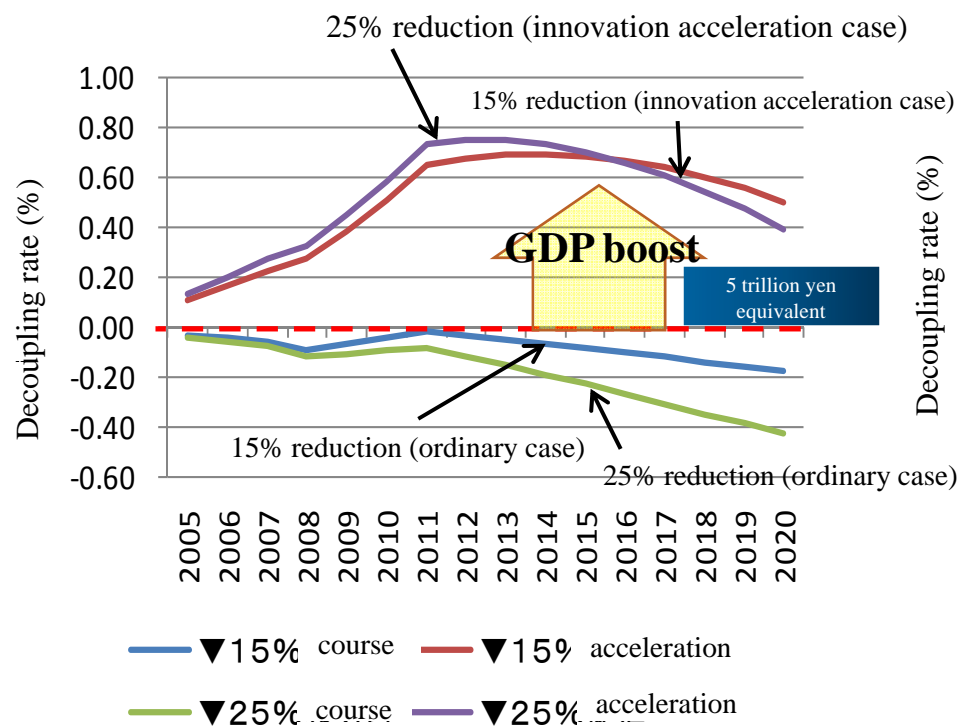
# Scenario and roadmap: policies and effects



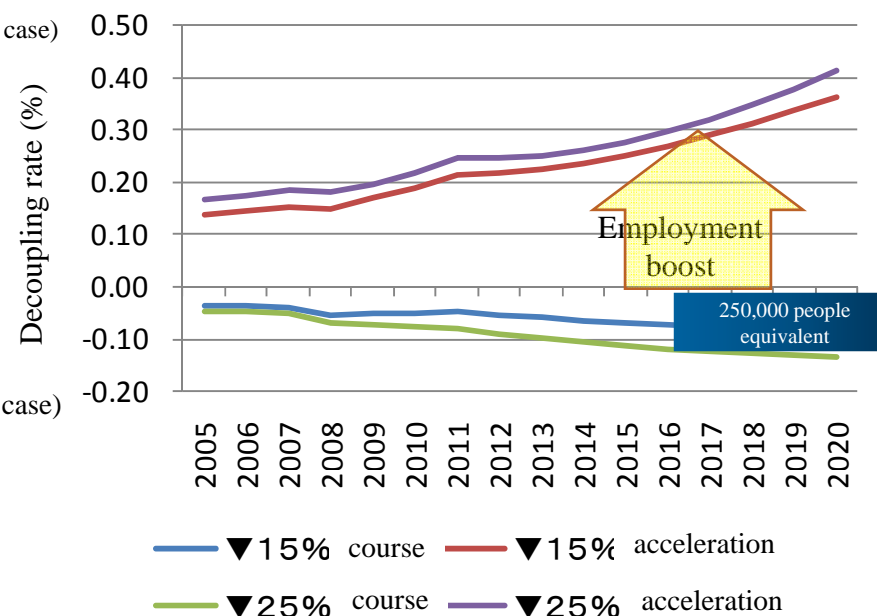
# Early signal makes industry active

Suggestion from applied general equilibrium model

**In a optimization model incorporating forward-looking investment behavior, there is a 5 trillion yen increase in GDP as of 2020 (consumption is replaced with assets) and a net increase in employment of 250,000 people when the direction of policy is clarified compared to when it is not clarified, and an early signal has an effect on the low-carbon society direction.**



<Movement of GDP (comparison with course case)>

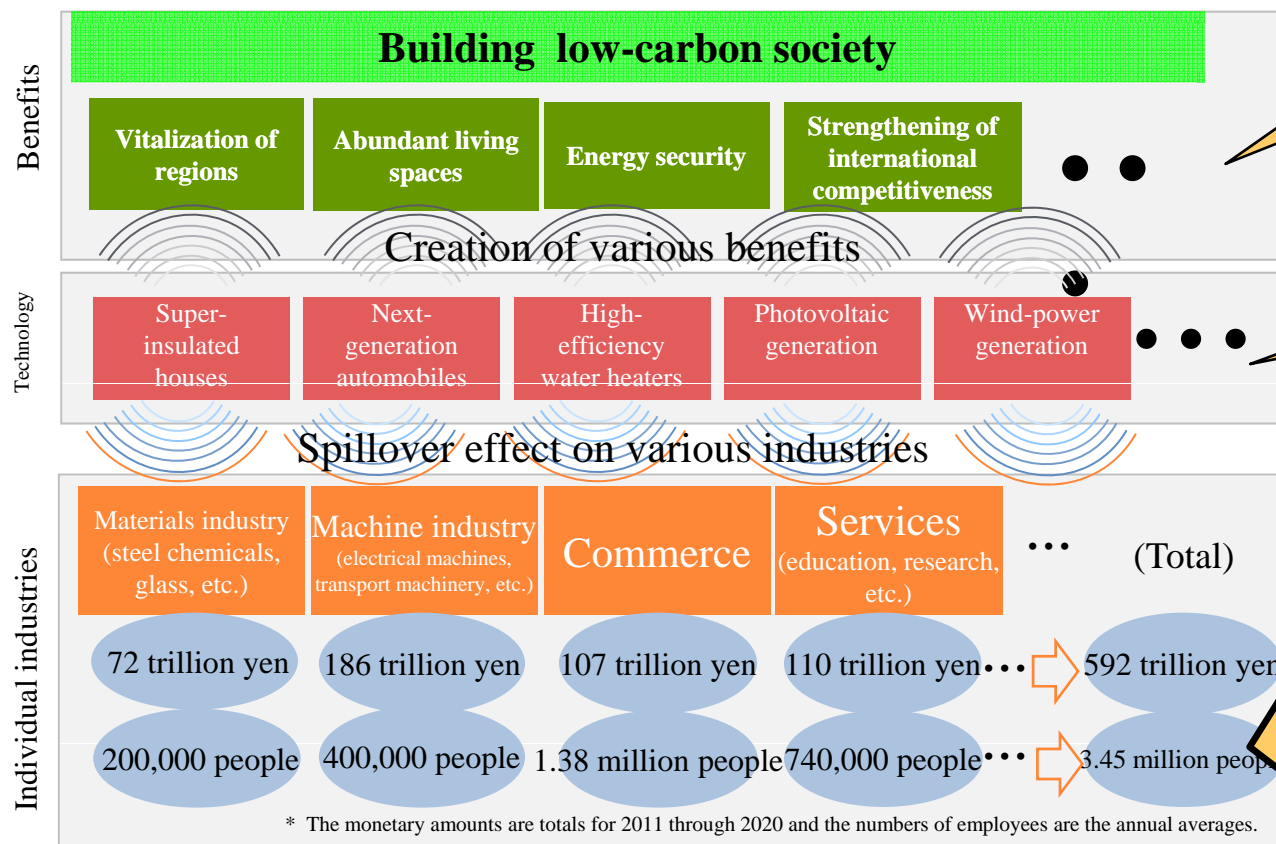


<Movement of employment (comparison with course case)>

# Spillover effect of green investment is more than two-fold employment spillover effect is significant

## inter-industry relations table analysis

The creation of green markets results in the generation of demand of 45 trillion yen and employment of 1.25 million people as of 2020 (equivalent to 90% of the environmental energy field in new growth strategy). Based on an inter-industry relations table analysis, the production spillover effect on the incremental investment necessary for a 25% reduction is 118 trillion yen and the employment spillover effect is 3.45 million jobs. The positive effect on the materials, machinery, commerce, and service industries is significant.



Various benefits are created that cannot be expressed with economic indicators

As of 2020, **45 trillion yen in demand and employment for 1.25 million people are created**

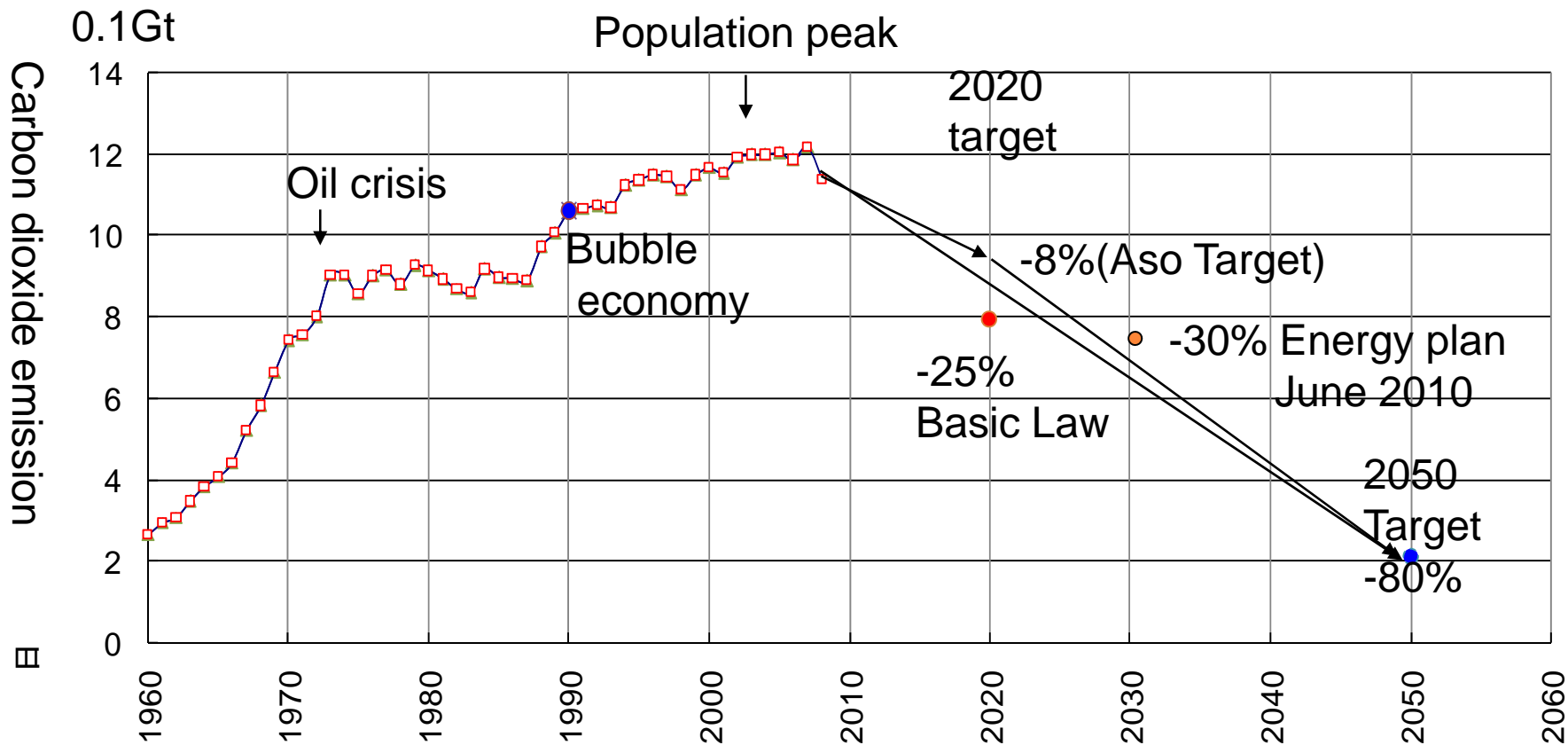
Demand for global warming measures will have various spillover effects on industry, and as of 2020 there will be:  
a market scale of **118 trillion yen** \*1  
an employment scale of **3.45 million jobs** \*2

\*1: This is calculated assuming that the the market scale for low-carbon technologies will grow through 2020.  
\*2: Actually as an effect of the creation of new markets, it is expected that the existing types of industries will shrink to a certain degree. The above figure does not include this type of minus effect.



## Target & path

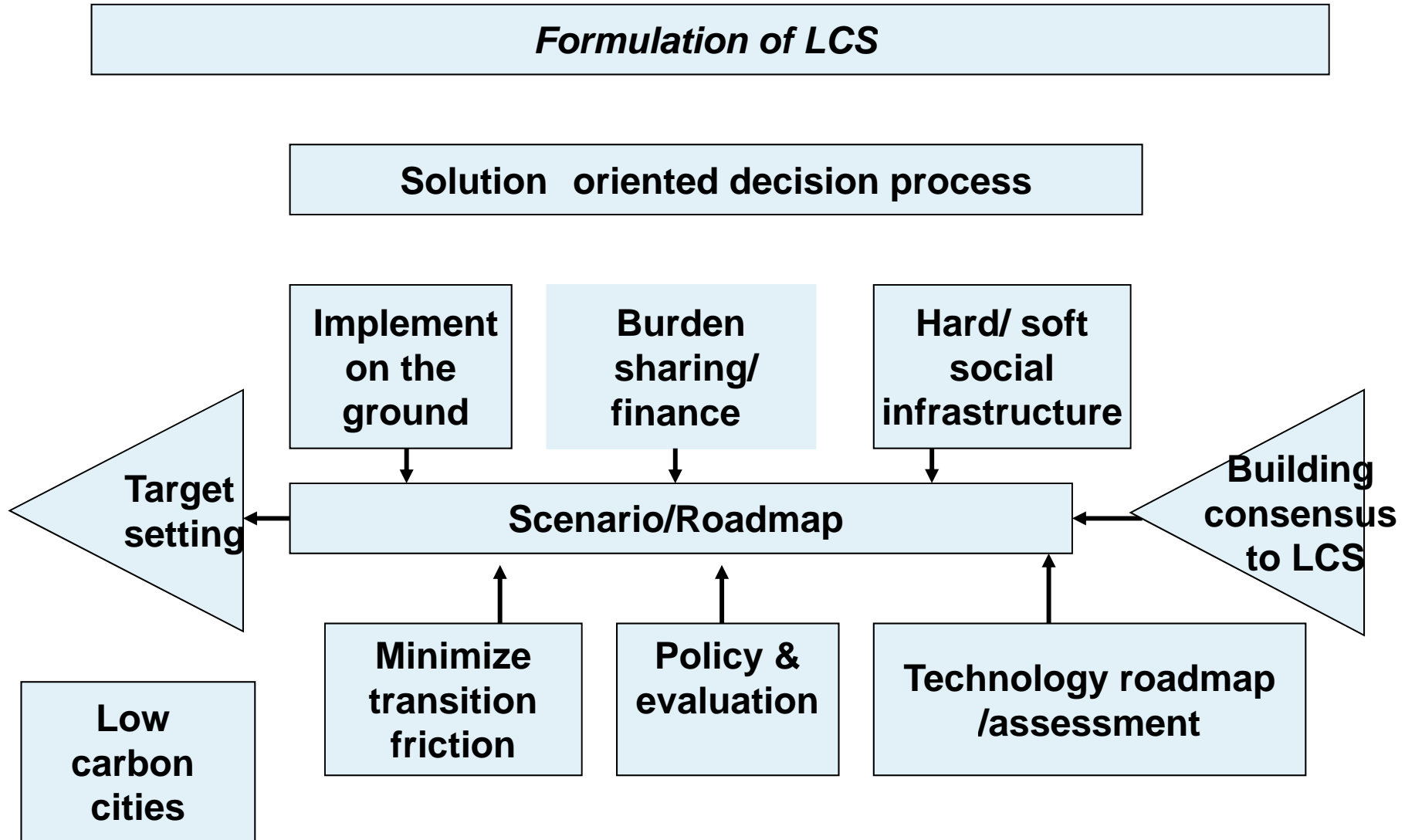
### Mid-term Target on the right track to 2050 target?



出典: IEA CO2 Emissions(-1989), 環境省 温室効果ガス排出量 (1990~2008)

Meanwhile, climate is changing.....

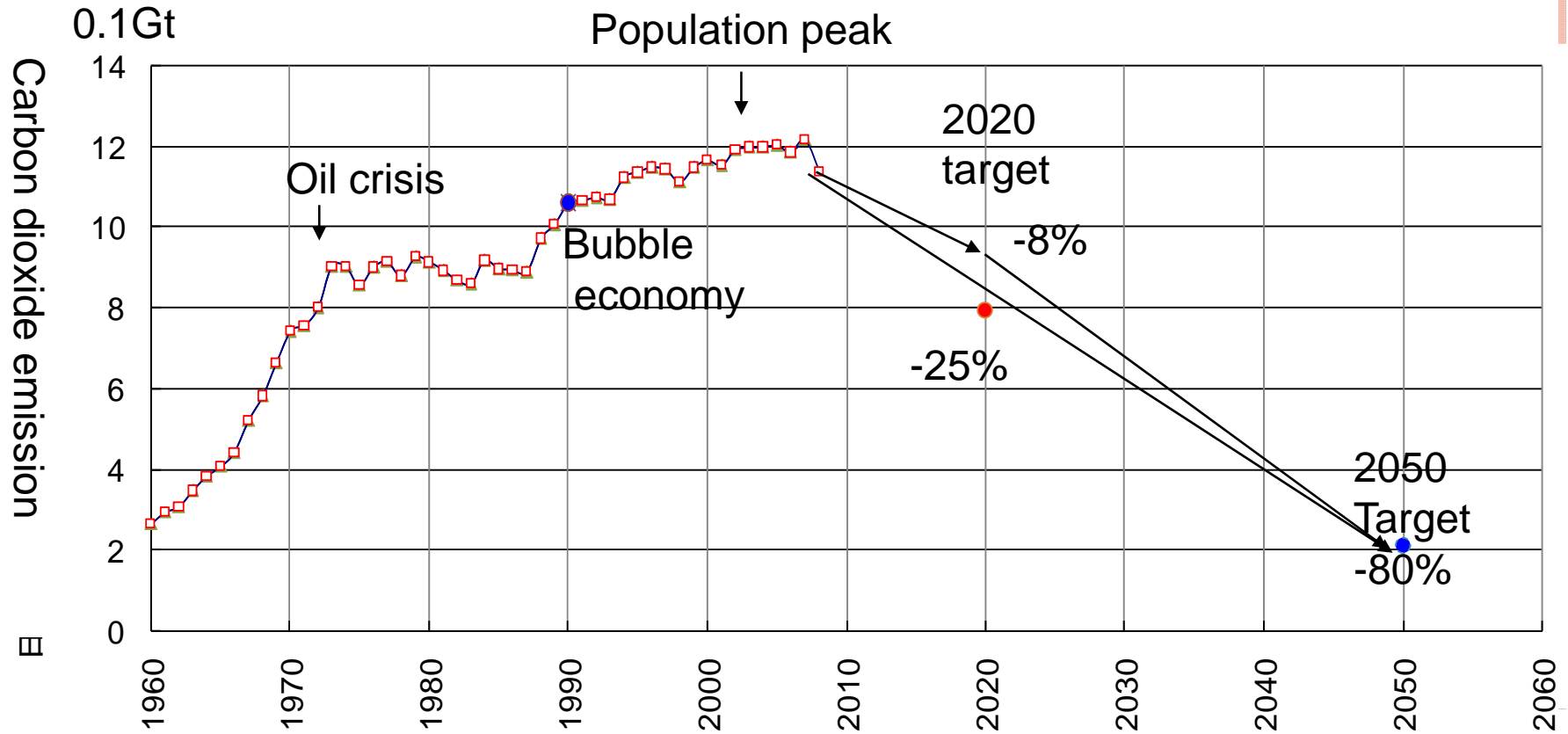




**A dozen challenges to be tackled by LCS research in Japan**

# Timing:

## Mid-term Target on the right track to 2050 target?



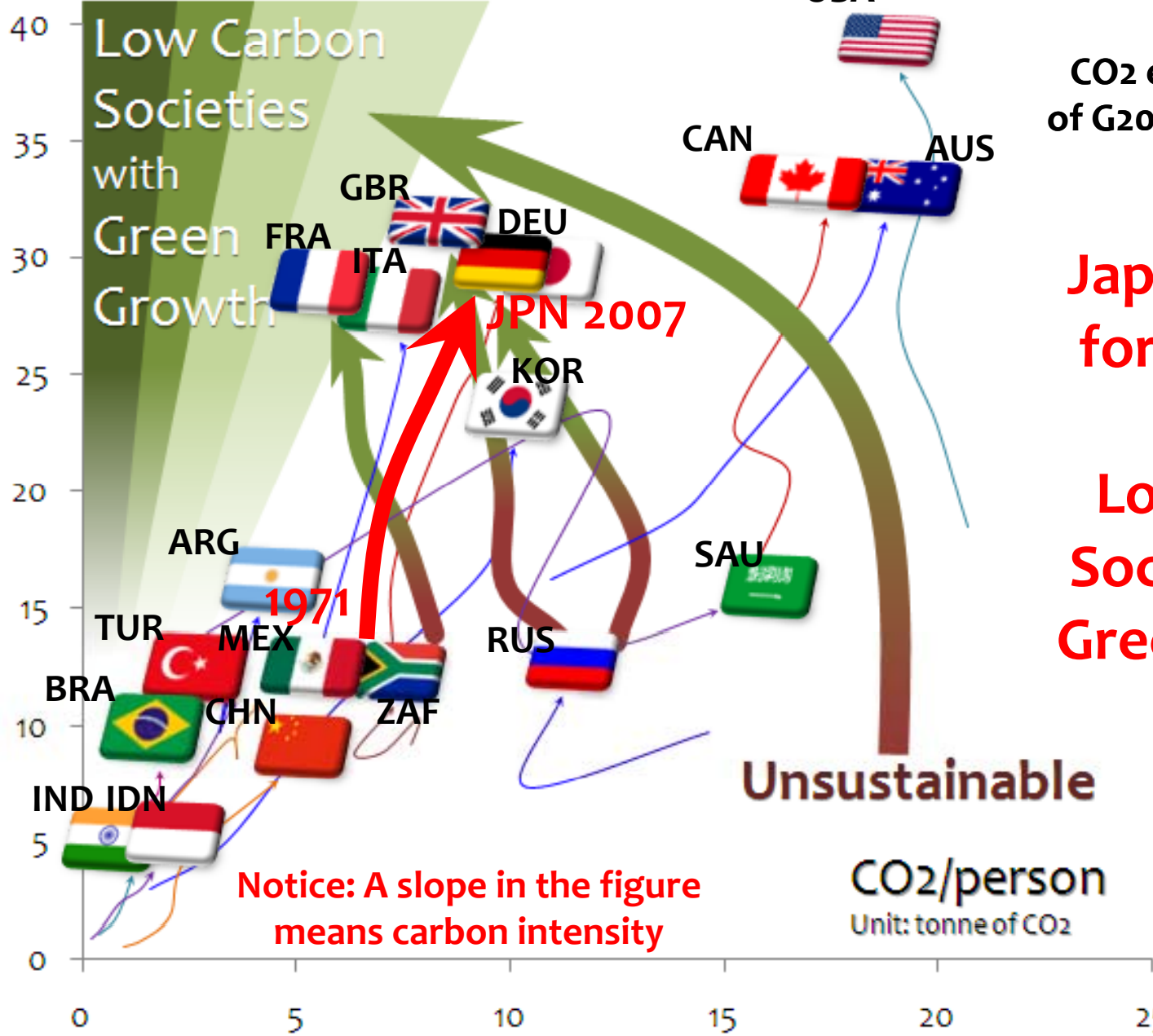
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# GDP/person (in PPP)

Unit: Thousand 2000 US dollars



Notice: A slope in the figure means carbon intensity

GDP per capita in Purchasing Power Parities and CO2 emission per capita of G20 countries, 1971-2007

Japan delayed for transition toward Low Carbon Societies with Green Growth?



## *Integrating into economic growth policy*

### **The New Growth Strategy Toward a Radiant Japan** (decided by the Government in Dec 2009)



#### Target to reach by 2020

#### Achieve Environmental Conservation and Economic Growth

- Create over 50 trillion yen (approximately 500 billion dollars) in new markets and 1.4 million new jobs
- Reduce worldwide greenhouse gas emissions by 1.3 billion ton-CO<sub>2</sub> using Japanese technology

#### Principal measures

- Support for increasing renewable energy by expanding feed-in tariffs, etc
- Turn homes, offices, etc. into zero-emission structures
- Speed development of innovative technology
- Concentrate investment for creating an eco-friendly society

## Green Growth in Japan

### Toward Green Consumption

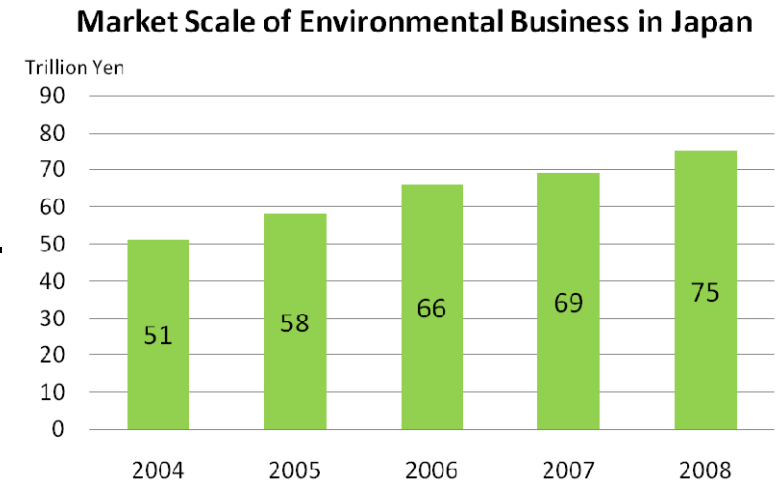
- Eco-points
- Green purchasing in Public Sectors etc.

### Toward Green Investment

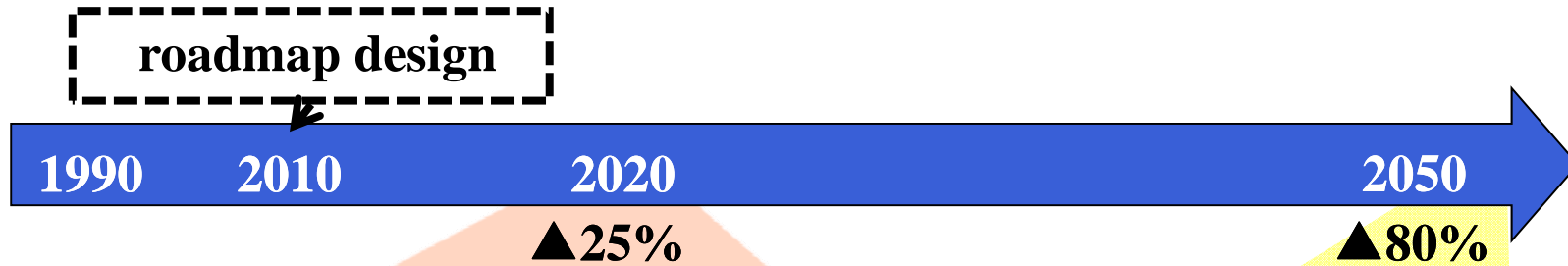
- Greening tax system
- JVETS (Japan's Voluntary Emissions Trading Scheme) etc.

### Toward Green Technology

- Research on environment and economy for policy development
- Research on the adaptation of climate change etc.



# Targets for Mid- and Long-Term measures and policies



## ★ Toward mid-term objective (2020)

### Maximum utilization of current technologies for measures

- Mass spreading of existing technologies
- Thoroughly making emissions volumes known
- Building a mechanism in which people and companies cooperating with reducing emissions are rewarded

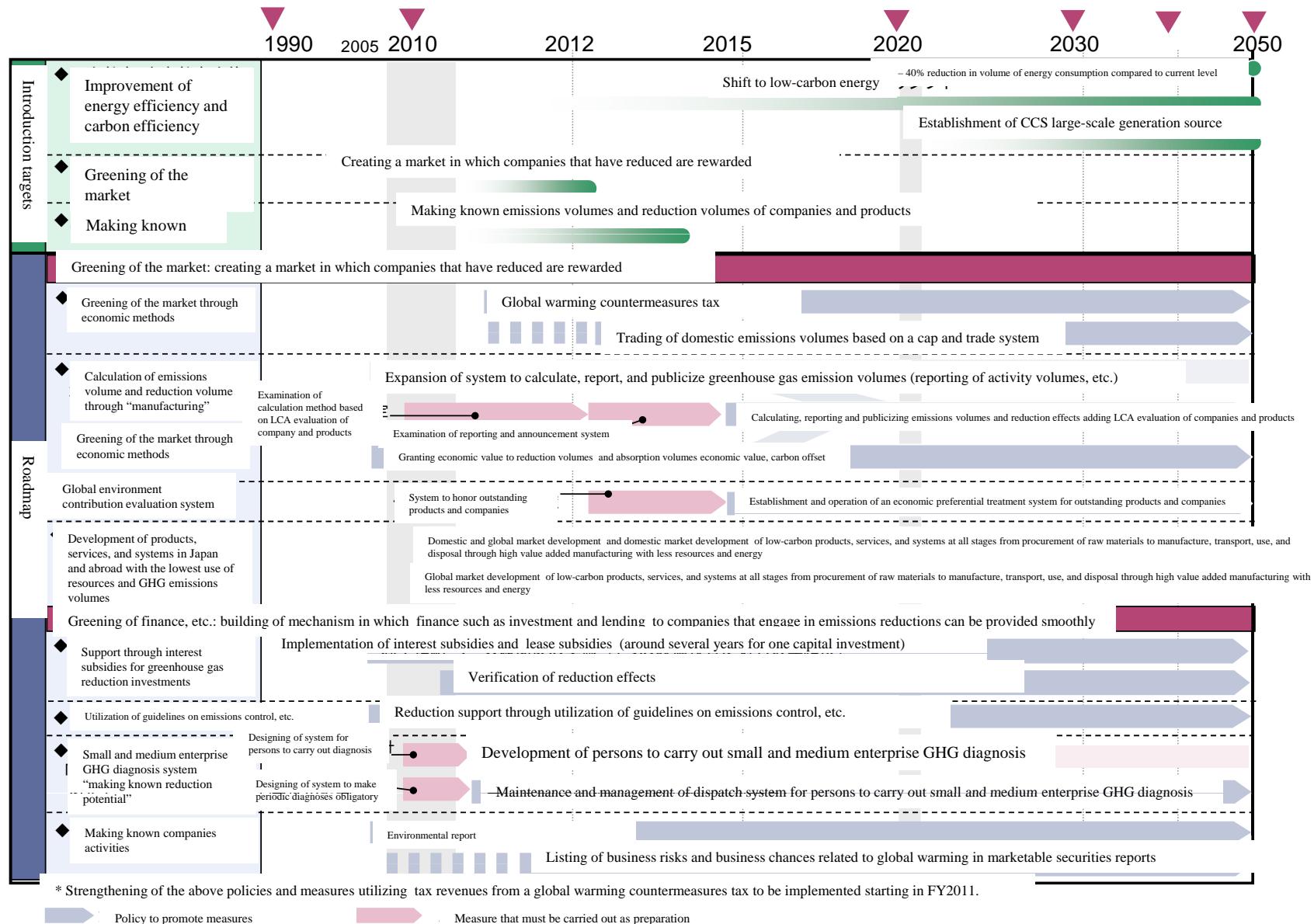
## ★ Toward long-term objective (2050)

### Changing mechanisms and infrastructure of society starting from now

- Building a mechanism to promote continuous research and development and commercialization of revolutionary technologies
- Promoting hardware and infrastructure development to realize a low-carbon society
- Vitalization of human resource development, environmental education, and environmental finance



# Example: Sector-wise Roadmap



# Element models for Japan low carbon society project developed by Prof. Matsuoka (Kyoto Univ.)

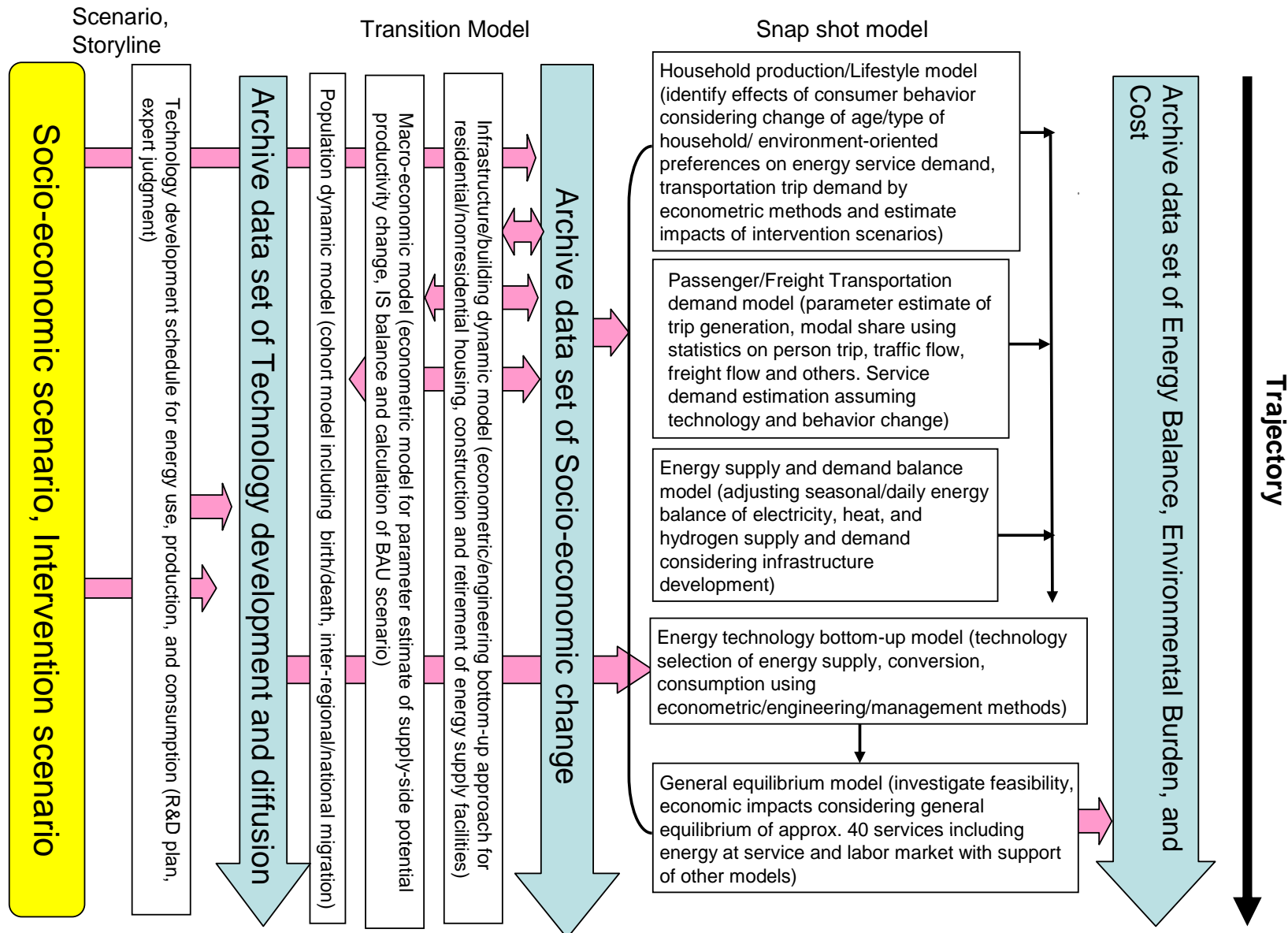
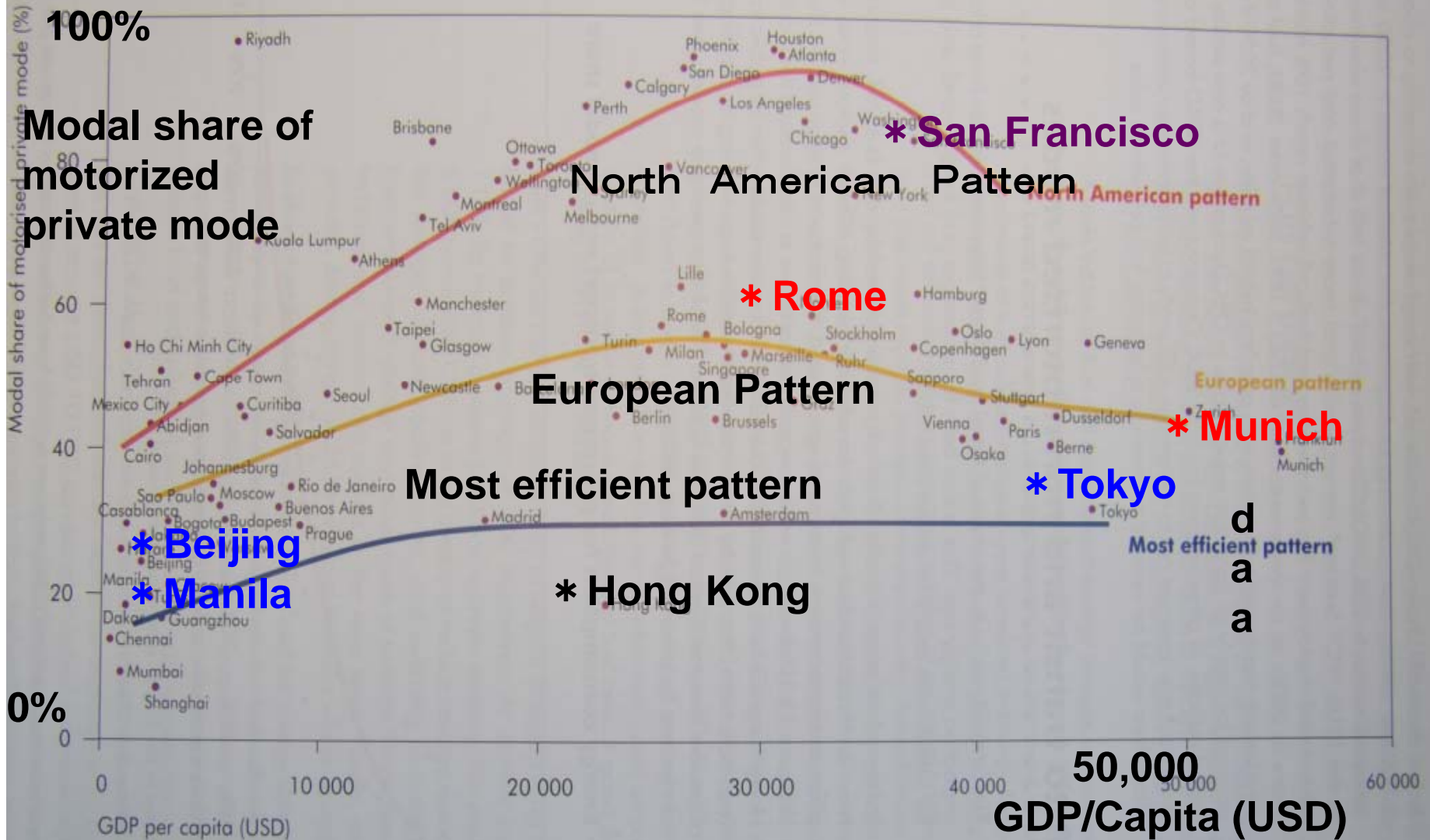




Figure 15.11 Relationship between GDP per capita and motorised modal share



**Cities: Designing efficient Infrastructure**

**Key point**

There is a wide range of modal shares for cities of similar incomes with three distinct pathways as incomes rise. If cities in the developing world invest heavily in public and on-motorised transport infrastructure, they may be able to follow more sustainable pathways.

From IEA: 2008



# **Roadmap toward Low Carbon Japan: feasibility, cost and burden sharing**

**Recent Japanese Climate Policy  
Roadmap to realize Low Carbon Japan  
Implication of Low Carbon Society  
No alternatives but technology**

**Shuzo Nishioka**

**Chair, Mid- and Long-Term Roadmap Survey Sub-committee,  
Central Council of Environment, Japan**

**Senior Visiting Researcher, National Institute for Environmental Studies**

## **Recent Japanese Climate Policy**

- **2008: long-term target of 60-80% reduction in 2050 was set in PM Fukuda's Low Carbon Society Vision declared before Toyako G8 Summit**
- **2009: mid-term target of 15% reduction in 2020 compared to 2005 was announced by PM Aso before L'Aquila G8 Summit**
  - **But no clear political will, in shape of law and countermeasures, has been expressed so far.**
- **2010: Hatoyama Cabinet: submission of the Basic Law on Global Warming Countermeasures to the Diet: a historical step in Japanese climate policy**

## Major issues

- **Conditionality: how to define?**
- **Substantial domestic reduction/ international purchase?**
- **Clear transition program? ⇒ roadmap**
- **Domestic burden sharing?**
- **How to ease economic impacts of rapid change?**
- **Adjustment with energy demand-supply plan**
- **How to survive international technological competition?**

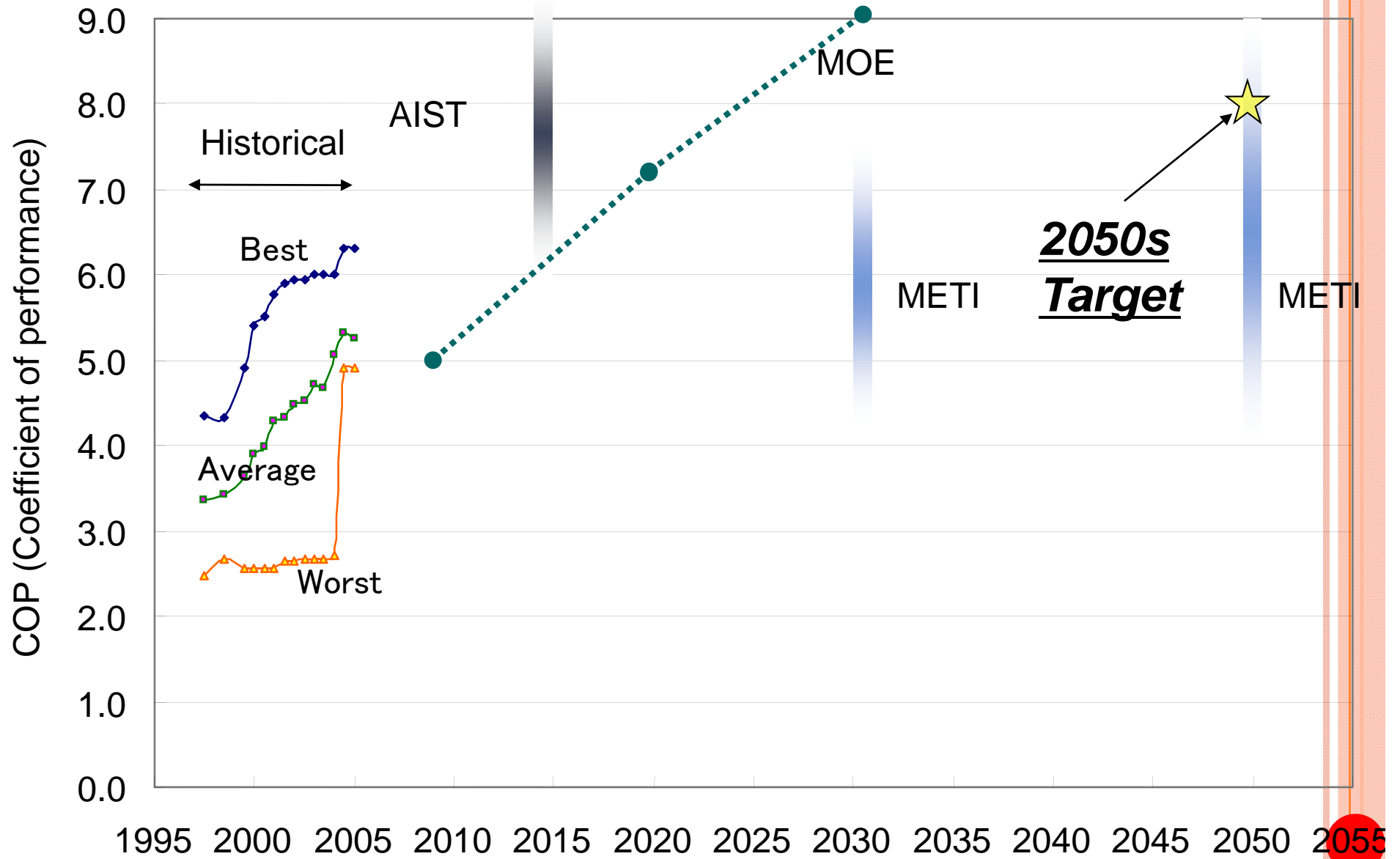


# **Transition program: Drawing Roadmap toward 2020**

- To show business and citizen a clear signal and pathway to reach reduction target**
- The underlying strategy is restructuring Japan to be a world-leading low-carbon society and make low carbon know-how as a core of economic growth.**
- A set of technical and economic models (AIM : Asia-Pacific Integrated Model) was applied to confirm technical feasibility and to evaluate economic impacts of transition to low carbon society.**
- A group of experts of more than 50, in housing, transportation, urban planning and industry sectors engaged in drawing concrete procedures to reach sector-wise reduction target by removing existing technological and institutional barriers.**
- The study concludes that 25% reduction is technically feasible, with cost of less than 2% of GDP, but strong policy guidance is indispensable for realizing this low carbon transformation.**



# Projected energy efficiency improvement: Air-conditioners for cooling and heating



# Implication of low carbon society

- Demand side energy reduction is essential and the key, which requires demand side technological development and, more importantly, deployment into society.
- Not only technology, but social-infrastructure change should be followed
- Achieving low carbon society requires acceleration of improvement in carbon and energy intensity into double than the past trend.
- One common barrier throughout sectors is the lack of human resources to apply new technologies in operation.
- Severe international technological competition for decoupling GHG emission and GDP has started already. Japan delayed in participating this transition race and is not easy to maintain its leading position in low energy technologies after 20 years' stagnation in improving energy intensity.
- In addition, a very rapid catching-up of Asian emerging countries, with technological leapfrogging possibilities as shown in the cases of PV and EV technologies, is another factor threatening Japanese industry.

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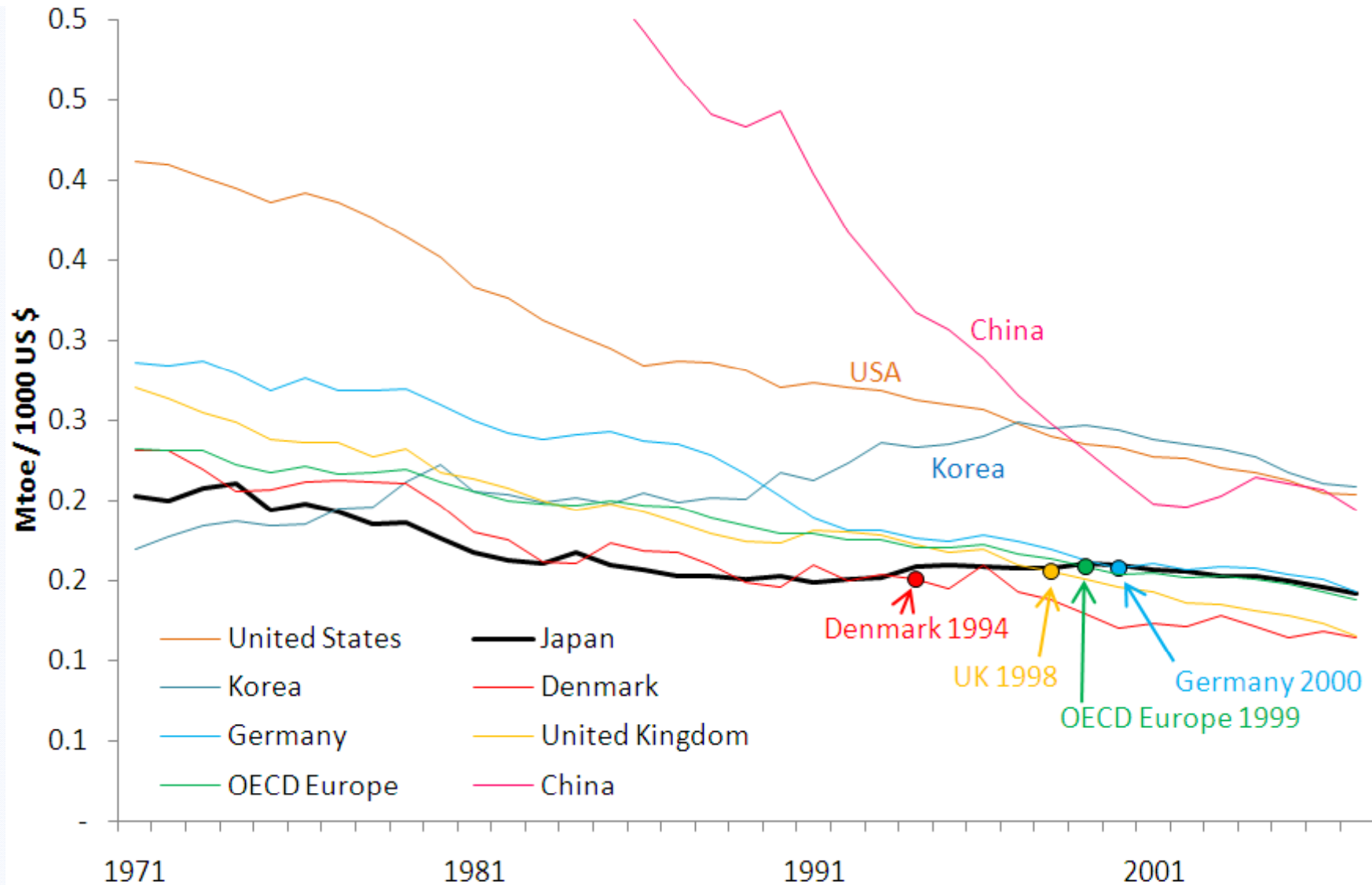
# Implication of low carbon society

- Demand side energy reduction is essential and the key, which requires demand side technological development and, more importantly, deployment into society.
- Not only technology, but social-infrastructure change should be followed
- Achieving low carbon society requires acceleration of improvement in carbon and energy intensity into double than the past trend.
- **Severe international technological competition for decoupling GHG emission and GDP has started already. Japan delayed in participating this transition race and is not easy to maintain its leading position in low energy technologies after 20 years' stagnation in improving energy intensity.**
- In addition, a very rapid catching-up of Asian emerging countries, with technological leapfrogging possibilities as shown in the cases of PV and EV technologies, is another factor
  - threatening Japanese industry.
- One common barrier throughout sectors is the lack of human resources to apply new technologies in operation.



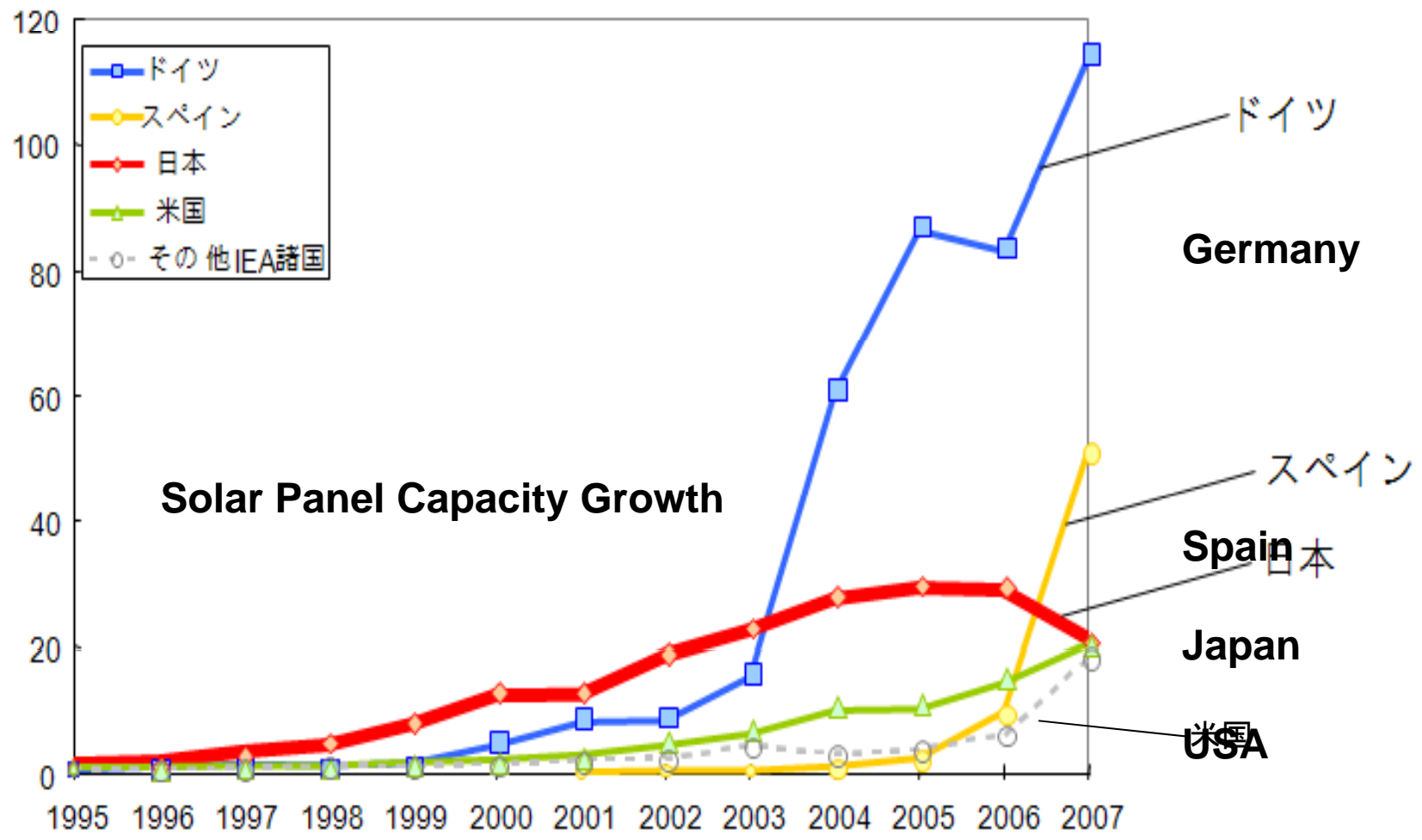
# Japan delayed for low carbon technologies development and deployment?

Energy Intensity (ppp)

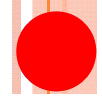


Original Data: IEA (2009) CO2 Emissions from Fuel Combustion - Highlights

# New Energy competition : distributed energy



出典) IEA PVPS ホームページ (<http://www.iea-pvps.org/>)

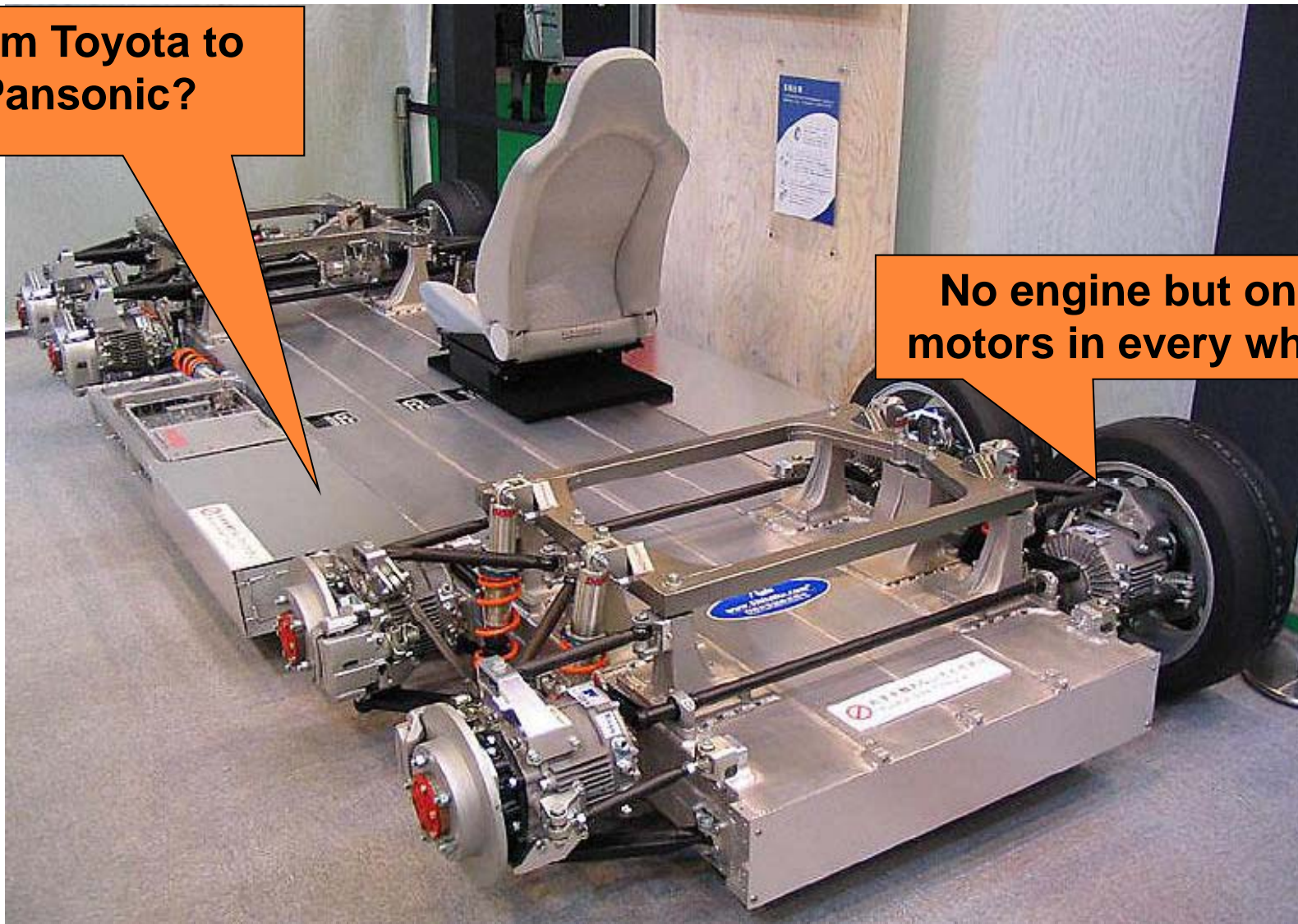


# Implication of low carbon society

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**From Toyota to  
Panasonic?**



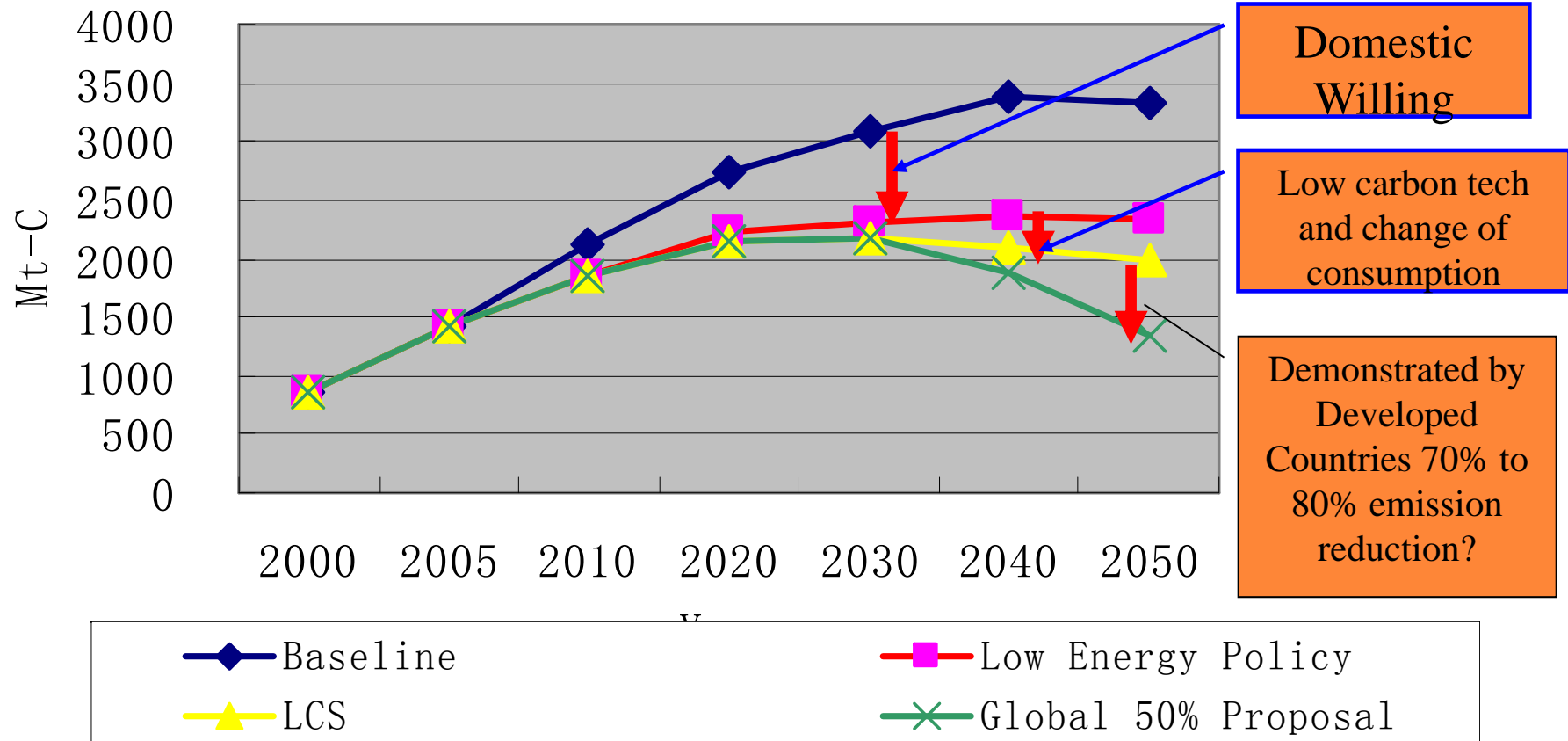
**No engine but only  
motors in every wheel**

**PLATFORM by SIM-Drive**



# Chinese Low Carbon Scenario

CO2 Emission from Energy Activities in China, IPAC Results

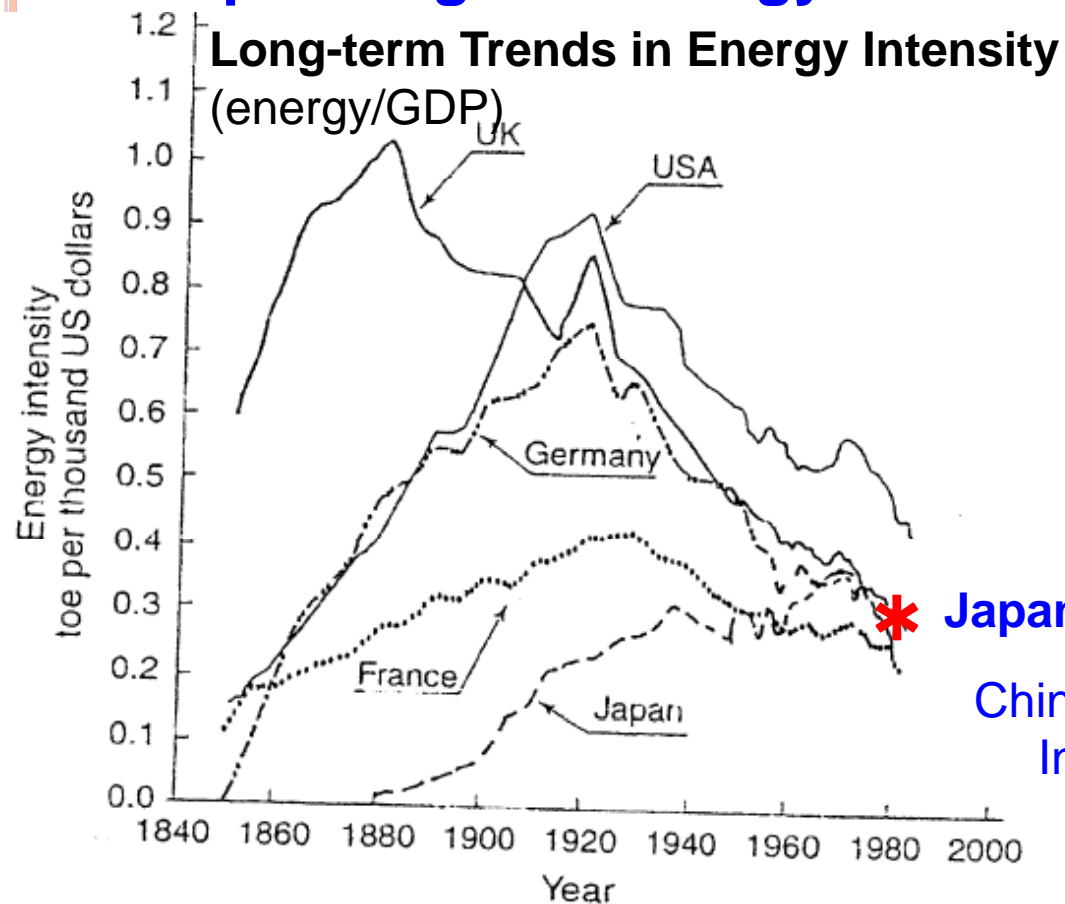


ERI 2009





## Asian Opportunity : Free from past high-energy- depending technology track



**\* Japan's leap-frog**

China ?  
India ?

**Possibility of Asian  
countries' catch-up**

- How can we facilitate technology leap flogging to promote low carbon development?
- What would be mechanisms (international and national, market and non market) that could facilitate those leap-floggings to low carbon technologies?

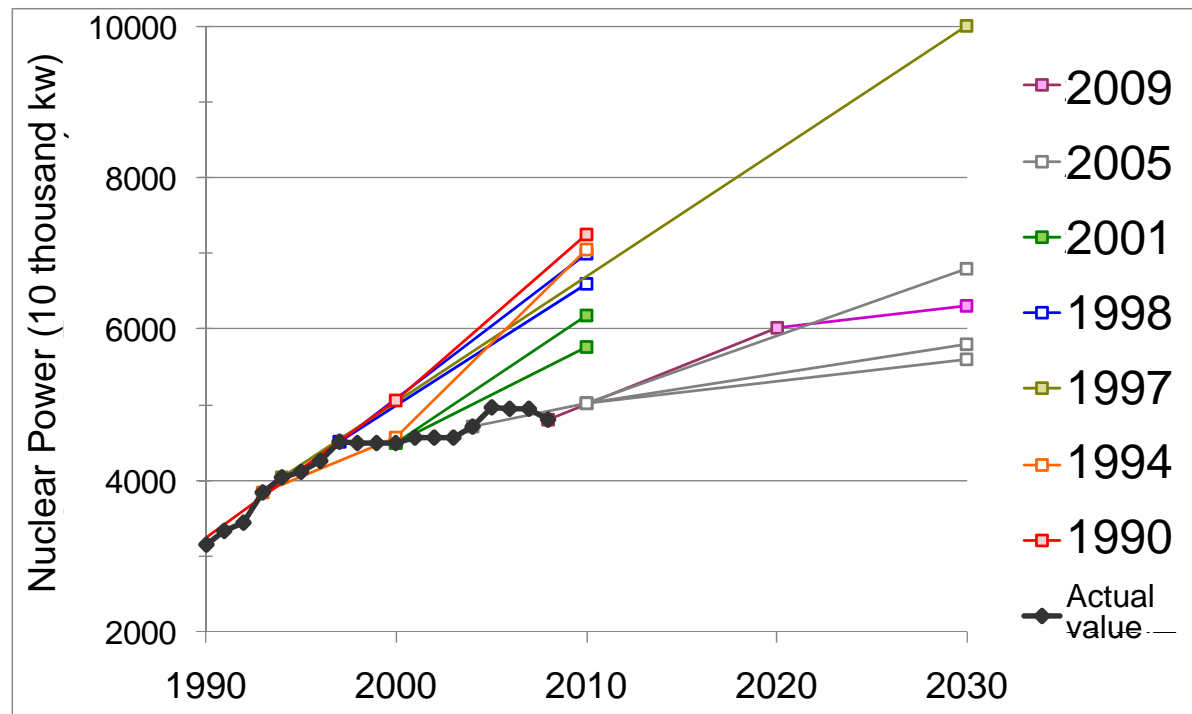
## No other alternatives but innovation in technology and the society

- **“Stable Climate” is not free and has no alternatives**
- **Introducing innovative policies to pull up again Japanese technological superiority by setting higher GHG reduction target is quite necessary now.**
- **Early actions based on clear roadmap are strongly recommended, not only for preventing additional accumulation of GHG in the atmosphere, but for accelerating technological innovations by capturing market share and accumulate learning-by-doing experience, and for well planed investments in social infra-structure which need long lead-time**
- **Clear political will and signal is the most required in this big transition era toward low carbon Japan**

# Changes to macro-frames (2)

Taking into consideration the forecast of the Advisory Committee on Energy and Natural Resources for this estimate, it is supposed that an additional eight atomic power plants will be constructed between now and 2020 (with a power generation volume of 60.15 million kW, equal to all the atomic power plants in Japan), but the plan for atomic power plans has been moving forward at a lower order than required, so the examination of a risk management proposal is needed.

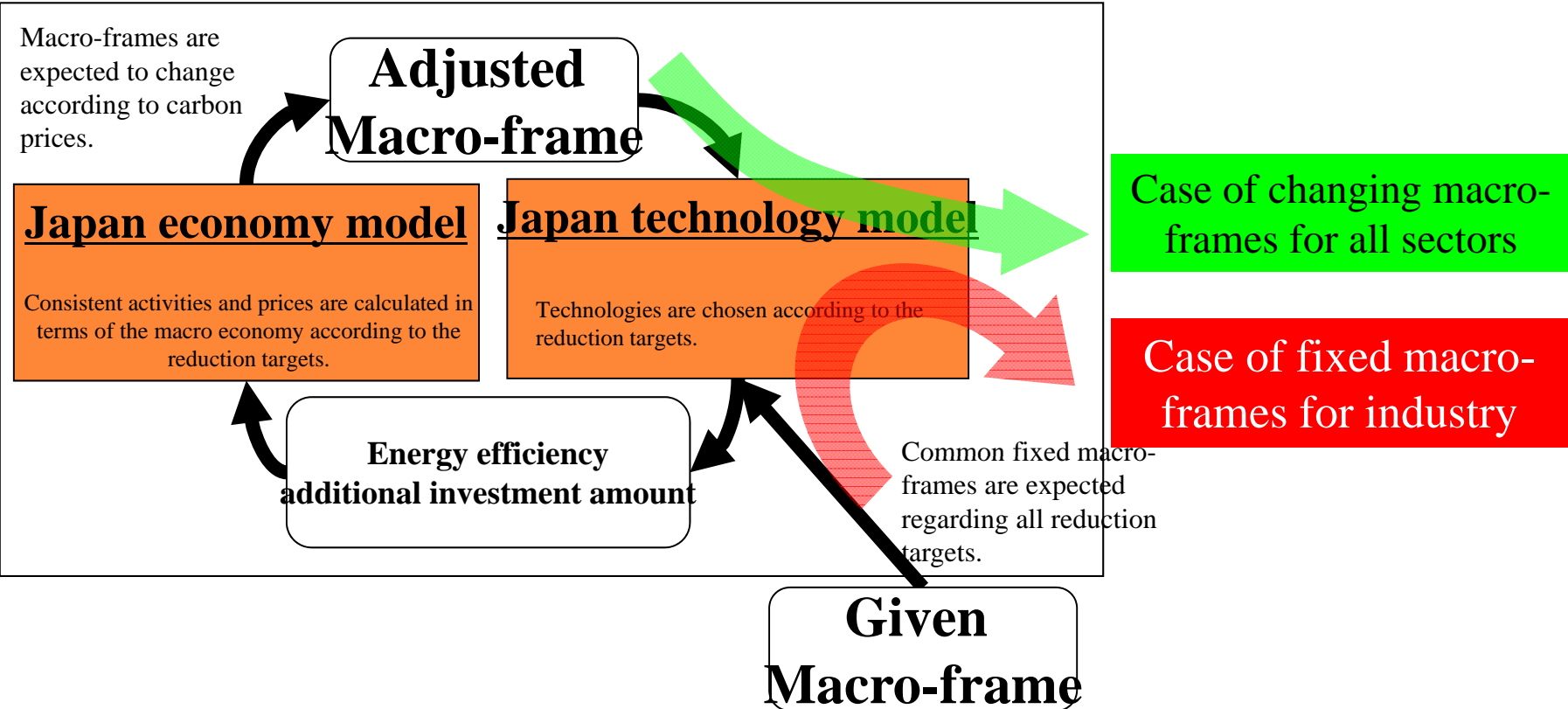
<Forecast for atomic power at the Advisory Committee on Energy and Natural Resources>

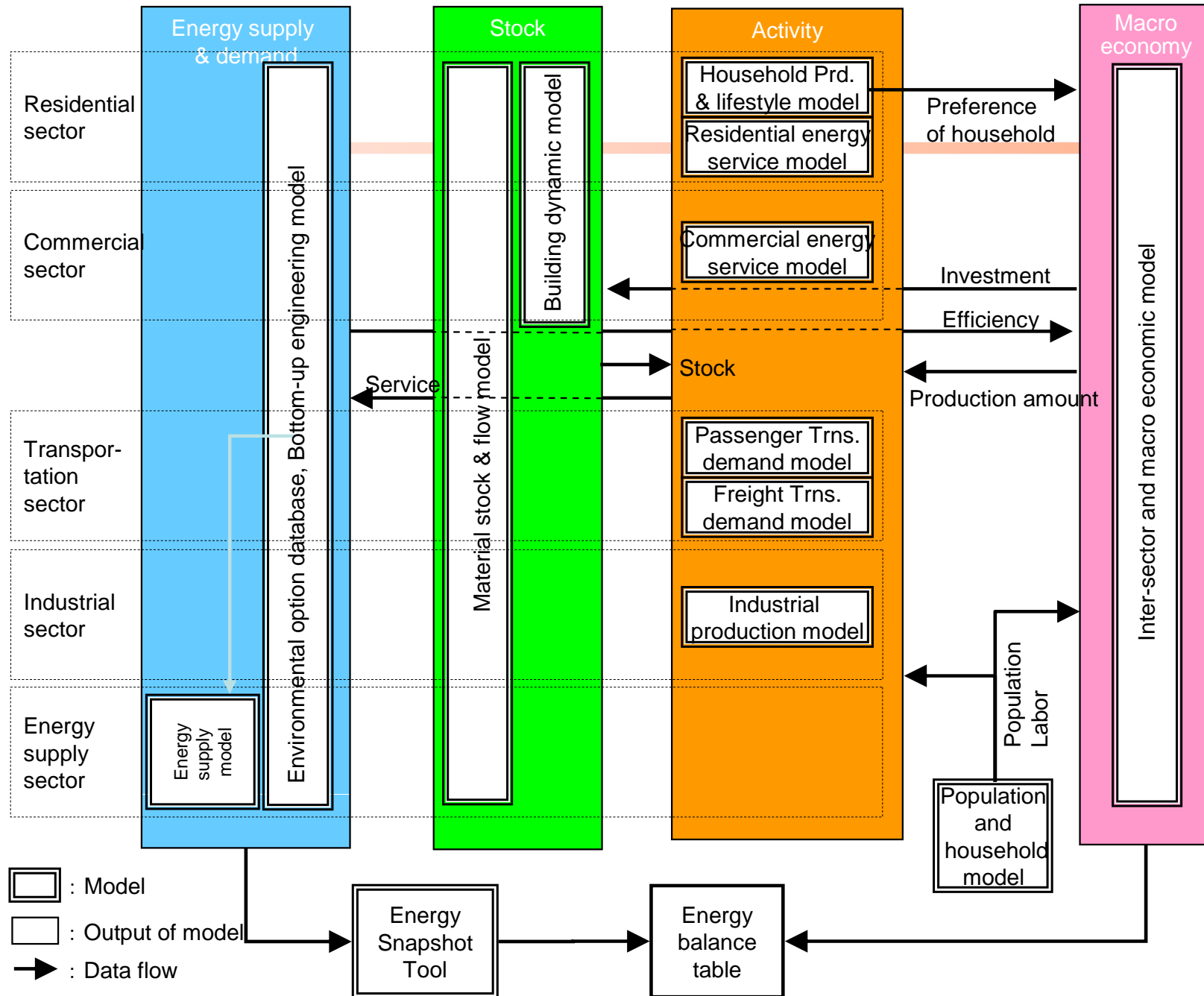


The years on the graph are the years in which long-term energy demand and supply forecasts were designed.

# Methodology: Technology model and CGE Model

The macro-frames (indicators showing the condition of society and the economy) will be changed according to measures. In addition to the preliminary calculation of macro-frames given initially, analysis and evaluation regarding emissions volumes and reduction volumes will be carried out based on the macro-frames, which have been changed according to carbon prices.





# AIM (Asia-Pacific Integrated Modeling) for Japan LCS scenarios

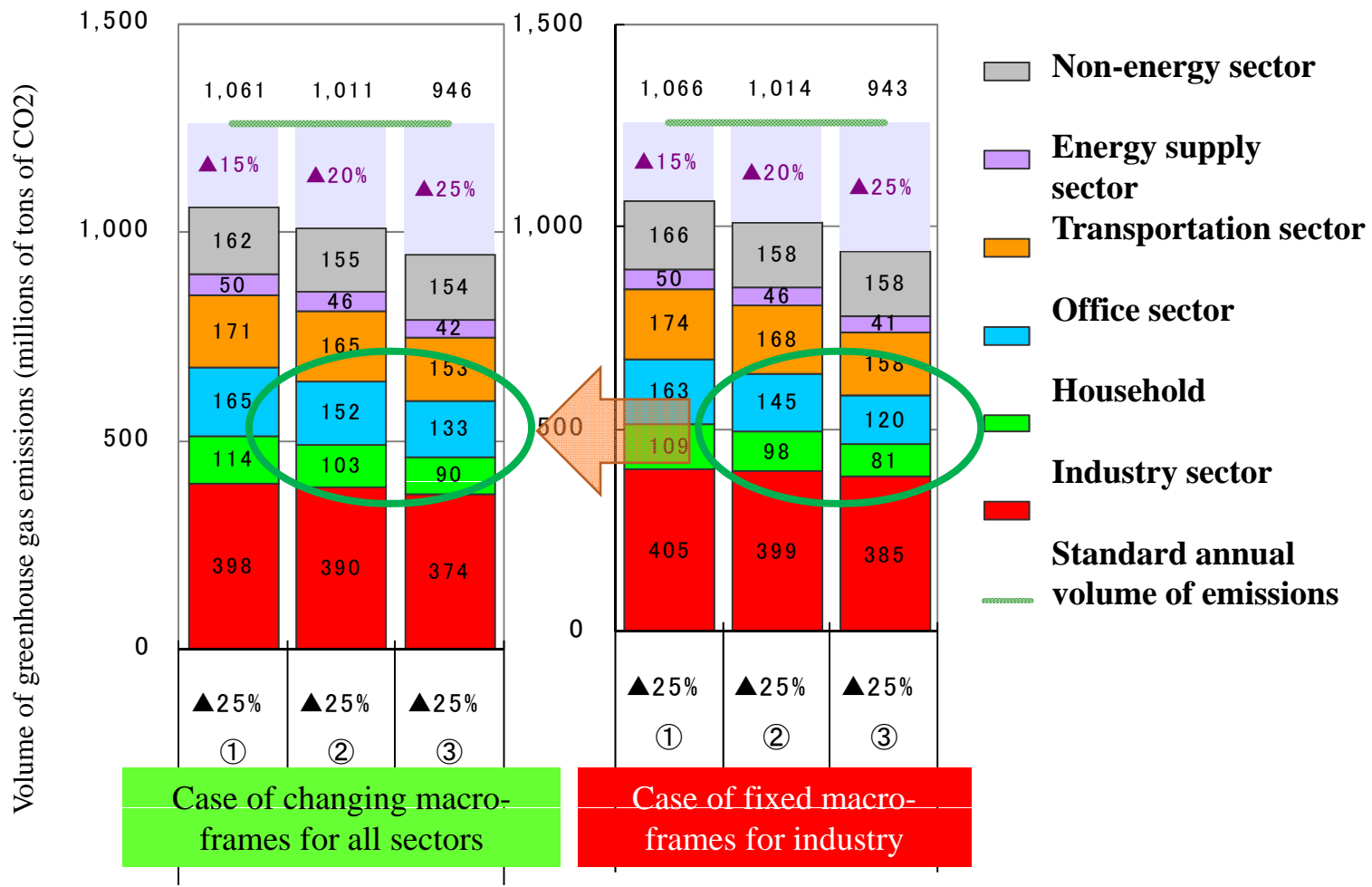




# Industrial structural change eases demand side efforts

(2020)

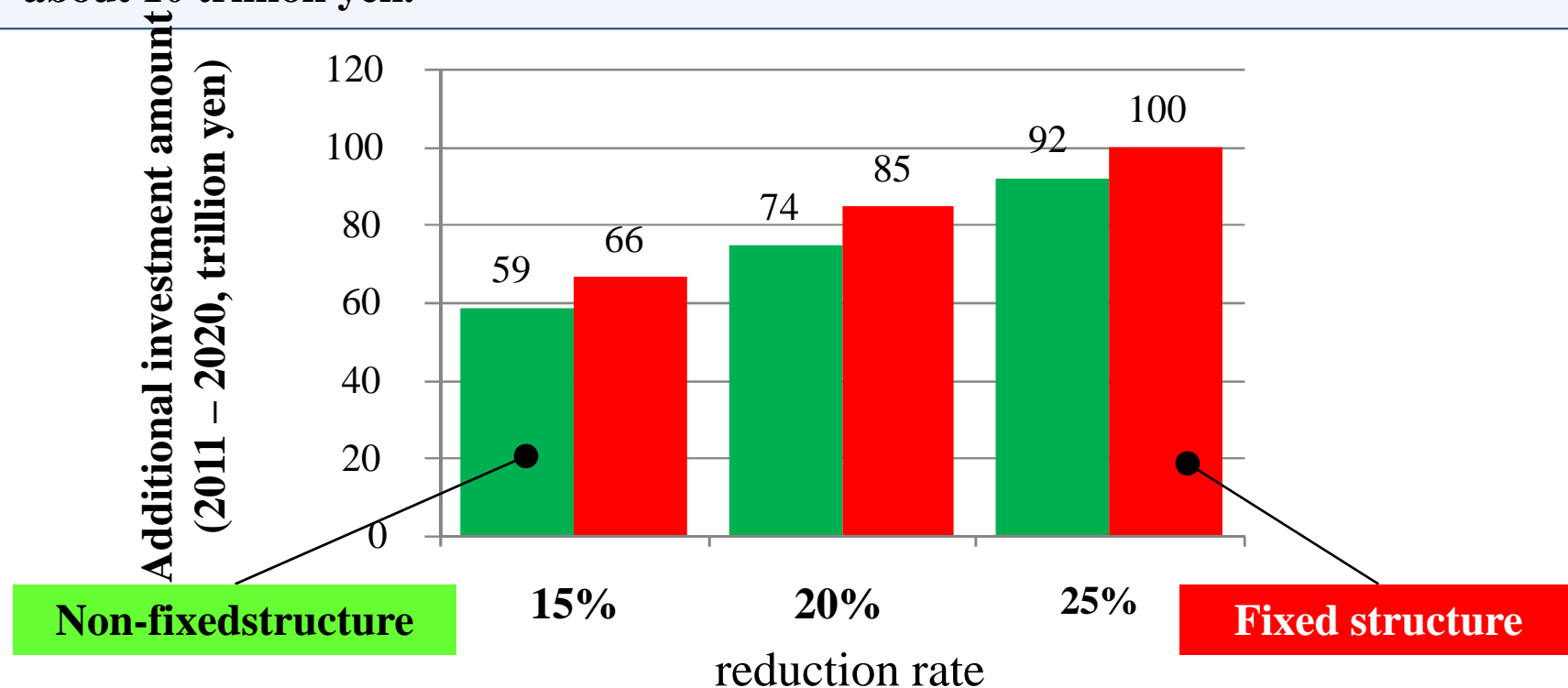
• non-fixed macro-frames, the reduction efforts in daily life are reduced.



Note: 2020 25% (1): case including around 10% of international contribution and sinks; 25% (2): case including around 5% of international contribution and sinks; 25% (3): case including no international contribution and sinks.

## More economically achievable when industrial structure changes

- The total investment amount in order to realize a 25% is approximately 60 to 100 trillion yen in the period from 2011 through 2020.
- By changing the industrial structure, the addition investment amount is lowered by about 10 trillion yen.





# 5. Side effects and creation of new industries

## Making manufacturing low-carbon to become a pillar for Japan's growth

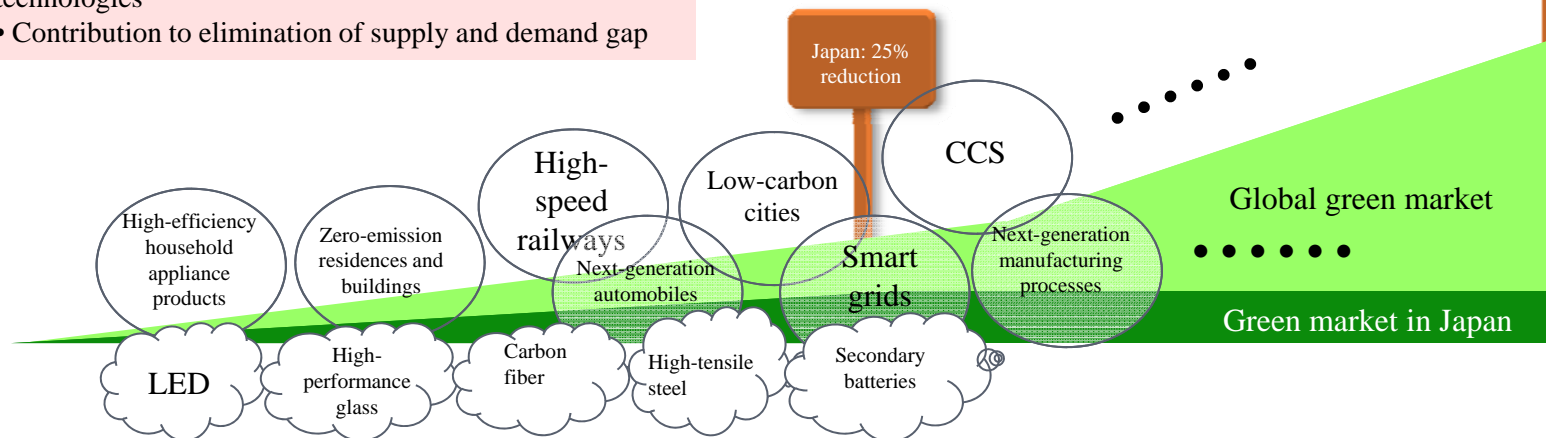
### Now to 2020

- Contribution of global warming measures to domestic measures
- Strengthening of sophistication and versatility of technologies
- Research and development of revolutionary technologies
- Contribution to elimination of supply and demand gap

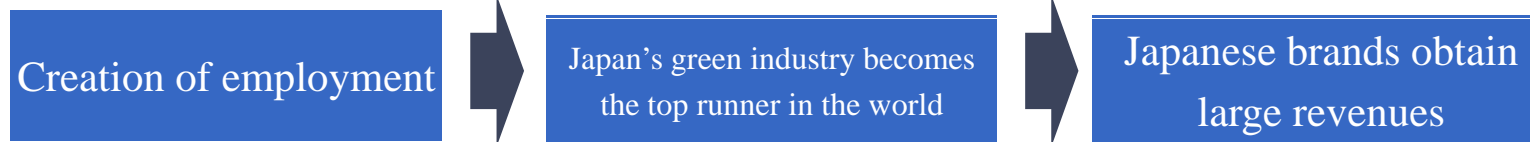
### 2020 to 2050

- Large contribution to global reduction in emissions
- Spread of revolutionary technologies
- Increased dependence on income from overseas accompanying the domestic decrease in the population of workers

Japan: 80% reduction  
World: 50% reduction



Japan's high-quality materials and products give underlying support for the development of low-carbon products

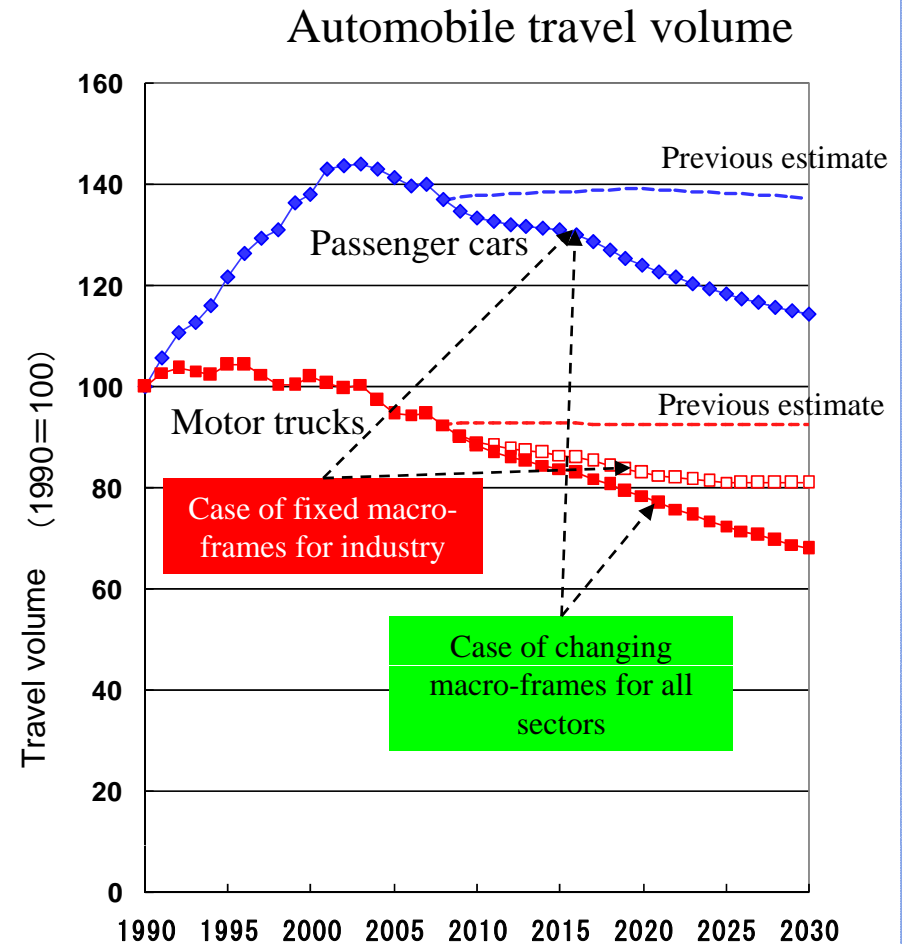
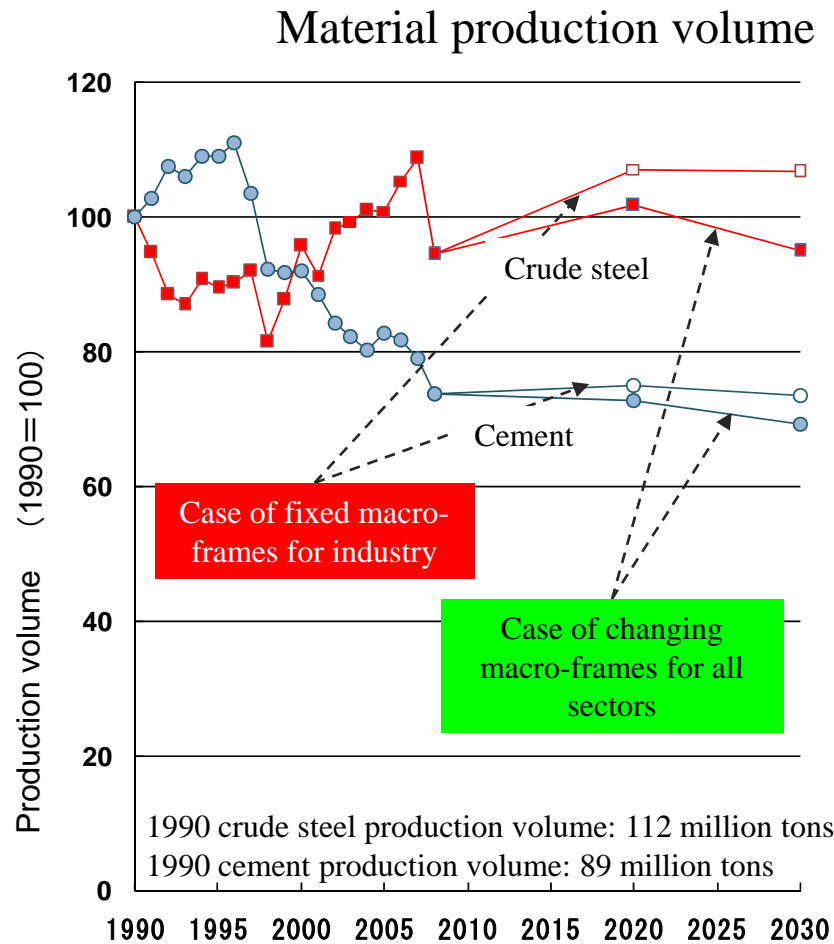


Building mechanisms to promote low-carbon investment in a concentrated manner



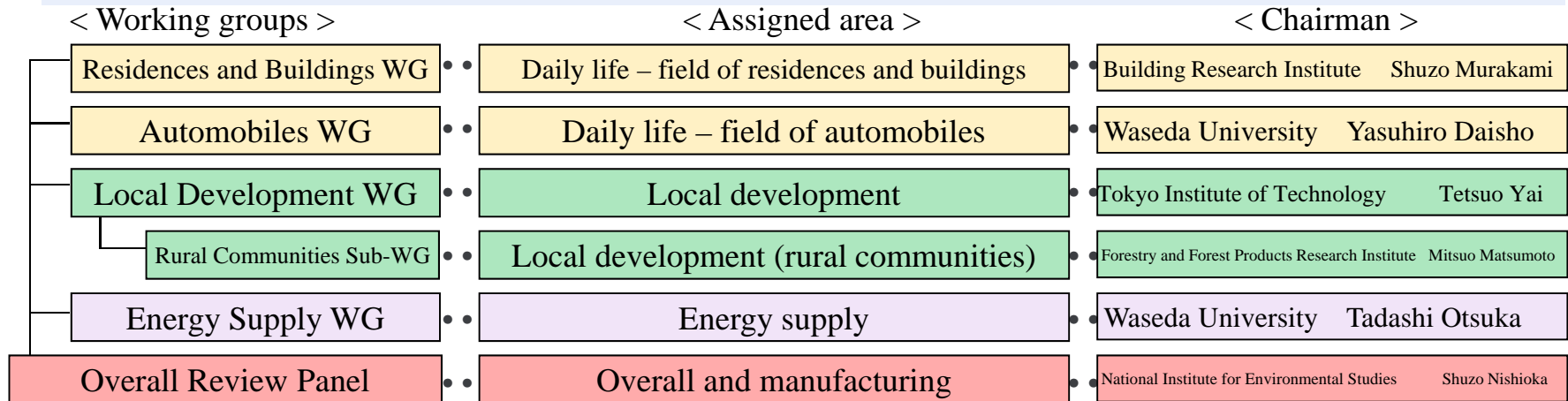
# Changes to macro-frames (1)

The volume of activity changes according to the carbon price. The macro-frame is not fixed, and it is necessary to analyze taking into consideration the width.



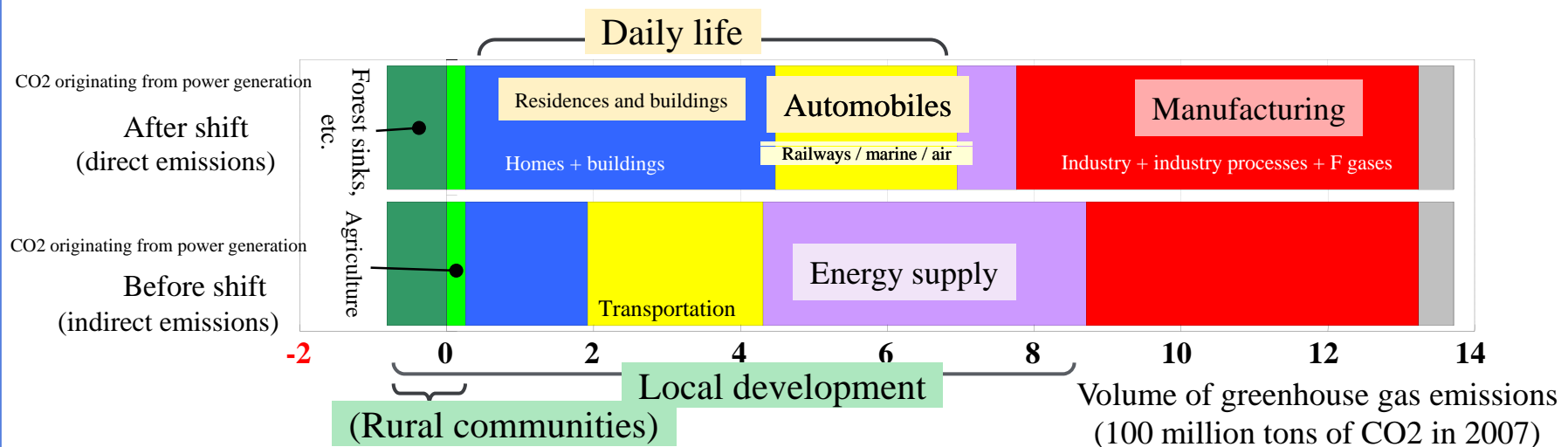
# Structure of Mid- and Long-Term Roadmap review panel

- The review panel is implemented as an operation commissioned by the Ministry of the Environment. A total of 29 review panel meetings have been held bringing together 52 experts from various fields.



(Honorary titles omitted)

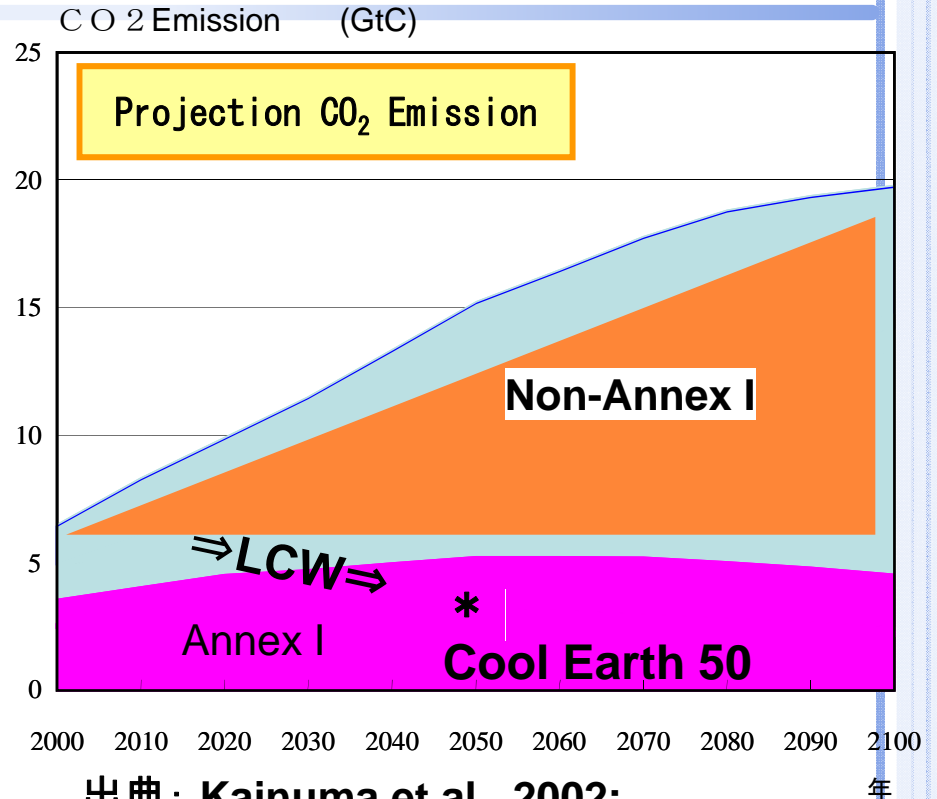
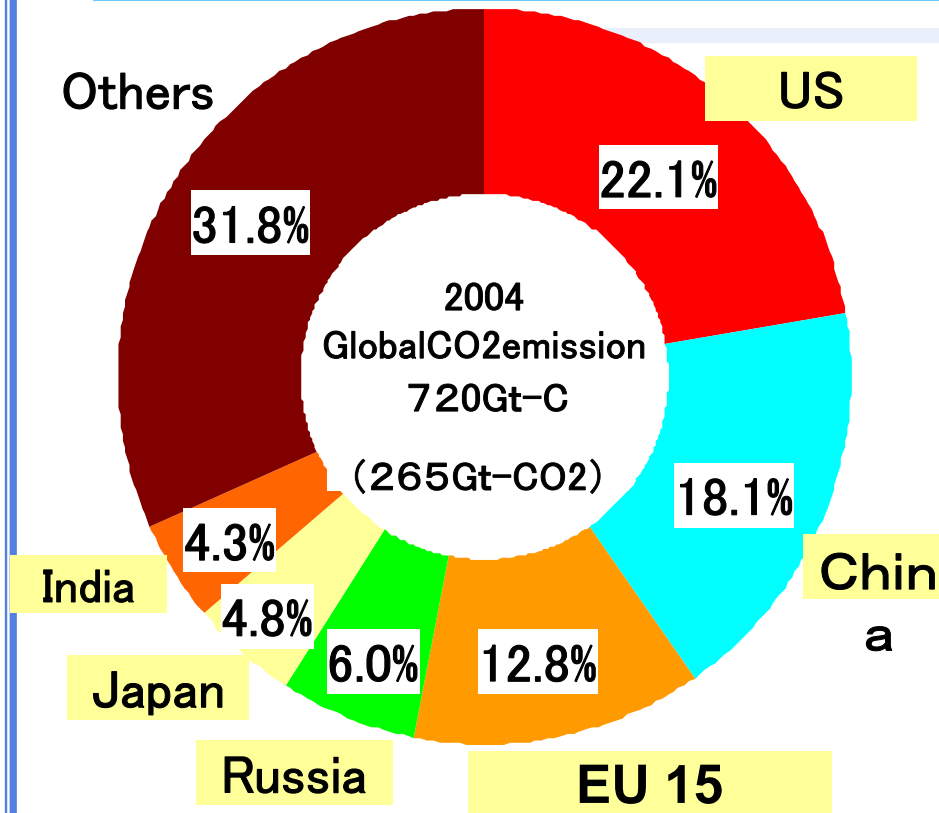
## ◆ Relationship between assigned areas of working groups and emission sectors





Sharing common field of interest

# Low Carbon Growth/Development



出典: Kainuma et al., 2002:

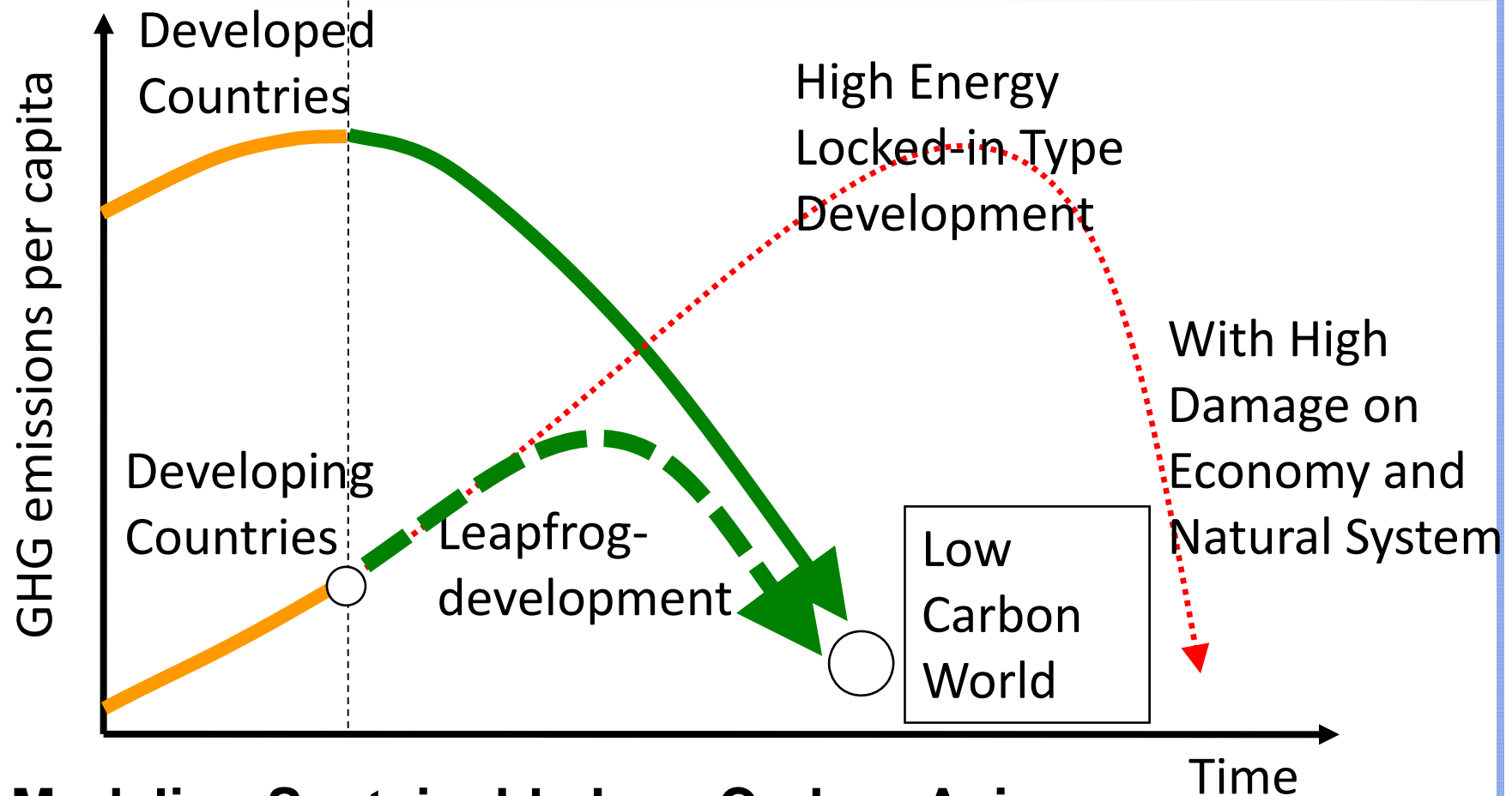
エネルギー・経済統計要覧 (2007年版)より環境省作成

Climate Policy Assessment, Springer, p.64.

京都議定書第1約束期間後（2013年以降）の次期枠組みについては、

- ・ 京都議定書を批准していないアメリカや、
- ・ 京都議定書上、削減約束のない中国、インドなどの主要排出途上国にも

# Asian LCS scenarios study

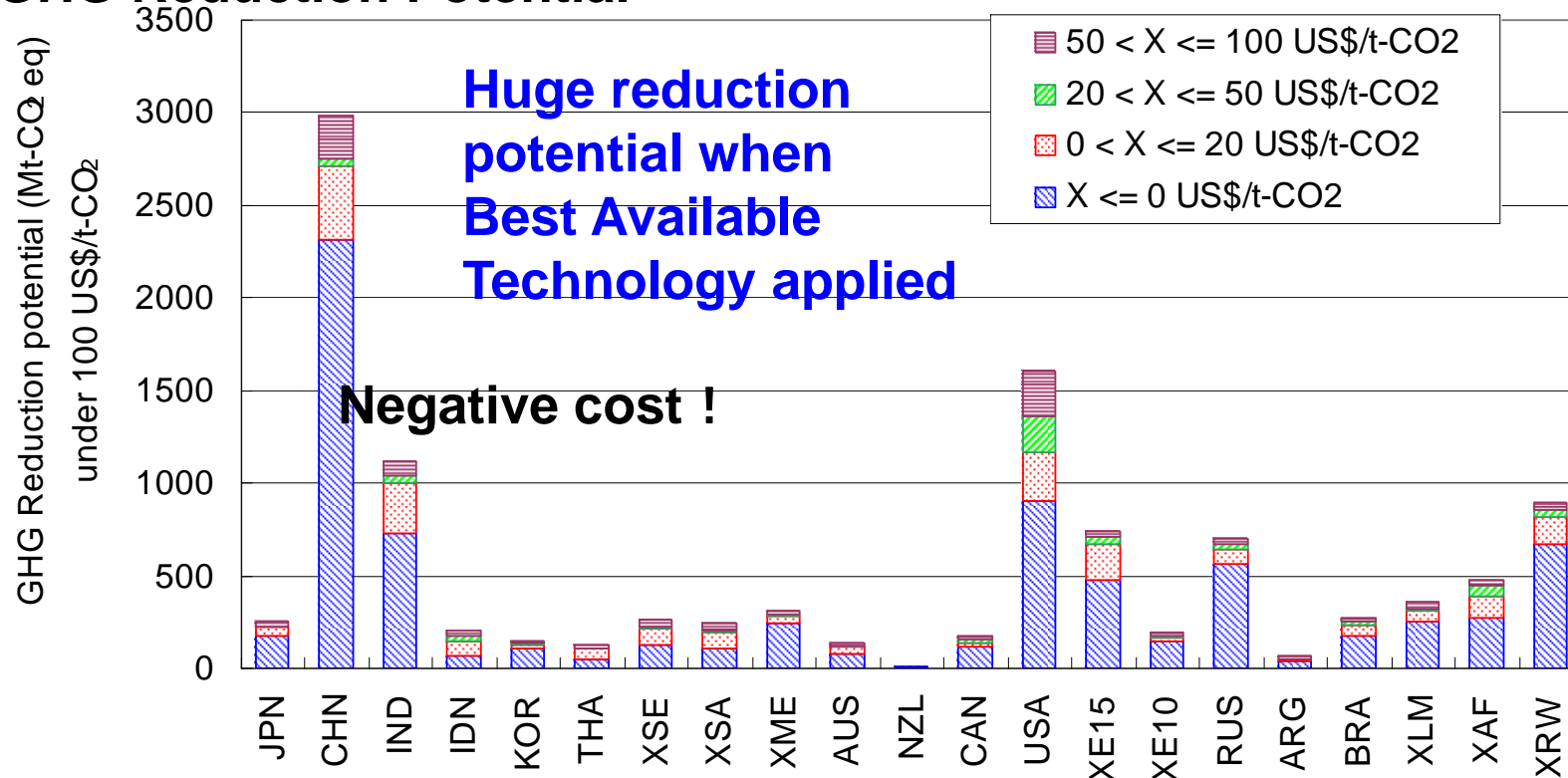


## Modeling Sustainable Low-Carbon Asia

We have just started new research project “Asian Low-Carbon Society Scenario Development Study” (project leader: Mikiko Kainuma) during FY2009-2013, funded by Global Environmental Research Program, MOEJ

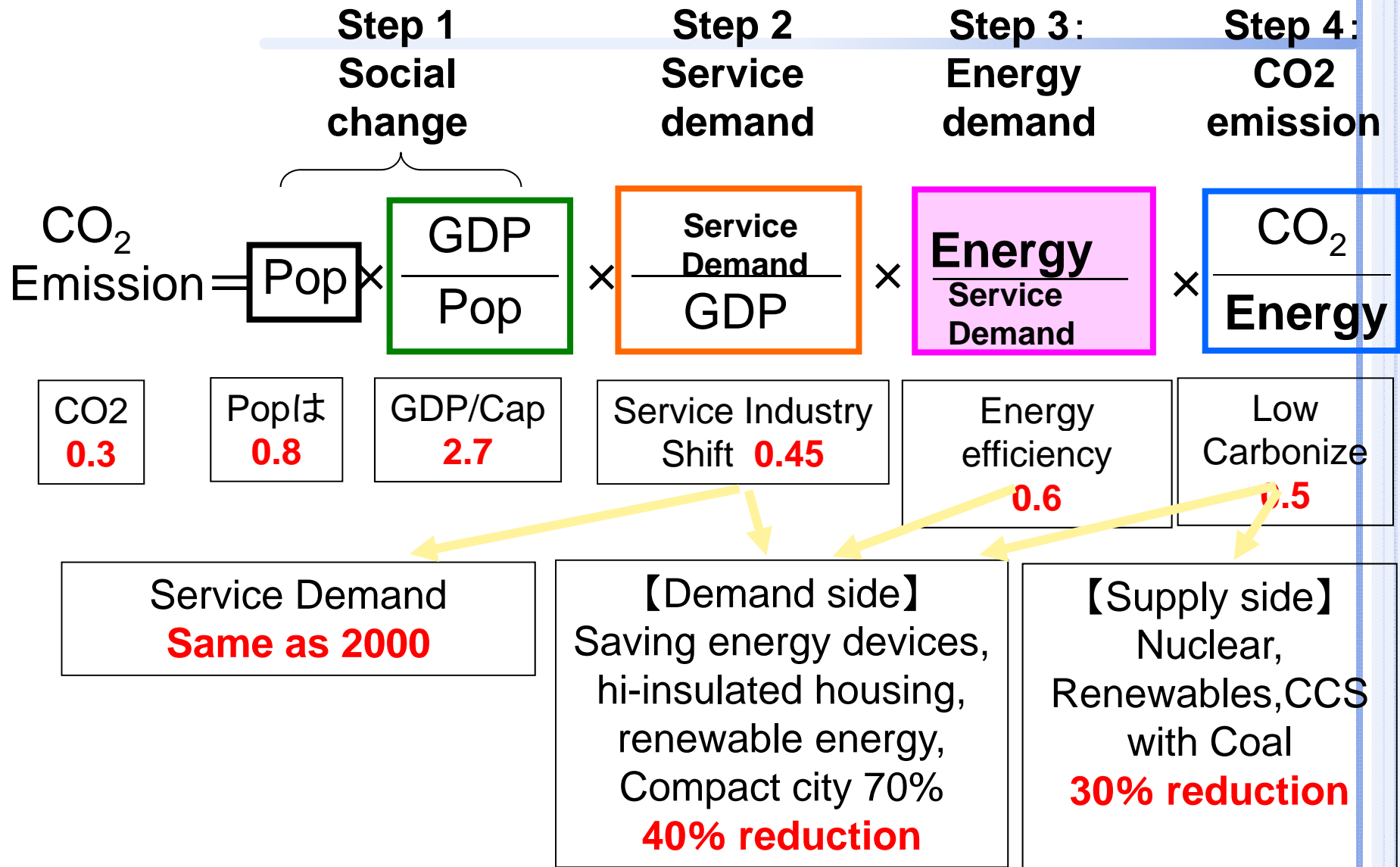
# Asian Opportunity 1: Low carbon technologies already available if technologies commonly shared (2020)

## GHG Reduction Potential



- **China, US, India, Western Europe and Russia are major 5 regions where there are large reduction potentials, and it accounts for 63 % of total reduction potentials in the world. Top 10 regions account for about 80 % of total reduction potentials.**

# Energy Efficiency is the key, but not enough



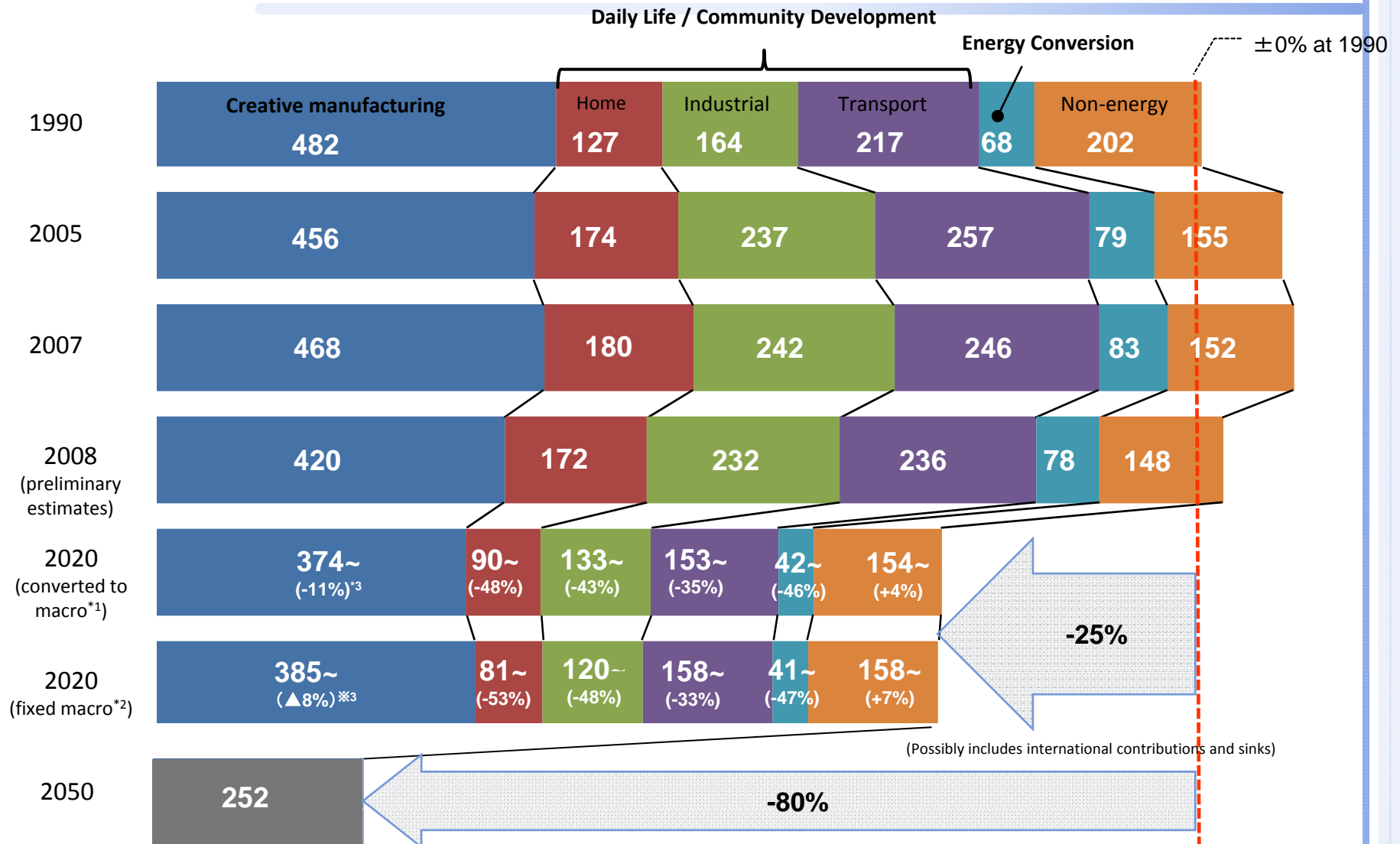


# Ex. Roadmap for Manufacturing

		2010	2020	2030	2040	2050
Roadmap	Target			30 to 40% reduction in energy consumption	Elimination of chlorofluorocarbons	
	Benchmarks		Establishment of CCS large-scale generation source			
	Greening of the market		Global warming countermeasures tax and trading of domestic emissions volumes with a cap and trade system			
			Examination of methods System design	Granting of economic value for reduction volumes and absorption volumes		
	Environmental finance		Interest subsidies for reduction investments			
			Listing of business risks and business chances related to global warming in marketable securities reports			
Revolutionary technologies / elimination of chlorofluorocarbons		Research and development	Revolutionary technologies / spread and expansion of non-chlorofluorocarbon products			
			Interest subsidies for reduction investments			

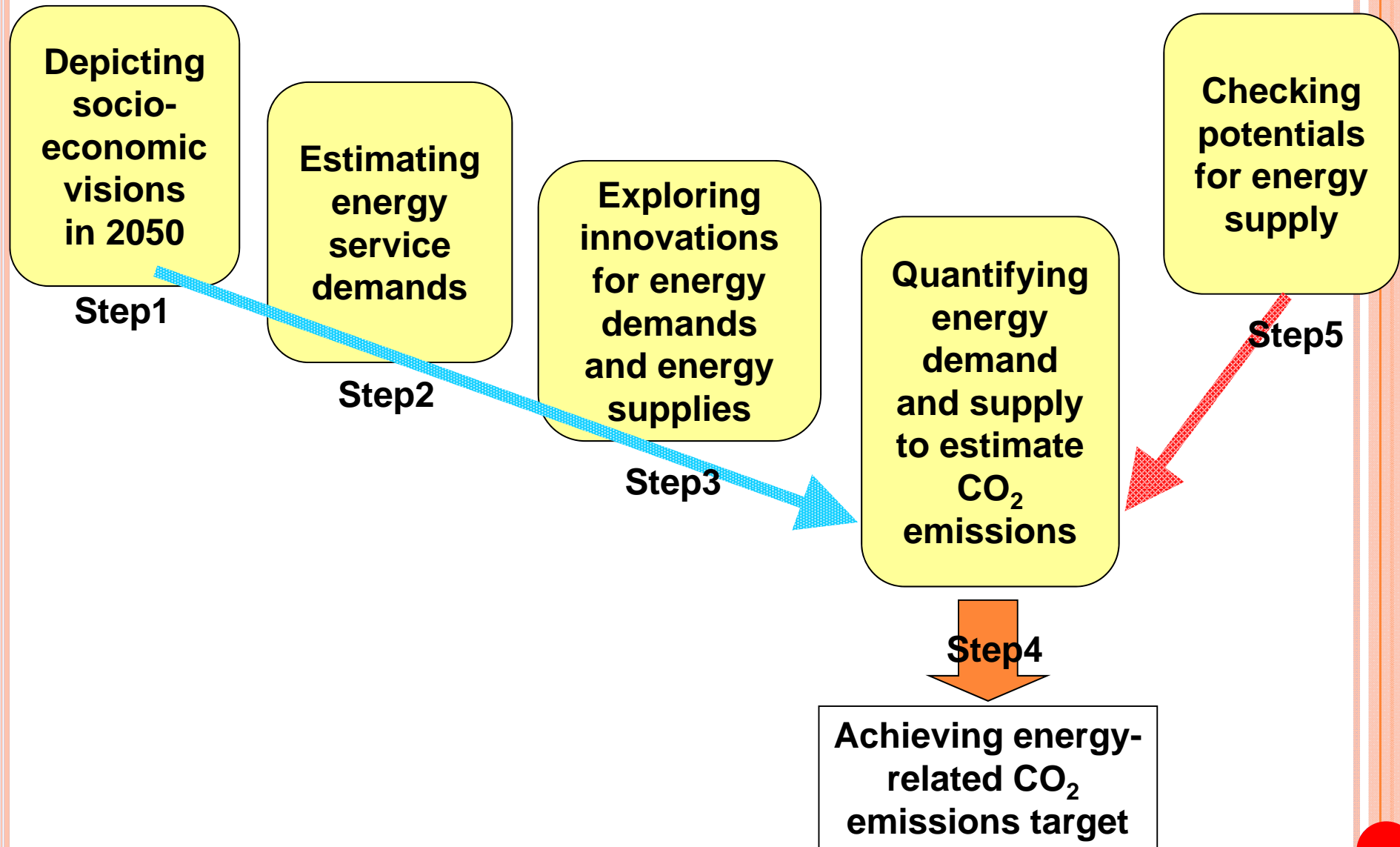


# A Look at Greenhouse Gas Emissions by Sector in 2020 and 2050 (unit: million tons of CO<sub>2</sub>)



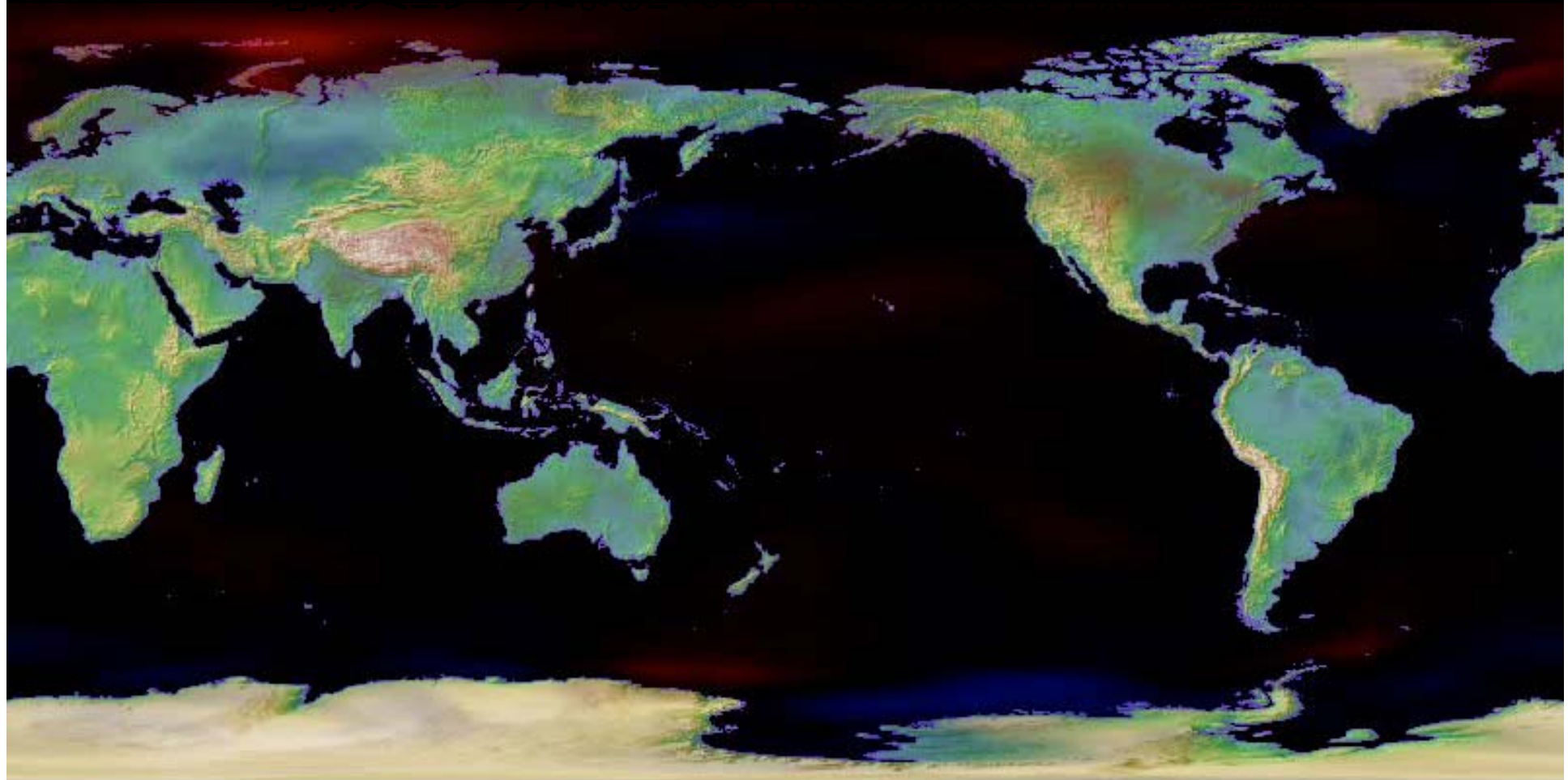
\*1: "Case of all sectors converted to macro frameworks" based on the pricing of carbon.  
 \*2: "Case of the industrial sector fixed to macro frameworks"  
 \*3: Ratio of emissions cut to 2008.

# Scenario Approach to Develop Japan Low-Carbon Society (LCS)



# Can we live with such a catastrophe?

## Projection of surface temperature from 1900

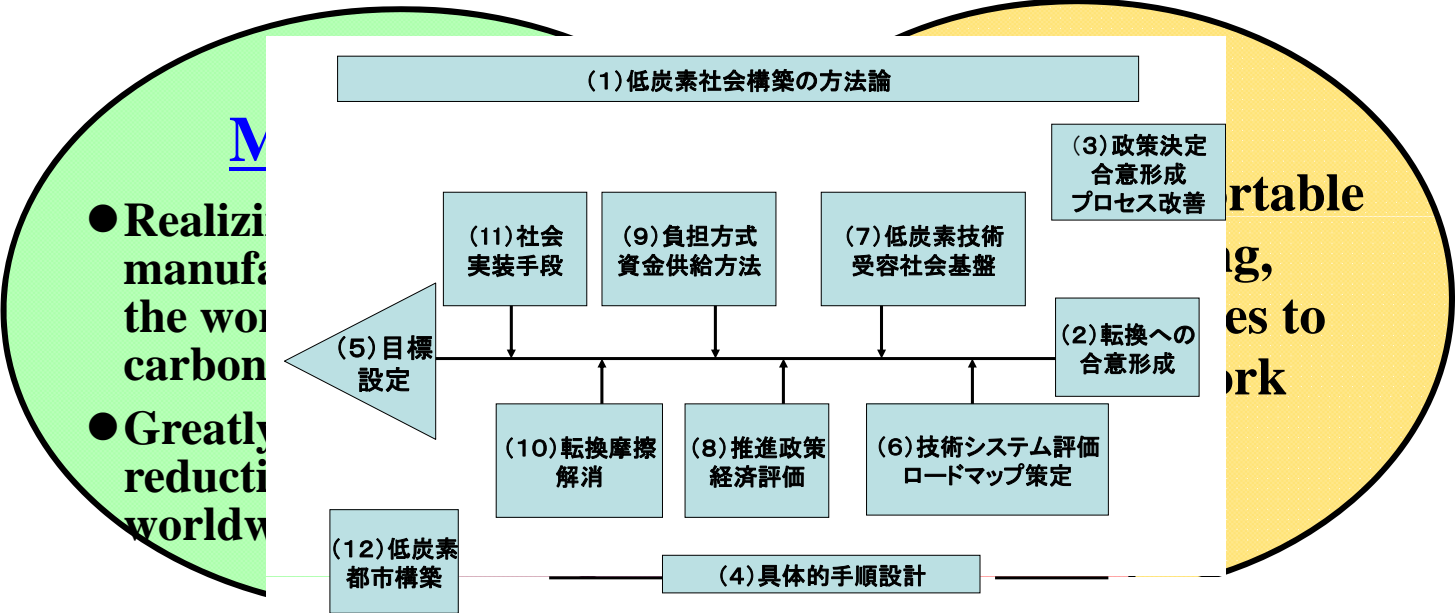


1950



CCSR/NIES/FRSGC+Earth Simulator

# Scope, division, and viewpoints



日本において低炭素社会研究が取り組むべき12の挑戦

13/06/2010SN

of the characteristics of each region.

- Reducing carbon, including sinks in rural areas.

Local development



# International Low Carbon Society Research Network

The 2<sup>nd</sup> Annual Meeting  
20-21 September, 2010 Berlin  
Shuzo Nishioka, Secretary General (IGES)

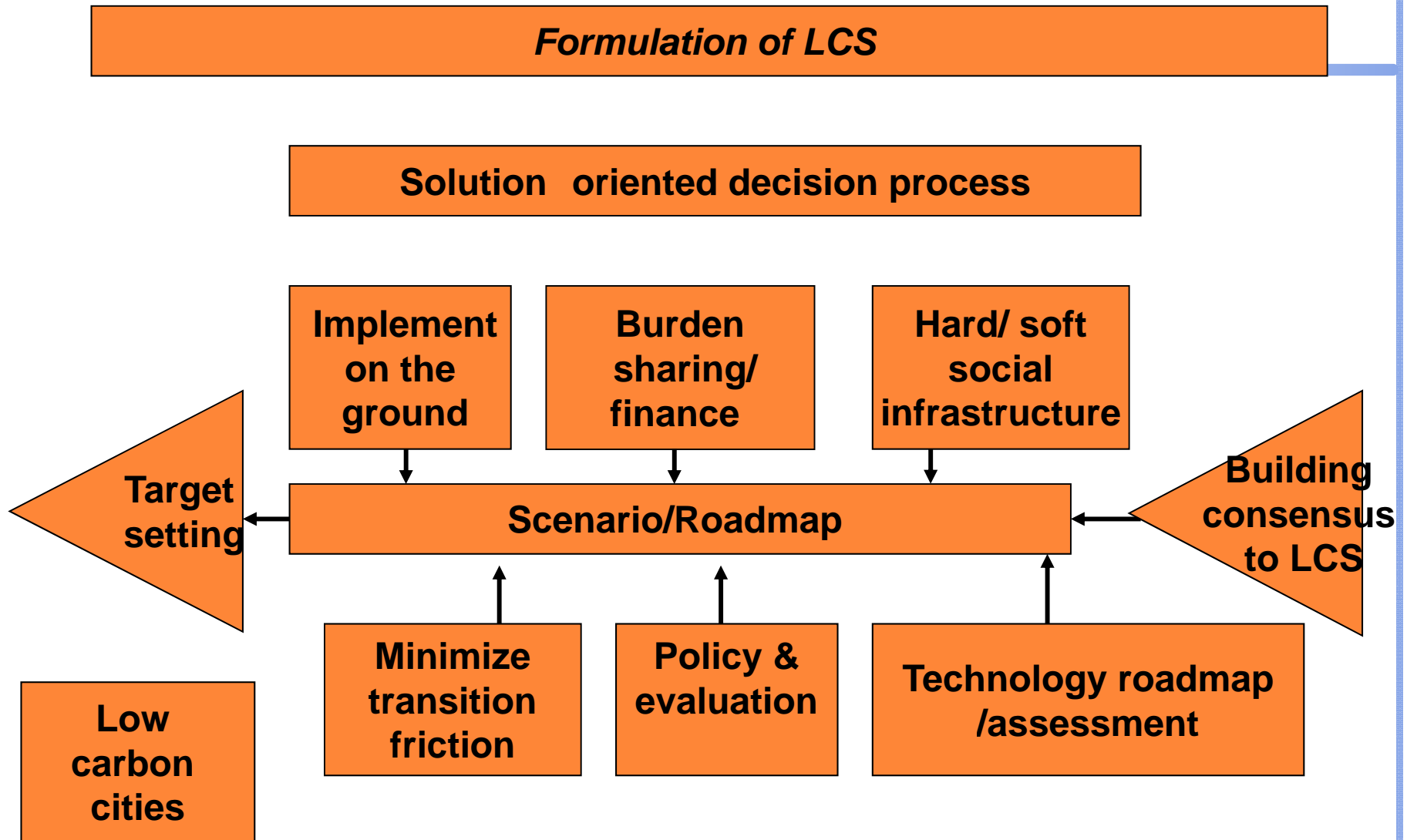
気候の恵みをかみしめる



# ...regulation toward Low Carbon Society

	<i>Mid/ long- term GHG reduction policy making</i>	<i>Contribution from Research Society</i>
-2005	More focus on Kyoto target	
2005-	G8 Glen Eagles Process set	70% reduction scenario research project (04-08, NIES/ Kyoto U., MOE + 50 researchers), Japan/UK-Joint RP
2007. 6	G8 Heiligendamm: 50% reduction globally (PM. Abe)	Technological innovation scenario to 2050 (METI)
2008. 6	Kobe G8 + Environmental Minister's Meeting: <a href="#">LCS RNet</a> proposed	Environmental Energy Innovation Plan published by CSTP (Central Council for S&T Policy, Chair: PM)
.7	G8 Toyako: Japan 2050 target 60-80% reduction towards <a href="#">Low Carbon Society</a> (PM. Fukuda)	Low Carbon Model Cities (Local base)
2008. 12- 2009. 4	Cabinet's Consultative Committee (Chair: Fukui) for 2020 target to Copenhagen	6 modeling institutions (NIES, IEEJ, RITE, JCER, Keio U.) invited. Discussed tech. feasibility, economic impact of policies, burden-sharing, international equity
.6	G8 L'aquila: Japan's 2020 target of 8%reduction (1990 base) PM.Aso	
2009. 9	UN Climate Summit: Japan's target 2020:25%, 2050 80% (1990 base) (PM. Hatoyama)	<a href="#">LCRNet Bologna Meeting (Oct.)</a>





A dozen challenges to be tackled by LCS research in Japan



# Low Carbon Society related policies in Japan

2007 Feb. : Low Carbon Society (NIES) research interim report

June : PM Abe Cool Earth 50 (Worldwide reduction of 50% in 2050)

in Heiligendamm G8

2008 May: PM Fukuda's vision ( 60-80% reduction in 2050 from now)

“Low Carbon Society” in Fukuda's Basic Policy in Congress speech

Low Carbon City -10 cities designated

June : LCS Rnet proposed and accepted at G8 Environment

Ministry Meeting in Kobe

Nov. : 6 levels discussed for 2020 Mid -term Reduction Target

## Techno-Economic Models Applied for Analysis

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- International Comparability: MAC (marginal abatement cost) and Cost/GDP analysis models by:
  - National Institute for Environmental Studies (NIES)
  - Research Institute of Innovative Technology for the Earth (RITE)
- Domestic Reduction: Bottom-up technology-based analysis models by:
  - National Institute for Environmental Studies (NIES)
  - Institute of Energy Economics Japan (IEEJ)
- Economic Evaluation: General Equilibrium / Macro-economic models by:
  - Japan Center for Economic Research (JCER)
  - National Institute for Environmental Studies (NIES)
  - Keio University

# Overview of the Basic Law on Global Warming Countermeasures

## Mid- and Long-term Goals

### Greenhouse gas emissions reduction targets:

**25% reduction below 1990 level by 2020**

•\*premised on the establishment of a fair and effective international framework by all major economies and agreement on their ambitious targets

**80% reduction below 1990 level by 2050**

\*striving to share with all economies the vision of the goal of achieving at least 50% reduction of global emissions by 2050

### Renewable energy target:

**Raising the share of RE out of total primary energy supply to 10% by 2020**

## Basic Measures

### Emission Trading System:

- Establishment of domestic emission trading scheme
- Consider a formula of setting limits of emission as absolute amount of GHG emissions

### Tax for Measures against Global Warming:

- “Greening” of the tax system overall, including the consideration of a tax for measures against global warming to be implemented from fiscal year 2011

### Feed in Tariff applying all renewable energies



## Economic Evaluation of Six Options for Japan's Mid-term Target (3)

Impacts on Economy (as deviations from reference case in 2020)					
	Percent GDP on a cumulative basis by 2020	Private investment in 2020	Unemploy- ment rate in 2020	Disposable income per household in 2020	Lighting and heating expenses per household in 2020
1	1.3%/y Growth Reference Case				
2	/				
3	-0.6 ~ -0.5%	-0.8 ~ +3.4%	+0.2 ~ +0.3%	-150~-40 thousand JPY (-3.1 ~-0.8%)	+20~30 thousand JPY (+13 ~20%)
4	/				
5	-2.1 ~ -0.8%	-0.2 ~ +7.9%	+0.5 ~ +0.8%	-390~-90 thousand JPY (-8.2 ~-1.9%)	+60~80 thousand JPY (+35 ~45%)
6	-6.0 ~ -3.2%	-11.9 ~ +12.5%	+1.3 ~ +1.9%	-770~-220 thousand JPY (-15.9 ~-4.5%)	+110~140 thousand JPY (+66 ~81%)

Financial stimulus packages such as "Green New Deal" are not included in the model analyses.

Cost of inaction should be considered as well.

# Elements of Options and Evaluation

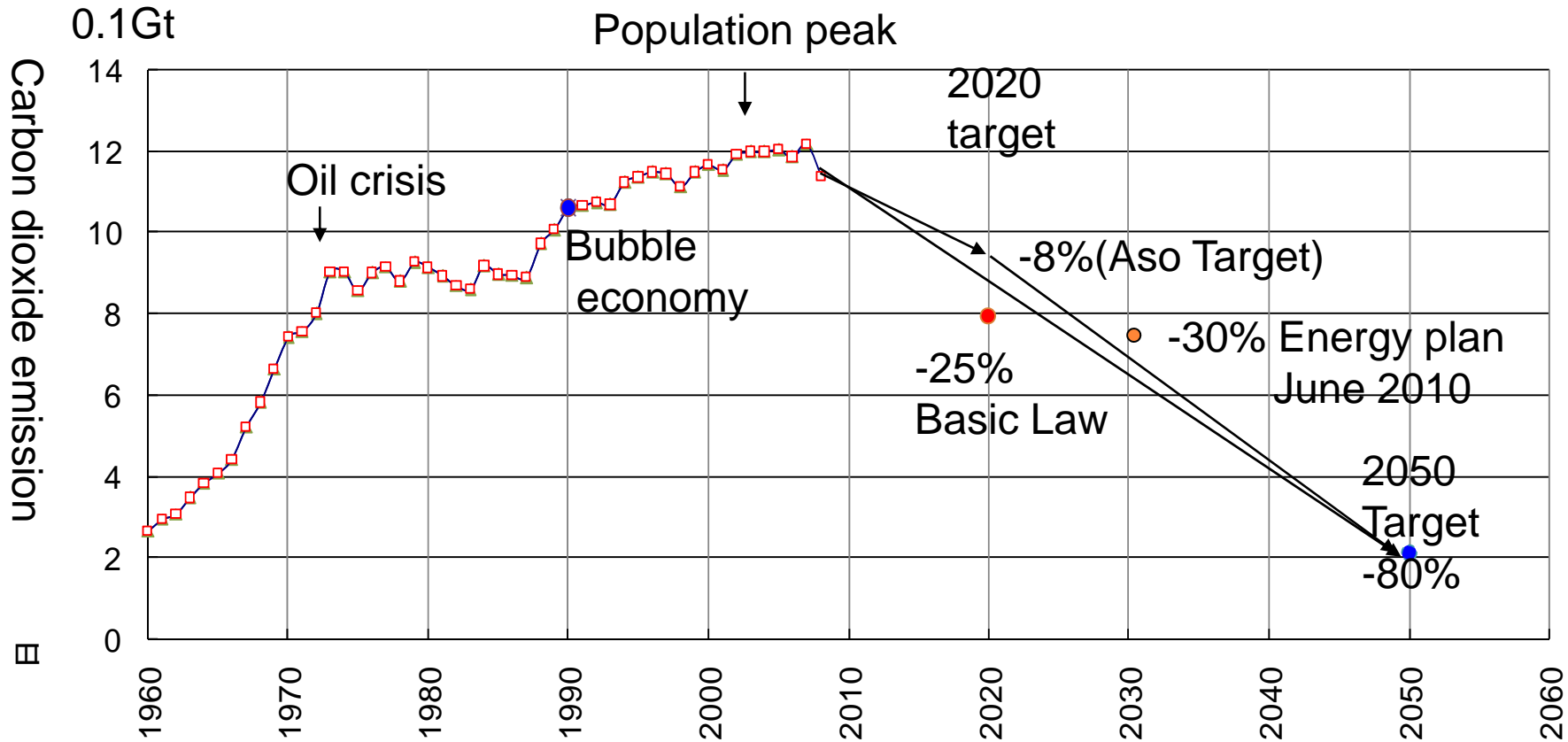
1. Level of targets
  - GHG: Energetic-origin CO<sub>2</sub> emissions + Non-CO<sub>2</sub> GHGs
  - International Comparability: Marginal Abatement Cost (MAC) & Cost /GDP
2. Emission reduction scenarios to satisfy the level of targets
  - Fuel shares of electricity generation
  - Primary energy supply by fuel
  - Level of required measures (supply and demand side)
  - Activity data
3. Macro-frame fixed (Iron & Steel Production, Nuclear power, Traffic Volume, GDP growth)
4. Economic and social influence with the level of targets  
(economic growth, employment, energy security etc.)
5. Checked by
  - Compatibility with UNFCCC consideration ( Annex I: 25-40%reduction)
  - The path to 2050 (Fukuda Vision of 60-80% reduction in 2050)
  - Cost of inaction
6. In addition, following elements are to be considered later as final decision for negotiation
  - carbon sink,
  - carbon credits

Six Options for Japan's Mid-term Target (1)

	Description	Reduction in 2020		Necessary Policies and Measures
		% above/ below 1990	% above/ below 2005	
1	<b>“Business as usual” case based on Long-term Energy Demand and Supply Outlook /</b>	<b>+4%</b>	<b>-4%</b>	<b>Spontaneous renewal of machines and facilities based on existing technologies</b>
2	<b>25 % reduction of overall developed countries' emissions below 1990 (allocated on a basis of equivalent marginal abatement cost)</b>	<b>-5 ~ +1%</b>	<b>-12 ~ -6%</b>	
3	<b>Introduction of best available technologies to machinery being renewed based on Long-term Energy Demand and Supply Outlook</b>	<b>-7%</b>	<b>-14%</b>	<b>Introduction of best available technologies to machinery being renewed partly with compulsory measures</b>
4	<b>25 % reduction of overall developed countries' emissions below 1990 (allocated on a basis of equivalent cost as a percentage of GDP)</b>	<b>-17 ~ -8%</b>	<b>-23 ~ -13%</b>	

# Timing:

## Mid-term Target on the right track to 2050 target?



出典: IEA CO2 Emissions(-1989), 環境省 温室効果ガス排出量 (1990~2008)