The Low-Carbon Scenarios for Japan

Visions and Actions towards LCSs

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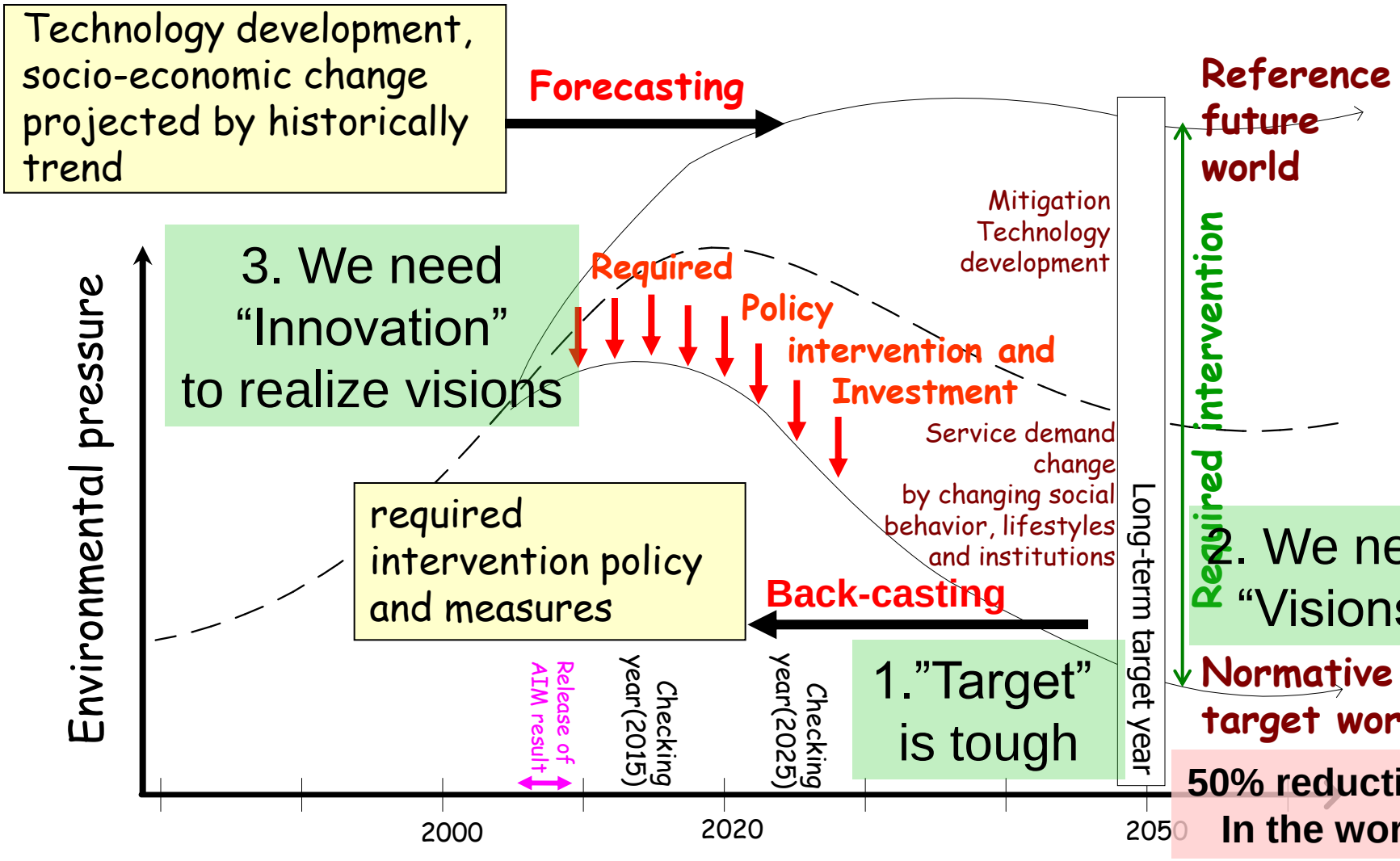
National Institute for Environmental Studies

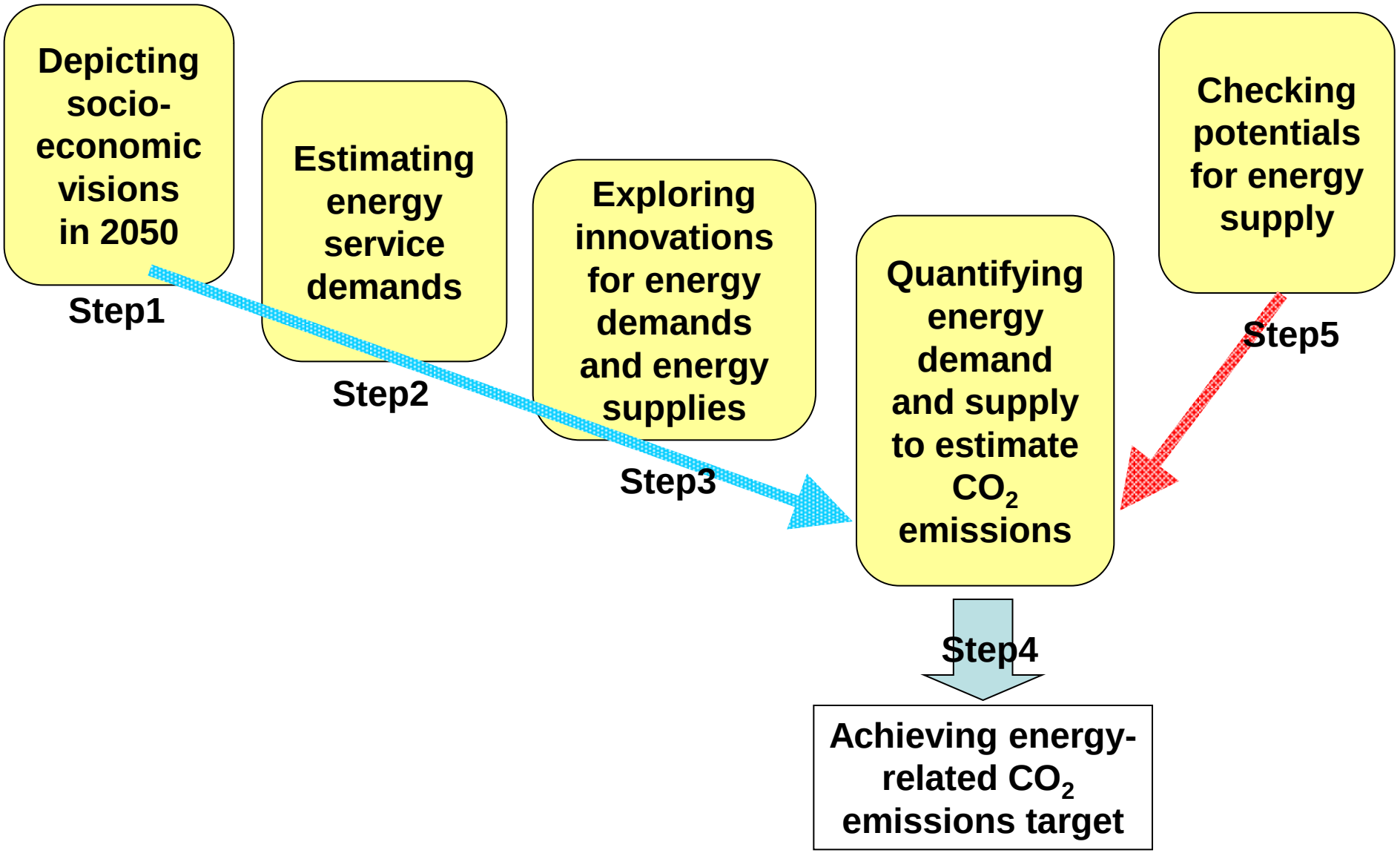
First Annual Meeting of the International Research Network for Low-carbon Societies
CMCC, BOLOGNA
12-13 October 2009

Japan Low Carbon Society Scenarios toward 2050

[FY2004-2008, Global Environmental Research Program, MOEJ]

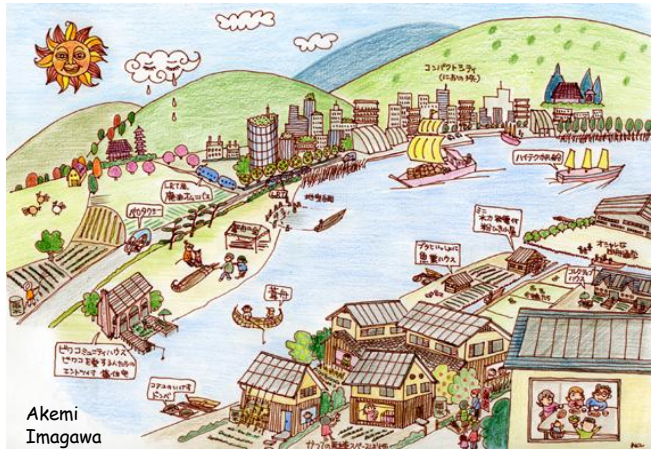


Scenario Approach to Develop Japan Low-Carbon Society (LCS)



Visions

we prepared two different but likely future societies for Japan

Vision A	Vision B
Vivid, Technology-driven	Slow, Natural-oriented
Urban/Personal	Decentralized/Community
Technology breakthrough Centralized production /recycle	Self-sufficient Produce locally, consume locally
Comfortable and Convenient	Social and Cultural Values
2%/yr GDP per capita growth	1%/yr GDP per capita growth
	

Visions and Innovations

LCS house in 2050
Comfortable and energy-saving house

Utilizing solar power

Photovoltaic

34-69MW
(25-47% house has PV on roof (now 1%))
and develop high efficiency (<30%) PV

Eco-life education

10-20% energy demand reduction

rooftop gardening

High efficiency lighting
【eg LED lighting】

Reduce 1/2 energy demand
Share 100%

Solar heating

Diffusion rate: 20-60%
(currently 8%)

Monitoring system
equipped with appliances

High-insulation

Reduce 60% warming energy demand, share 100%

Super high efficiency air conditioner

COP (coefficients of performance=8), share 100%

Fuel cell

share 0-20%

Heat-pump heating

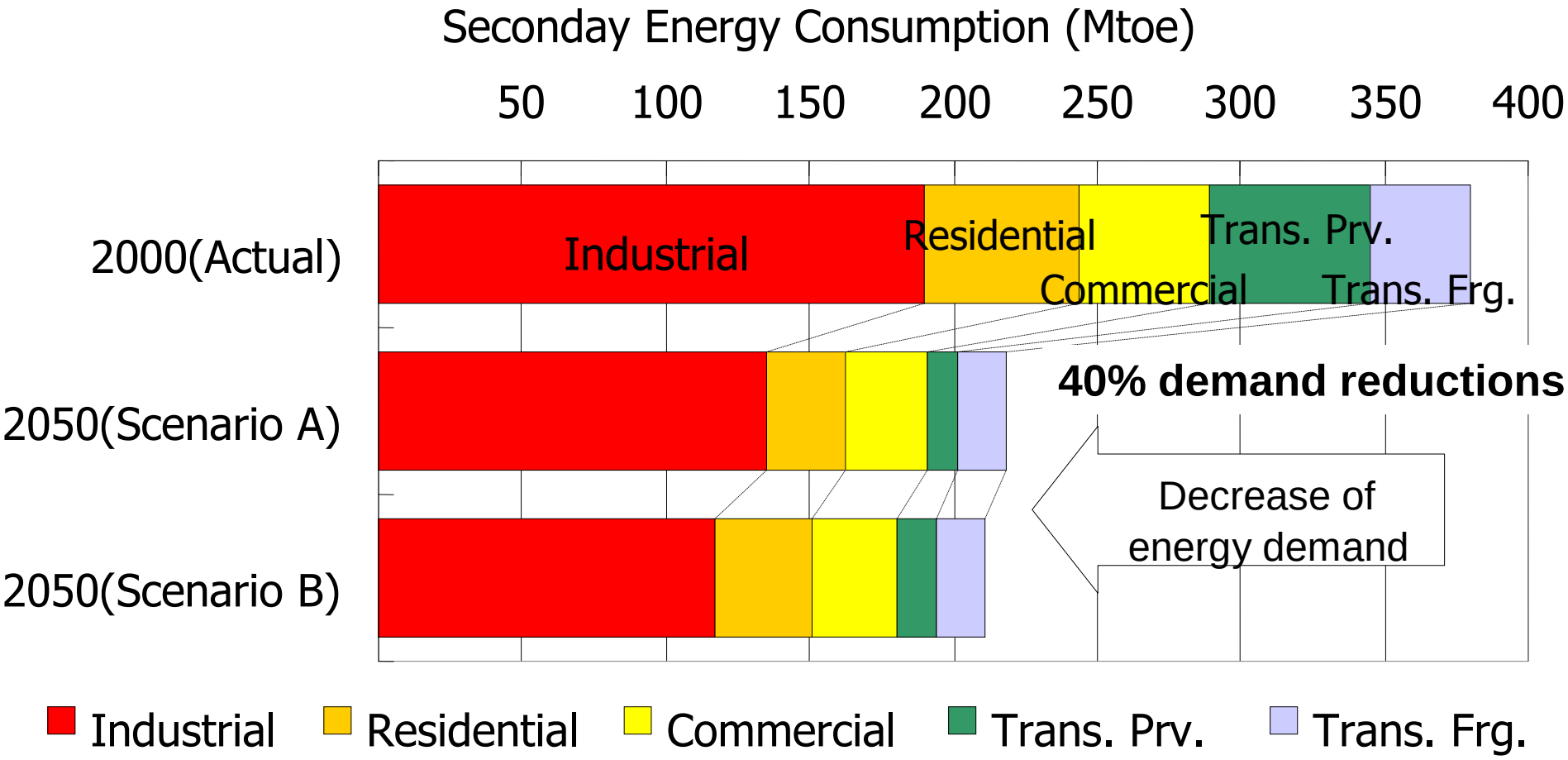
COP = 5
share 30-70%

Stand-by energy reduction

Reduce 1/3 energy demand, share 100%

Good information for economy and environment makes people's behavior low-carbon

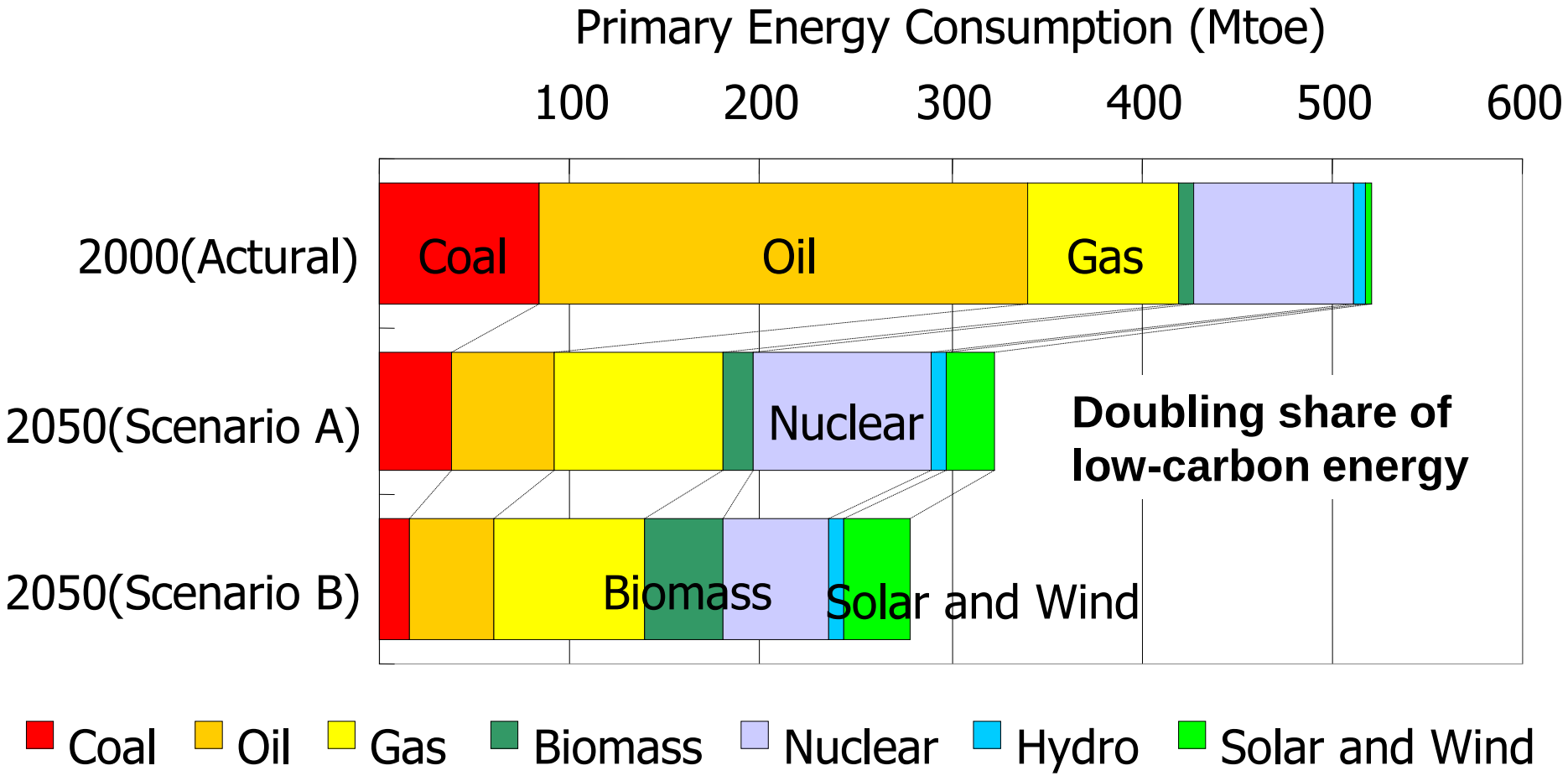
High efficiency appliances reduce energy demand and support comfortable and safe lifestyle



Possible energy demands reductions for each sector:
Industry：structural change and introduction of saving energy tech. 30-40%
Passenger Transport :land use, saving energy, carbon-intensity change 80%
Freight Transport :efficient transportation system, energy efficient 50%
Residential: high-insulated and energy-saving houses 40-50%
Commercial: high-insulated building and energy saving devices 40%

And we need low-carbon energy.

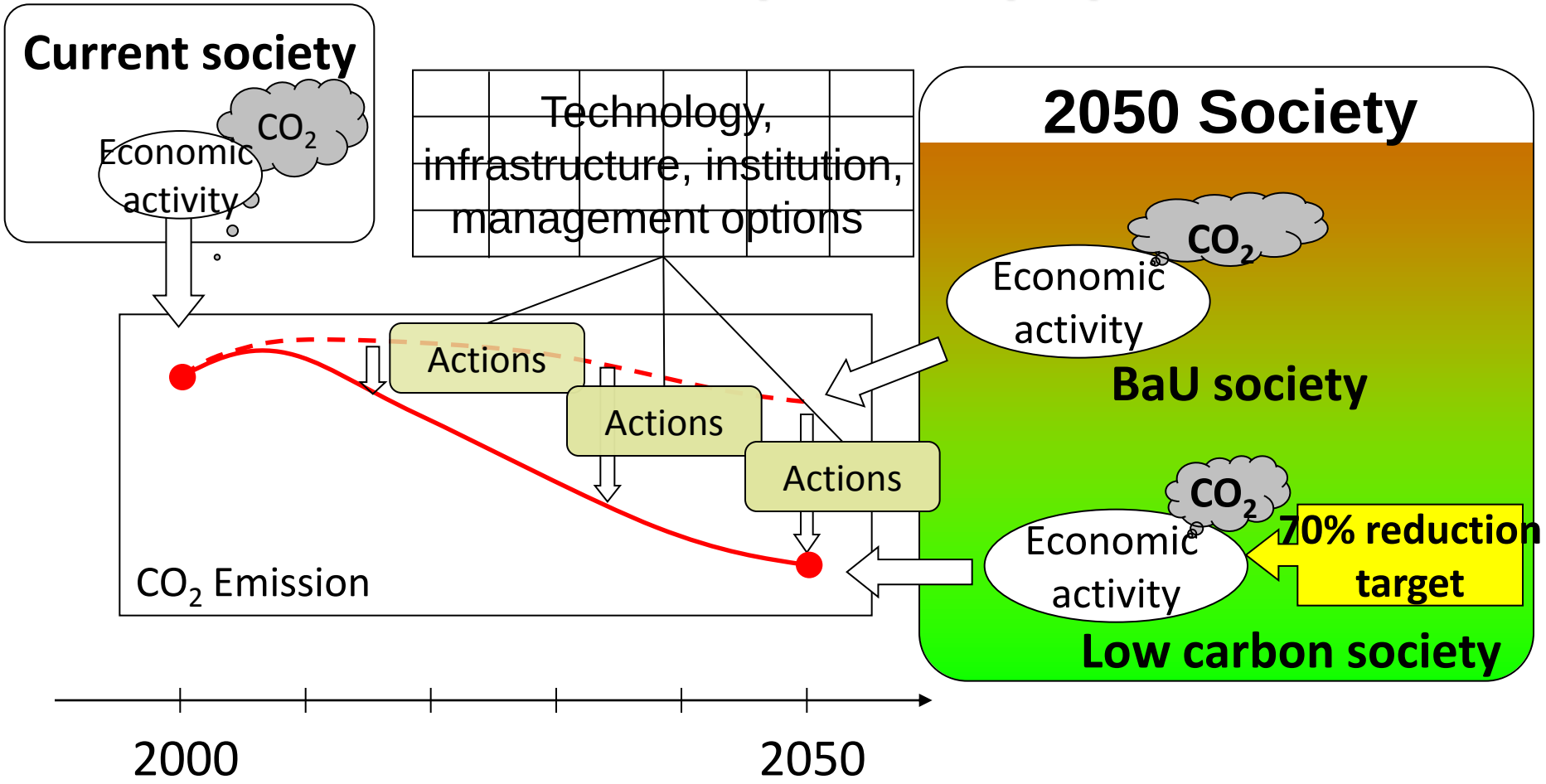
- Renewable energy
- Nuclear energy
- Fossil fuel + CCS



To achieve the 70% reduction goal by 2050, we investigated

- **which options should be selected,**
- **when options should be introduced,**
- **how much of each option should be introduced at each stage,**

with reference of candidate options as prepared.



What do we need?
Focal point for designing roadmaps

- Future target vision
- Social/Economical conditions and service demands to the future
- Set of options (countermeasures and policies) for achieving future target

And, each options'

- Sequential order
- Elapsed time
- Kick-off period

How to achieve Low-Carbon Life?

LC-Life

Action 1

Comfortable and Green Built Environment

Popularization of Environment buildings

Policy

Obligation and regulation

Action 2

Anytime, Anywhere Appropriate Applicances

Support for live

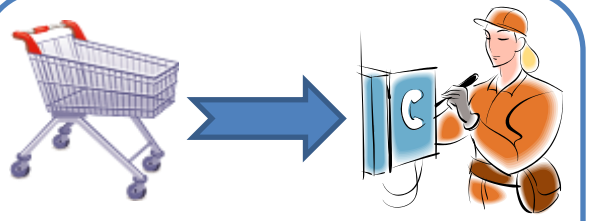
Navigation System

Support for Choice

Eco-Labeling

Efficiency Improvement

Support for Purchase



Transition to service Consumption lifestyle

Financing

Construction Skills

Design Skills

Policy

Communization and Standardization of technical know-how

Tax benefits for aggressive company for LCS Building

Policy

Tax benefits, subsidy, reimburse

LC-Life

Sequence is important!

Action 1

Comfortable and Green Built Environment

- Skipping of option leads to failure of the action
- If one option become infeasible, subsequent options will not allow to implement.

Popularization of Environment buildings

Policy

Obligation and regulation

Construction Skills

Design Skills

Policy

Communization and Standardization of technical know-how

Tax benefits for aggressive company for LCS Building

Financing

Policy

Tax benefits, subsidy, reimburse

Time-line occupies important place in options!

LC-Life

Action 1

Comfortable and Green Built Environment

- In order to achieve our target by 2050, each option will start at least when?
- What option was started in 2020/2030?

In 2020, we must reach here!

Action 1 requires 40 yrs

Popularization of Environment buildings

Policy

Obligation and regulation

Construct… Skills

5 yrs

Design Skills

Policy

Communization and Standardization of technical know-how

Tax benefits for aggressive company for LCS Building

Financing

5 yrs

Po…

Tax benefits, subsidy, reimburse

A Dozen Actions towards Low-Carbon Societies

Press release on May 22, 2008

Residential/commercial sector actions

1. Comfortable and Green Built Environment
Efficiently use of sunlight and energy efficient built environment design. Intelligent buildings.

2. Anytime, Anywhere Appropriate Appliances
Use of Top-runner and Appropriate appliances. Initial cost reduction by rent and release system resulting in improved availability.

Industrial sector actions

3. Promoting Seasonal Local Food
Supply of seasonal and safe low-carbon local foods for local cuisine

4. Sustainable Building Materials Using local and renewable buildings materials and products.

5. Environmentally Enlightened Business and Industry Businesses aiming at creating and operating in low carbon market. Supplying low carbon and high value-added goods and services through energy efficient production systems.

Transportation sector actions

6. Swift and Smooth Logistics
Networking seamless logistics systems with supply chain management, using both transportation and ICT infrastructure

7. Pedestrian Friendly City Design
City design requiring short trips and pedestrian (and bicycle) friendly transport, augmented by efficient public transport

Energy supply sector actions

8. Low-Carbon Electricity Supplying low carbon electricity by large-scale renewables, nuclear power and CCS-equipped fossil (and biomass) fired plants

9. Local Renewable Resources for Local Demand
Enhancing local renewables use, such as solar, wind, biomass and others.

10. Next Generation Fuels Development of carbon free hydrogen- and/or biomass-based energy supply system with required infrastructure

Cross-sector actions

11. Labeling to Encourage Smart and Rational Choices
Visualizing of energy use and CO2 costs information for smart choices of low carbon goods and service by consumers, and public acknowledgement of such consumers

12. Low-Carbon Society Leadership Human resource development for building “Low-Carbon Society” and recognizing extraordinary contributions.

1. Comfortable and Green Built Environment

Contribution of Building Owners	Selection of residential buildings with high environmental efficiency Commission of low carbon design to architects and construction companies.
Contribution of Architects, etc.	Development of low carbon architectural design methods. Investing for technology development in insulation technologies, etc. Sustenance of regional worker skills.

Standardization Period → Environmental Efficiency Labeling Introduction Period

Barriers		Future Objectives
	Residential household energy demand: -40% (from FY2000 level) Building floor area energy demand: -40% (from FY2000 level)	
Complex energy saving performance metrics, high calculation costs, insufficient personnel	Dissemination of diagnosis practitioners for energy saving and CO_2 reduction efficiencies Establishment of simplified evaluation method for environmental efficiency of residences and buildings Organizing training classes and events for passing on knowledge of architectural technologies	Solar and wind utilization design Finance-friendly Environmental efficiency
Insufficient incentives for choosing energy saving residences and buildings	Introduction and expansion of residence and building labeling system for environmental efficiency (new building, renovation, mandatory indication upon leasing) Implementation and expansion of tax breaks and low interest loan financing based on the environmental efficiency lab Establishment and review of long term energy saving standard targets for buildings.	Nurturing of worker skills & information transmission

2000 2010 2020 2030 2040 2050

Backcast Model: Overview

- Investigating "When and Which options and How much" of each option (countermeasures and policies) should be introduced in order to achieve the goal with keeping consistency of energy/economy.

Input

- Future target vision
- Social/Economical conditions
- Set of options

And, each options'

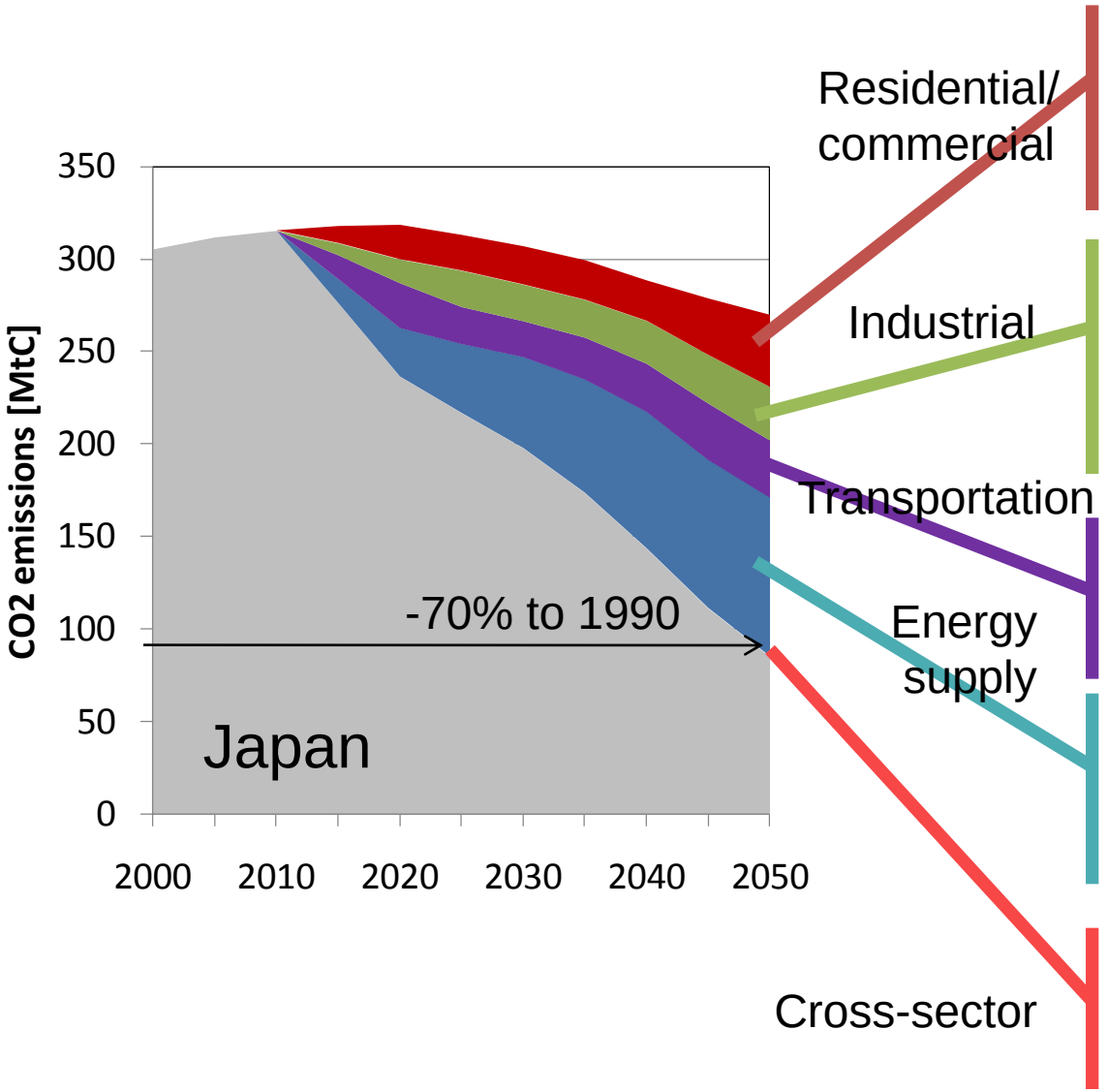
- Sequential order
- Elapsed time
- Kick-off period

Output

- Feasibility of the target
- Roadmaps
- CO_2/Cost trajectories

AIM/LCS

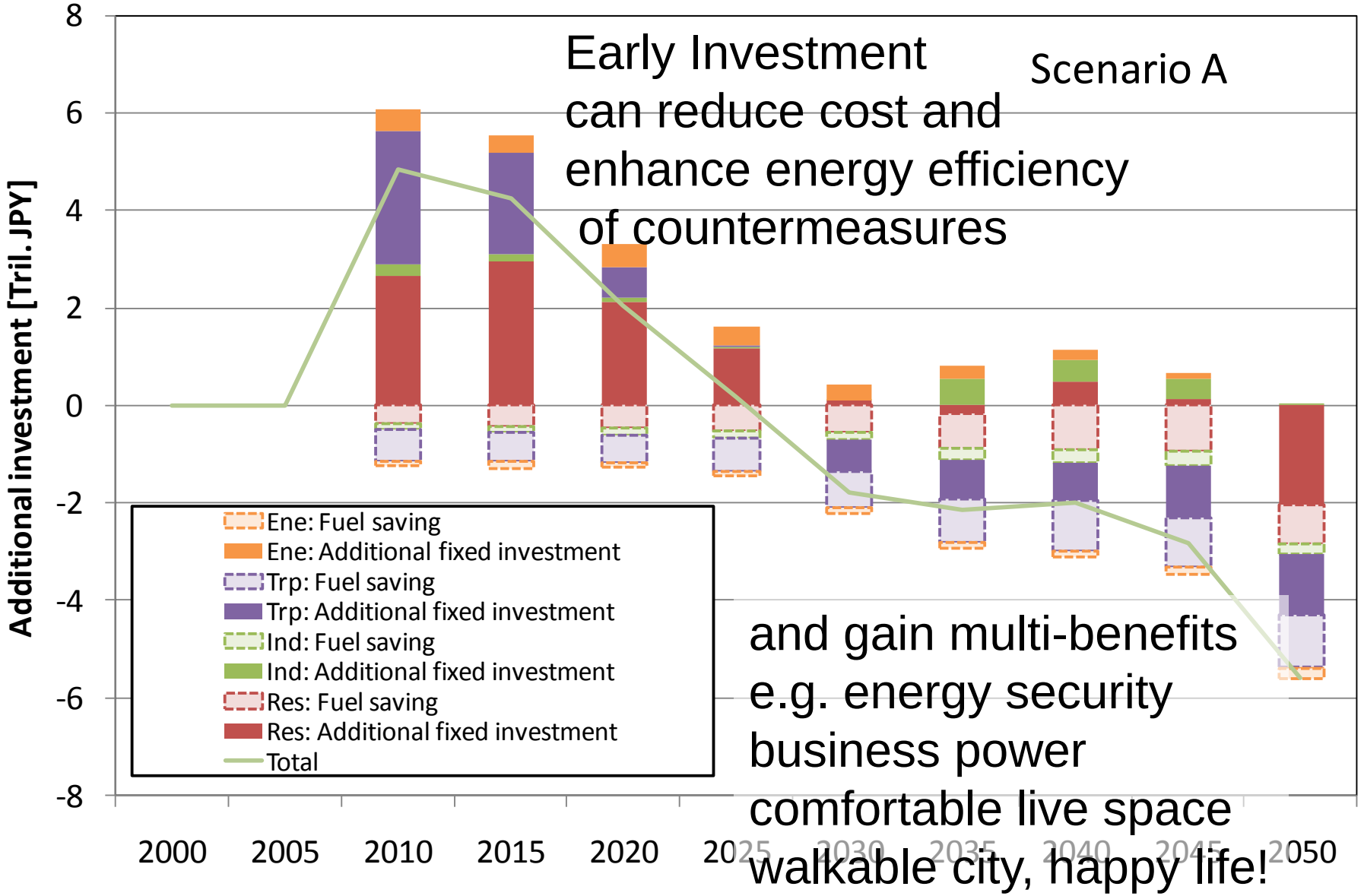
CO2 emission projections based on a dozen actions toward 70% reduction



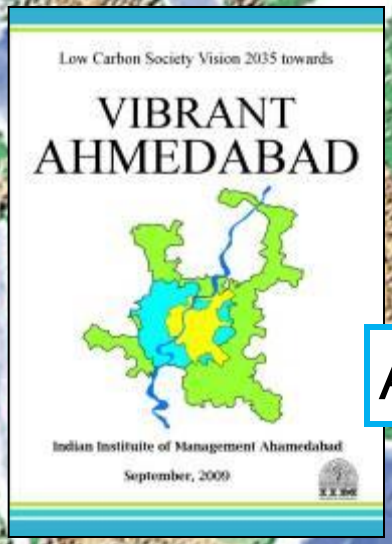
A Dozen Actions

1. Comfortable and Green Built Environment
2. Anytime, Anywhere Appropriate Appliances
3. Promoting Seasonal Local Food
4. Sustainable Building Materials
5. Environmentally Enlightened Business and Industry
6. Swift and Smooth Logistics
7. Pedestrian Friendly City Design
8. Low-Carbon Electricity
9. Local Renewable Resources for Local Demand
10. Next Generation Fuels
11. Labeling to Encourage Smart and Rational Choices
12. Low-Carbon Society Leadership

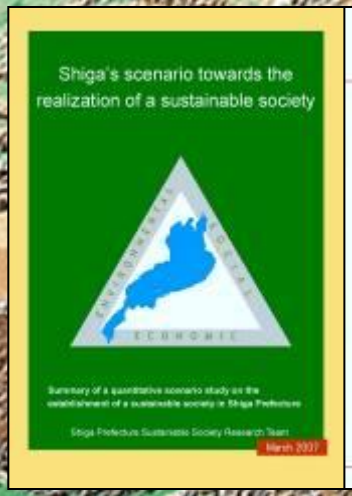
How to reach the Japan LCS?

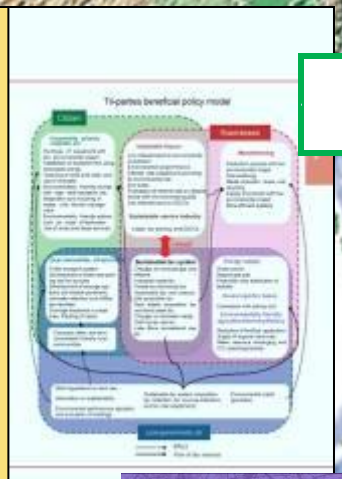


Low-Carbon Scenarios for Asian cities



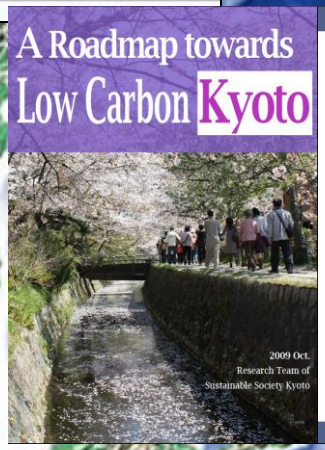
Ahmedabad

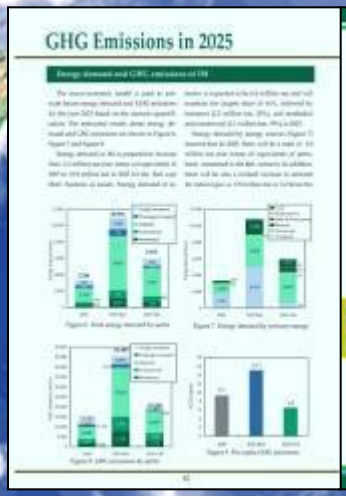


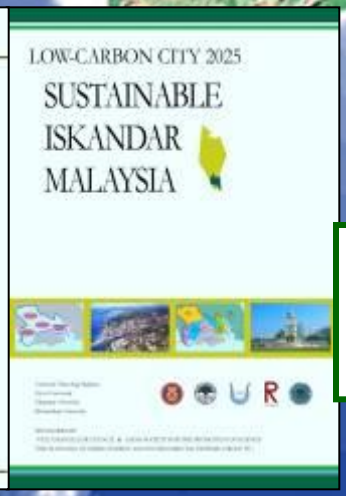


Shiga

Kyoto

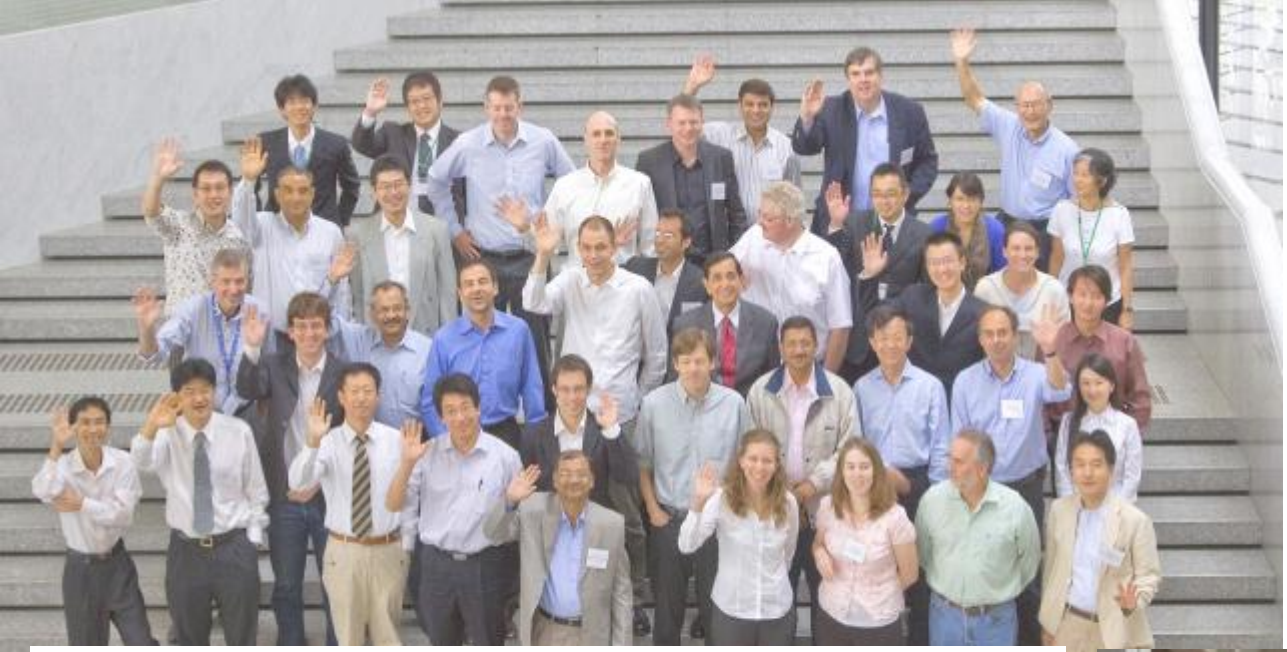






Iskandar Malaysia

Asia Modeling Network



Asian Modeling Meeting at Tsukuba on 17-18 September 2009

14th AIM International Workshop on 14-15 February 2009

AIM Training Workshop on 31 August – 11 September 2009

"Live simply that others may simply live.“
Mohandas Gandhi.

Thank you for your attention!

New Japan's Mid-term Target

Japan's mid-term target was announced by New Prime Minister Hatoyama on September 26th, 2009. The target is

25 percent reduction from the 1990 level by 2020

New Prime Minister Hatoyama

	New Mid-term target	Old Mid-term target	Kyoto target
Target Year	2020	2020	2008 - 2012
Base Year	1990	2005(1990)	1990
Domestic reduction	**Totally 25**	15(8)	0.6
Carbon sinks		-	3.8
Credits		-	1.6

*Japan's Kyoto target (6% reduction) includes carbon sinks and credits through the Kyoto mechanisms.

Three types of models for the analyses

1. Models for international comparability by way of MAC

Emphasizing on optimization of costs and consistency among regions by way of sectoral bottom-up models which encompass the whole world, and evaluating fairness based on indicators including MAC.

- RITE (Research Institute of Innovative Technology for the Earth): DNE21+
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2. Models accumulating domestic technologies

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3. Models analyzing impacts on economy

Analyzing economic impacts when the target of each option is achieved.

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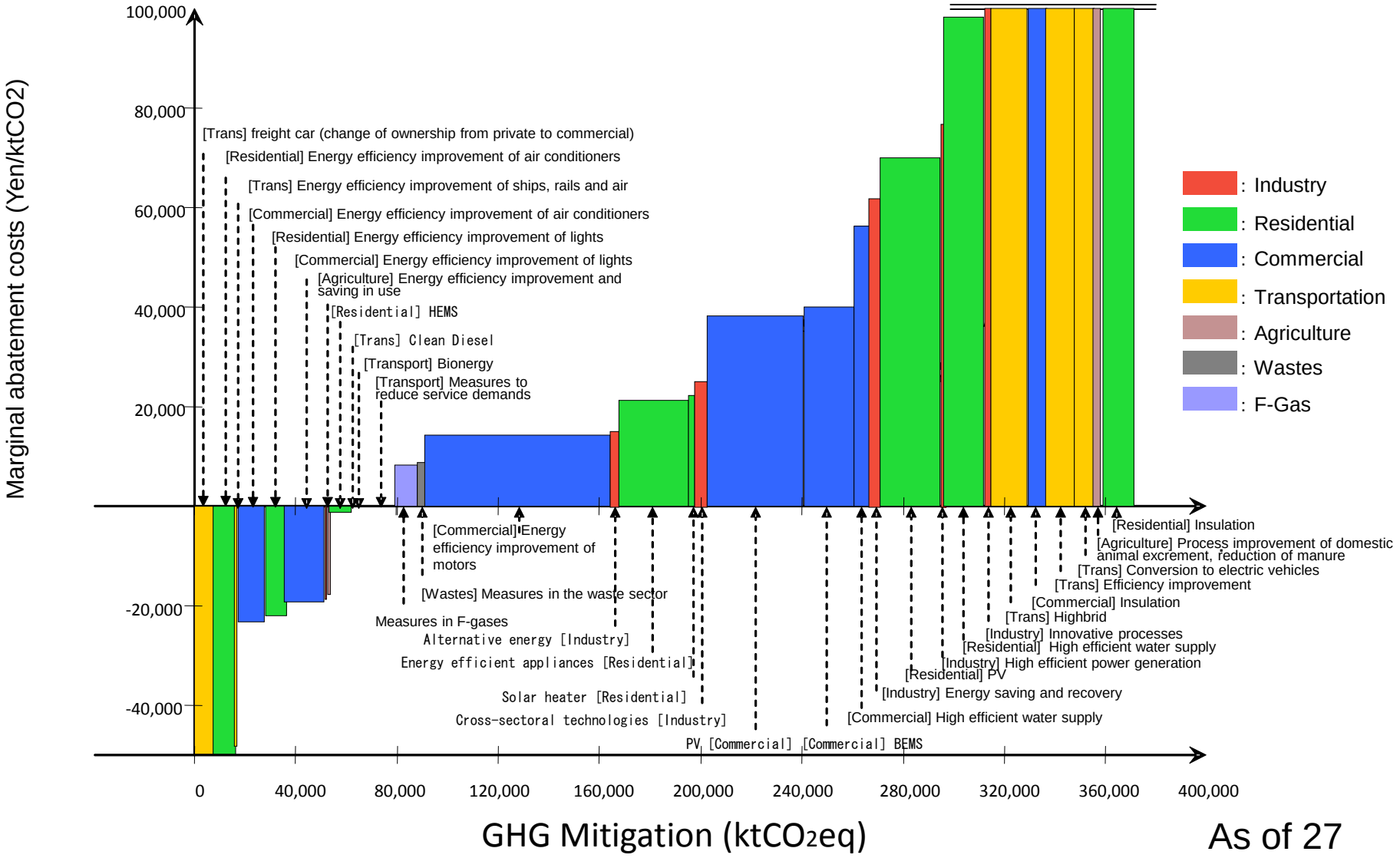
JCER (Japan Center for Economic Research), NIES: AIM/CGE [Japan], KEO Model

(2) Macro model: JCER

Cost to Reduce GHG emissions in Japan

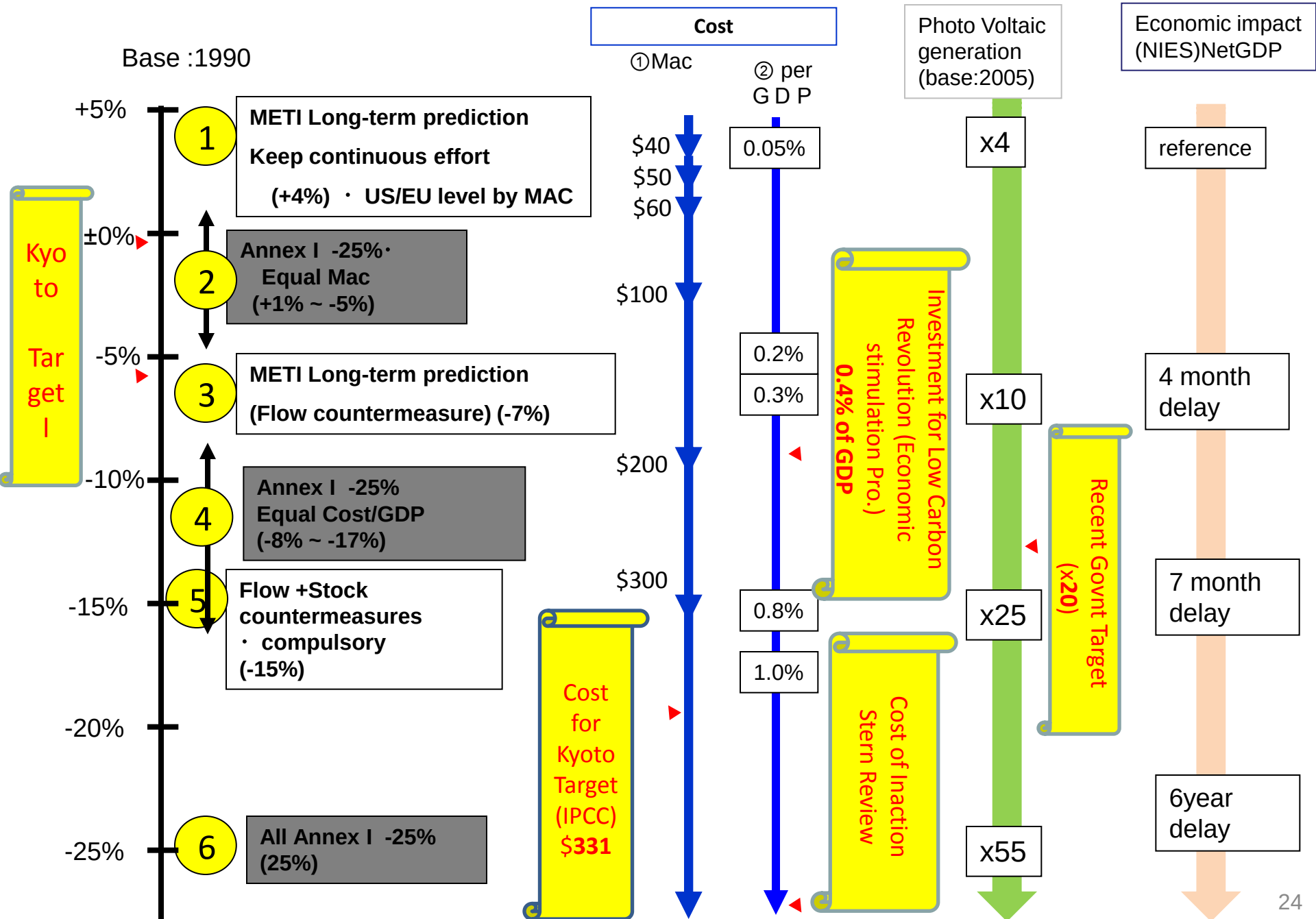


AIM/Enduse[Japan]

in 2020 (Case III)

As of 27 March 2009

Evaluation of Options



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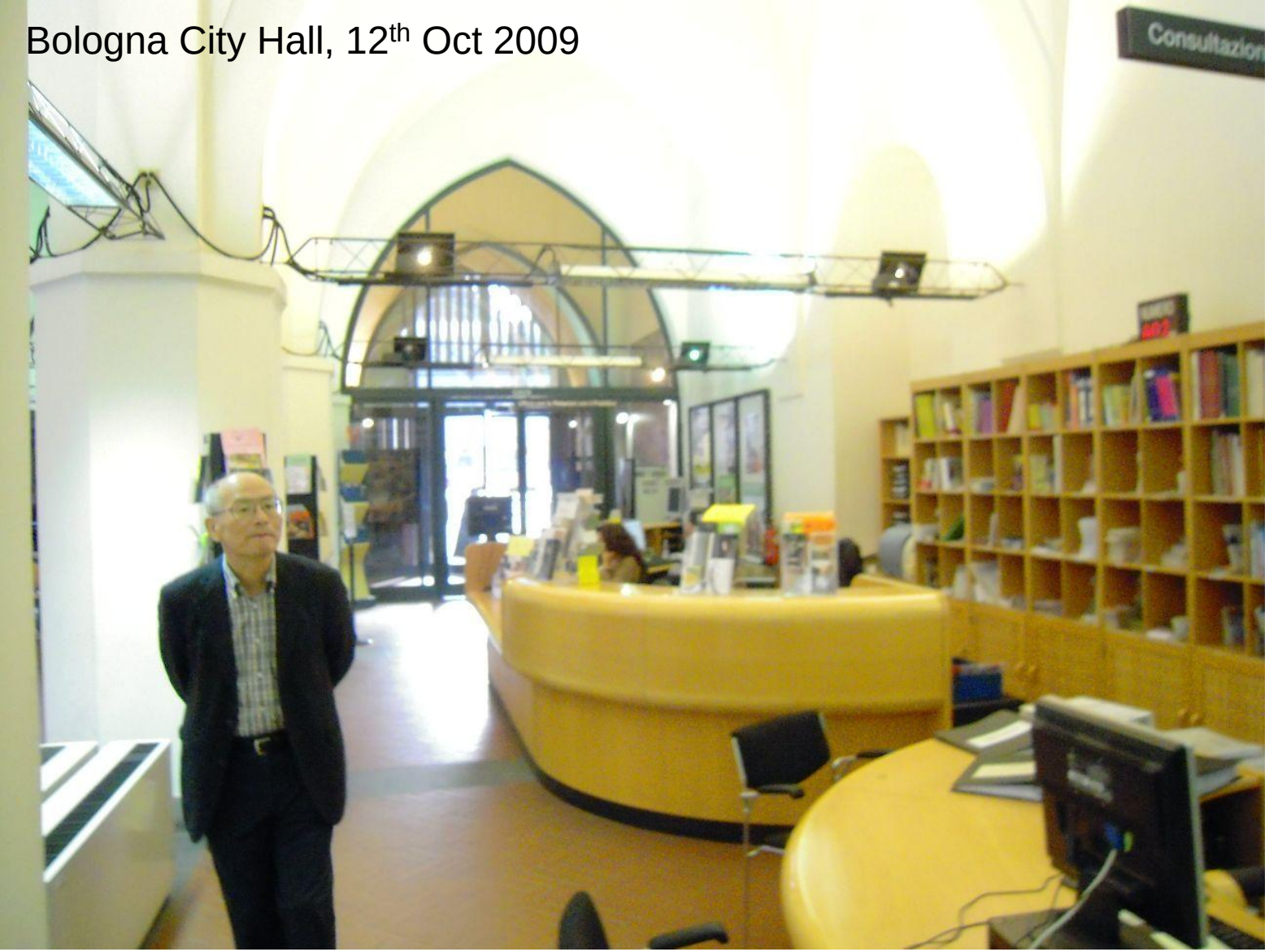
Bologna City Hall, 12th Oct 2009



1. Comfortable and Green Built Environment

2. Anytime, Anywhere Appropriate Appliances

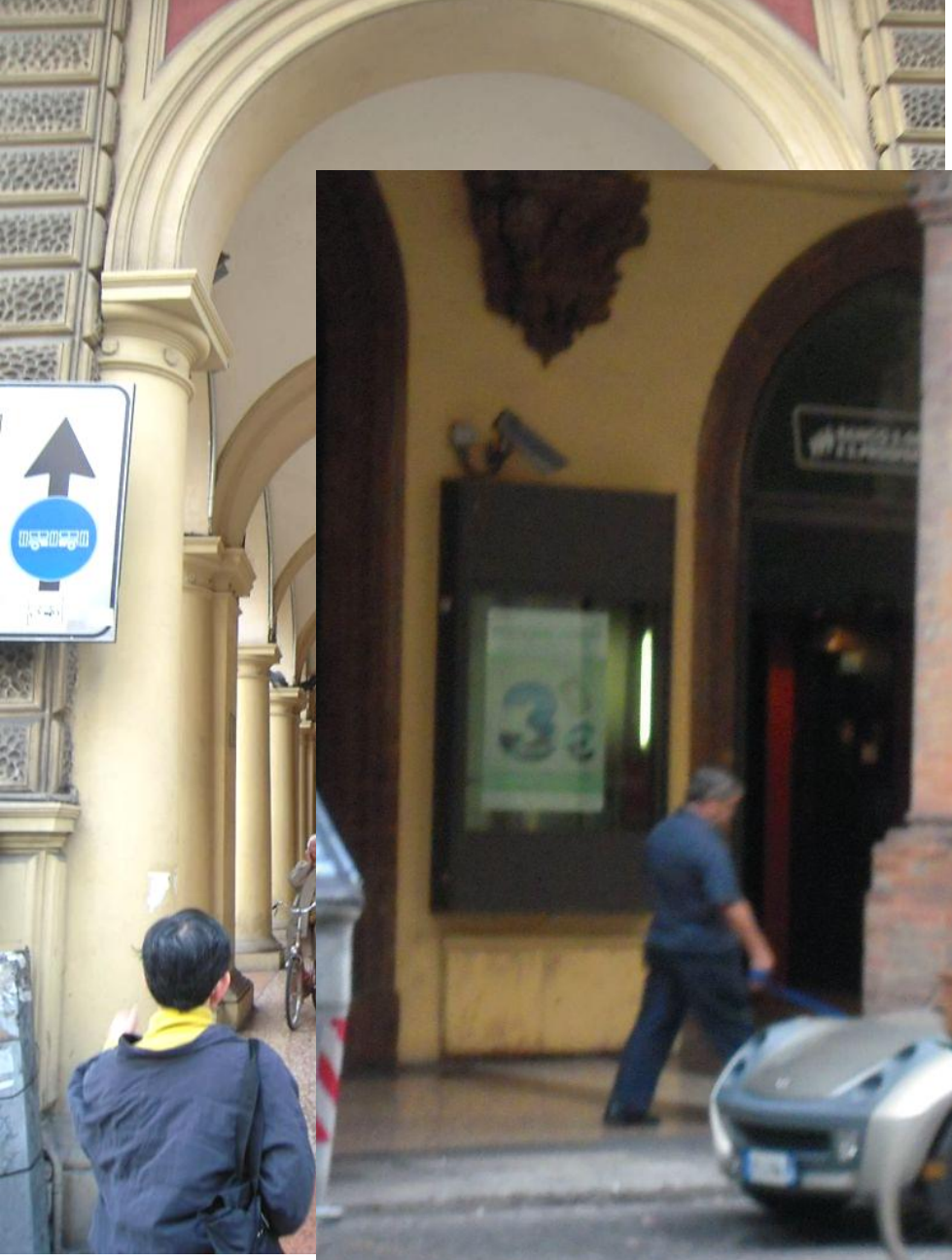
Pizza Maggiore, 12th Oct 2009

3. Promoting Seasonal Local Food

Le Due Torri (The Two Towers), 12th Oct 2009

4. Comfortable and Green Built Environment

5. Environmentally Enlightened Business and Industry



7. Pedestrian Friendly City Design

12. Low-Carbon Society Leadership

Backup slides

Japan's Mid-term Target
- Process and Decision -

October 2009

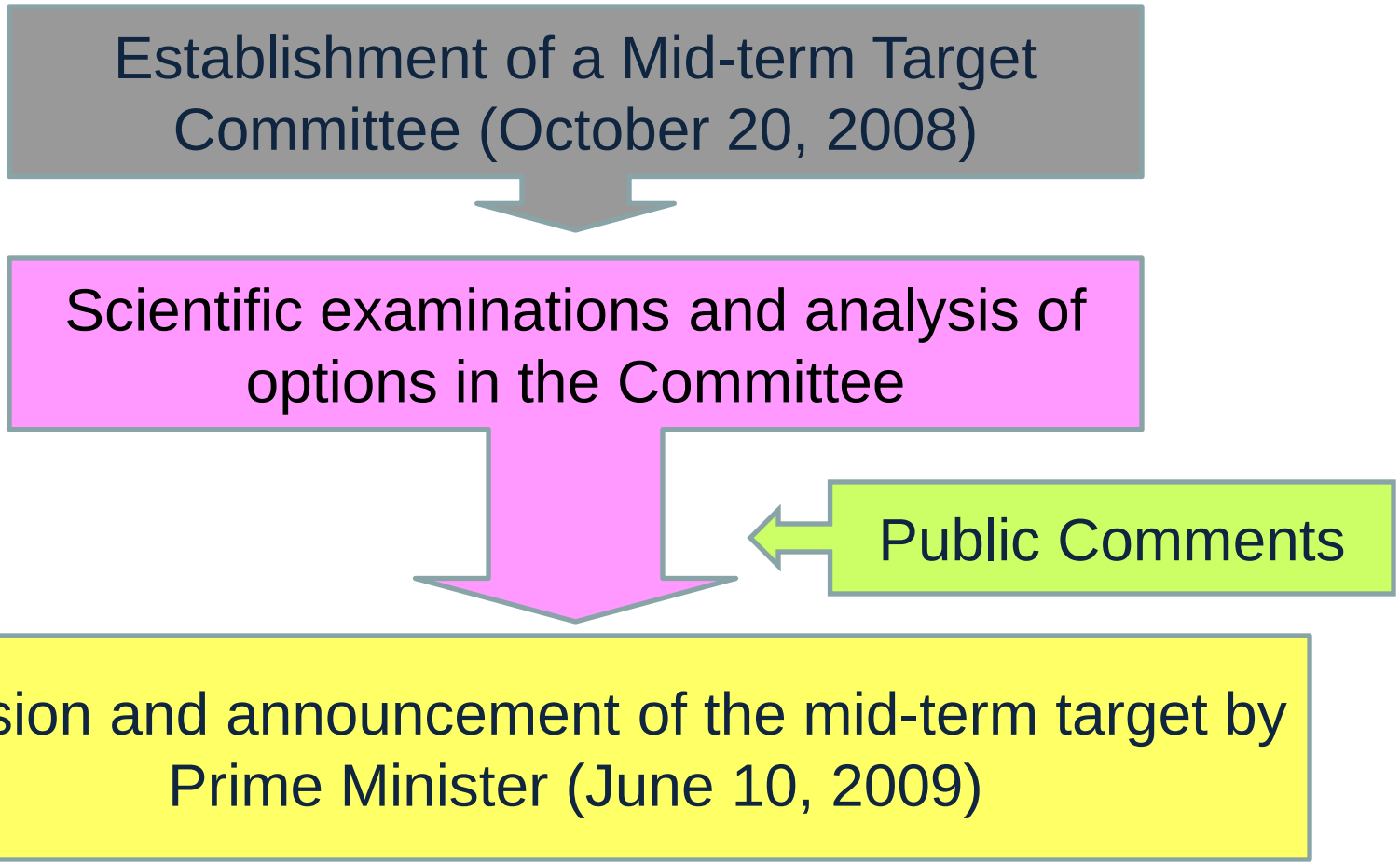
1. Consideration on Mid-term Target

Prime Minister Aso's Speech (Jan 2009)

" We are currently examining our mid-term target based on scientific analysis, considering the environment, the economy, and energy in an integrated manner, and I intend to announce the target by June. This target should not be a declaration without backing; I intend for this to be viable from an economic perspective and serve as a contribution to global warming countermeasures for the entire planet."

From the Special Address by Prime Minister Aso in Davos (January 31, 2009)

Process of the Consideration



Establishment of the Committee

Cabinet Office

The Council on the Global Warming Issue

- Established in February 2008
- Discuss a low-carbon society
- Chair: Mr. Hiroshi OKUDA
  (former TOYOTA president)

The Mid-term Target Committee

- Established in October 2008
- Consider Japan's mid-term target from a scientific viewpoint and offer options
- Chair: Mr. Toshihiko FUKUI (former governor of the Bank of Japan)

Elements of Options

1. Level of emissions
   - Volume of emissions, reduction rates
2. Comparison of Japanese target level with those of other countries
   - Comparison by the Marginal Abatement Costs (MAC) with;
     - EU target (20% reduction below 1990 level)
     - US target (14% reduction below 2005 level)
   - Volume of emissions of Japan in the case where the developed countries in aggregate are to reduce their emissions by 25% below 1990 level with (a) equal MAC and (b) equal total abatement costs as percentage of GDP for each developed country
3. Measures and policies to be introduced
   - The measures and relevant policies to be introduced in order to achieve each option are specified with regard to such major advanced technologies as solar power generation, next generation vehicles and energy-efficient houses
4. Impacts on Japanese society and economy
   - Growth or decline of GDP in each option, impact on employment and household burden, when the target in each option is to be achieved
5. Relationship with the long-term goal, costs incurred when relevant measures are not taken

Three types of models for the analyses

1. Models for international comparability by way of MAC

Emphasizing on optimization of costs and consistency among regions by way of sectoral bottom-up models which encompass the whole world, and evaluating fairness based on indicators including MAC.

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(2) Macro model: JCER

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

	Description	Reduction in 2020		Necessary Policies and Measures
		% above/ below 1990	% above/ below 2005	
1	"Business as usual" case based on Long-term Energy Demand and Supply Outlook /	+4%	-4%	Spontaneous renewal of machines and facilities based on existing technologies
2	25 % reduction of overall developed countries' emissions below 1990 (allocated on a basis of equivalent marginal abatement cost)	-5 ～ +1%	-12 ～ -6%	
3	Introduction of best available technologies to machinery being renewed based on Long-term Energy Demand and Supply Outlook	-7%	-14%	Introduction of best available technologies to machinery being renewed partly with compulsory measures
4	25 % reduction of overall developed countries' emissions below 1990 (allocated on a basis of equivalent cost as a percentage of GDP)	-17 ～ -8%	-23 ～ -13%	
5	Introduction of best available technologies to machinery being renewed and, partly, still used	-15%	-21 ～ -22%	Mandatory introduction of best available technologies to machinery being renewed and ,partly, still used
6	25 % reduction below 1990 levels	-25%	-30%	Mandatory introduction of best available technologies to almost all machinery

Six Options for Japan's Mid-term Target (2)

	Allocation approach	Comparability (Reduction in 2020)							
		% above / below 1990				% above / below 2005			
		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%
6	25% reduction	---	-25%	---	---	---	-30%	---	---

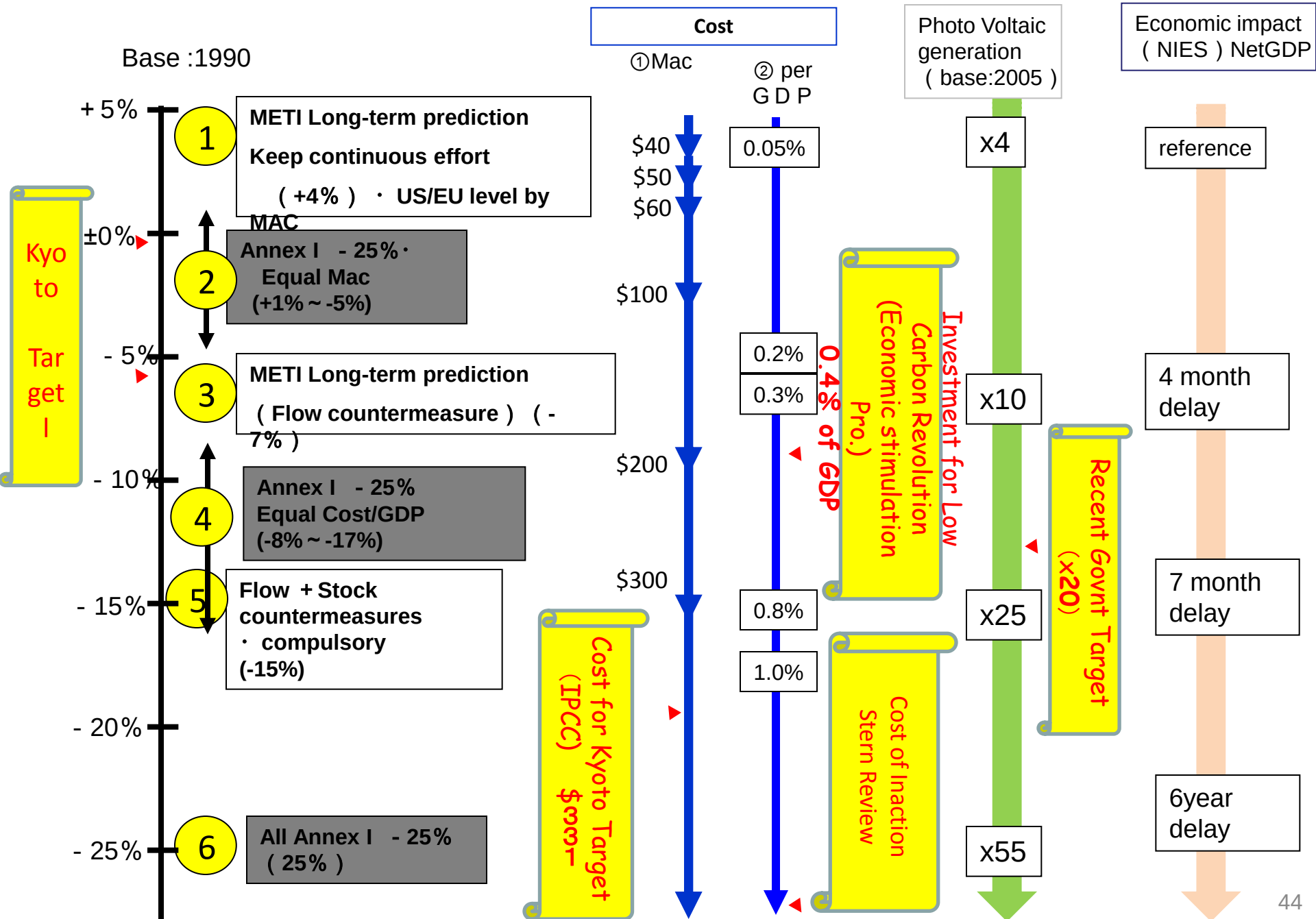
Six Options for Japan's Mid-term Target (3)

	Impacts on Economy (as deviations from reference case in 2020)				
	Percent GDP on a cumulative basis by 2020	Private investment in 2020	Unemployment rate in 2020	Disposable income per household in 2020	Lighting and heating expenses per household in 2020
1	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%)

(Note)

- Financial stimulus packages such as "Green New Deal" are not included in the model analyses.
- Cost of inaction should be considered as well.

Evaluation of Options



Voice of the people (1): Discussion session

Six discussion session between the government and people were held since April throughout the country.

- Date and venue:

  1) April 20 in Tokyo, 2) April 21 in Nagoya, 3) April 22 in Osaka

  4) May 11 in Sapporo, 5) May 12 in Fukuoka, 6) May 13 in Tokyo

- The number of participants: about 1,000 in total
- The number of participants who expressed their opinions: 108

  - Many participants supported option 1 (-4% from 2005 level) or option 6 (-30% from 2005 level)

Voice of the people (2): Public Comments

- Public comment period: from April 17 to May 16
- The number of collected comments: 10,671
- Result:

Option 1 (-4% from 2005 level)	: 7,937 (74.4%)
Option 2 (-6 to -12% from 2005 level)	: 515 (4.8%)
Option 3 (-14% from 2005 level)	: 111 (1.0%)
Option 4 (-13 to 23% from 2005 level)	: 41 (0.4%)
Option 5 (-21% from 2005 level)	: 61 (0.6%)
Option 6 (-30% from 2005 level)	: 1,389 (13.0%)

Voice of the people (3): Public Opinion survey

- Period of the survey: from May 7 to May 17
- Study population: 2,000 people aged 20 or over
- Sampling method: Random sampling method
- Number of valid response: 1,222 (30.6%)
- Survey method: face-to-face interview by investigators
- Result:

-4% from 2005 level: 15.3%

-14% from 2005 level: 45.4%

-21% from 2005 level: 13.5%

-30% from 2005 level: 4.9%

Can’t decide: 20.9%

2. Japan’s Mid-term Target

Old Japan's Mid-term Target

Japan's mid-term target was announced by Prime Minister Aso on June 10, 2009. The target is

15 percent reduction from the 2005 level by 2020

(domestic reduction)

	Mid-term target		Kyoto target
Target Year	2020		2008 - 2012
Base Year	2005	1990	1990
Domestic reduction	15	8	0.6*

*Japan's Kyoto target (6% reduction) includes carbon sinks and credits through the Kyoto mechanisms.

Three Basic Principles

Three basic principles in considering the decision:

1.Participation of all major emitters in the post-2012 framework and determination to show Japanese leadership

2.Making the environment and the economy compatible

3.Achieving the long-term goal

In order to halve the world's total GHGs by 2050, emissions need to peak by 2015 in developed countries and by 2025 in developing countries.

New Japan's Mid-term Target

Japan's mid-term target was announced by New Prime Minister Hatoyama on September 26th, 2009. The target is

25 percent reduction from the 1990 level by 2020

New Prime Minister Hatoyama

	New Mid-term target	Old Mid-term target	Kyoto target
Target Year	2020	2020	2008 - 2012
Base Year	1990	2005(1990)	1990
Domestic reduction	**Totally 25**	15(8)	0.6
Carbon sinks		-	3.8
Credits		-	1.6

*Japan's Kyoto target (6% reduction) includes carbon sinks and credits through the Kyoto mechanisms.