

Japan's contribution towards formation of Low-Carbon societies (LCSs) in Asia

1. If we cannot go to LCS,...
2. LCS offers higher QOL with less energy demand and lower-carbon energy supply
3. LCS needs good design, early action, and innovations



Designed by Hajime Sakai

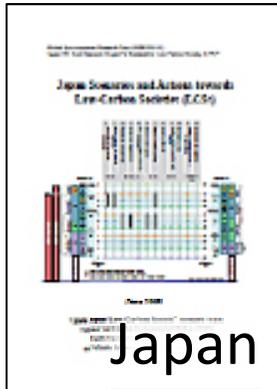
Junichi FUJINO (fuji@nies.go.jp)

NIES (National Institute for Environmental Studies), Japan

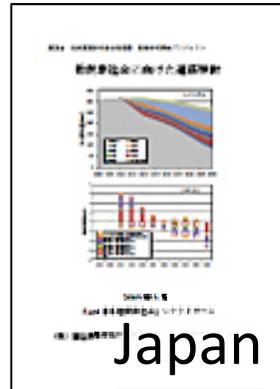
**First Results of Capacity-building of NAMAs in a MRV Manner in Asia
- Launch of preparation for the NAMA Guidebook -**

Friday, 7 June 2013, UNFCCC SB38 Side Event in Bonn, Germany

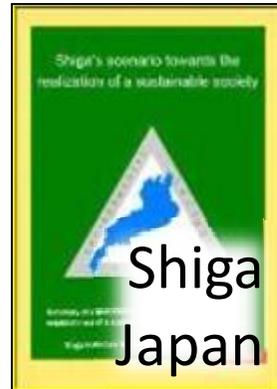
Low-Carbon Society Scenarios in Asia using AIM



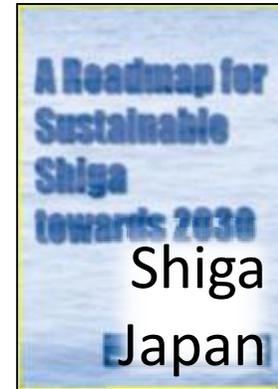
Japan



Japan



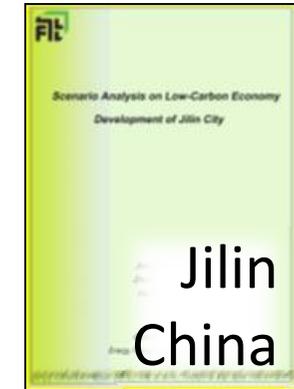
Shiga
Japan



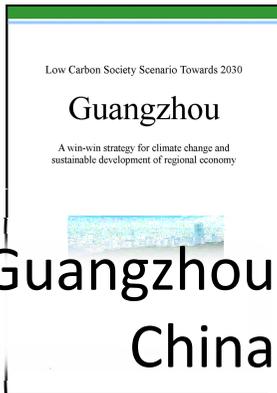
Shiga
Japan



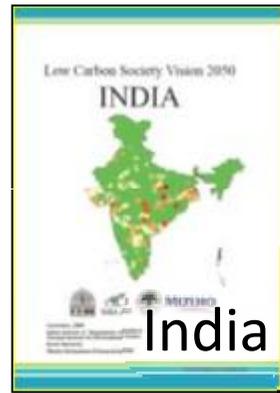
Kyoto
Japan



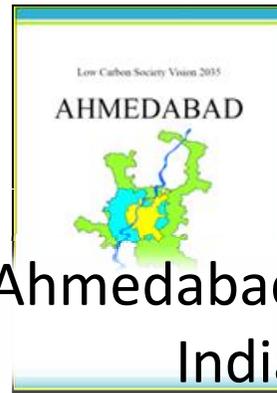
Jilin
China



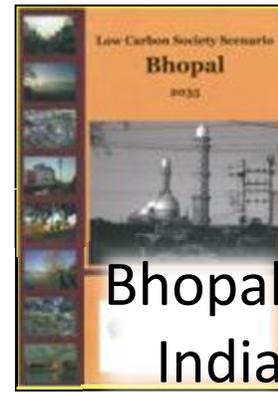
Guangzhou
China



India



Ahmedabad
India



Bhopal
India



Thailand



Indonesia



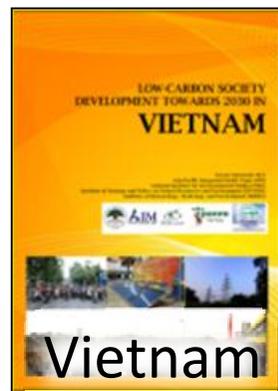
Iskandar
Malaysia



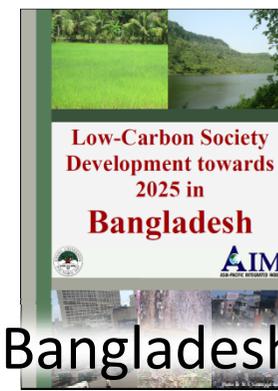
Putrajaya
Malaysia



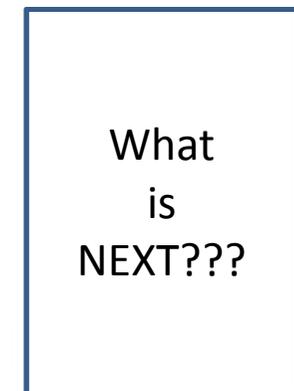
Cyberjaya
Malaysia



Vietnam



Bangladesh



<http://2050.nies.go.jp>



AIM is an abbreviation of “Asia-Pacific Integrated Model” to support design sustainable societies and suggest actions comprehensively and consistently in quantitative manner.

AIM developed by National Institute for Environmental Studies (NIES) in collaboration with Kyoto University and several research institutes in the Asia-Pacific region since 1990.

AIM has more than 20 simulation models such as top-down economy models, bottom-up technology models, sector-wise service demand and energy supply model, and environmental aspect models in global/national/sub-national scale.

Vietnam



Low Carbon Society Study Workshop
31st May 2012, Hanoi, Vietnam

DEVELOPING VIETNAM LOW CARBON SOCIETY

Kyoto University: Nguyen Thai Hoa, Kei Gomi, Yuzuru Matsuoka

National Institute for Environmental Studies: Tomoko Hasegawa, Junichi Fujino, Mikiko Kainuma

Institute of Strategy, Policy and Natural Resources: Nguyen Thi Thuy Duong, Nguyen Tung Lam, Nguyen Lanh, Nguyen Van Tai

Institute of Meteorology, Hydrology and Environment: Huynh Thi Lan Huong, Tran Thuc

Water Resources University: Nguyen Quang Kim

Japan International Cooperation Agency: Hiroshi Tsujihara



Low Carbon Society Study Workshop 31st May 2012, Hanoi, Vietnam

Why we need a LCS?

Background

In conventional growth pathway, developed countries have been emitting a large amount of green house gases in the process of economic growth.

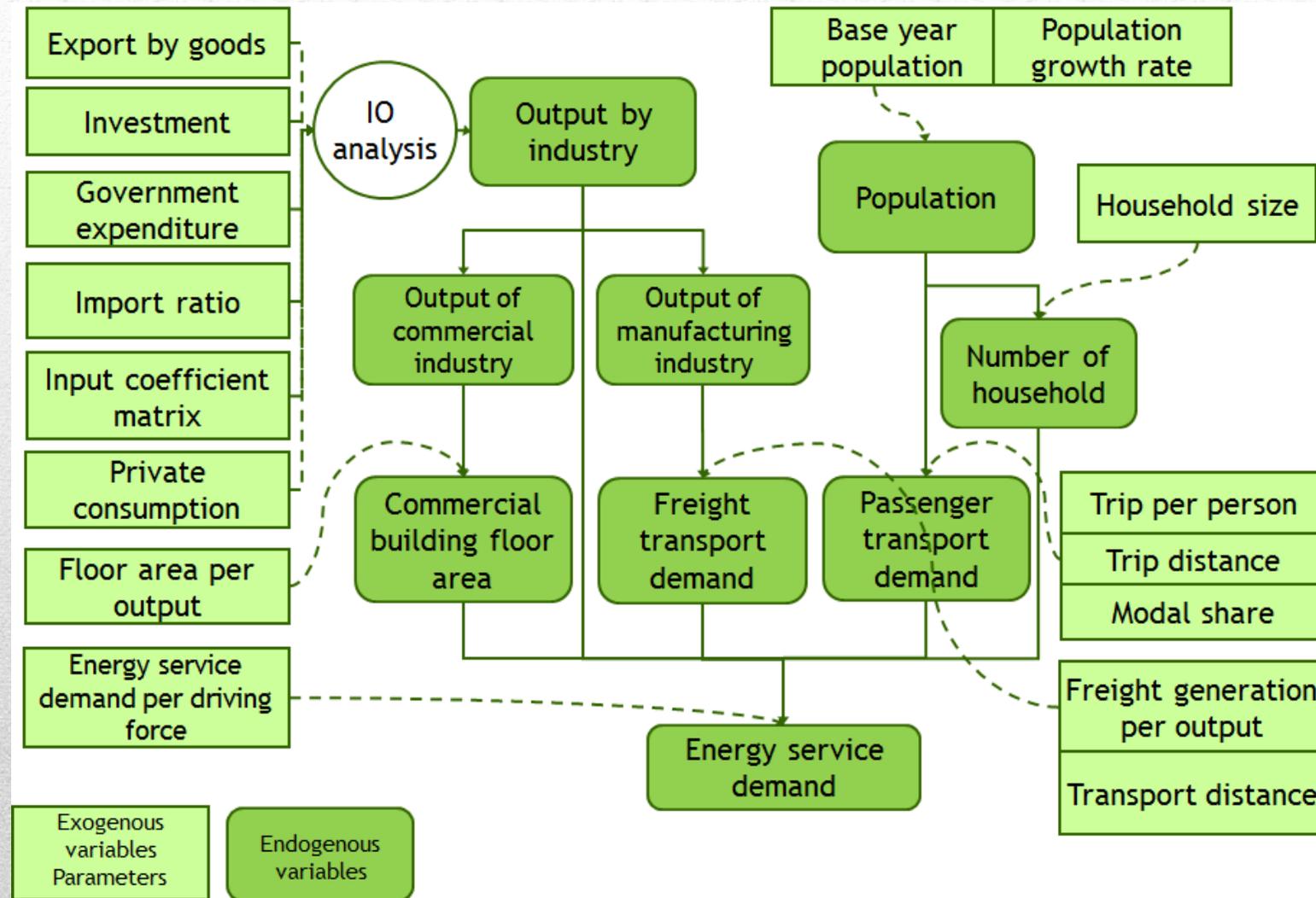
To avoid it, a developing country like Vietnam should leap-frog this process and creates low-carbon society (LCS) directly.

One of the strategic objectives of “National Target to Respond to Climate Change” is “take an opportunity to develop towards a low-carbon economy” and “ National Climate Change Strategy” is “consider low carbon economy as principles in achieving sustainable development; GHG emission reduction to become mandatory index in social and economic development”

In order to contribute discussion on LCS, we created a national sustainable LCS scenario in Vietnam in 2030.

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Socio-economic part of ExSS



Data collection (socio-economic)

Data	Source
Population	Population Division - United Nations Population low variant, 2030 for Vietnam, General Statistic Office of Vietnam (2008)
Household	Vietnam Population and Housing Census (2009).
IO table	Input-output table 2005 (Trinh Bui, 2009)
Transport	JICA/MoT(2009): The comprehensive study on the sustainable development of transport system in Vietnam (VISTRANSS 2)
	General Statistic Office of Vietnam (2009)
	Schipper L., A. T. Le, O. Hans., 2008. Measuring the invisible. Quantifying emissions reductions from transport solutions. Hanoi case study. EMBARQ – The WRI Center for Sustainable Transport and World Resources Institute. Walter, H. and R. Michael (1995). Motorization and non-motorized transport in Asia. Transport system evolution in China, Japan and Indonesia. Land Use Policy, Vol 13, No.1, pp. 69-84, 1996.

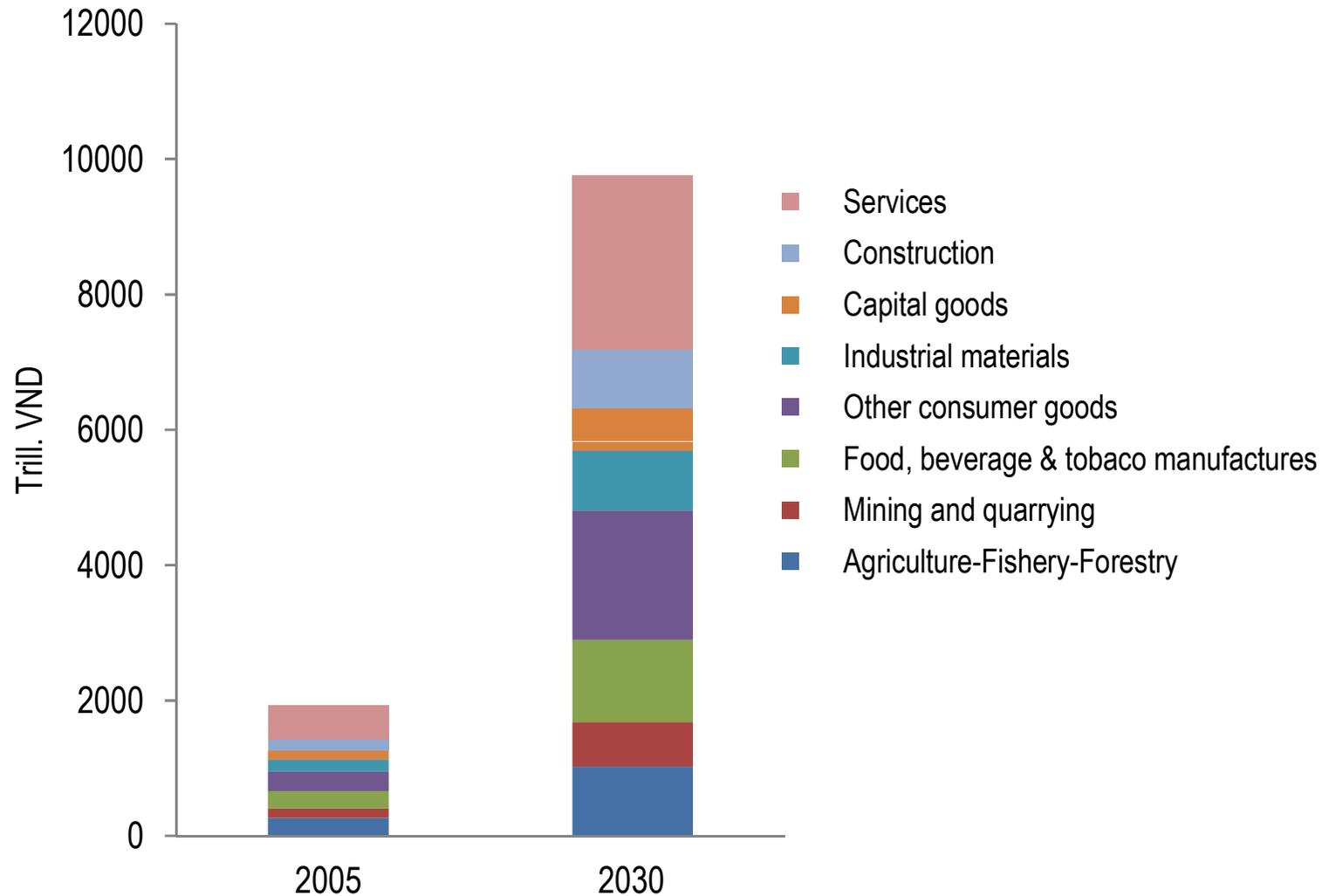
2030 BaU Assumptions

Indicator	Quantification (2030BaU scenario)	Tendency to
Population	104 million people	Growth rate at 0.9 % per annum
Demographic composition	[Male] 0-14: 8%, 15-64: 35.9%, 65 and over: 5.8% [Female] 0-14: 7.7%, 15-64: 35.2%, 65 and over: 7.4%	Number of male births are higher than female births
Average number of persons per household	3.5 (4.2 in 2005)	Slight decrease in average size of household
GDP	6.5%	Average annual growth rate during the period 2005 - 2030
Industrial structure	[Agriculture, Fishery, Forestry]: 17% (22% in 2005) [Industry, Construction]: 43% (41% in 2005) [Service]: 40% (37% in 2005)	Primary industry sectoral share has a decrease trend, whilst secondary and tertiary industry have an increasing trend.
Demand structure	Contribution of export in GDP: 29% (29% in 2005)	Export maintains there share in GDP
Modal shift in transport	Passenger transport: [Train] 0%, [Bus] 0.6%, [Waterway] 0.6%, [Car] 0.3%, [Motorbike] 8.3% [Walk & Bike] 90%, [Aviation] 0.1% Freight transport: [Train] 2%, [Waterway] 27%, [Truck] 71%, [Aviation] 0%	Increasing of public transport, keep people respond to walk and use bicycle Increasing of share of train and waterway freight transport

Estimated socio-economic indicators

	2005	2030 BaU	2030 CM	2030BaU/2005	2030CM/2005
Population (million people)	83.1	104.0	104.0	1.3	1.3
No. of households (million)	20.0	29.7	29.7	1.5	1.5
GDP (trillion VND)	818.5	3,963	3,963	4.8	4.8
Gross output (trillion VND)	1,934	9,750	9,750	5.0	5.0
Primary industry (trillion VND)	404	1,684	1,684	4.2	3.9
Secondary industry (trillion VND)	1,033	5,497	5,497	5.3	5.2
Tertiary industry (trillion VND)	497	2,569	2,569	5.2	5.2
Passenger transport demand (million people-km)	223,981	542,687	518,028	2.4	2.3
Freight transport demand (million ton-km)	38,856	235,212	235,124	6.1	6.1

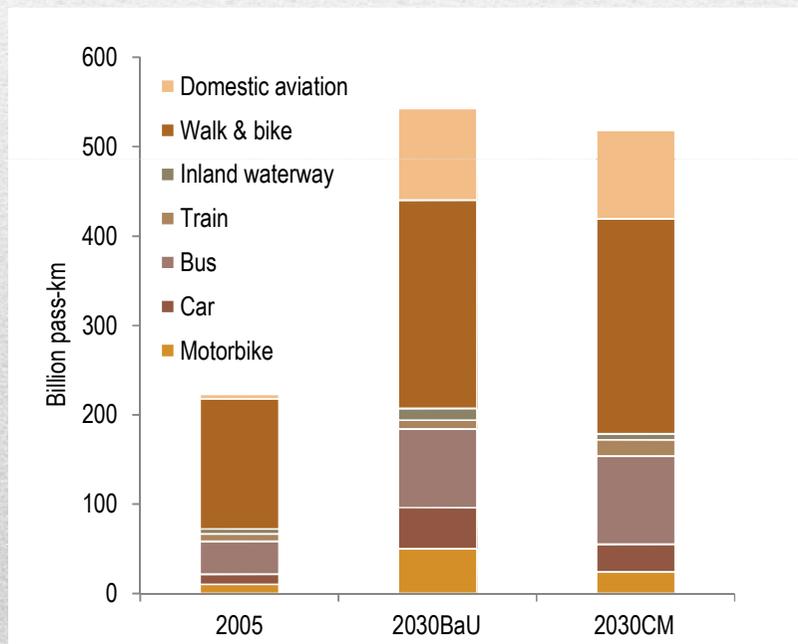
Projected industrial output



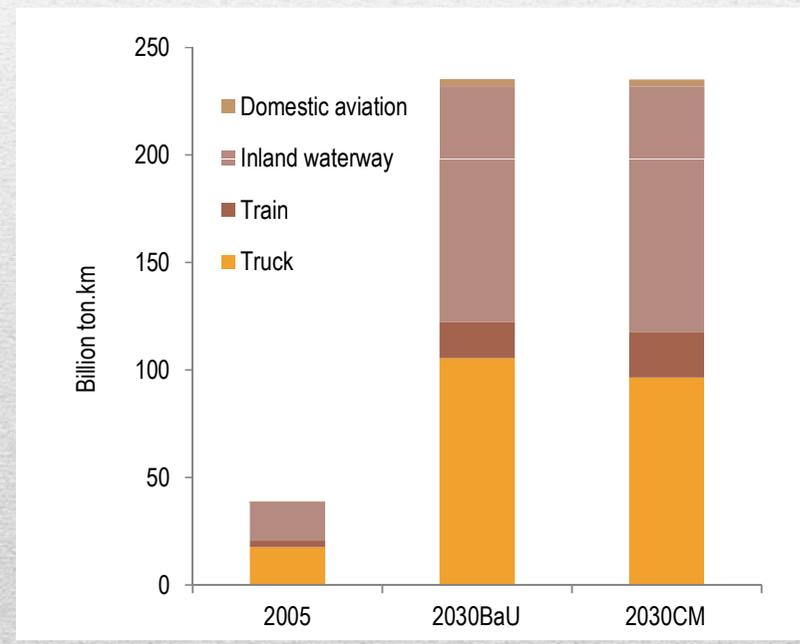
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Projected transport demand

- ✓ There is an increasing share of motorbike and domestic aviation in passenger transport in 2030
- ✓ Freight transport volume increases proportionally with growth of secondary industries

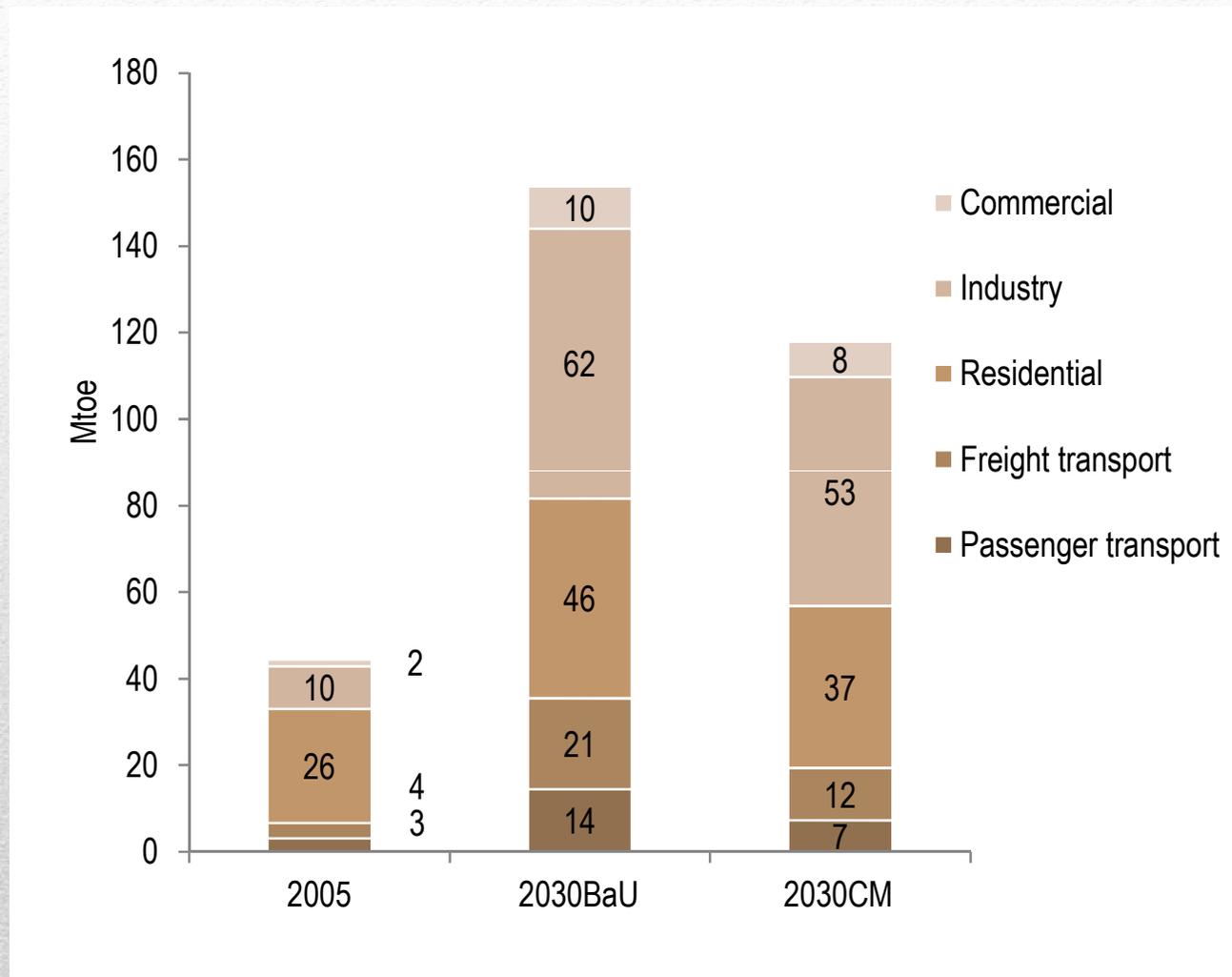


Passenger transport

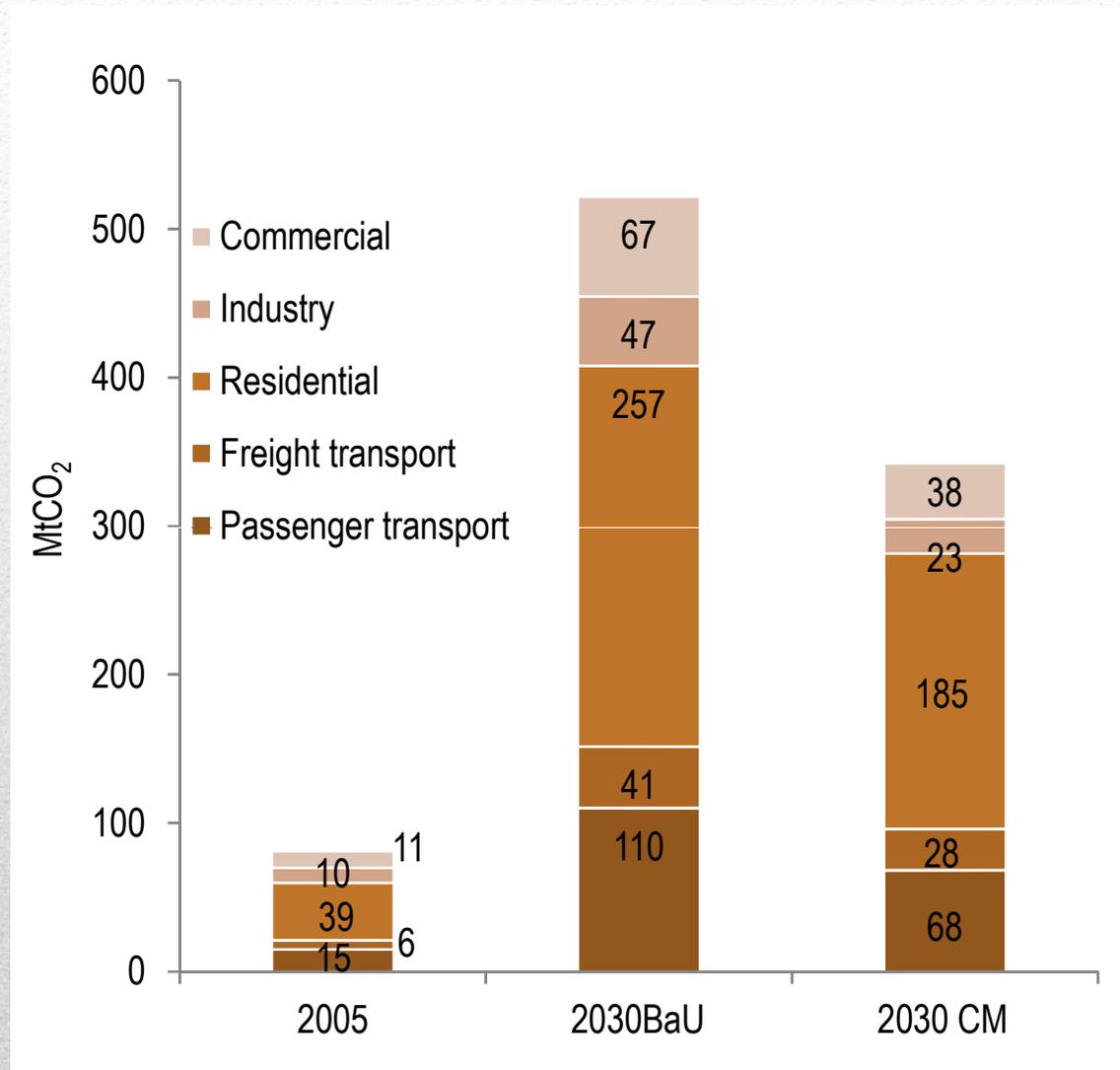


Freight transport

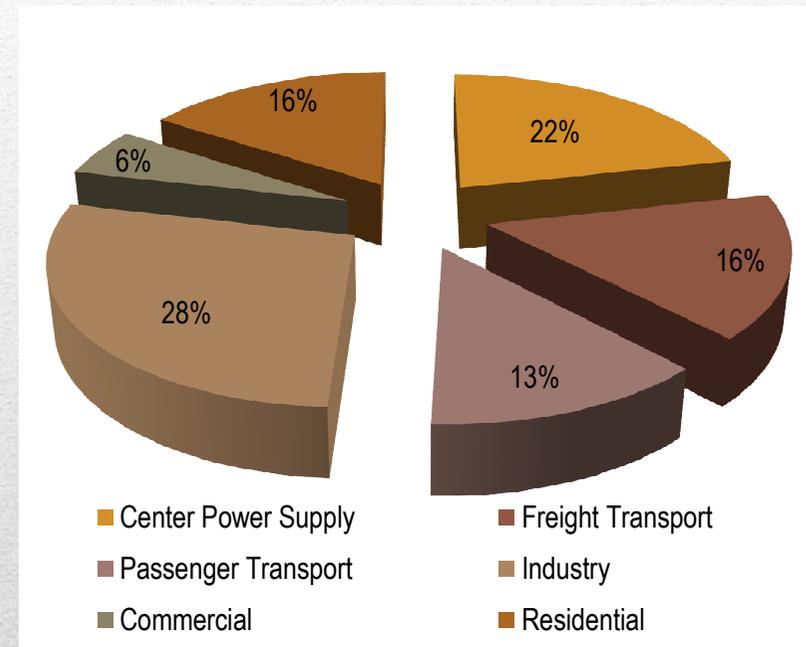
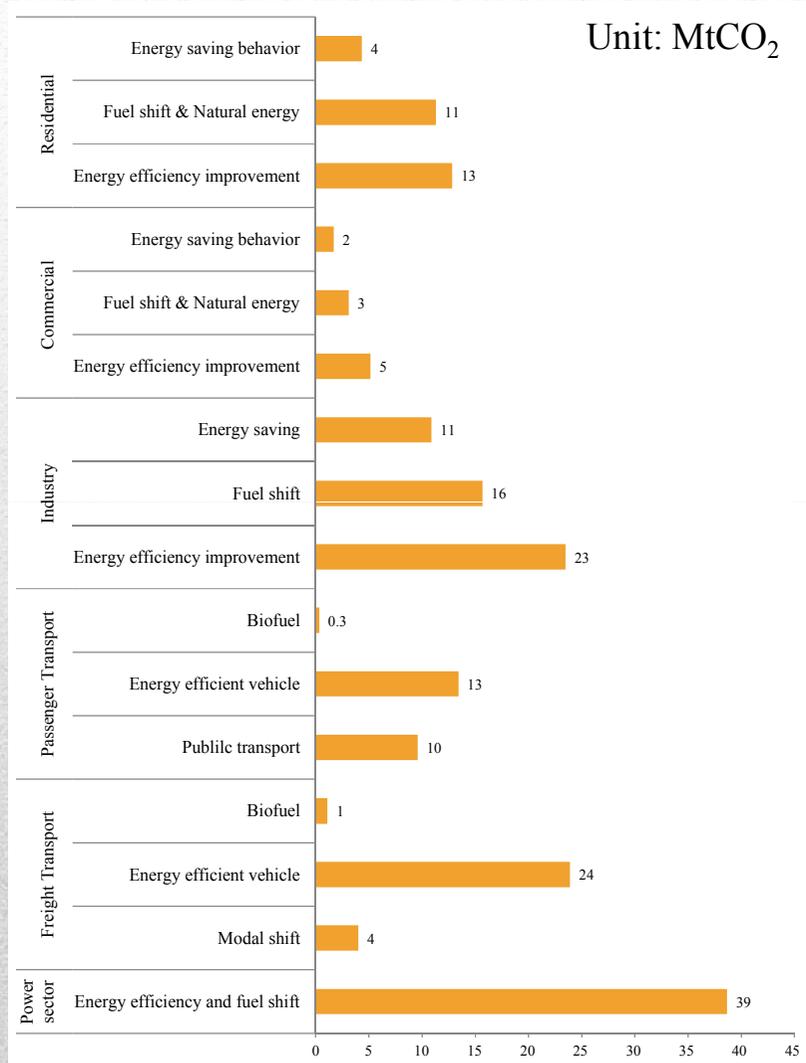
Projected final energy demand by sectors



Projected CO₂ emissions from energy sector



Contribution of low carbon countermeasures



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AFOLUB model

Activity data

AFOLUB model

Emission/mitigation

- AG/Bottom-up
- LULUCF/Bottom-up

- **AFOLUB model**
 - Bottom-up type model to determine combination and amounts of individual mitigation countermeasures
 - Estimate GHG emissions and mitigations in AFOLU sectors
 - Analyze effect of policies such as carbon tax, energy tax, subsidy etc.
 - Time horizon: mid-term (typically until 2030)
- **AGriculture Bottom-up module (AG/Bottom-up)**
 - Illustrate behavior of agricultural producers and selection of mitigation countermeasures
 - Maximize producer's profit
- **The LULUCF/Bottom-up**
 - Illustrate land use and land use change cohort
 - Maximize total accumulated mitigation in the future



**Low Carbon Society Study Workshop
25th Apr 2013, Vinh Phuc, Viet Nam**

Cambodia



Low Carbon Development Strategy for Cambodia toward 2050

- A Preliminary Study -

This report introduces an ongoing study on systematic and quantitative design of low carbon development action in Cambodia. The main objective of this study is to formulate and propose a concrete low carbon development strategy in Cambodia towards 2050 and to engage research collaboration between the Royal Government of Cambodia and the research institutes in Japan. This research is being conducted in a collaboration between the Ministry of environment and Royal University of Agriculture, Cambodia and Kyoto University (KU), Institute for Global Environmental Strategies (IGES), and National Institute for Environmental Studies (NIES), Japan.

Why does Cambodia need Low Carbon Development? Low-Carbon Development is a guiding principle and strategy to turn the challenges into opportunities so that Cambodia can make headway towards sustainable economic growth and environmental sustainability with mitigating GHG emissions into the atmosphere.

How is the Low Carbon Development Strategy developed in Cambodia? This study so far has identified the *Four Policies* :

- Policy 1: Green Environment
- Policy 2: Harmonization of Green Economy, Society and Culture
- Policy 3: Blue Economy
- Policy 4: Eco-Village

to achieve low carbon development in Cambodia, and to attain the Four Policies, *a dozen strategies*

**Workshop on Systematic and Quantitative Design of Low Carbon Development Plan for Cambodia
Phnom Penh, 22 April, 2013**



Four Policies and a Dozen Strategies

Policy 1: Green Environment

Sustainable forest management strategy

- Effective forest concession management through implementing effective law enforcement against illegal logging
- Promotion and implementation of REDD+
- Increasing carbon sequestration via forest restoration and replantation
- Forest ecosystem conservation and management



Sustainable waste management strategy

- Development of environmentally sound technology landfill sites through waste management strategy/plan, waste collection and segregation
- Minimization of waste and by-products and maximum use of renewable resources by implementing 3R principle and promote waste-to-energy technologies
- Environmentally sound waste management through allocation of waste disposal/storage and proper control of second hand goods import
- Promotion of local level self-governance and leadership to improve de-centralized coordination of waste management and segregation



Green agriculture management strategy

- Promotion of climate-smart agriculture which increases productivity, resilience (adaptation), and reduces/removes greenhouse gases (mitigation) while enhancing national food security
- Promotion of Eco-agriculture through the use of organic fertilizer such as biomass waste, bio-slurry, compost and livestock manure
- Introduction and implementation of system of rice intensification (SRI) to increase yield of rice without purchased inputs
- Introduction and implementation of integrated farming system (IFS)
- Sustainable land use and land management for agriculture purpose



Policy 2: Harmonization of Green Economy, Society, and Culture

Green transport management strategy

- Promotion of public transport in major cities by intensive urban mass transit facilities, better traffic management and development of non-motorized transport infrastructure
- Green belt development by planting trees along the roads and parks
- Freight modal shift for long-distance shipment
- Introduction of low-emission and energy-efficient vehicles
- Improvement of public transport service in the rural areas with the development of infrastructure for bus with reliable and affordable price



Green energy management strategy

- Encouraging the use of renewable energy through construction of hydro power plants and private sector participation with solar, wind, mini-hydro, tidal, and biogas/biomass, etc.
- Encouraging the use of smart appliance and home automation system including energy saving appliance, power control devise, and fire protection and electricity appliance maintenance
- Encouraging all institutions and households to save energy



Green tourism management strategy

- Promotion and implementation of clean city, clean resort and good services
- Promotion of tourist attraction through introducing cultural heritages and natural tourism (eco-tourism)- Cambodia-Kingdom of Wonder
- Promotion of group tour with comfortable public transport
- Promotion of green flag competition and green award
- Encouraging tourists to recycle waste and to reduce emission



a Dozen Strategies

Green Good Governance and human resource development strategy

- Integrating green concept into curriculum from primary education to higher one as well as vocational and training
- Introducing and improving the green institutional management and arrangement
- Implementing green management initiatives and intellectual capital and green job
- Introducing and encouraging green concept into local communities to seek their participation for natural resource management
- Increasing human resource development throughout the country considering youth and gender participation for low carbon society

Green technology and investment strategy

- Promotion of green industries and industrial ecology
- Implementation of transfer of green technologies such as cleaner production, sustainable product innovation, renewable energy utilization
- Encouraging and incentivizing the investment in effective environmental protection and natural resource management
- Promotion of green business competition and green credit



Green financial mobilization strategy

- Green financial incentives including green tax and subsidy
- Adoption of green budget reform
- Implementing Payment for Environmental Services based on polluter pays principle to promote the internalization of environmental costs
- Conducting fund mobilization from development partners for green development
- Development of a sound market-based financial system to support resource mobilization, effective financial resource allocation

Policy 3: Blue Economy

Green merchant marine and sustainable coastal zone management strategy

- Introduction of emission standard in maritime transport through inspection and maintenance system
- Promotion of integrated coastal zone management
- Development and enforcement of the ballast water management to control marine invasive species



Policy 4: Eco-Village

Low carbon infrastructure development strategy

- Implementation of decentralized management system for a sustainable urban environment and better mobility
- Construction and rehabilitation of rural roads to facilitate local transportation, and making transit point to improve connection from one village to another
- Designing walkable city through providing comfortable and safe pavement
- Designing a standard road facility to differentiate between vehicle, motorist, and cyclist lane to avoid road accident and traffic congestion



Green building design and construction strategy

- Promotion and implementation of green building designs and constructions through encouraging the use of energy efficient materials
- Increasing the use of wood for climate smart buildings and encouraging tree planting
- Encouraging embedding renewable energy and energy saving appliance in the building design



Iskandar
Malaysia

Background

Iskandar Malaysia: Key Challenges



Size: 2,216.3 km²

Population: 1.3 mil. (2005) | 3.0 mil. (2025)

GDP: 35.7 bil. RM (2005) | 141.4 bil. RM (2025)



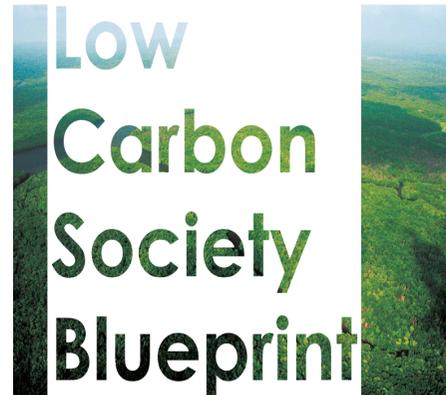
November 2012

Voluntary
40%
reduction
of CO₂
emission
intensity by
2020

Issues

- Rapid urbanization and industrialization
- Higher energy demand and Co2 emission
- Decouple economic growth and emission on fossil fuel

Development of Low Carbon Society Scenarios for Asian Regions Summary for Policymakers



for Iskandar Malaysia 2025

November 2012

Blueprint – 3 main thrusts – Green economy, community and environment.
=12 actions
Joint collaboration work of UTM, KU, NIES under SATREPS program



01 Introduction: Background of Project

Development of Low Carbon Society Scenarios for Asian Regions



Research Team: Universiti Teknologi Malaysia (UTM), Kyoto University (KU), Okayama University (OU), National Institute for Environmental Studies (NIES)

Joint Coordinating Committee: Iskandar Regional Development Authority (IRDA), Federal Department of Town and Country Planning (JPBD), Malaysia Green Technology Corporation (MGTC)

Sponsorship: Japan International Cooperation Agency (JICA) , Japan Science and Technology (JST)

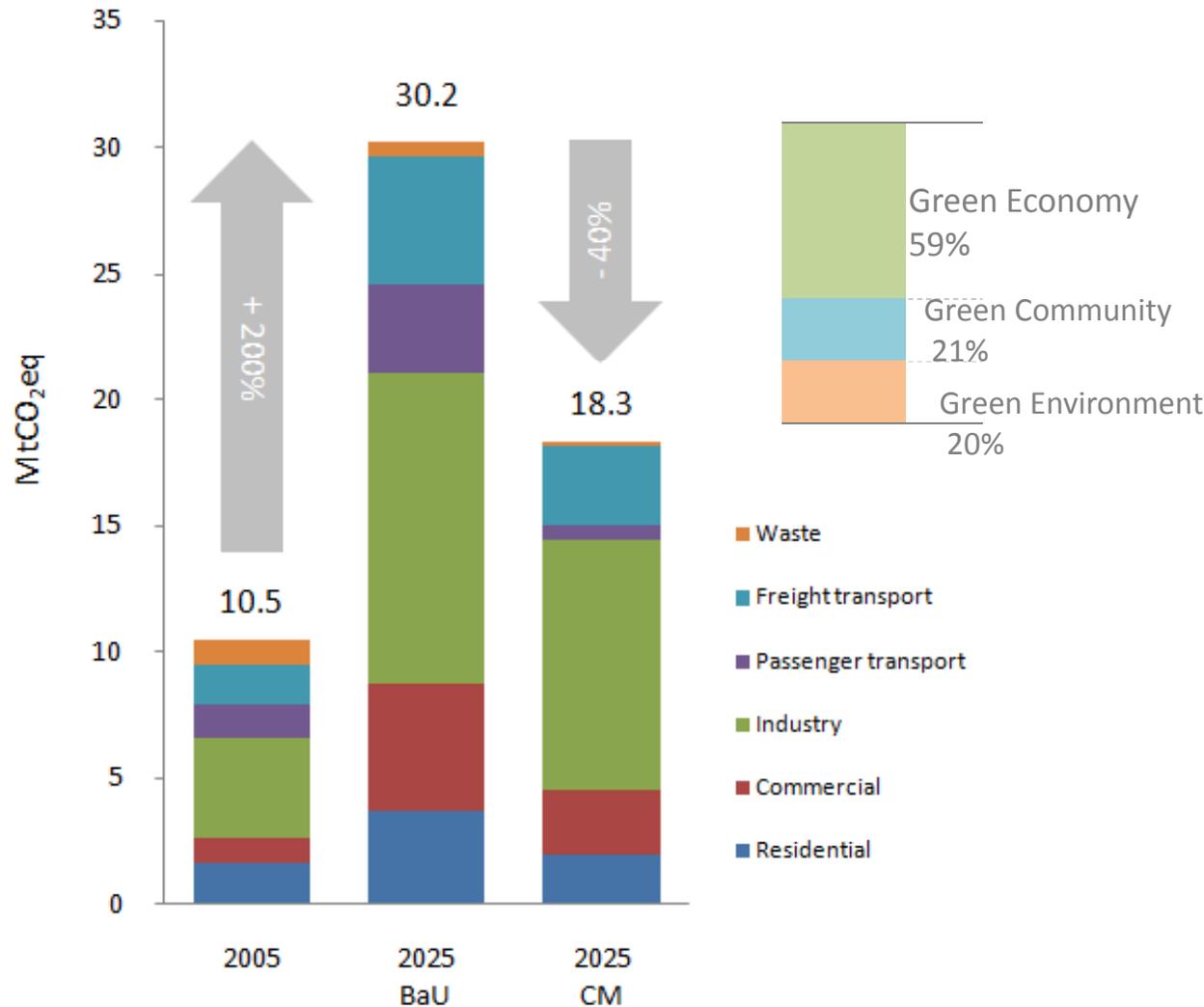
Period: 2011 - 2016

Research Output:

- i. **Methodology** to create LCS scenarios which is appropriate for Malaysia is developed.
- ii. **LCS scenarios** are created and utilised **for policy development** in IM.
- iii. **Co-benefit of LCS policies** on air pollution and on recycling-based society is quantified in IM
- iv. **Organizational arrangement of UTM** to conduct trainings on LCS scenarios for Malaysia and Asian countries is consolidated, and a network for LCS in Asia is established

Potential Mitigation Options for Iskandar Malaysia

Green Economy, Green Community and Green Environment



Unit	2005	2025 BaU	2025 CM	2025BaU /2005	2025CM /2005
Final Energy Demand (Mtoe)	2.5	7.6	5.2	3.11	2.14
GHG emissions (MtCO ₂ eq)	10.5	30.2	18.3	2.88	1.74
Per Capita CO ₂ Emissions (tCO ₂ eq)	7.7	10.1	6.1	1.30	0.78
GHG Intensity (kgCO ₂ eq/RM)	0.29	0.21	0.13	0.73	0.44

LCS Actions for IM by Three Main Themes

Development of Low Carbon Society Scenarios for Asian Regions

	Action Names	Themes
1	Integrated Green Transportation	GREEN ECONOMY
2	Green Industry	
3	Low Carbon Urban Governance	
4	Green Building & Construction	
5	Green Energy System & Renewable Energy	
6	Low Carbon Lifestyle	GREEN COMMUNITY
7	Community Engagement & Consensus Building	
8	Walkable, Safe, Livable City Design	GREEN ENVIRONMENT
9	Smart Growth	
10	Green and Blue Infrastructure & Rural Resources	
11	Sustainable Waste Management	
12	Green and Clean Environment	

Potential Mitigation Options for Iskandar Malaysia

12 Actions Towards Low Carbon Future

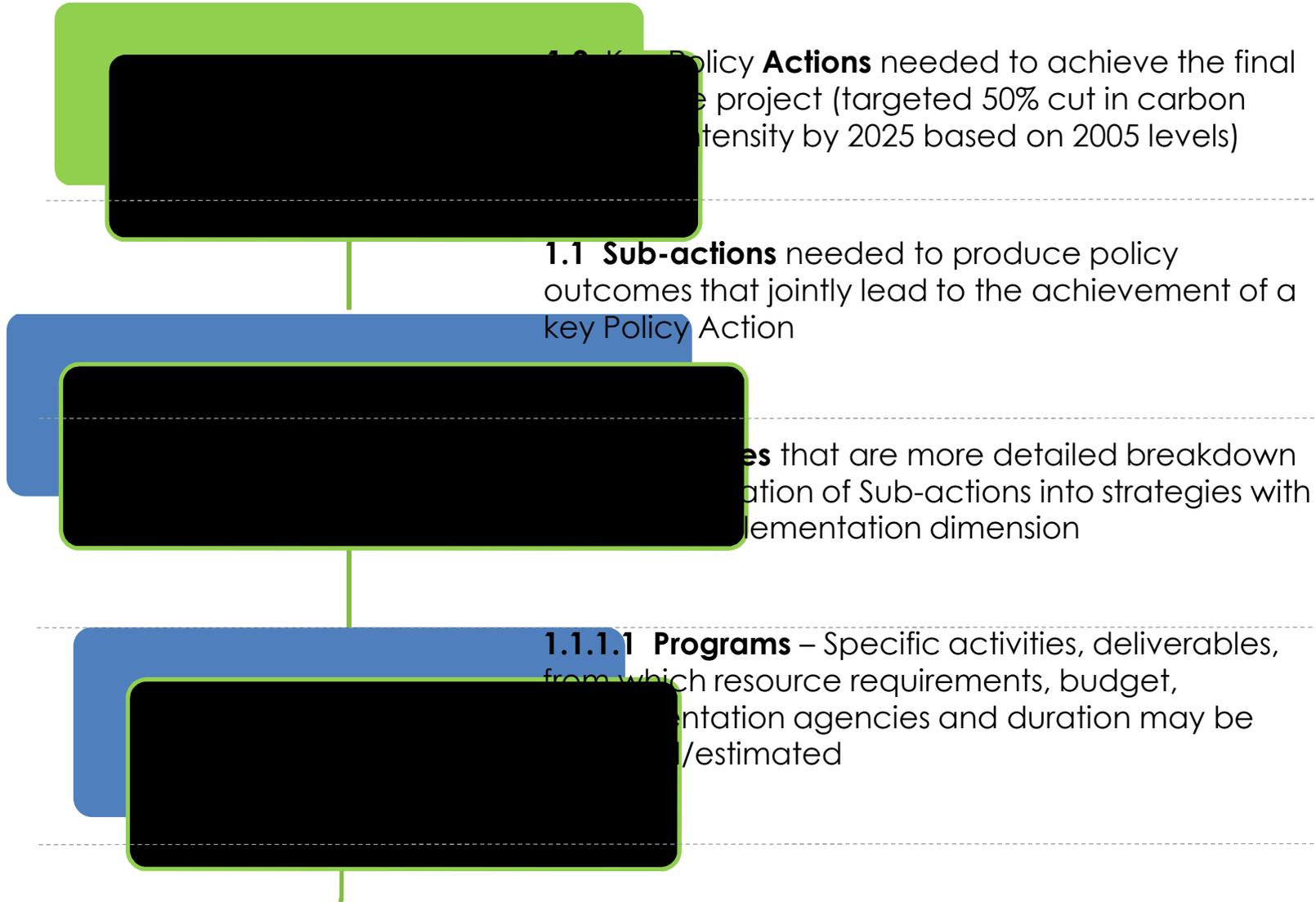
Mitigation Options	CO2 Reduction	%
Green Economy	7,401	59%
Action 1 Integrated Green Transportation	1,916	15%
Action 2 Green Industry	1,085	9%
Action 3 Low Carbon Urban Governance**	-	-
Action 4 Green Building and Construction	1,338	11%
Action 5 Green Energy System and Renewable Energy	3,061	24%
Green Community	2,557	21%
Action 6 Low Carbon Lifestyle	2,557	21%
Action 7 Community Engagement and Consensus Building**	-	-
Green Environment	2,510	20%
Action 8 Walkable, Safe and Livable City Design	264	2%
Action 9 Smart Urban Growth	1,214	10%
Action 10 Green and Blue Infrastructure and Rural Resources	620	5%
Action 11 Sustainable Waste Management	412	3%
Action 12 Clean Air Environment**	-	-
Total	12,467**	100%

*Contribution to GHG emission reduction from 2025BaU to 2025CM ** Action 3, 7 and 12 does not have direct emission reduction, but their effect is included in other Actions. *** Since contribution of Action 10 includes carbon sink by forest conservation and urban tree planting, the total of contribution of the 12 Actions is greater than difference of the GHG emissions between 2025BaU and 2025CM in Figure 2 and Table2.

LCS Actions for IM – Work Breakdown Structure

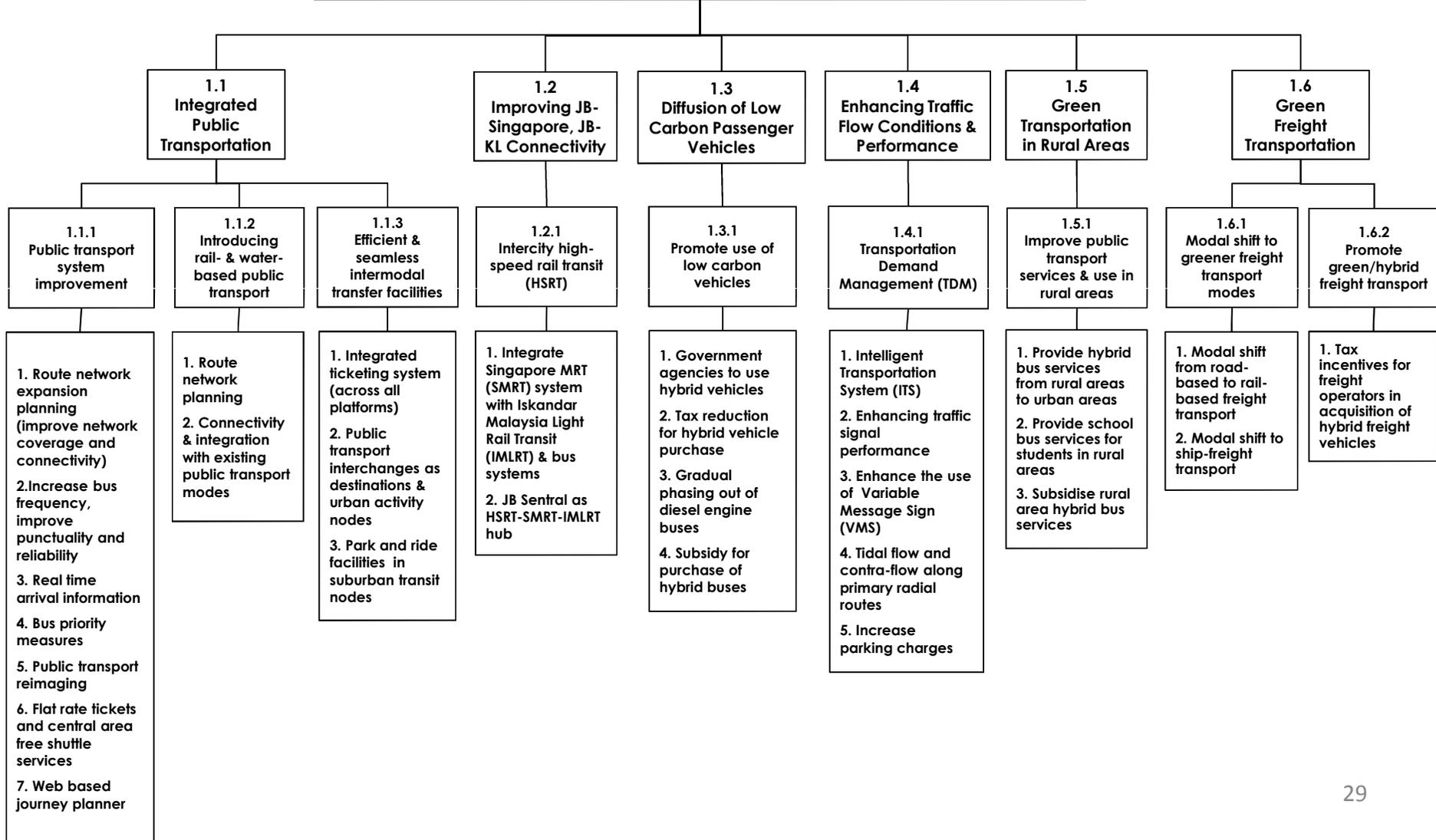
Development of Low Carbon Society Scenarios for Asian Regions

Work Breakdown Structure of 12 LCS Actions



LCS Actions for IM – WBS Diagram by Action (WBS: Work Breakdown Structure)

Action 1: Integrated Green Transportation



Low Carbon Actions in Asia

Modeling to Bridge Science and Policy

DOHA 2012
UN CLIMATE CHANGE CONFERENCE
COP18·CMP8

Date : 30 Fri. Nov. 2012
Time : 11:30 - 13:00
Venue : Side Event Room 1
Organizers : National Institute for Environmental Studies (NIES), Japan
Universiti Teknologi Malaysia (UTM), Malaysia



Dato Ismail, CE of IRDA
(Iskandar Regional
Development Authority)

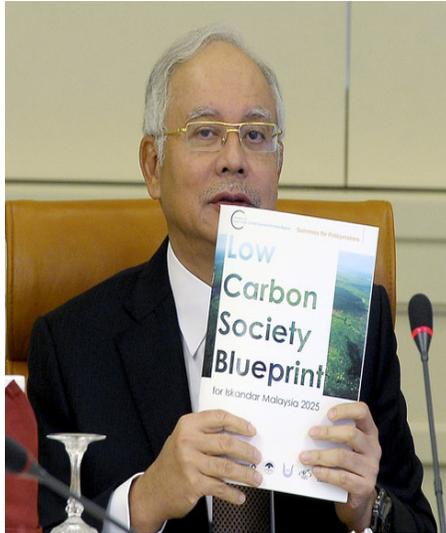


Launching of "SPM
(Summary for Policy Makers
of Low Carbon Society
BP (Blueprint)
for Iskandar Malaysia"



Minister of NRE,
Malaysia
Visited our booth

PM Malaysia launched LCS Blueprint Iskandar Malaysia Dec 11, 2012



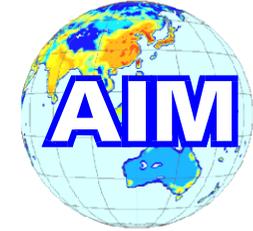
Bridging Research and Policy in Iskandar Malaysia.

SATREPS project between UTM, Kyoto University, NIES, Okayama University and IRDA and FTCPD.

Prime Minister Datuk Seri Najib Razak believed the newly launched Iskandar Malaysia Low Carbon Society (LCS) Blueprint has the potential to attract more interest among investors at Iskandar Malaysia as an investment destination

Japan

Japan LCS research project and CC policy



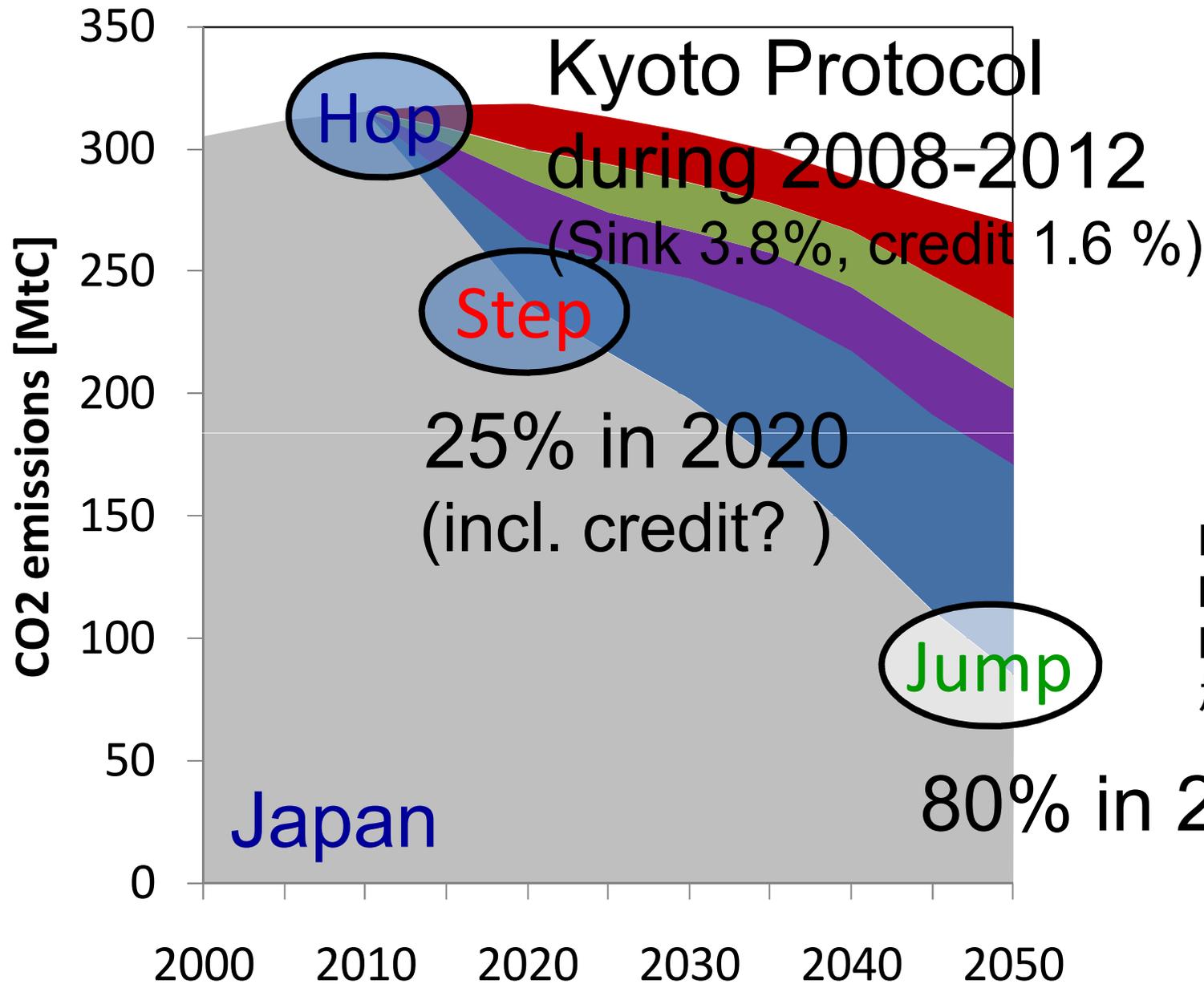
0. FY1990- start AIM (Asia-Pacific Integrated Model) project
 - FY1997 AIM provided Kyoto Protocol simulations for Japan
 - FY2000 AIM provided IPCC SRES/A1B marker scenario

1. Feb 13th 2007, Interim Report “Japan Scenarios towards Low-Carbon Society (LCS) -Feasibility study for 70% CO2 emission reduction by 2050 below 1990 level-”
 - May 24th 2007 Former Prime Minister Abe launched “Cool Earth 50” to reduce 50% GHG emissions by 2050
 - June 9th 2008 Former Prime Minister Fukuda set the target of Japanese CO2 emissions reduction by 60-80% in 2050

2. May 22nd 2008, Interim Report “Dozen Actions towards LCSs”
 - July 29th 2008 Japanese government set “Action Plan for Achieving a Low-carbon Society”

3. April 2009, The Mid-term Target Committee, “six options for 2020” (including 7%, 15%, 25% reduction compared as 1990 level)
 - September 22nd 2009, New Prime Minister Hatoyama set the target as 25% for 2020.

Japanese Emissions Targets towards 2050

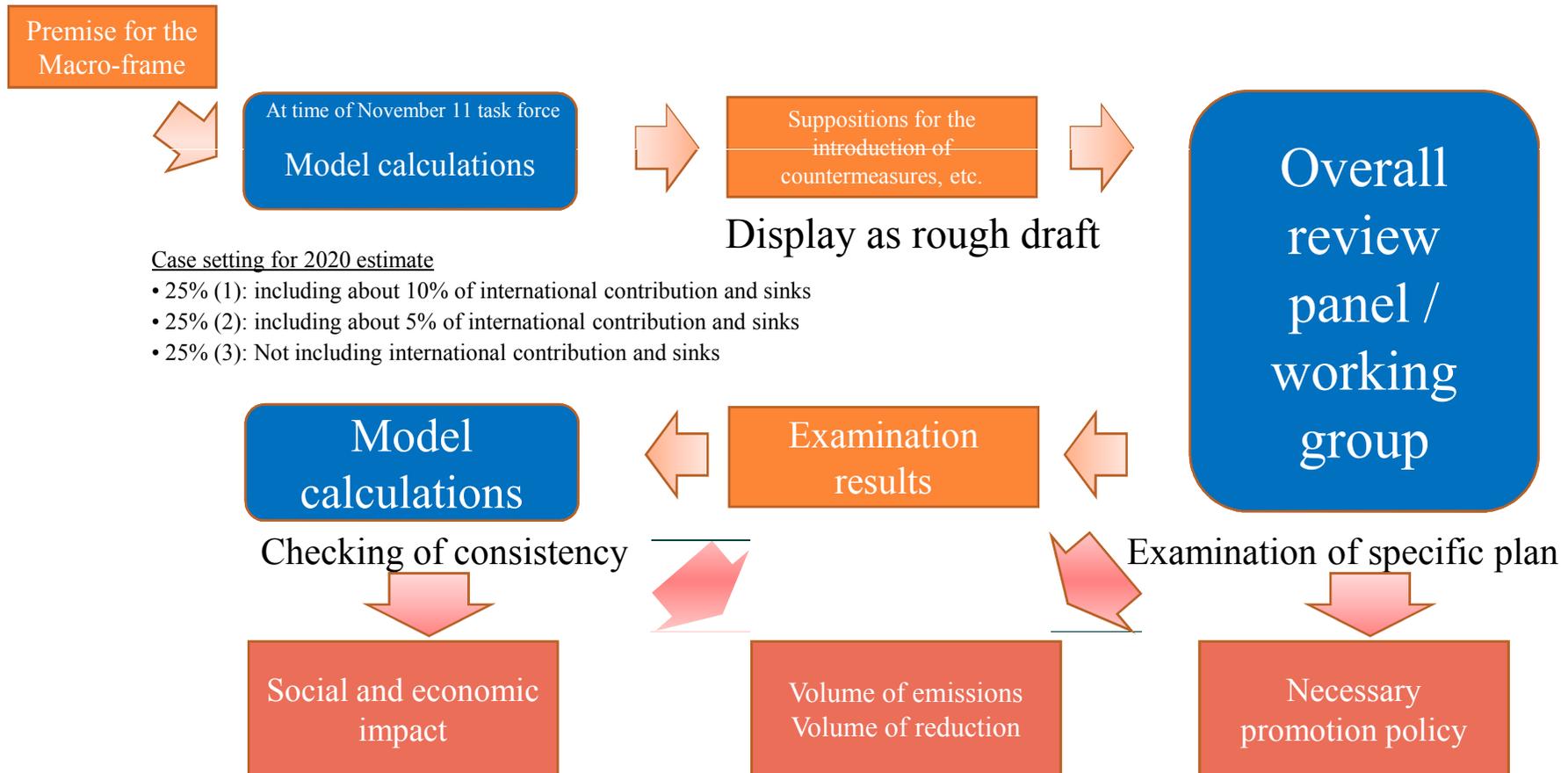


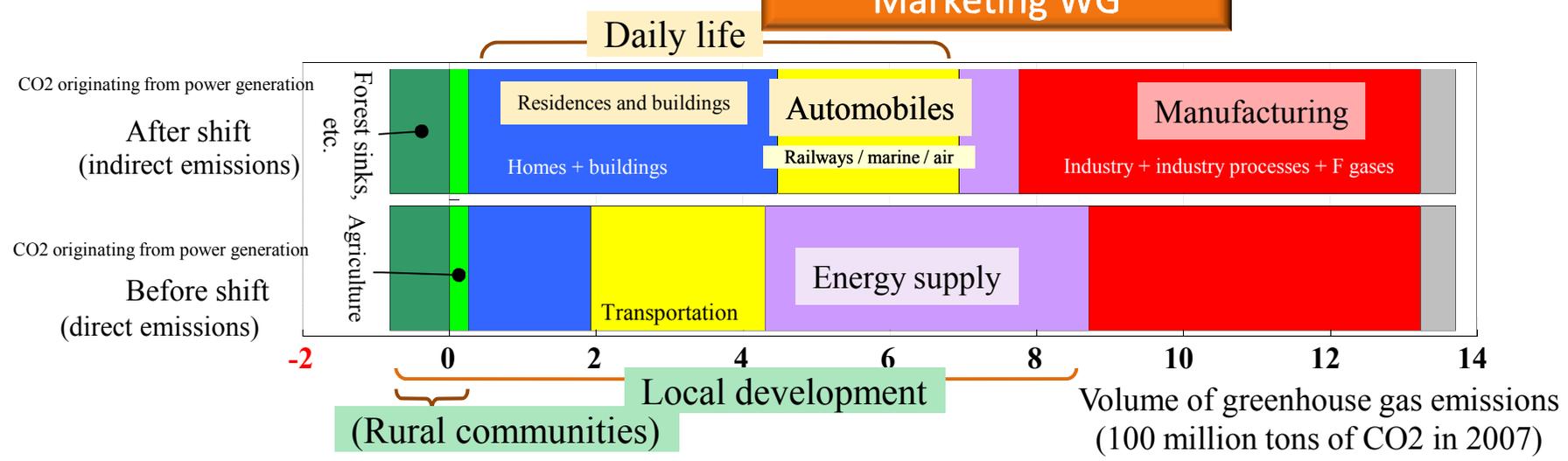
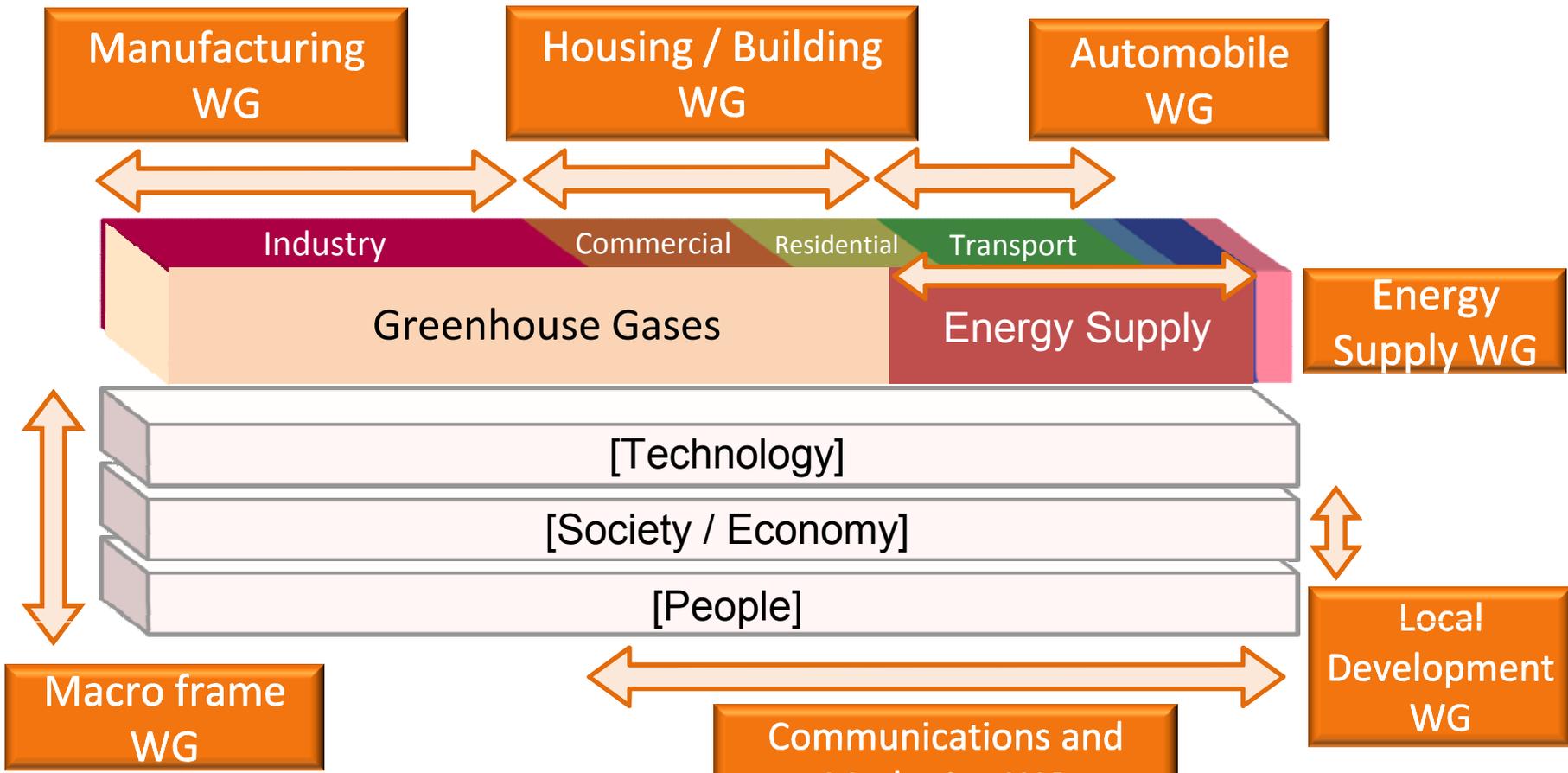
Former Prime Minister
Hatoyama
鳩山由紀夫

Japan

Interactions between simulations and policy assessments

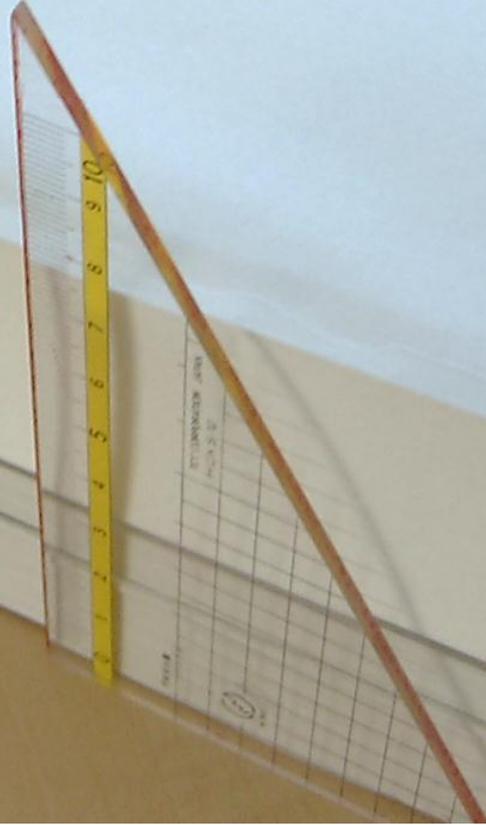
- The model calculations maintain the overall alignment of the path, and the estimated volume of emissions and economic impact are evaluated.
- The overall review panel / WG examines a specific plan that will enable reductions in each field.





地球温暖化対策に係る
中長期ロードマップ
各WGの現時点での
とりまとめ

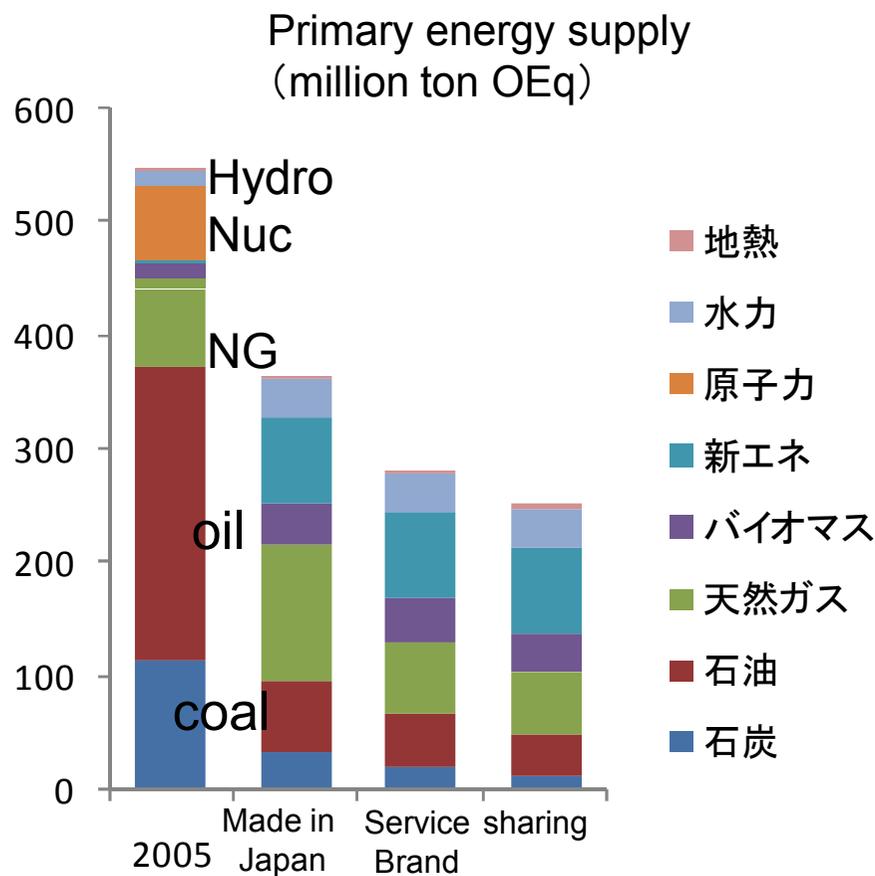
平成22年12月21日



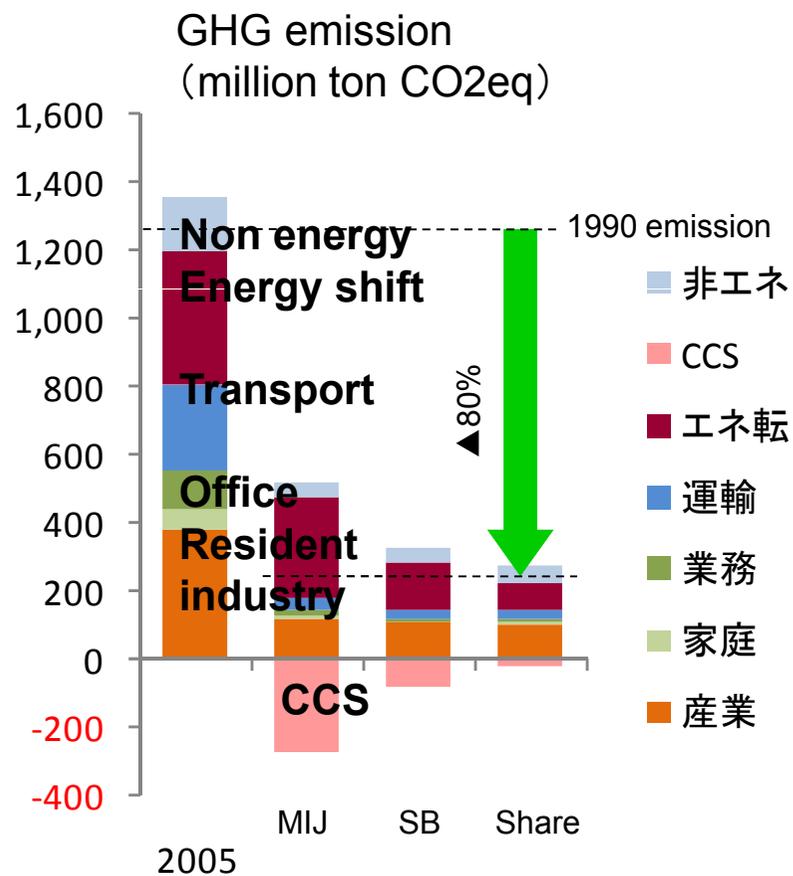
Possibility on 80% reduction in 2050

Without nuclear, we have to depend much on renewable energy and CCS (Carbon Dioxide Capture and Storage).

Possibility depend on how we design Japanese future. Service oriented society can achieve 80% reduction with domestic CCS but industry oriented society needs foreign CCS



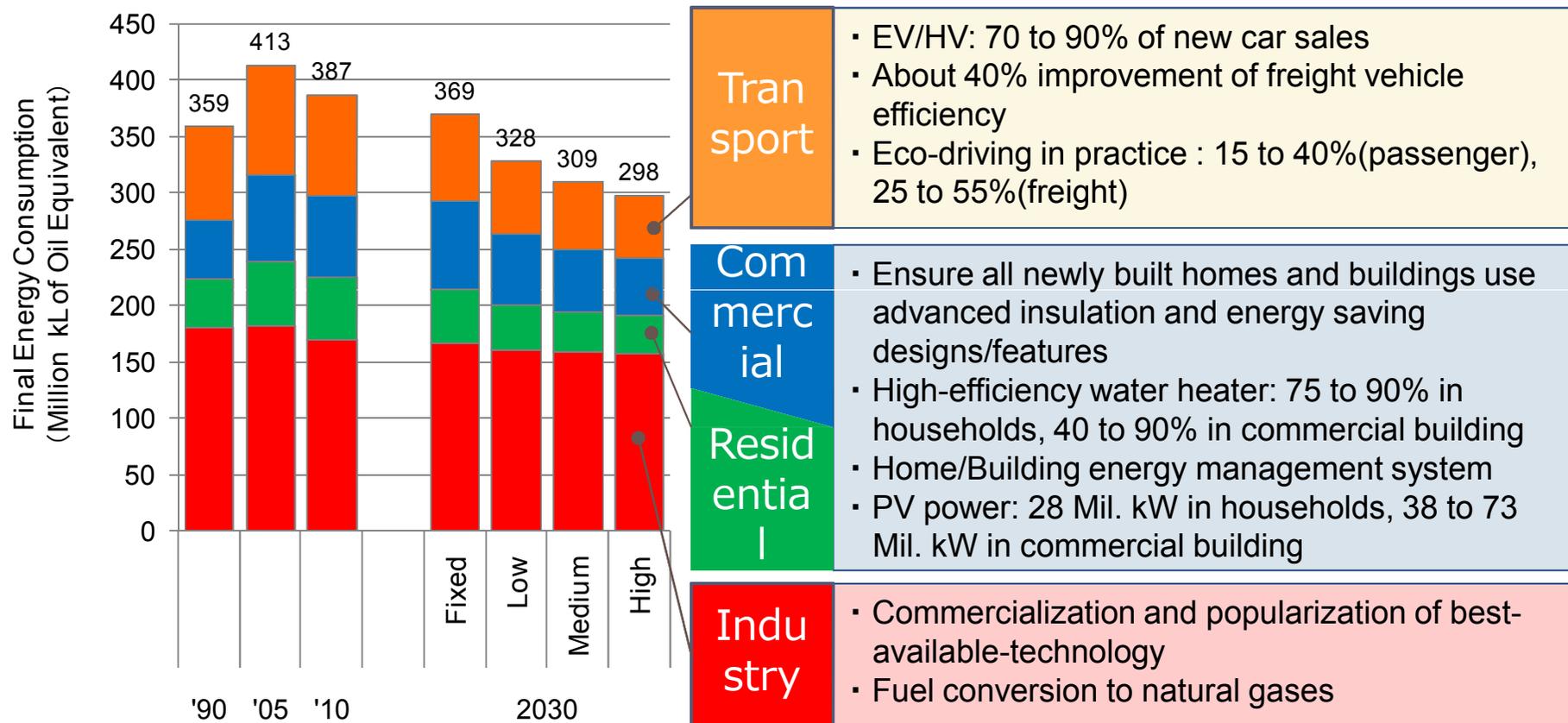
Vision of Society in 2050



Vision of Society in 2050 ~

Analysis by AIM/Enduse in Japan

Final energy consumption in 2030 (low growth case)

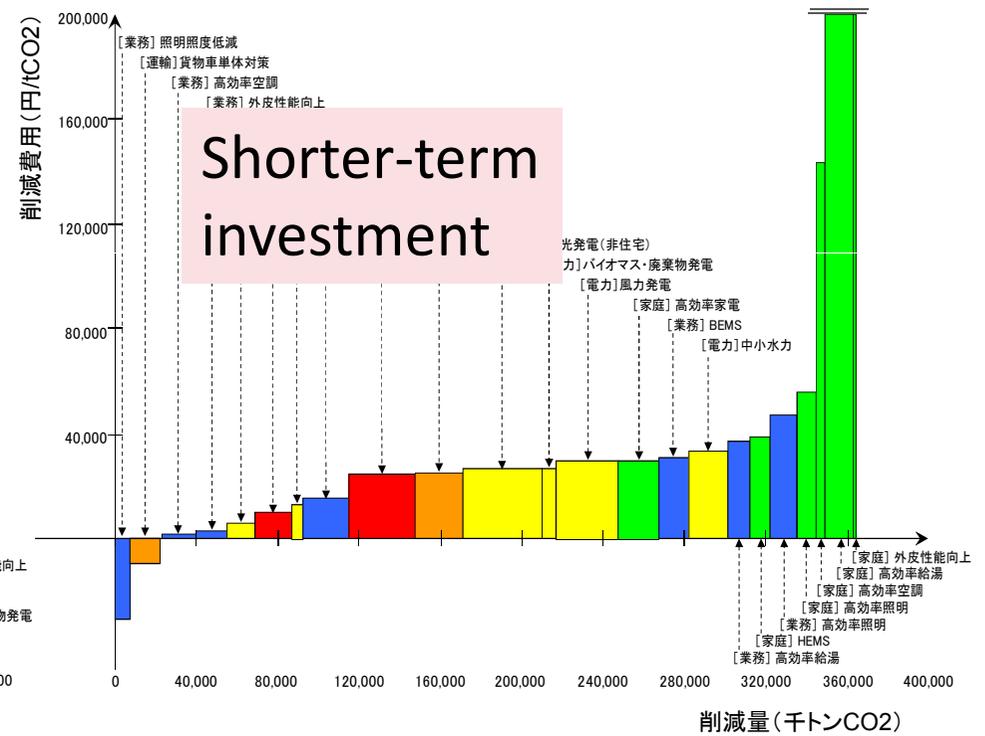
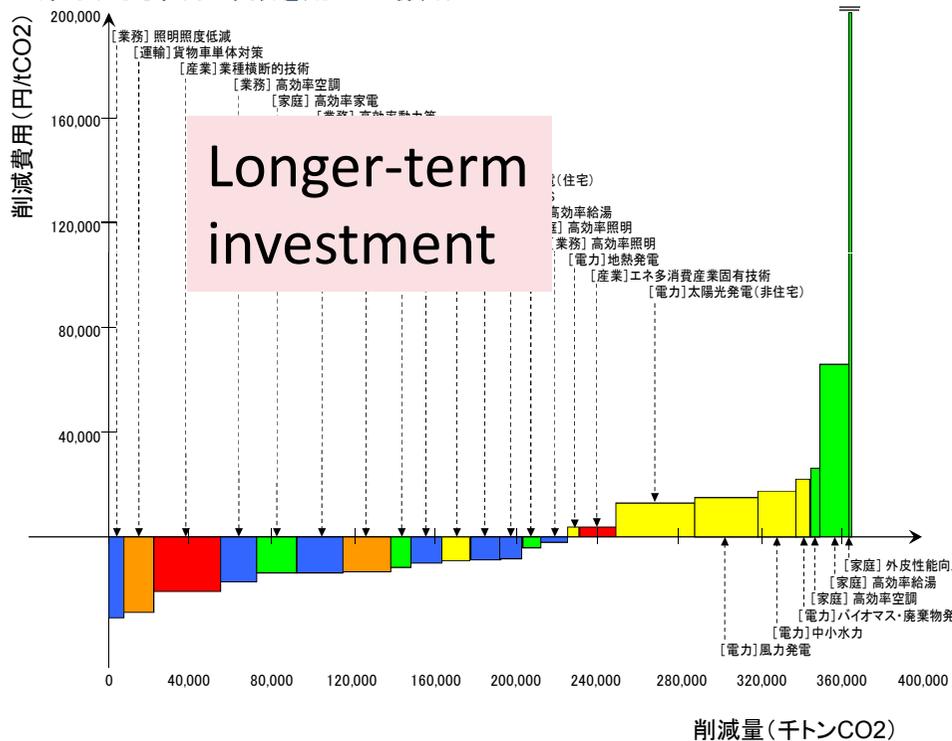


Mitigation cost curve in Japan to take aggressive emissions reductions options by 2030

(3)・2030年 高位ケース

行われるようにすると、削減費用は大きく変化する。
 場合には、家庭部門や運輸部門の対策は削減費用が
 運輸部門で原則3年、再生可能エネルギー発電で10年

- 政策による後押しなどによって長期の回収年を前提に投資が行われる場合 (社会的な回収年数を用いた場合)
- 各主体が短期の回収年を念頭に投資を行う場合 (主観的な回収年数を用いた場合)



- 産業部門・投資回収年数 12~15年
- 運輸部門・投資回収年数 8年
- 家庭部門・投資回収年数 8年 (*2)
- 再エネ発電・投資回収年数 12年
- 業務部門・投資回収年数 8年
- *2 住宅は17年, *3 建築物は15年

- 産業部門・投資回収年数 3年 (*1)
- 家庭部門・投資回収年数 3年
- 業務部門・投資回収年数 3年

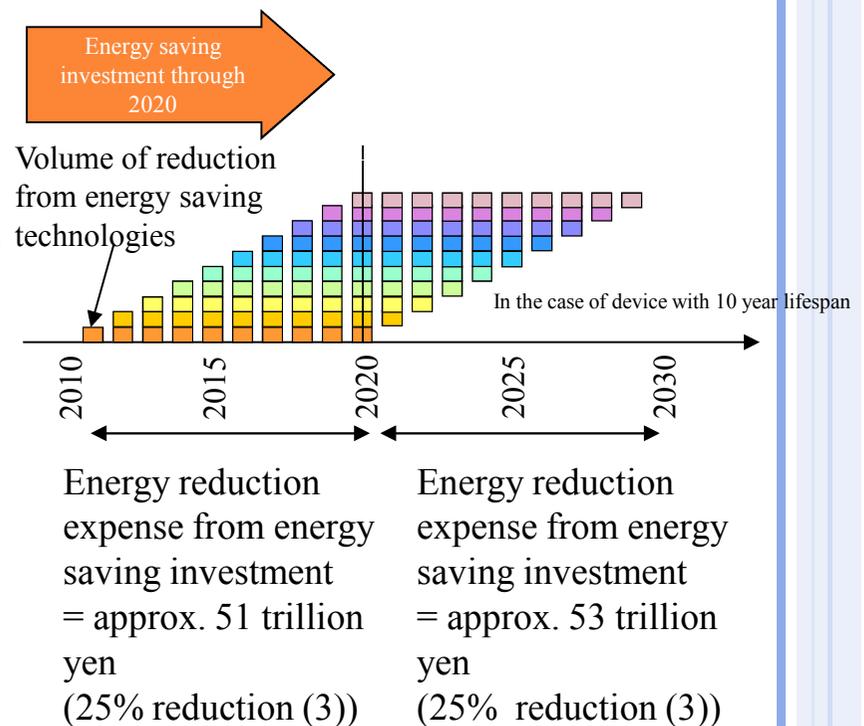
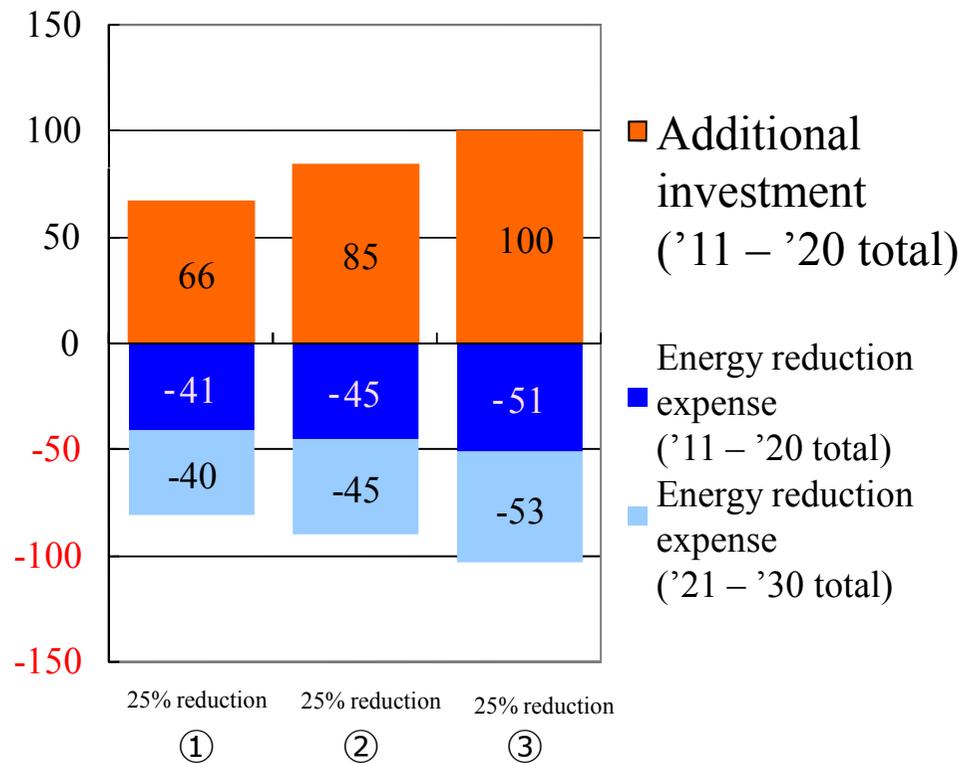
The result by AIM/Enduse[Japan]

※上記グラフが示す削減量は固定ケースと対策ケースの差である。本試算に用いたモデル内では、固定ケースと対策ケースでは原子力発電の出力が削減される想定である。また、再生可能エネルギー発電は、火力発電の発電電力量が低減すると想定した。そのため、火力発電の排出係数として0.54kgCO2/kWh(使用端)を仮に用いて算出した。再生可能エネルギー発電は、火力発電の発電電力量が低減すると想定した。そのため、火力発電の排出係数として0.54kgCO2/kWh(使用端)を仮に用いて算出した。再生可能エネルギー発電は、火力発電の発電電力量が低減すると想定した。そのため、火力発電の排出係数として0.54kgCO2/kWh(使用端)を仮に用いて算出した。

Relationship between low-carbon investment amount and energy reduction expense

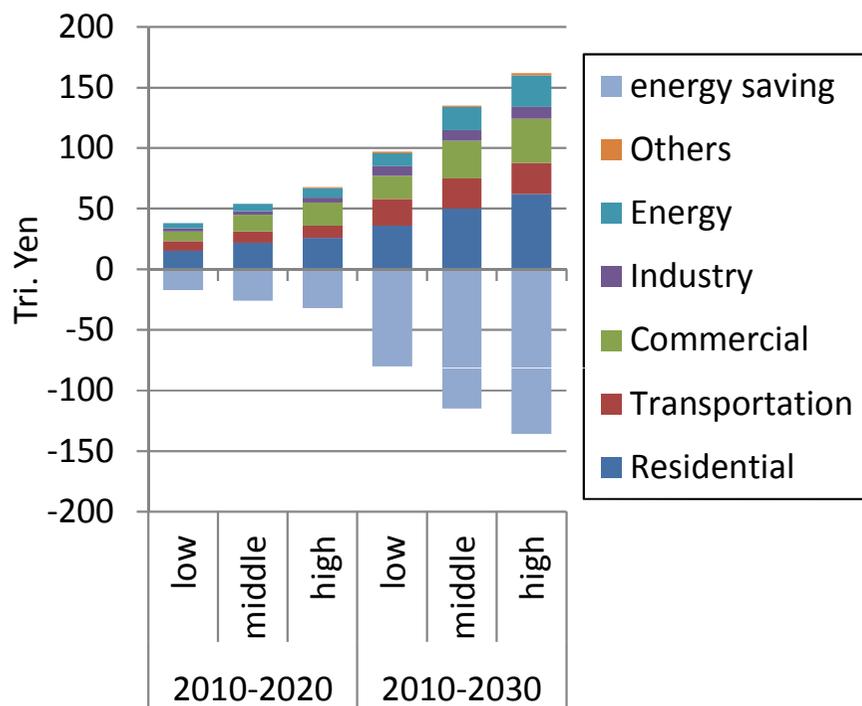
- As for the investment amount for global warming, half of the overall investment amount will be collected by 2020 and an amount equal to the investment amount will be collected by 2030 based on energy expenses that can be saved through technologies introduced.

<Low-carbon investment amount and energy reduction expense>

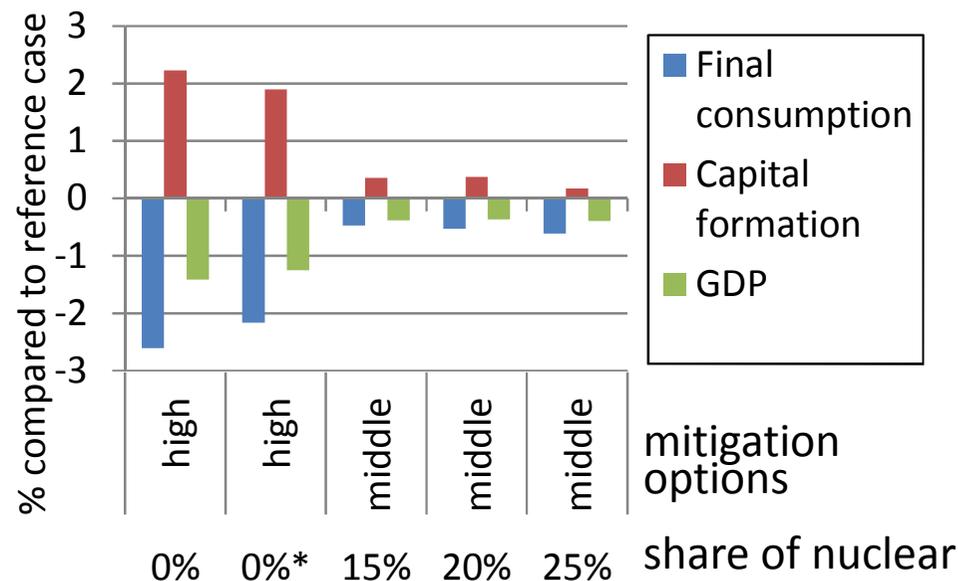


Simulation results provided in June 2012

For discussion on future energy and mitigation plan after accident at Fukushima dai-ichi nuclear power plant of TEPCO.



Cumulative additional investment by 2020 and 2030 [Results from Enduse]

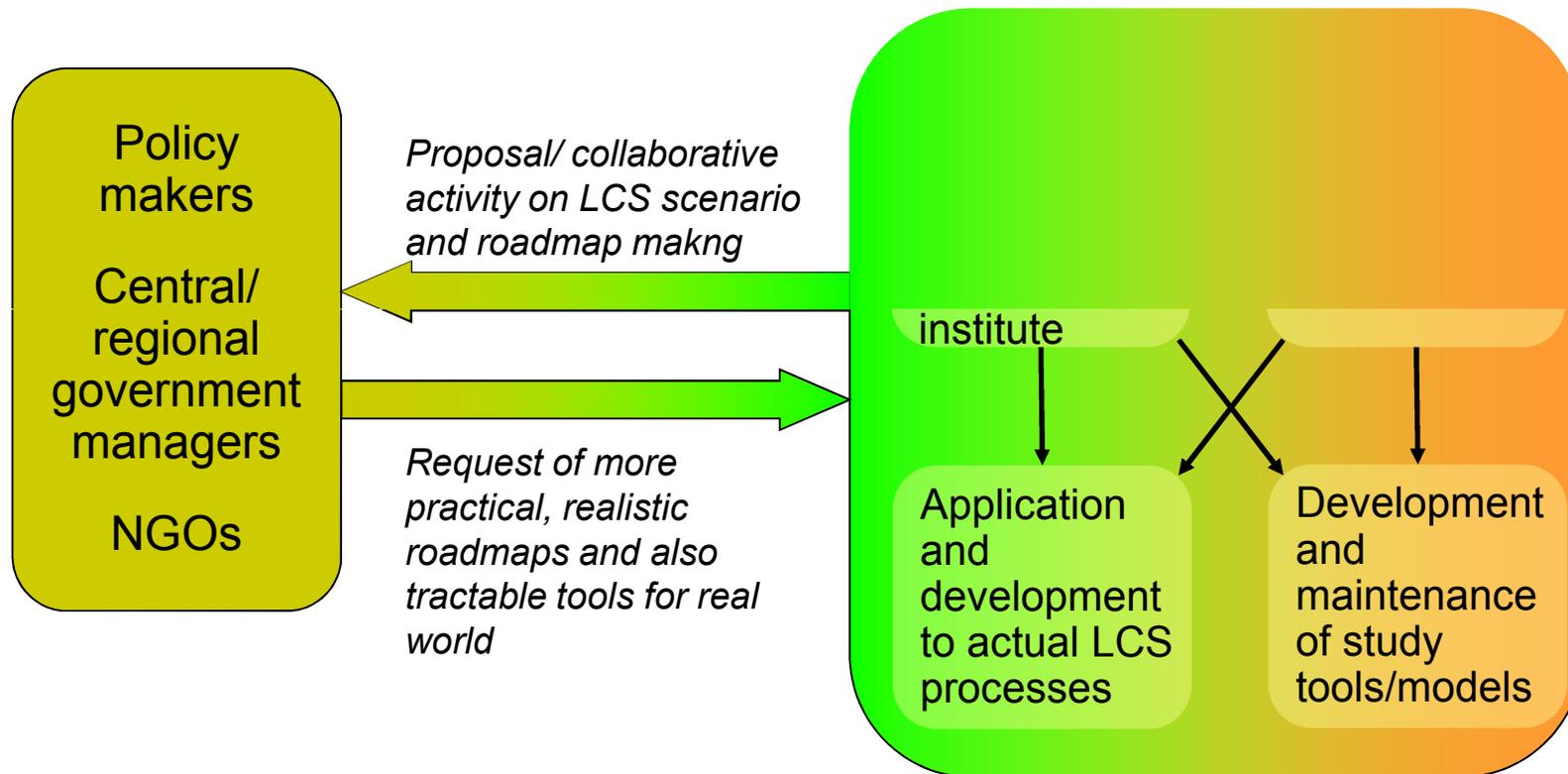


0%*: Nuclear will be 0% in 2020.

Macro economic impact compared to reference case in 2030, Low economic growth case [Results from CGE]

Our AIM approach

“How to deploy LCS study to real world?”



Sustainable
Low-Carbon Asia
comes from
design,
imagination
and
co-working...

Let's work together!

Asia LCS



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