

Research Activities for Realizing Low Carbon Societies in Asia

アジア低炭素社会実現に向けての アプローチ

Session-2 : Asia Low Carbon Society Scenario, Challenges to Low Carbon
Asia, Thursday, October 17, 2013

U Thant International Conference Hall, United Nations University

セッション2 : 低炭素アジアシナリオ, アジア低炭素社会へのチャレンジ、
環境研究総合推進費S-6 一般公開シンポジウム

会場 : 国連大学 ウ・タント国際会議場, 日 時 : 平成25年10月17日 (木)

Speaker: Yuzuru Matsuoka, Kyoto University, Japan

京都大学 松岡 譲

内 容

CONTENTS

1. アジア低炭素社会とは
The image of Low Carbon Societies in the study
2. 低炭素社会シナリオの策定
Research procedure of our LC development approach
3. 低炭素社会発展シナリオ策定のための道具群
Supporting tools for developing Low Carbon Societies
Scenarios
4. アジア地域での適用とその教訓
Applications to the Asian region and some lessons from
them

Outline of the Research towards Asian Low Carbon Societies

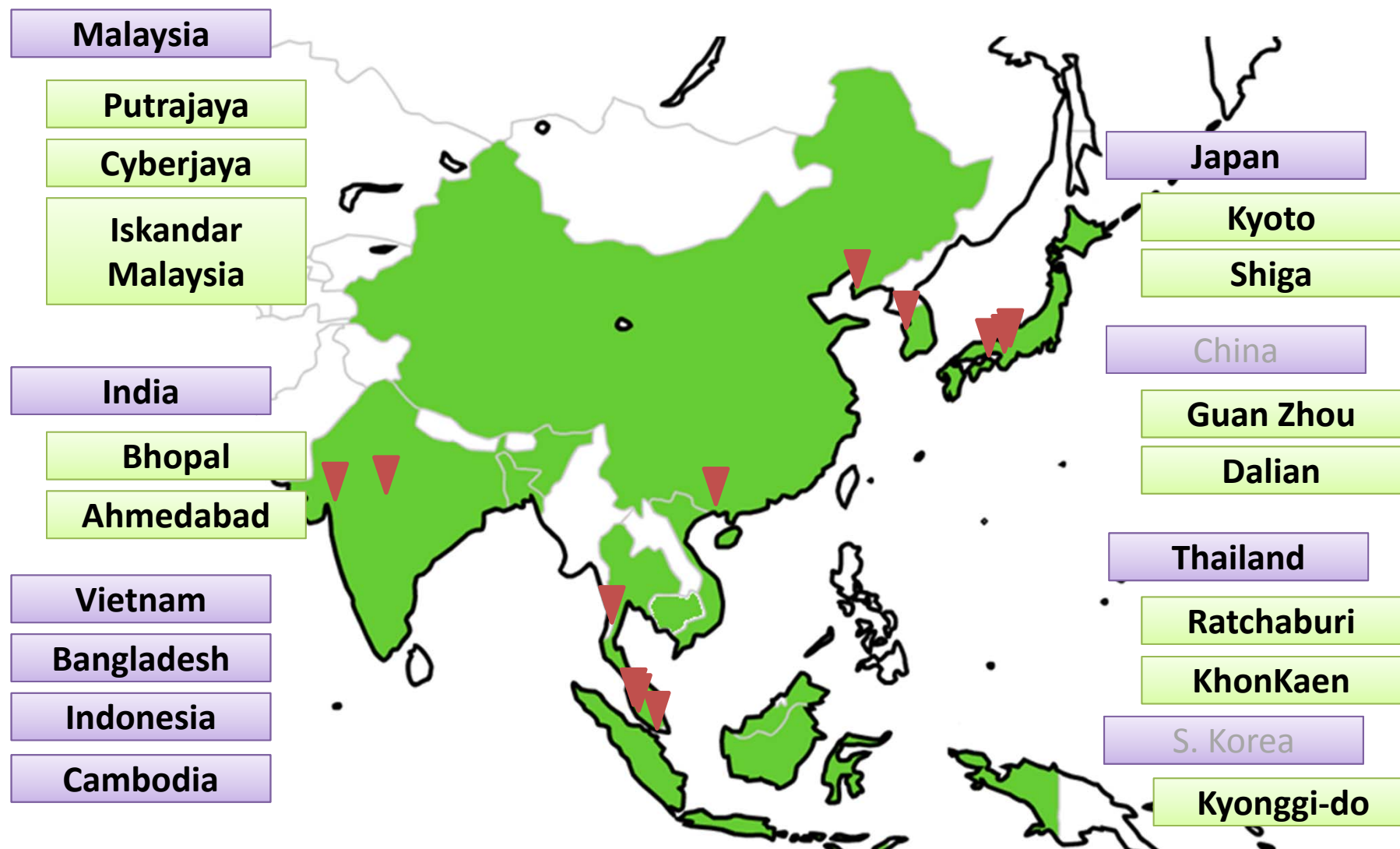
- 1. Considering domestic and international factors which will change dramatically in future, we must develop visions of Low Carbon Societies and prescribe the development, accumulation, and deepening of factors which control the realization of the Societies.**
- 2. Taking account of regional distinctive diversified characteristics of the region, and with the qualitative and quantitative methodologies, which I introduce in this presentation,**
- 3. We propose positive Asian Low Carbon Development Actions and roadmaps which realize the Low Carbon Societies.**

The Low Carbon Society Visions and Development Actions towards them should be;

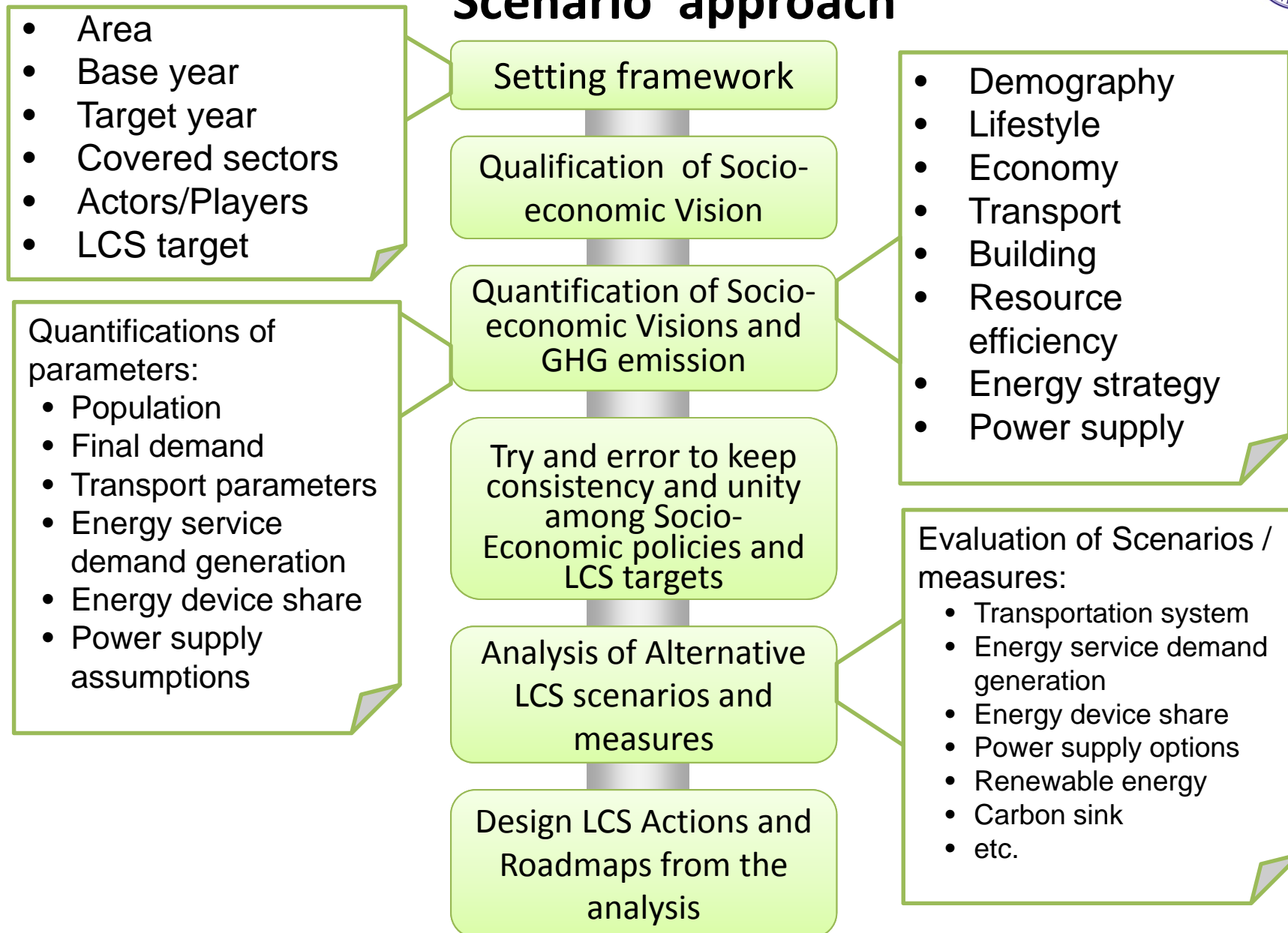
**By the middle of this century (2030-2050), the societies
must satisfy the followings;**

- 1. Harmonized with drastically changing future Asian society
and economy,**
- 2. Complying with each country's national reduction target
that consists with the global low carbon target, under the
global, national and regional constraints on fossil and
renewal energy resources, land resource, and human
capacity,**
- 3. Utilizing the most of co-benefits of LC policies and
neighboring policies.**

Up to now, we applied our LCS research approach to 8 nations and 12 regions in Asia regions



Overall research procedure of our LC Society Scenario approach



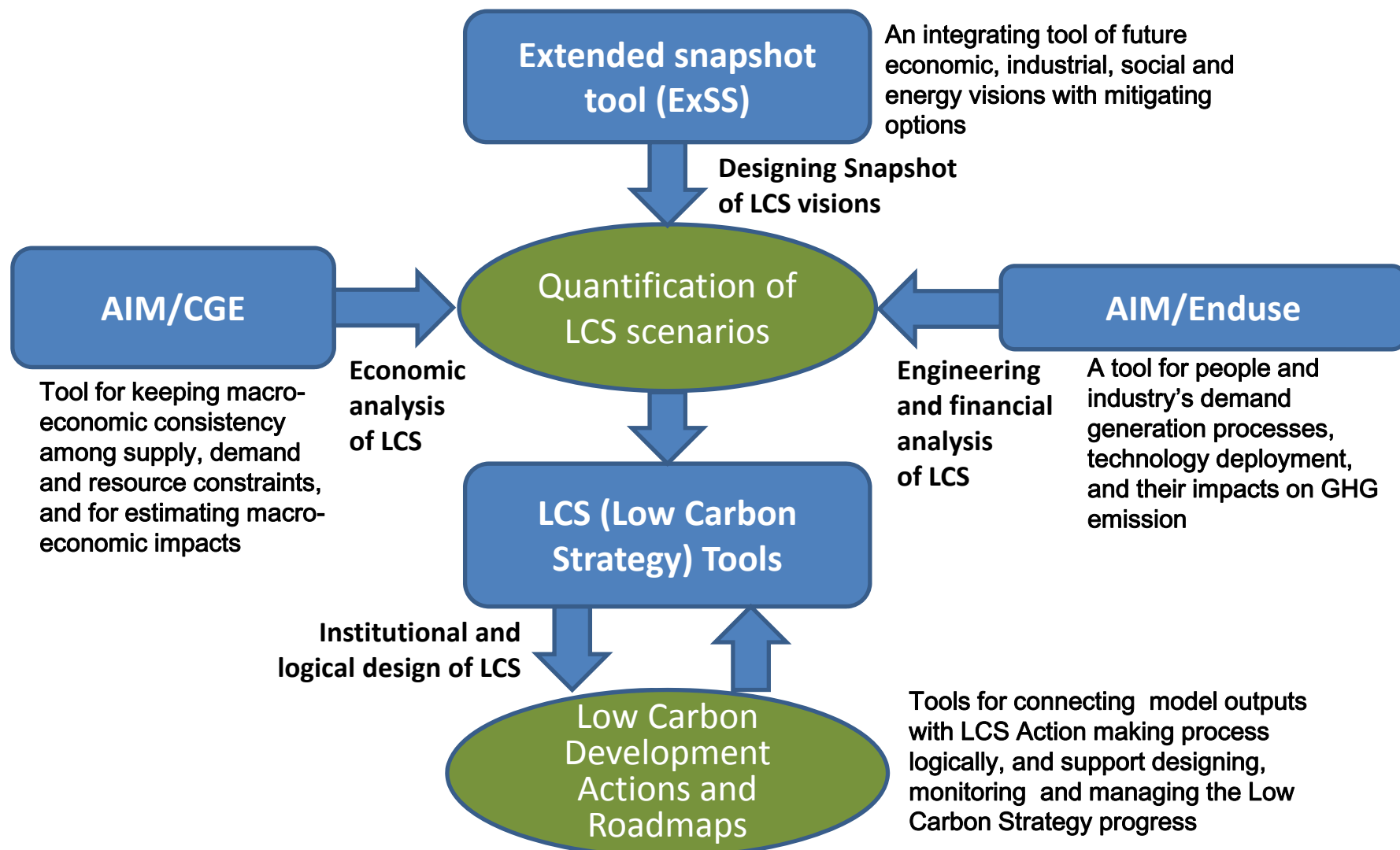
Some checking points of Low Carbon Society Scenario development

1. LC Society Visions and Development Actions should be;
 - 1-1) Technologically,
 - 1-2) Economically/Financially, and
 - 1-3) Institutionallyfeasible and efficient.
→Multi-criteria problem
2. Also, they should be well harmonized, collaborating with related policies on:
 - 2-1) Vitalization of national/regional economy
(Job creation, income increase, attraction of foreign direct investment, and so on),
 - 2-2) Environment, Comfortability, and Security→Multi-objective problem
3. Importance of quantitativity, logicality, rationality and transparency of the scenarios and their development procedure

Tools to support constructing LCS scenarios

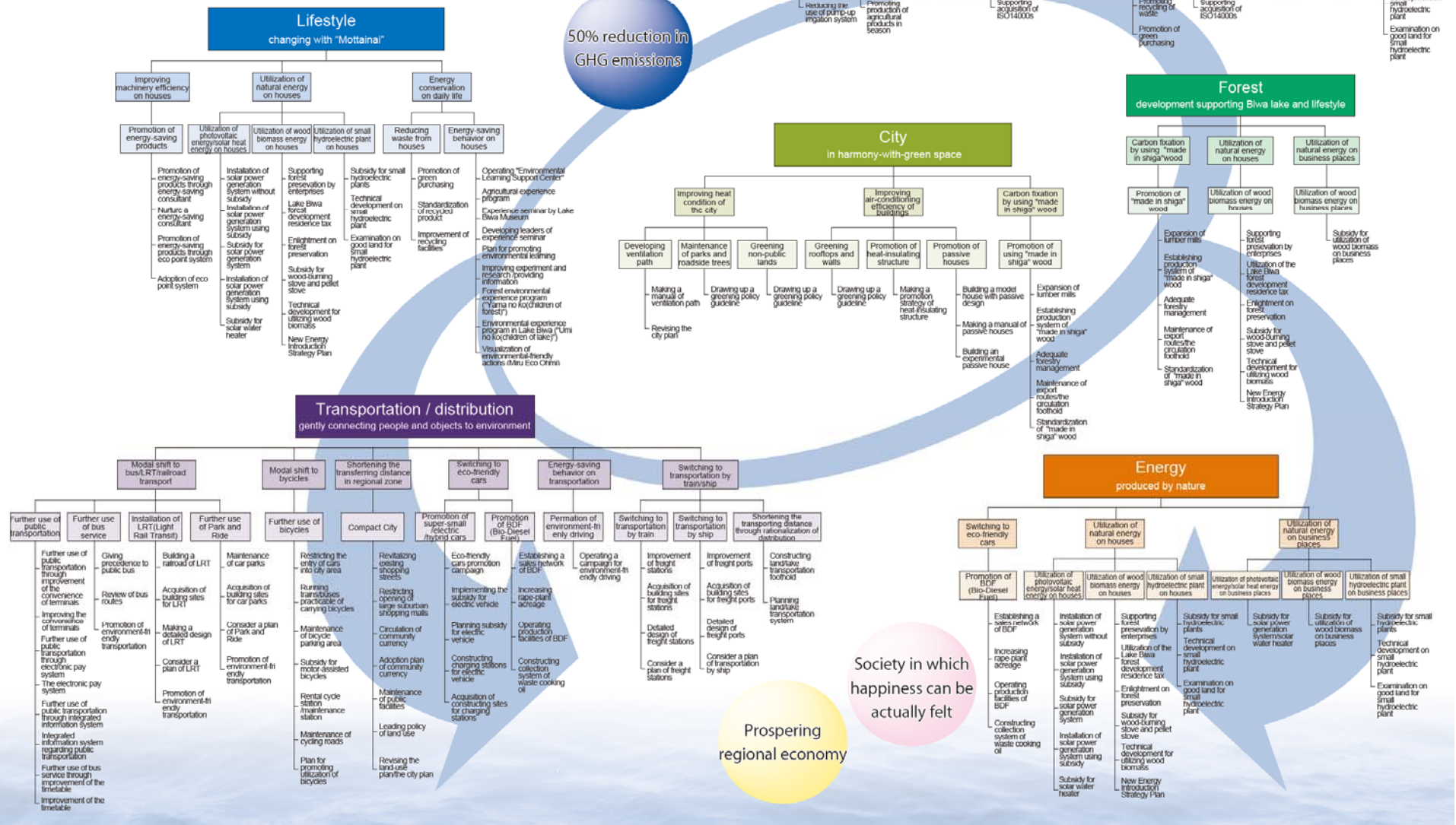
Question		Tool developed	Explanation
What kind of LCS measures are available?	→	LCM-DB	Low-carbon measures database
How to adjust diverse objectives and preferences among LCS Actions ?	→	AHP tool	Analytic hierarchy process tool
How to manage LCS Actions systematically ?	→	LCS-Action Tools	A group of Tools on Logical structure of LCS actions
How to develop quantitative visions, and check the feasibility with GHG reduction targets, industrial structure and so on?	→	ExSS	Extended snapshot tool.
What is the optimal technologies invested and how much are their costs?	→	AIM/Enduse	AIM Enduse-bottom-up model
How much is the impact to macro-economy of LCS actions ?	→	AIM/CGE	AIM Computable general equilibrium model
How to construct the schedule of LCS actions?	→	BCT	Backcasting tool

How to combine the tools in order to keep consistency and unity among Socio-Economic policies and LCS actions



Systematic diagram of LCS measures LCS Action Breakdown Structure(LCS-ABS)

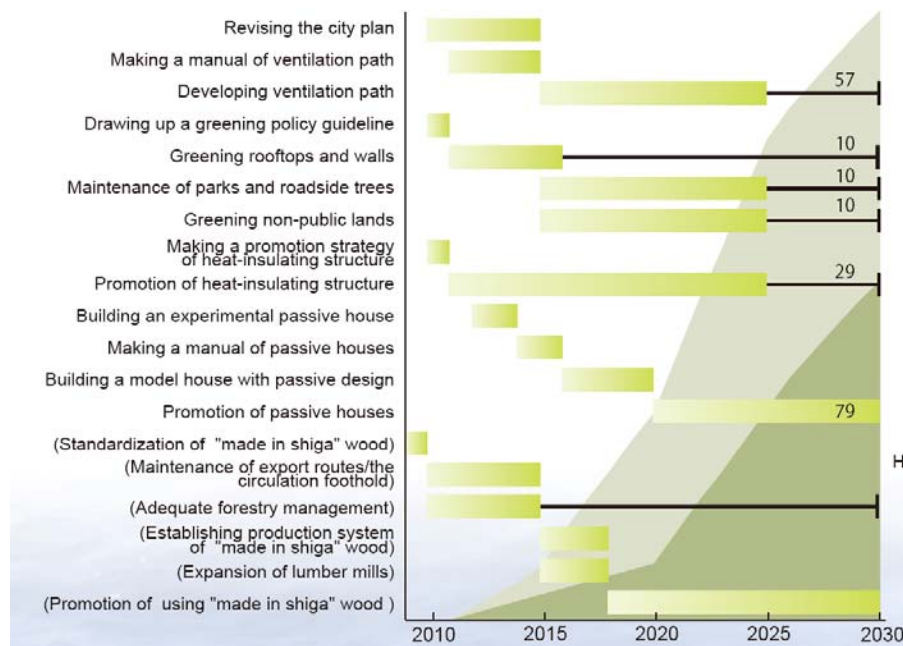
Shiga Study



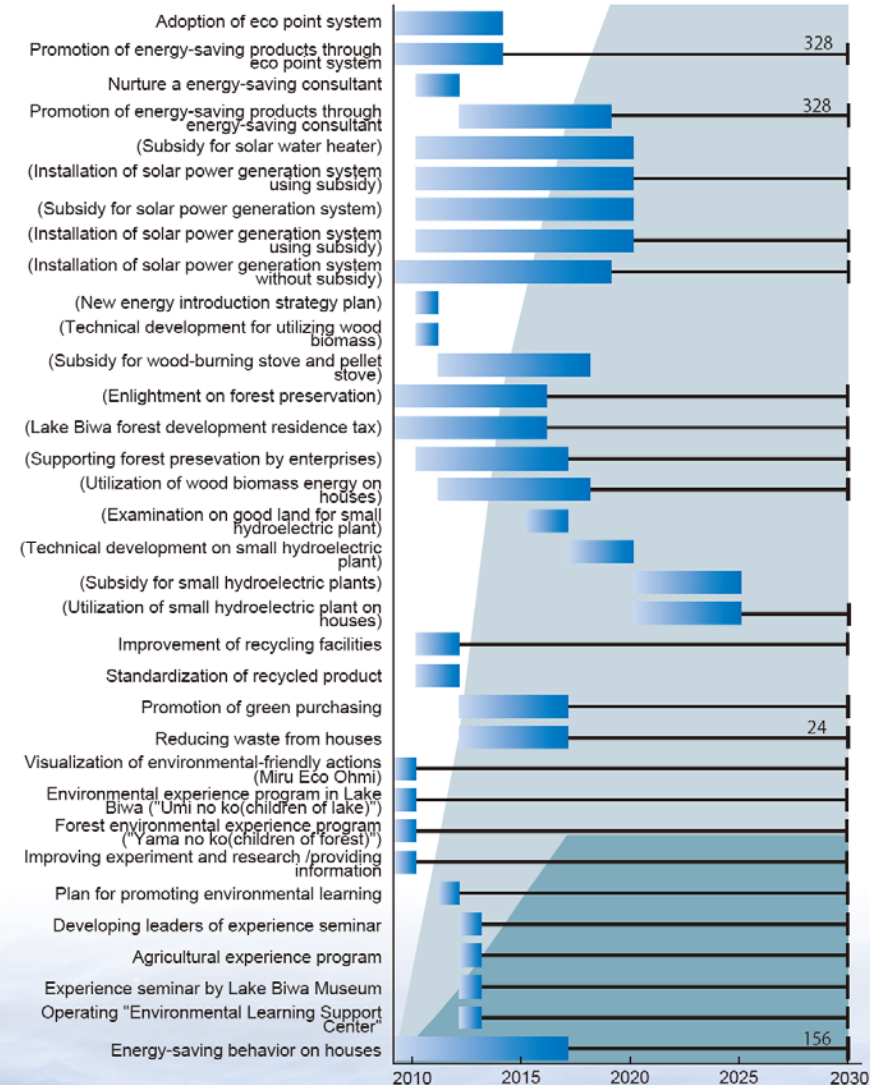
Necessary timing of actions backcasted and their effects (1)

Outputs of BCT, Shiga study

Action to make the City as harmony-with-green space

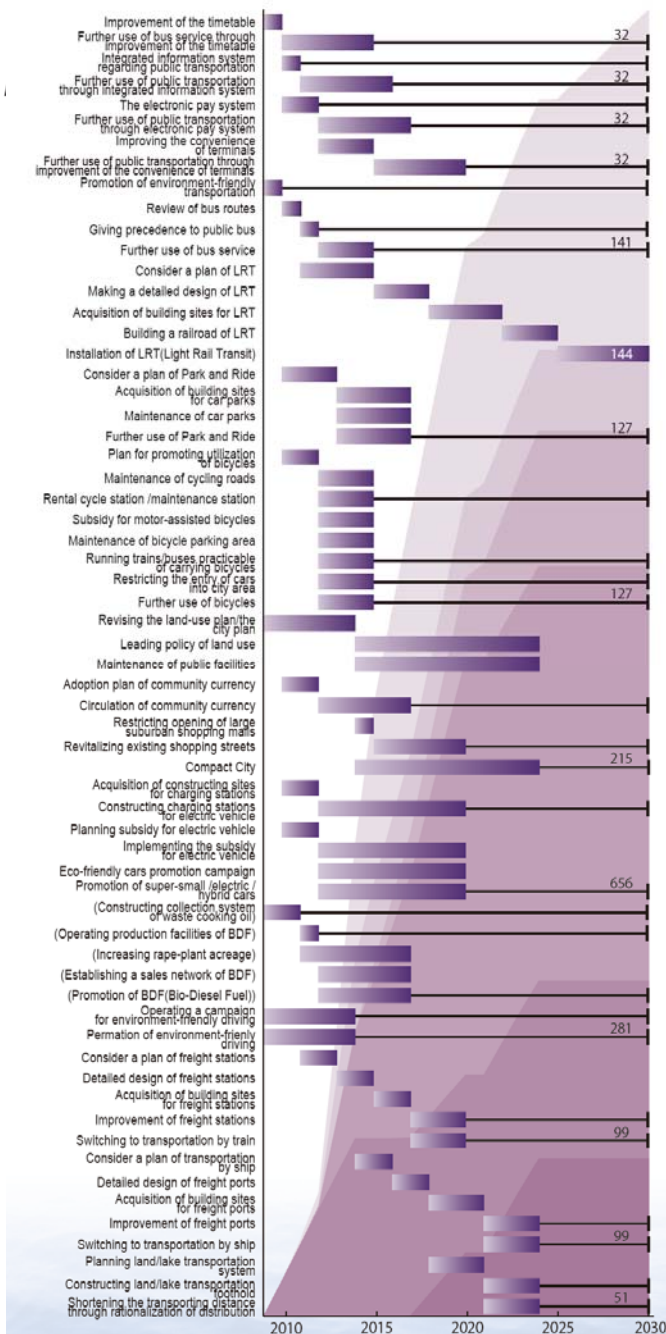


Action to make people's Lifestyle changing with "Mottainai"

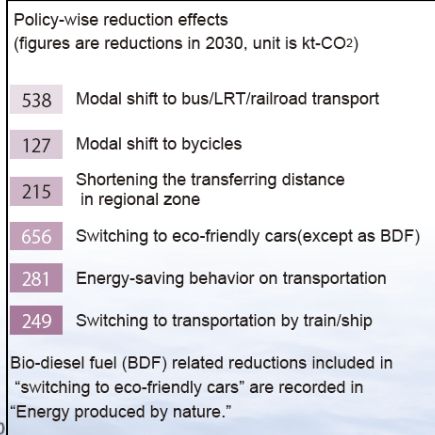


Necessary timing of actions backcasted and their effects (2)

Outputs of BCT, Shiga study

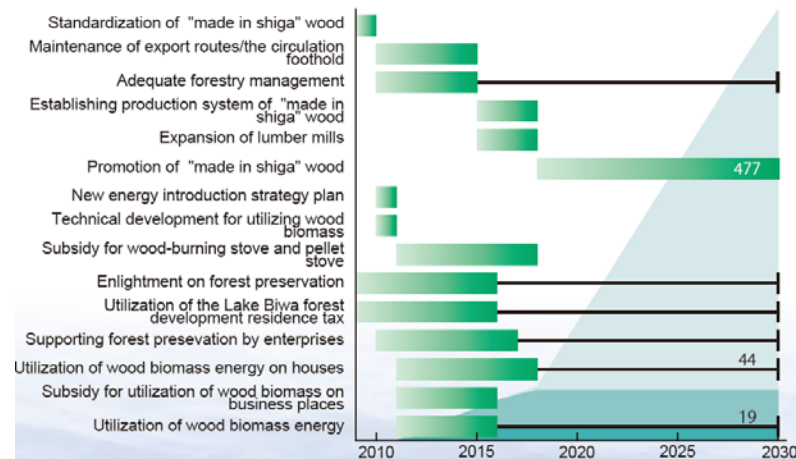
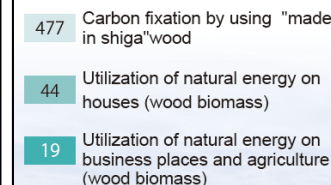


Action to make the
Transportation/
distribution
gently connecting
people and objects to
environment



Action to make
Forest
development
supporting Biwa lake
and lifestyle

Policy-wise reduction effects
(figures are reductions in 2030, unit is kt-CO₂)



Policy-wise reduction effects
(figures are reductions in 2030, unit is kt-CO₂)

86	Improving energy efficiency of agricultural production
1643	Improving energy efficiency of manufacturing
265	Improving energy efficiency of offices and stores
332	Energy-saving behavior on business places

Reductions achieved due to "Utilization of natural energy in agriculture and at business places" are recorded in "Energy produced by nature" and "Forest development supporting Lake Biwa and lifestyle."

Action to make
Industry
growing along with
environment

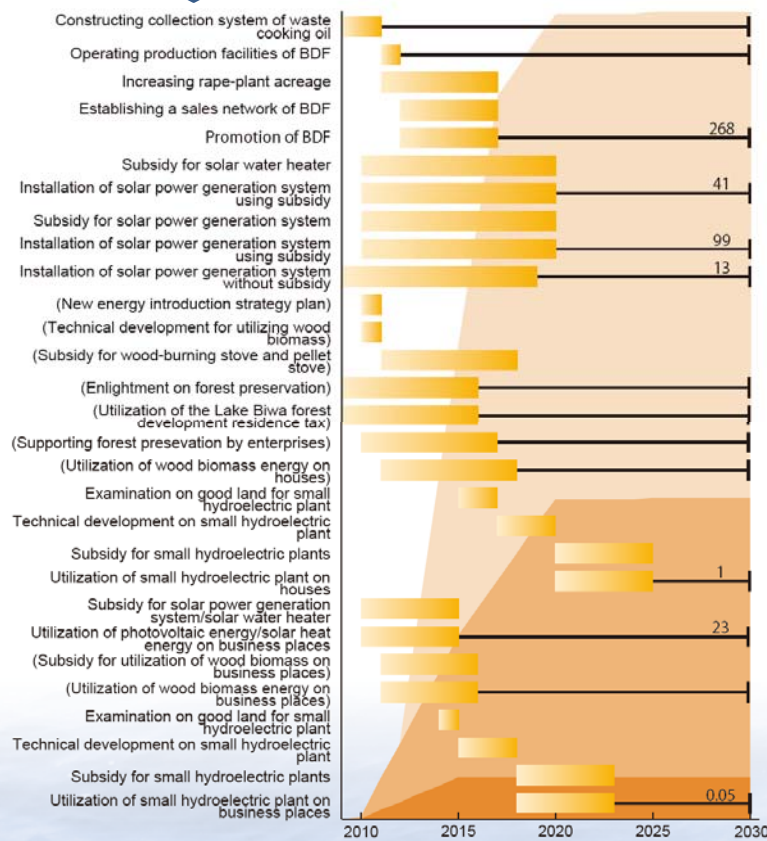
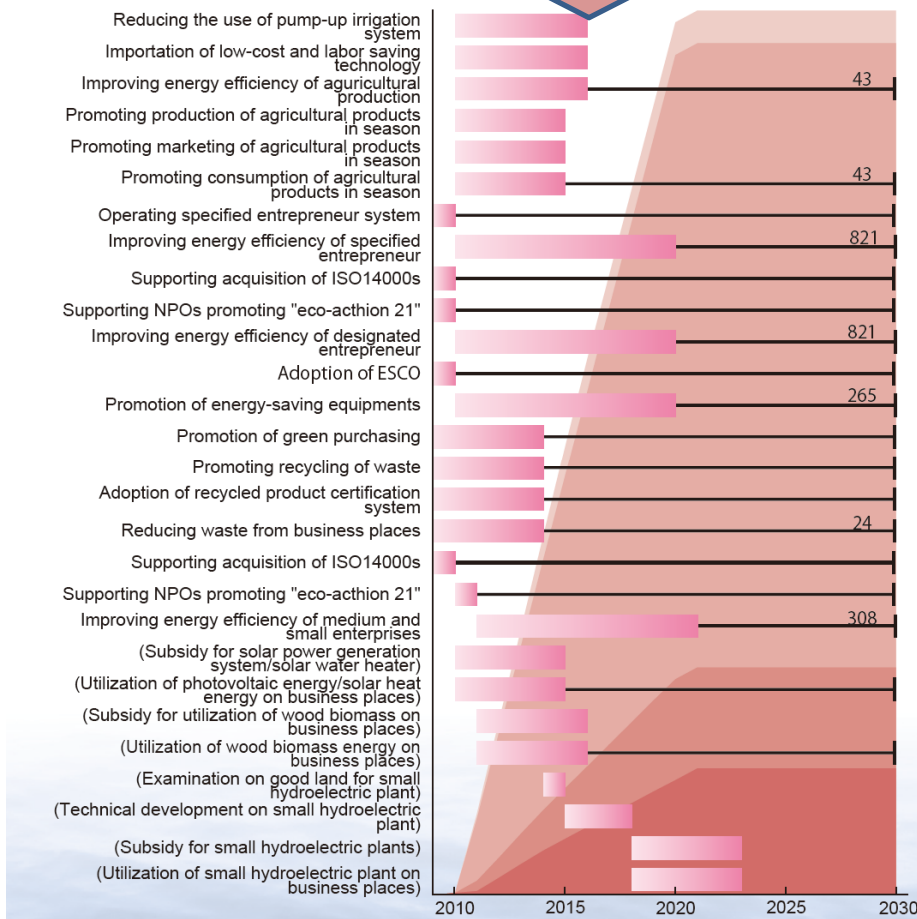
Necessary timing of actions backcasted and their effects (3) Outputs of BCT, Shiga study

Action to make
Energy
produced by nature

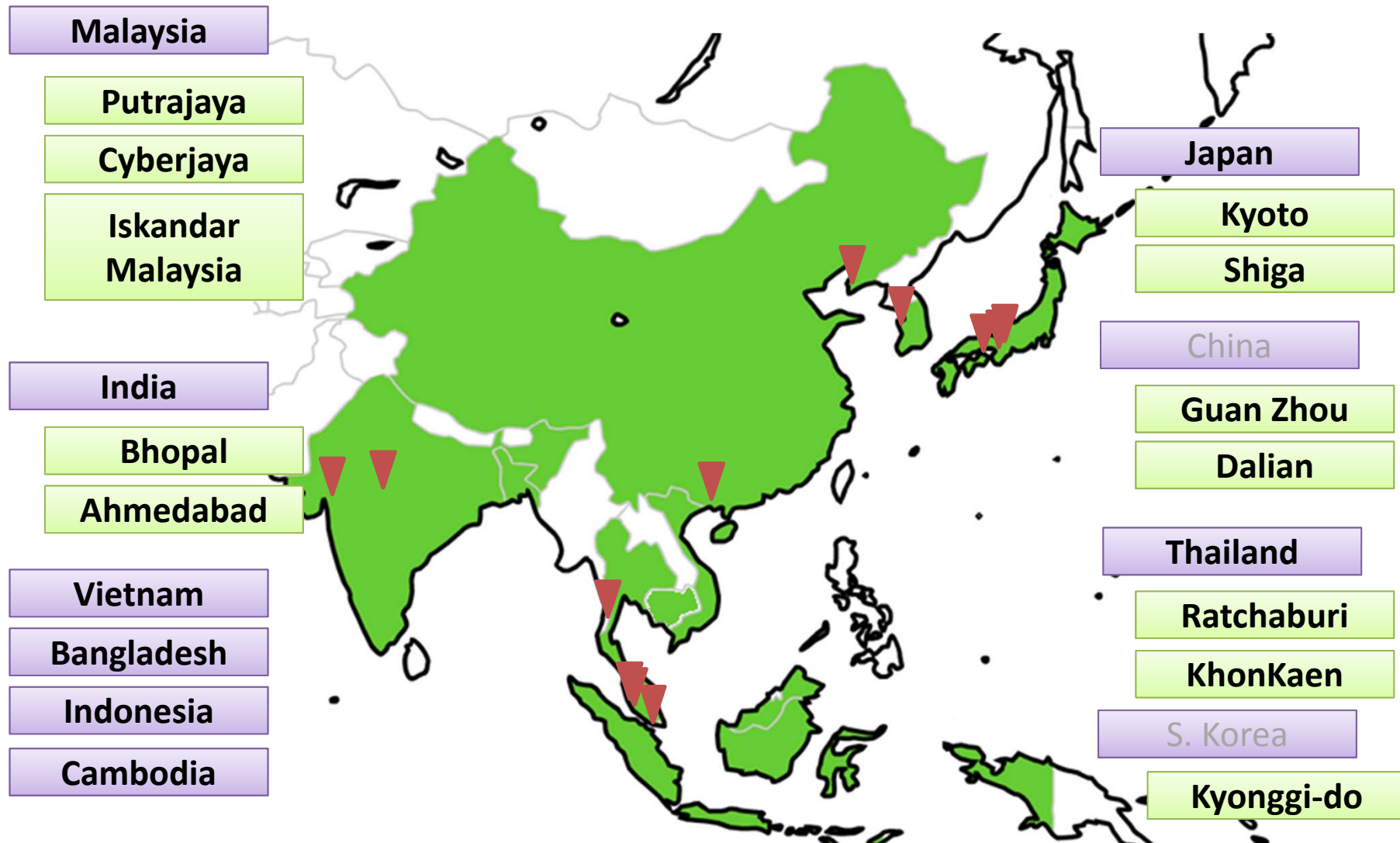
Policy-wise reduction effects
(figures are reductions in 2030, unit is kt-CO₂)

268	Switching to eco-friendly cars (promotion of BDF)
154	Utilization of natural energy on houses (except wood biomass)
23	Utilization of natural energy on business places and agriculture (except wood biomass)

Reductions achieved from wood biomass in "utilization of natural energy in houses" and "Utilization of natural energy in agriculture and at business places" is recorded in "Forest development supporting Lake Biwa and lifestyle."



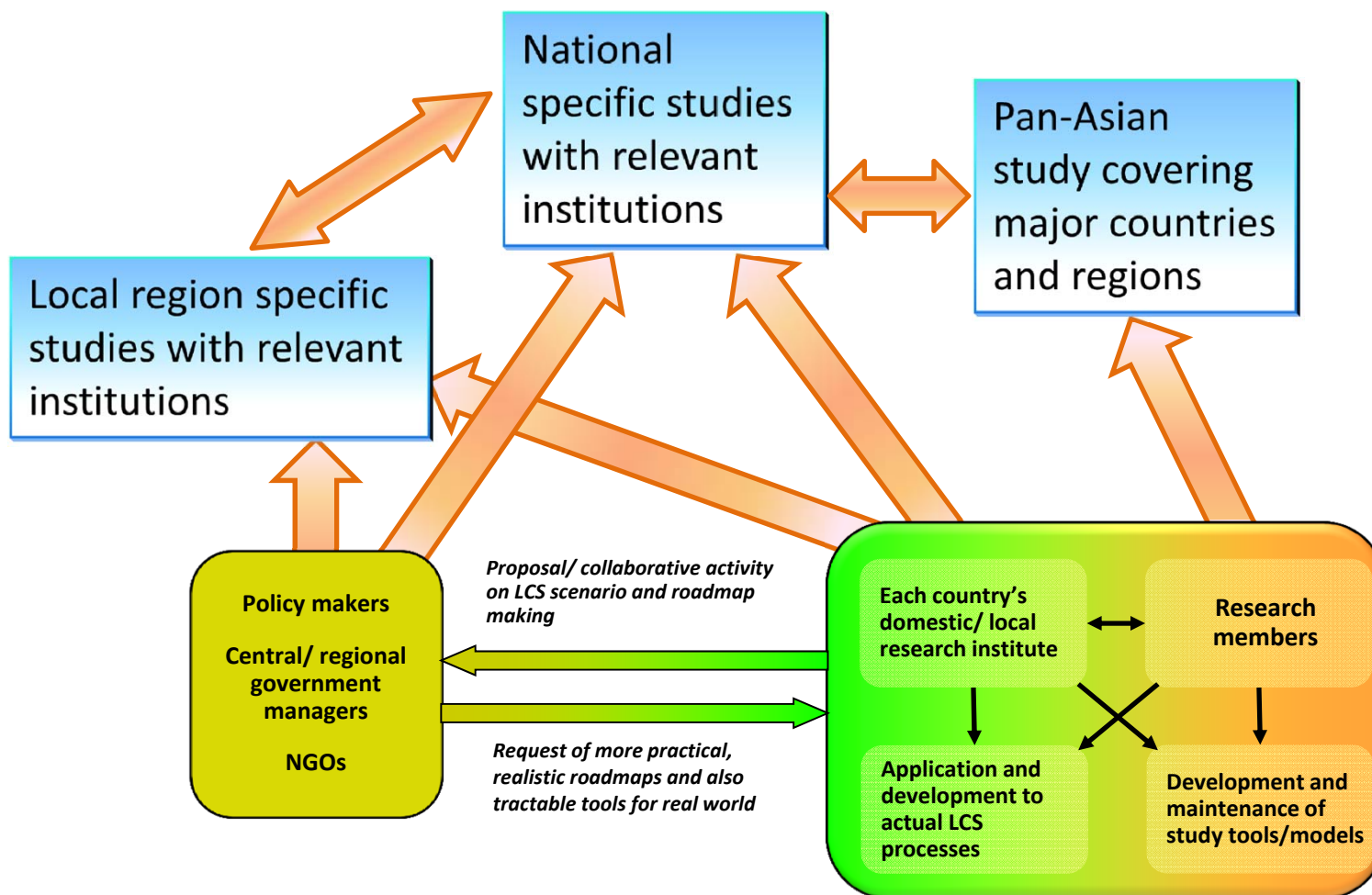
Up to now, we applied and are applying our LCS research approach to 8 nations and 12 regions in Asia regions



Communication and feedbacks of LCS study to real world



In order to make these actions happen, collaboration with central/regional governments and researchers in Asian region is necessary. Through this activities, their capacity developments are strongly expected



Some extracts of outputs from our recent Asian LCS studies

Per capita emission: 0.6 to 13.4 tCO₂, Percent reduction from BaU: 22% to 85%,
Percent change from Base year: -73% to 657%

Coutry /Region	Region code	Scenario code	Covered sectors	Base year information						Target year information						Year of study
				Year	Population	GDP (GRP)		GHG emission		Year	GHG emission in BaU		GHG emission with Actions			
					(1000)	total	per cap (USD)	total	per cap (tCO2)		(% change from base year)	(% change from BaU)	Number of Actions			
Shiga prefecture	JPN-SIG	JPN-SIG2030	Energy, Waste, Forestry, Water pollution, Industrial process	2000	1397	5884 Bill. JPY	40811	12877 ktCO2eq	9.2	2030	14369 (11.6)	6276 (-51.3)	(-56.3)	6 Actions	2007	
Kyoto city	JPN-KYT	JPN-KYT2030	Energy, Waste, Forestry	2005	1470	6124 Bill. JPY	40365	8015 ktCO2eq	5.5	2030	8897 (11.0)	4586 (-42.8)	(-48.5)	6 Actions	2009	
Dalian province	CHN-DLN	CHN-DLN2020	Energy	2007	5721	294 Bill. CNY	6201	46010 ktCO2eq	8.0	2020	177760 (286.4)	123490 (168.4)	(-30.5)	-	2010	
Dalian province	CHN-DLN	CHN-DLN2050	Energy	2007	5721	294 Bill. CNY	6201	46010 ktCO2eq	8.0	2050	651460 (1315.9)	256250 (456.9)	(-60.7)	-	2010	
Guang Zhou city	CHN-GZ	CHN-GZ2030	Energy	2005	9600	506 Bill. CNY	6368	98 MtCO2eq	10.2	2030	336 (242.9)	165 (68.4)	(-50.9)	5 Actions	2013	
Khon Kaen province	THA-KK	THA-KK2050	Energy, Waste, AFOLU	2005	1750	2933 Mill. USD	1676	2372 ktCO2eq	1.4	2050	7525 (217.2)	5173 (118.1)	(-31.3)	3 Strategies	2013	
Khon Kaen province	THA-KK	THA-KK2030	Energy, Waste, AFOLU	2005	1750	2933 Mill. USD	1676	2372 ktCO2eq	1.4	2030	5256 (121.6)	3585 (51.1)	(-31.8)	3 Strategies	2013	
Gyeonggi province	KOR-GYG	KOR-GYG2030	Energy, Land use	2005	10600	169 Tril. KRW	15348	76 MtCO2eq	7.1	2030	162 (114.7)	126 (67.2)	(-22.1)	-	2012	
Putrajaya district	MYS-PTJ	MYS-PTJ2030	Energy, Waste, Forestry	2007	49	1062 Mill. MYR	5653	664 ktCO2eq	13.4	2030	4186 (530.4)	1780 (168.1)	(-57.5)	12 Actions	2012	
Iskandar Malaysia	MYS-ISK	MYS-ISK2025	Energy, Waste, Forestry	2005	1353	36 Bill. MYR	6944	11 MtCO2eq	8.4	2025	31 (174.6)	19 (65.8)	(-39.6)	12 Actions	2013	
India	IND	IND2050	Energy	2005	1103000	33 Tril. INR	680	1292 MtCO2eq	1.2	2050	7241 (460.4)	3114 (141.0)	(-57.0)	10 Actions	2009	
Bhopal city	IND-BPL	IND-BPL2035	Energy	2005	1844	70 Bill. INR	868	3 MtCO2eq	1.4	2035	12 (380.0)	7 (180.0)	(-41.7)	7 Actions	2011	
Ahamedabad city	IND-AMD	IND-AMD2035	Energy	2005	4700	305 Bill. INR	1483	10 MtCO2eq	2.2	2035	44 (332.4)	25 (140.4)	(-44.4)	8 Actions	2010	
Ahamedabad city	IND-AMD	IND-AMD2050	Energy	2005	4700	305 Bill. INR	1483	10 MtCO2eq	2.2	2050	86 (746.1)	25 (140.8)	(-71.5)	8 Actions	2010	
Vietnam	VNM	VNM2030	Energy, AFOLU	2005	83100	818 Tril. VND	615	151 MtCO2eq	1.8	2030	601 (298.0)	379 (151.0)	(-36.9)	11 Actions	2012	
Bangladesh	BGD	BGD2035	Energy, AFOLU	2005	140000	4 Tril. BDT	446	88 MtCO2eq	0.6	2035	310 (252.4)	179 (104.1)	(-42.1)	-	2010	
Indonesia	IDN	IDN2050CM1	Energy	2005	219000	1787 Tril. IDR	887	299 MtCO2eq	1.4	2050	4341 (1351.8)	2263 (656.9)	(-47.9)	-	2010	
Indonesia	IDN	IDN2050CM2	Energy	2005	219000	1787 Tril. IDR	887	299 MtCO2eq	1.4	2050	4341 (1351.8)	670 (124.1)	(-84.6)	-	2010	
Thailand	THA	THA2030	Energy	2005	60991	8017 Mill. THB	3391	185983 ktCO2eq	3.0	2030	563730 (203.1)	324170 (74.3)	(-42.5)	9Actions	2010	
Malaysia	MYS	MYS2020EXT	Energy, Waste, AFOLU	2005	26128	509 Bill. MYR	5129	270710 ktCO2eq	10.4	2020	533575 (97.1)	418709 (54.7)	(-21.5)	-	2013	
Malaysia	MYS	MYS2020APS	Energy, Waste, AFOLU	2005	26128	509 Bill. MYR	5129	270710 ktCO2eq	10.4	2020	533575 (97.1)	318567 (17.7)	(-40.3)	-	2013	
Malaysia	MYS	MYS2030EXT	Energy, Waste, AFOLU	2005	26128	509 Bill. MYR	5129	270710 ktCO2eq	10.4	2030	741247 (173.8)	429007 (58.5)	(-42.1)	-	2013	
Malaysia	MYS	MYS2030APS	Energy, Waste, AFOLU	2005	26128	509 Bill. MYR	5129	270710 ktCO2eq	10.4	2030	741247 (173.8)	359837 (32.9)	(-51.5)	-	2013	
Japan	JPN	JPN2050A	Energy, Waste, Forestry, Water pollution, Industrial process	2000	126926	520 Trill. JPY	39690	1144 MtCO2eq	9.0	2050	— (—)	312 (-72.8)	(—)	12 Actions	2008	
Japan	JPN	JPN2050B	Energy, Waste, Forestry, Water pollution, Industrial process	2000	126926	520 Trill. JPY	39690	1144 MtCO2eq	9.0	2050	— (—)	312 (-72.8)	(—)	12 Actions	2008	

削減目標設定 の方式	2050年での必要削減率(%、2005年比)											
	世界	先進 国	途上 国	アジア (除日 本)	中国	インド	インドネ シア	日本	韓国	マレーシ ア	タイ	ベト ナム
イ 一人あたり等排出 量	58	83	42	42	68	-51	15	83	85	67	61	12
ロ GDPあたり等排出 量	58	46-58	57-65	58-63	59-61	41-53	67	18-43	49-57	57-60	54-65	60-74
ハ 一人あたり等累積 排出量	58	95	34	43	97	-100	49	94	99	93	85	32

マイナスは2005年に比して許容排出量の増加を意味する

インドネシア及びマレーシアは、土地利用起源の排出・吸収を除外した値

ロの方式で値に幅があるのは、GDP成長率想定の変動であり、ここには既往推計の低位及び高位に対応するものを記している

Required GHG reduction ratio in 2050 compared with year 2005, to meet the global 50% reduction

Burden share scheme	Required GHG reduction ratio compared with year 2005											
	World	Annex- I	Non- Annex I	Asia except Japan	China	India	Indonesia	Japan	Korea	Malaysia	Thailand	Vietnam
pCAP	58	83	42	42	68	-51	15	83	85	67	61	12
pGDP	58	46-58	57-65	58-63	59-61	41-53	67	18-43	49-57	57-60	54-65	60-74
pCUM	58	95	34	43	97	-100	49	94	99	93	85	32

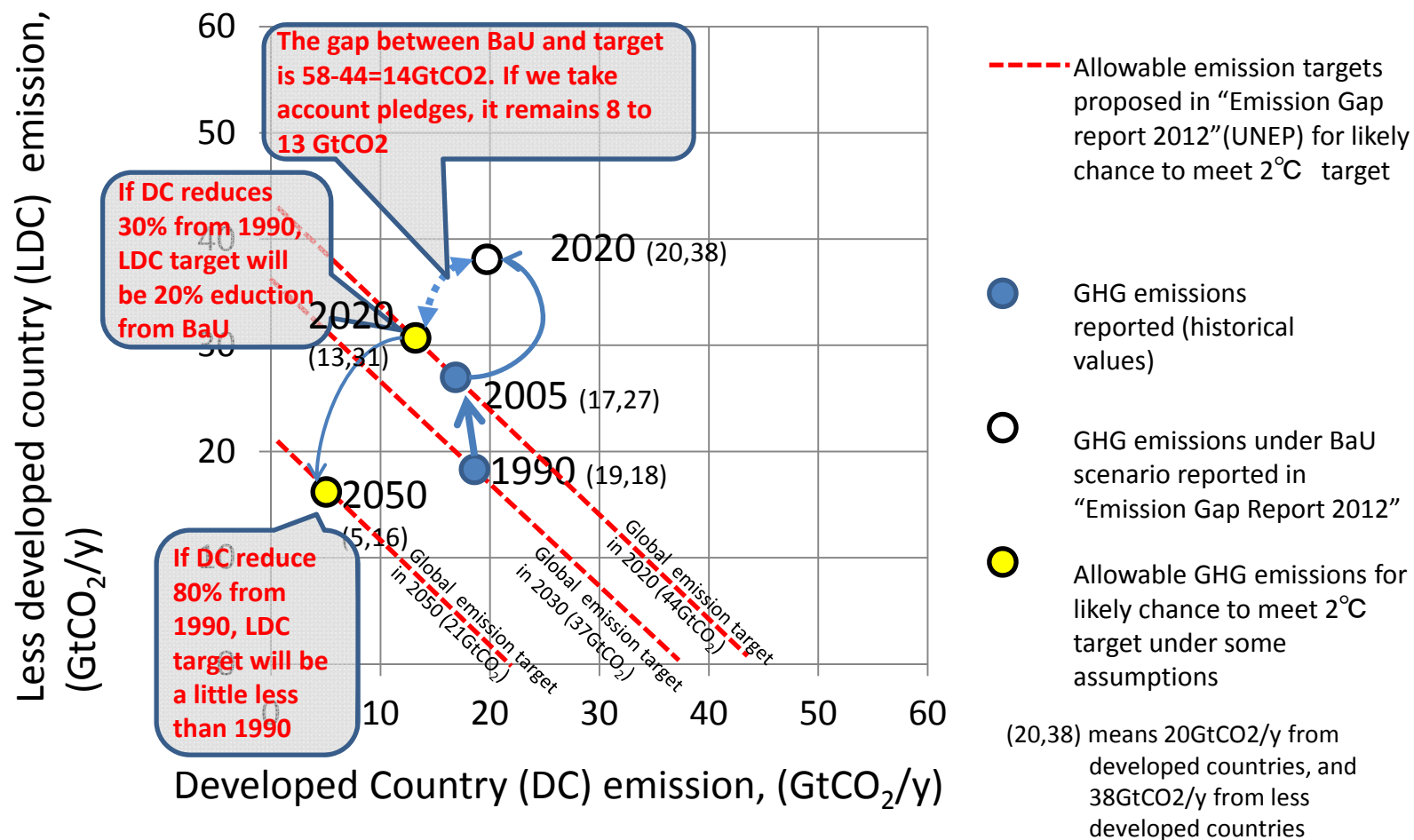
Minus is an increase of allowable emission compared with year 2005

Values of Indonesia and Malaysia are excluding emission/sink of LULC sectors

Ranges of pGDP are corresponding with ranges of GDP projections in references

Matsuoka, et al., 2013, How to approach Asian Low-Carbon Societies?
Global Environmental Research, 17(1), 3-10

Allowable emissions in Developed Countries (DC) and Less Developed Countries (LDC)



Final Remarks

—Lessons from the experience of applying the approach—

1. Importance of 1) showing explicitly and quantitatively the alternative scenarios, 2) proposing several combinations of necessary actions/policies which satisfy the prescribed targets, 3) indicating and comparing illustratively the social, economical and financial effects of the combinations.
2. Importance of describing explicitly and quantitatively the role of constraints, such as;
1) Financial constraint, 2) Experts capacity constraint, and 3) Management capacity constraint
And also
4) Complimentarily and competitiveness of these constraints with related policies
5) Inclusion of mitigation options to these constraints
3. Strong leadership, supports and ownerships by the heads and citizens of the regions on Low Carbon Developments.
4. Importance of local facilitators between the regional heads, citizens and the researchers, and their nurturing



15th AIM International Workshop on 20-22 February 2010

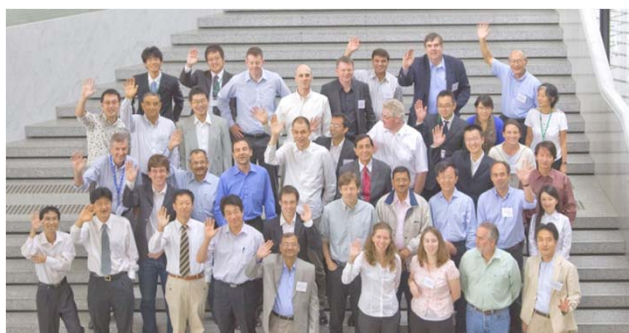


AIM Training Workshop on 27-31 October 2008



AIM Training Workshop on 16-20 October 2006

Our Capacity Building Activity on Asian Low Carbon Society Scenario Making since 1996



Asian Modeling Meeting at Tsukuba on 17-18 September 2009



14th AIM International Workshop on 14-15 February 2009



AIM Training Workshop on 2-14 August

研究総合推進費S-6 一般公開シンポジウム



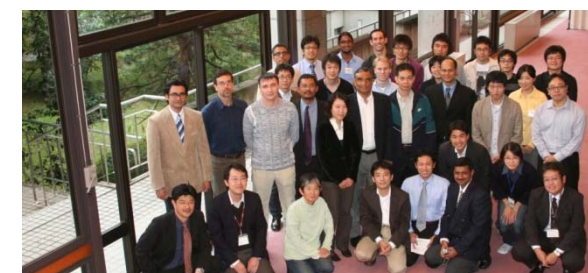
1st AIM International Workshop on 1-2 February, 1996



17th AIM International Workshop, 17-19, February 2012



16th AIM International Workshop on 19-21 February 2011



AIM Training Workshop on 22-26 October 2007

[illegible]

Strong supports of Low Carbon Developments by national and regional leaders and their announcements



日マ共同研究で施策12件発表 イスカンドルの低炭素化を支援

イスカンドル開発局 (IRDA) とマレーシア科学大学 (UTM) は、環境協力機構 (JICA) などと共同で、日本とマレーシアが共同で進める研究プロジェクトの研究成果として、ジョホール州南部のイスカンドル・マレーシア (イスカンドル開発地域 - IRD) の低炭素化に向けた施策案 12 件を発表した。イスカンドルを低炭素都市化のモデルケースとして目指すことを目的とする。今後、調査を経て、正式に政策として発表する。



依斯干達 吸炭203億

【本紙記者】依斯干達 (ISD) は、2012 年 11 月 24 日、依斯干達 (ISD) の低炭素化に向けた施策案 12 件を発表した。イスカンドルを低炭素都市化のモデルケースとして目指すことを目的とする。今後、調査を経て、正式に政策として発表する。



依斯干達 吸炭203億

【本紙記者】依斯干達 (ISD) は、2012 年 11 月 24 日、依斯干達 (ISD) の低炭素化に向けた施策案 12 件を発表した。イスカンドルを低炭素都市化のモデルケースとして目指すことを目的とする。今後、調査を経て、正式に政策として発表する。



依斯干達 吸炭203億

【本紙記者】依斯干達 (ISD) は、2012 年 11 月 24 日、依斯干達 (ISD) の低炭素化に向けた施策案 12 件を発表した。イスカンドルを低炭素都市化のモデルケースとして目指すことを目的とする。今後、調査を経て、正式に政策として発表する。



依斯干達 吸炭203億

【本紙記者】依斯干達 (ISD) は、2012 年 11 月 24 日、依斯干達 (ISD) の低炭素化に向けた施策案 12 件を発表した。イスカンドルを低炭素都市化のモデルケースとして目指すことを目的とする。今後、調査を経て、正式に政策として発表する。



PM Najib: Iskandar Malaysia has exceeded expectations

【本紙記者】依斯干達 (ISD) は、2012 年 11 月 24 日、依斯干達 (ISD) の低炭素化に向けた施策案 12 件を発表した。イスカンドルを低炭素都市化のモデルケースとして目指すことを目的とする。今後、調査を経て、正式に政策として発表する。




Metro
Cycling for charity
Low carbon society
All parties in Iskandar Malaysia have roles to play in transforming the economic growth corridor as a sustainable living place for the well-being of the society.




Balanced approach
Cooperate to transform Iskandar Malaysia for sustainable living
By ZAZALI MUSA
All parties in Iskandar Malaysia have roles to play in transforming the economic growth corridor as a sustainable living place for the well-being of the society.



NEW STRAITS TIMES
HOME NATION STREETS WORLD BUSINESS SPORTS LIFE
LATEST NEWS
Najib confident of Iskandar M'sia's investment drawing power
PUTRAJAYA: 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.



Cooperate to transform Iskandar Malaysia for sustainable living
By ZAZALI MUSA
All parties in Iskandar Malaysia have roles to play in transforming the economic growth corridor as a sustainable living place for the well-being of the society.

Up to now, we have conducted 8 times of stakeholder meetings (Focus Group Discussion) for discussing the Iskandar regional Low Carbon Society Blue Print, Malaysia.



Final Remarks

—Lessons from the experience of applying the approach—

1. Importance of 1) showing explicitly and quantitatively the alternative scenarios, 2) proposing several combinations of necessary actions/policies which satisfy the prescribed targets, 3) indicating and comparing illustratively the social, economical and financial effects of the combinations.
2. Importance of describing explicitly and quantitatively the role of constraints, such as;
1) Financial constraint, 2) Experts capacity constraint, and 3) Management capacity constraint
And also
4) Complimentarily and competitiveness of these constraints with related policies
5) Inclusion of mitigation options to these constraints
3. Strong leadership, supports and ownerships by the heads and citizens of the regions on Low Carbon Developments.
4. Importance of local facilitators between the regional heads, citizens and the researchers, and their nurturing