The 14th AIM International Workshop
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Backcast Modeling: Tools for Development of Quantitative Roadmaps towards (Sexy-) LCSs

Shuichi Ashina,
National Institute for Environmental Studies (NIES)

Overview of Modeling Activities for Japan LCS Study

LCS Models

Three model groups with two time frame

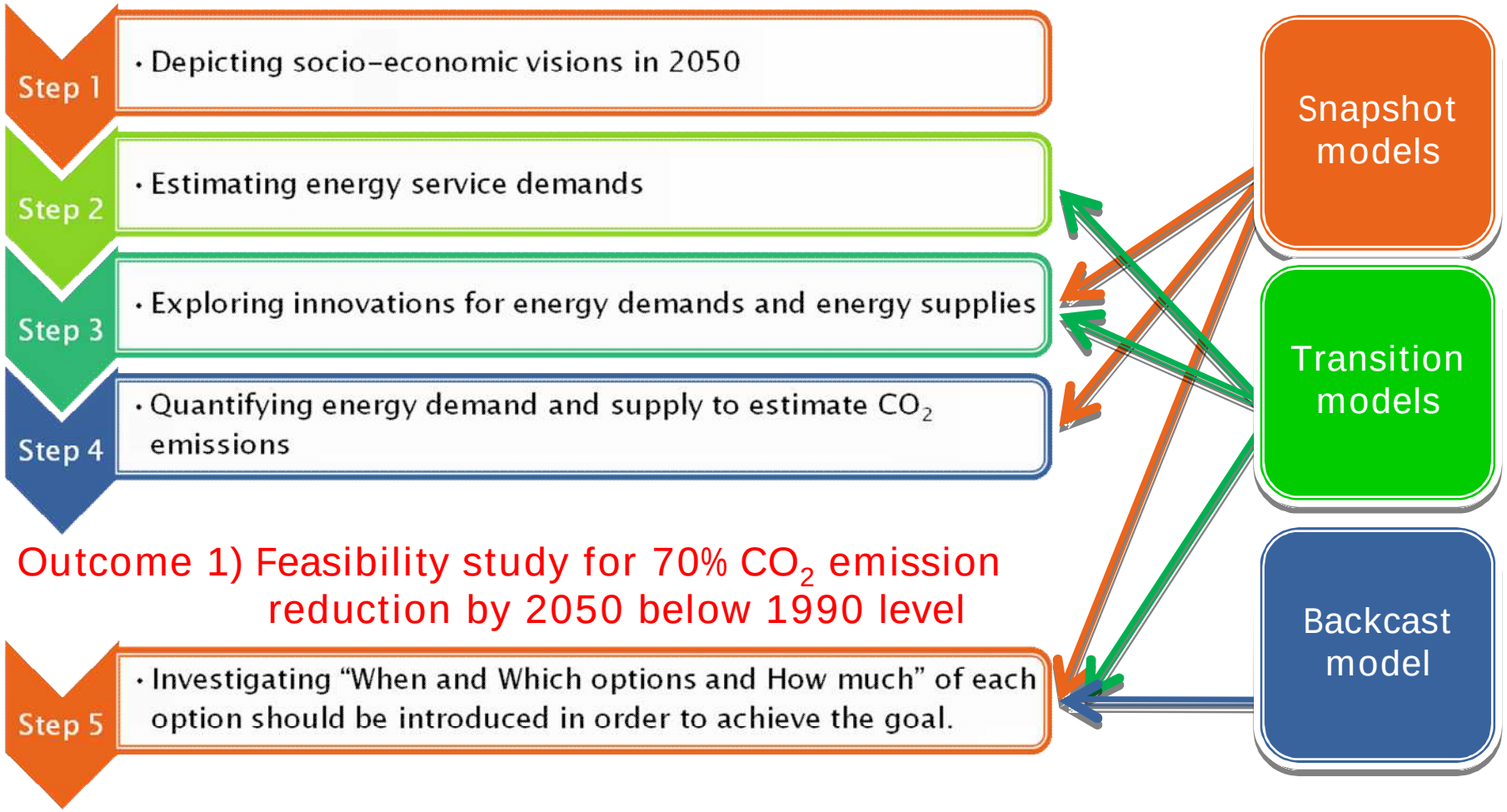
Time frame

Time frame		
Certain year (e.g. 2050)	Snapshot models	• describing LCS in a certain future, concretely, quantitatively, and consistently with physical, economical, technological laws.
Over the years (e.g. 2000–2050)	Transition models	• focuses on the dynamics and trend transition of the society, economic system, and the technological system.
	Backcast model	• Representing inter-temporal optimal strategy on introduction of new technologies and economic activity change in order to achieve the future targets.

Environmental Option Database (EDB)

Stores information of activities which accompany or reduce GHGs emission.

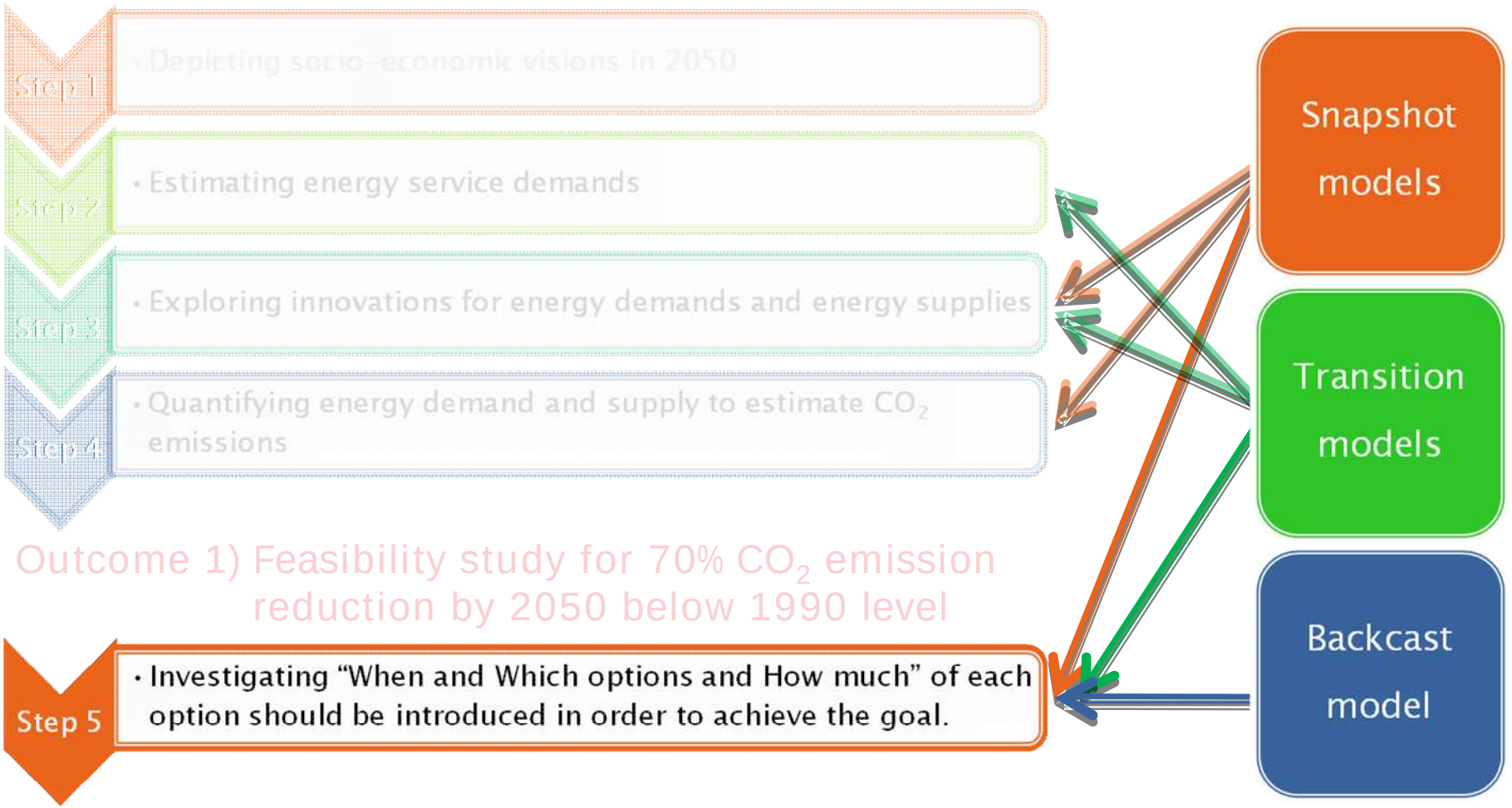
Steps towards Japan LCS Scenarios



Outcome 1) Feasibility study for 70% CO_2 emission reduction by 2050 below 1990 level

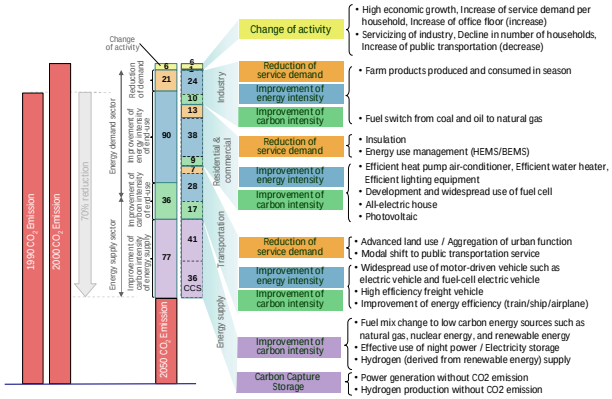
Outcome 2) Roadmap and Dozen Actions toward LCS

Steps towards Japan LCS Scenarios



Outcome 2) Roadmap and Dozen Actions toward LCS

How to depict LCS roadmaps?

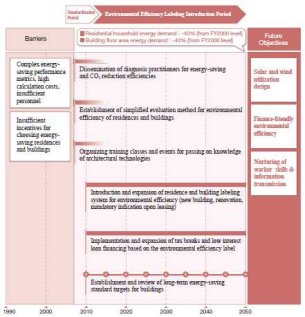


Target Vision in 2050

Backcast Model

Narrative Roadmaps

← Will be explained from Ehara-san and Iwabuchi-san



Roadmaps

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

A Dozen actions towards Low-Carbon Societies

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.

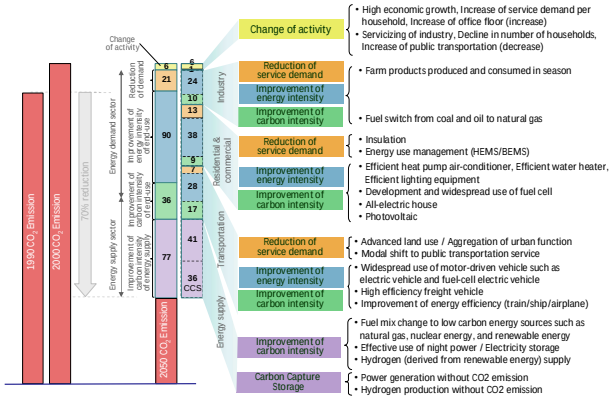
10. Next Generation Fuels Development of carbon free hydrogen- and/or biomass-based energy supply system with required infrastructure

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.

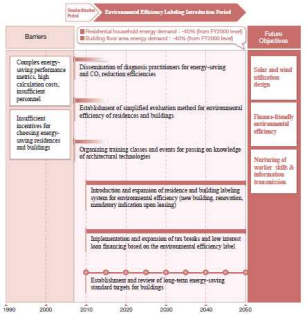
How to depict LCS roadmaps?



Target Vision in 2050

Backcast Model

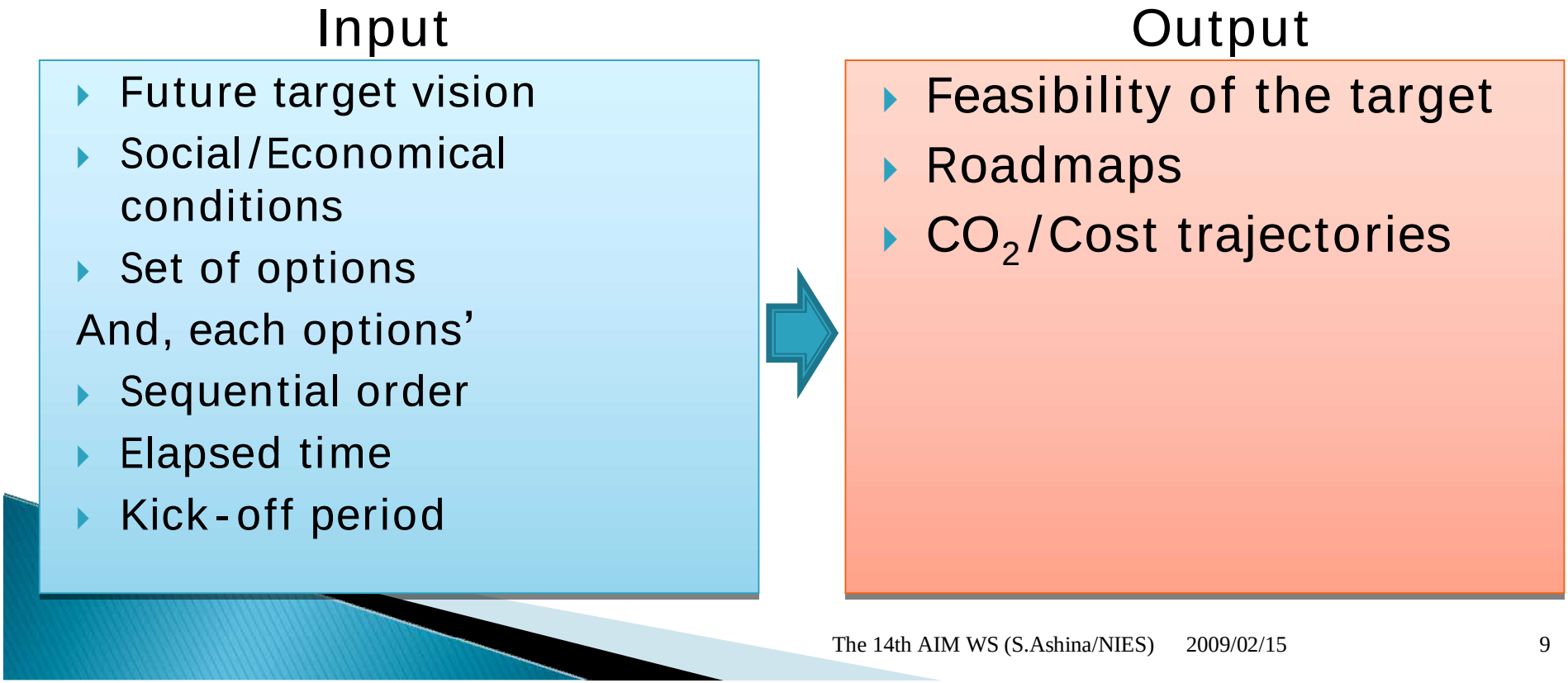
Narrative Roadmaps



Roadmaps

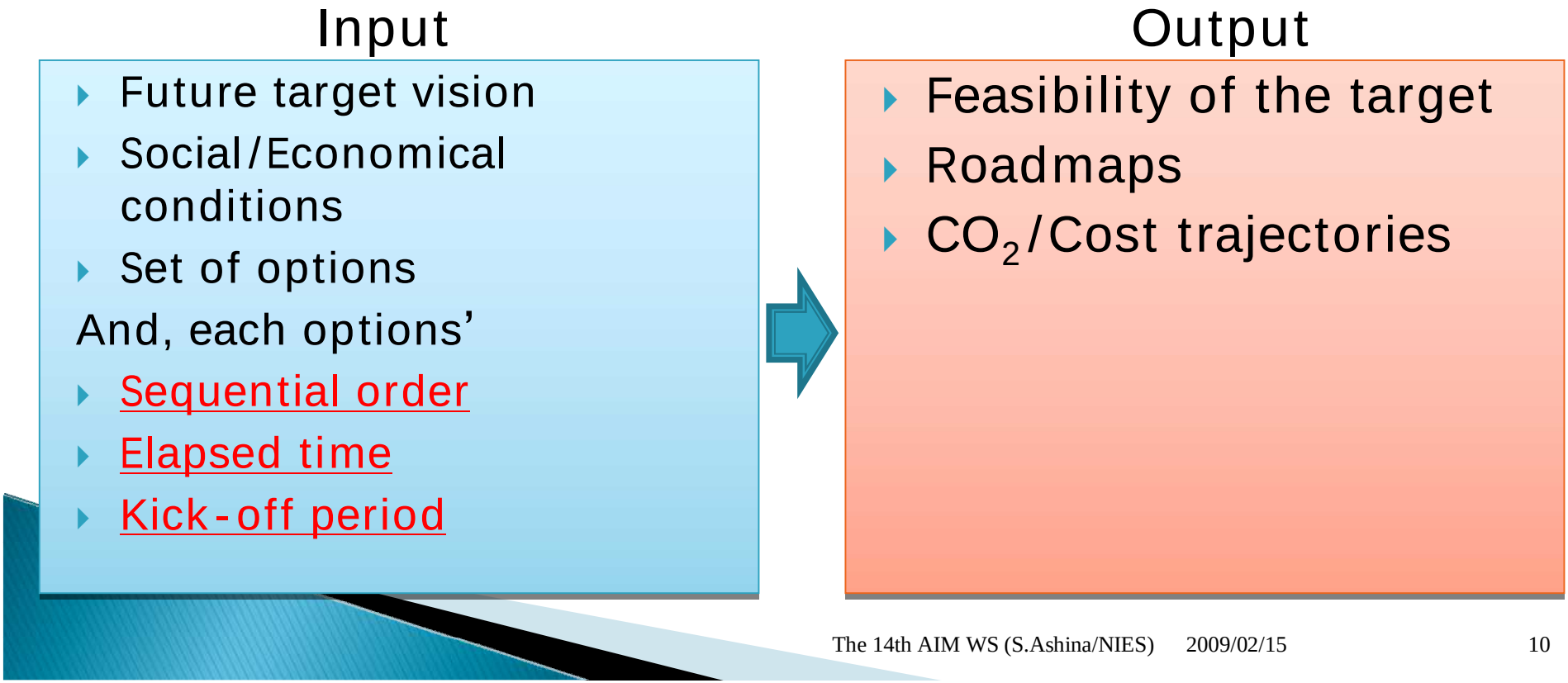
Backcast Model: Overview

- 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.



Why did we develop the Backcast Model? To involve…

- 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.

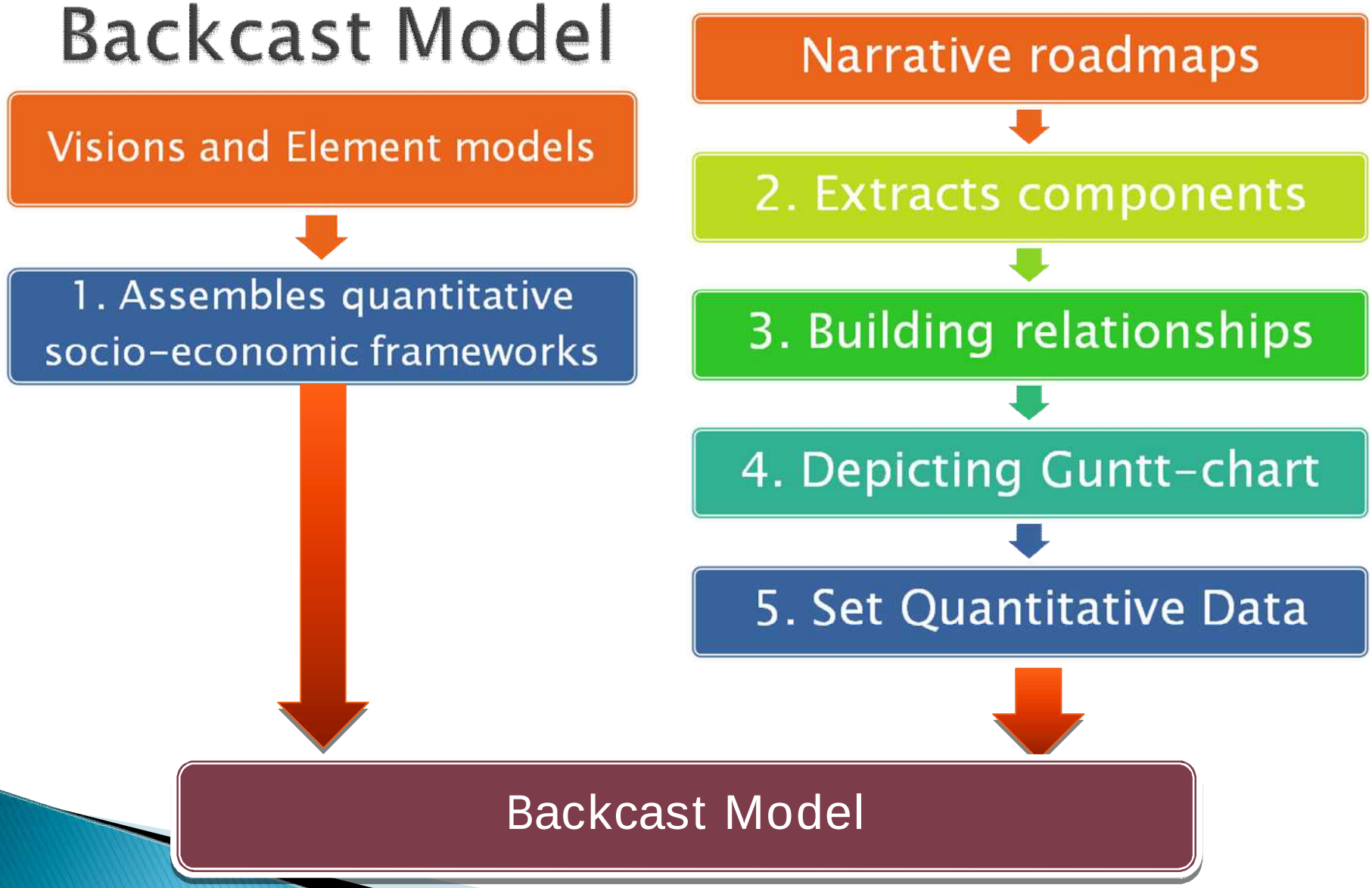


Steps towards Operation of Backcast Model

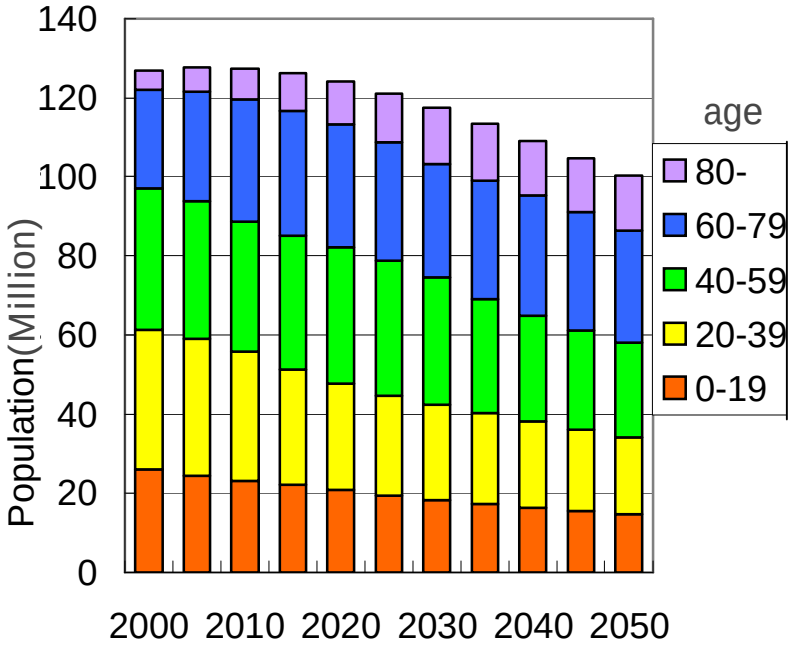
1. Assembles quantitative socio-/economic-frameworks used in depicting future visions
2. Extracts individual components from the Narrative roadmaps
3. Builds relationships between components
4. Depicts Gantt-chart and judges the validity of included components and relationships
5. Sets quantitative data into components

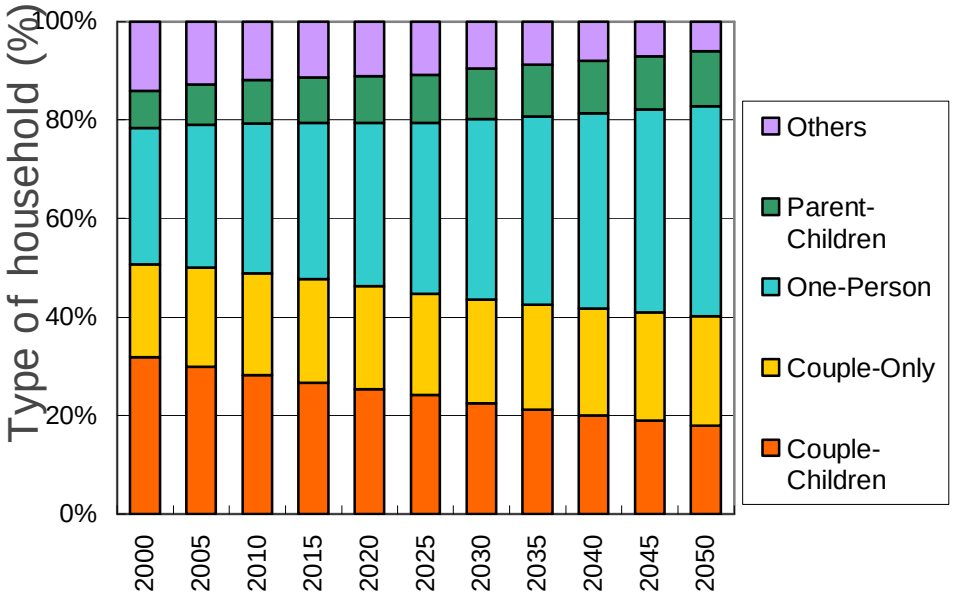
Backcast model

Steps towards Operation of Backcast Model



Projection of population and households under Vision A by Population and Household Model



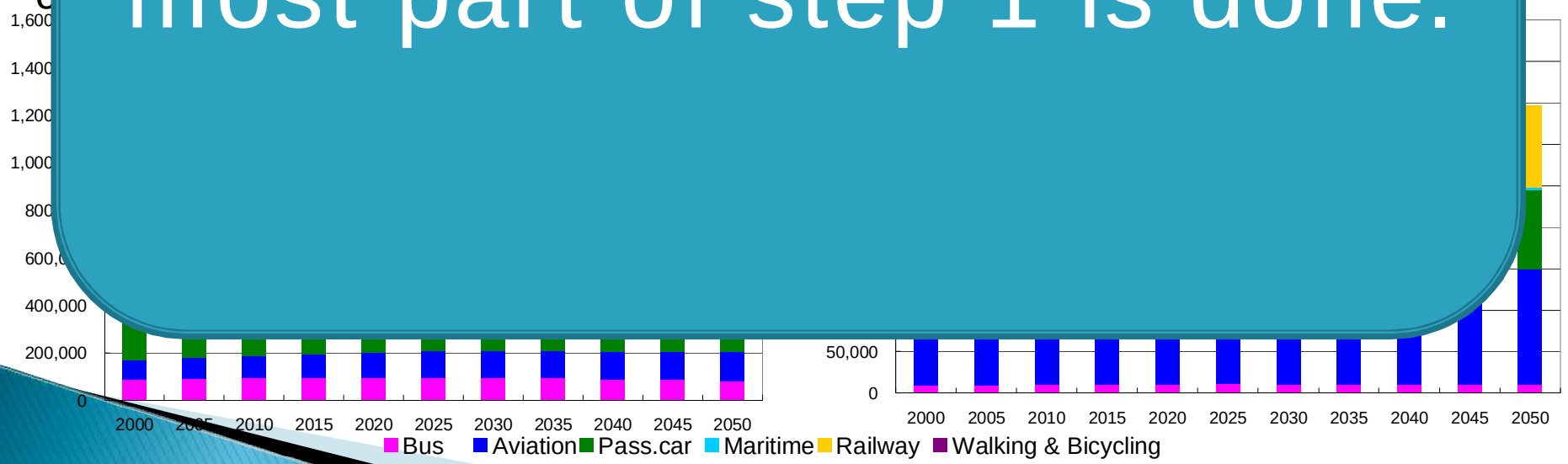


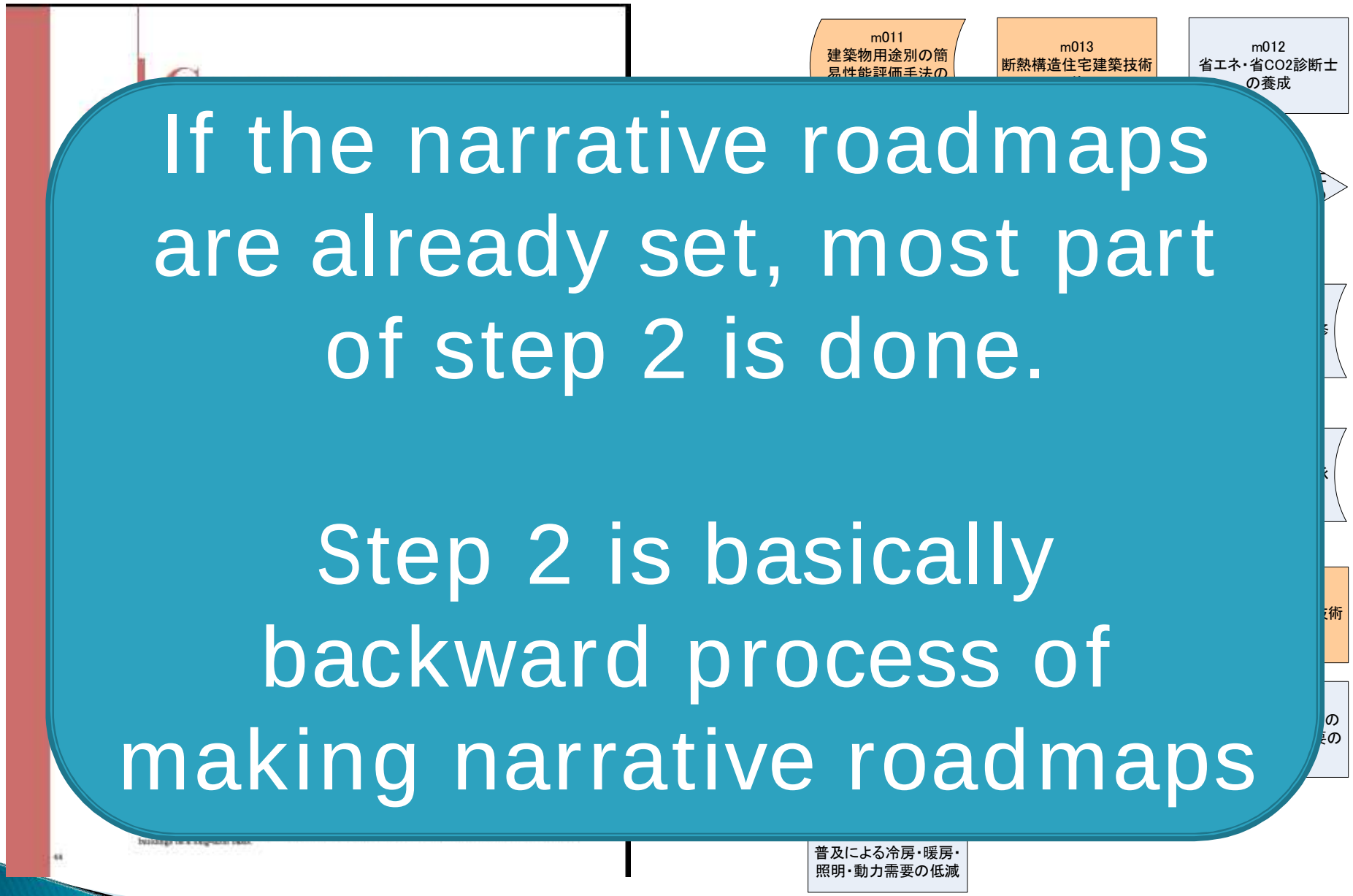
year	2000	2050	
		A	B
Population (million)	126.9	94.5	100.3
Aged population ratio (%)	17.4	38.0	35.8
Average number of household	2.71	2.19	2.38
Single-person households (%)	27.6	42.6	35.1

Passenger Transportation Demand Model: Application to Japan

Indices	Example of element
Pers	

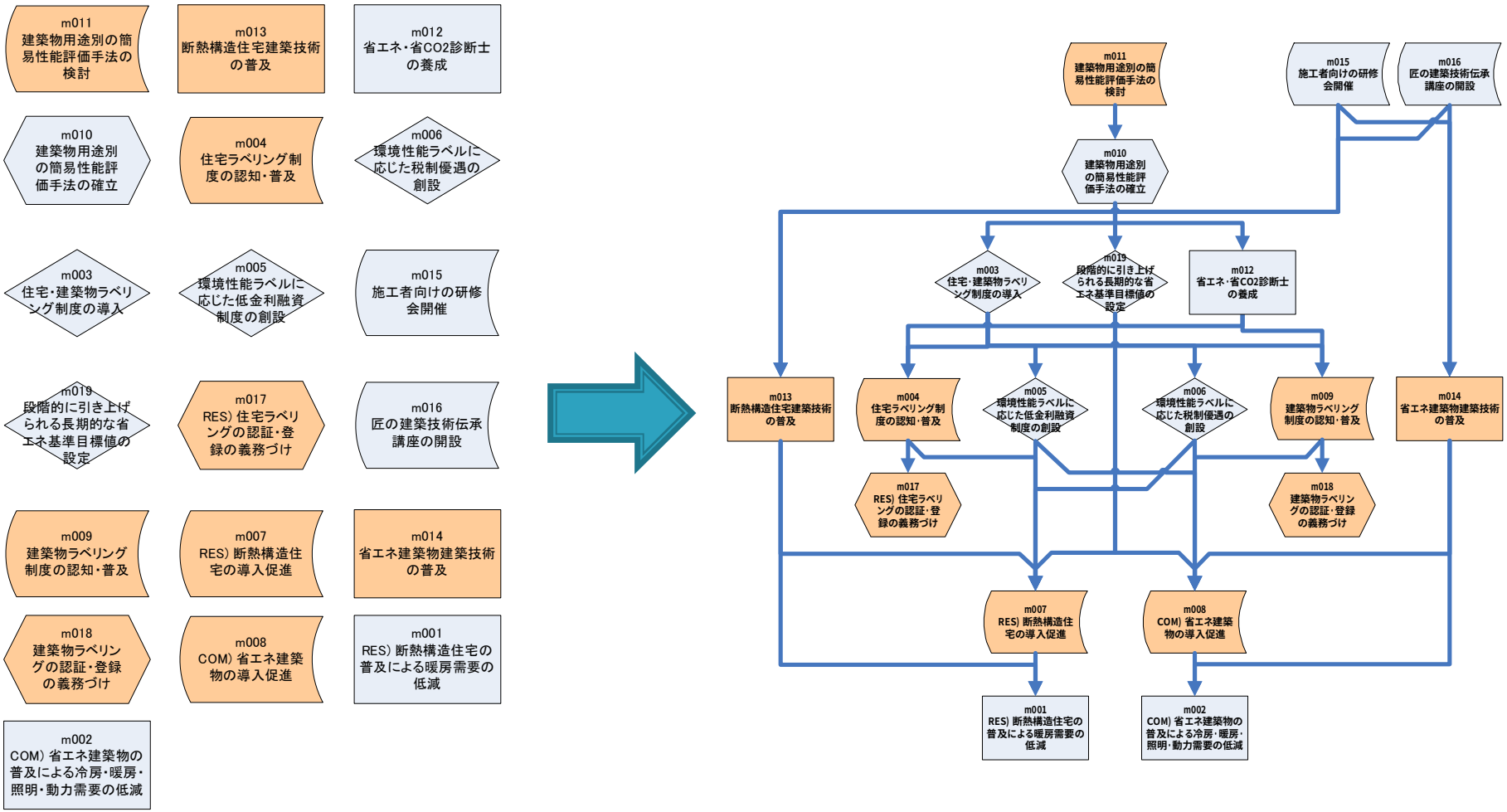
If the vision is already set, most part of step 1 is done.





If the narrative roadmaps are already set, most part of step 2 is done.

Step 2 is basically backward process of making narrative roadmaps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断熱構造住宅建築技術の普及
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住宅・建築物ラベリング制度の導入
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環境性能ラベルに応じた低金利融資制度の創設
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施工者向けの研修会開催
m019
段階的に引き上げられる長期的な省エネ基準目標値の設定
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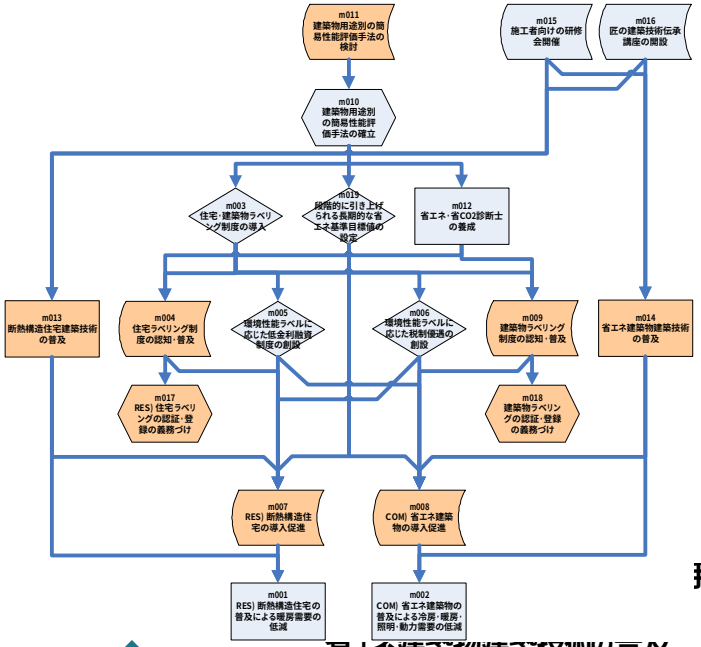

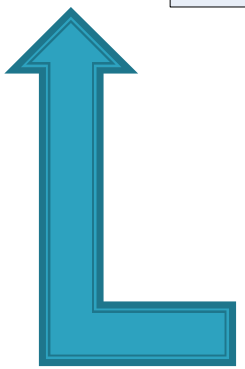

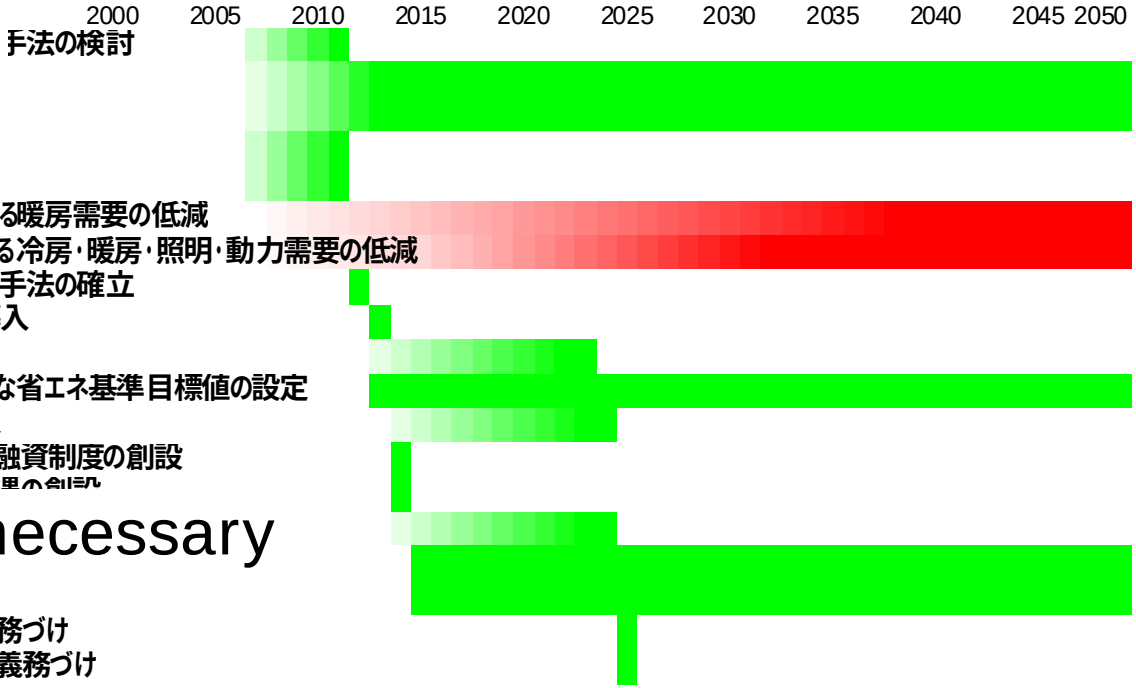

手法の検討
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Back to Step 2/3, if necessary

省エネ建築物の導入促進
住宅ラベリングの認証・登録の義務づけ
建築物ラベリングの認証・登録の義務づけ

Input data sheet in the Backcast model (1 /4)

Init/Max quantity

How many years will be taken for implementing of options

	FLAG	CONTFLA	FLOW	QINIT	QMAX	YRINIT	YREND	S0	SMIN	LIFE	DPRYR	COST
m001	1	1		0	1	2008	2070	35	30	50	15	5685.57
m002	1	1		0	1	2008	2070	50	20	50	15	4378.25
m003	1			0	1	2010	2070	1	1		1	0
m004	1			0	1	2010	2070	10	10		10	0
m005	1			0	1	2010	2070	1	1		1	0
m006	1			0	1	2010	2070	1	1		1	0

When will the option become feasible?
When will the option become not available?

Ex. CCS will be available after 2020

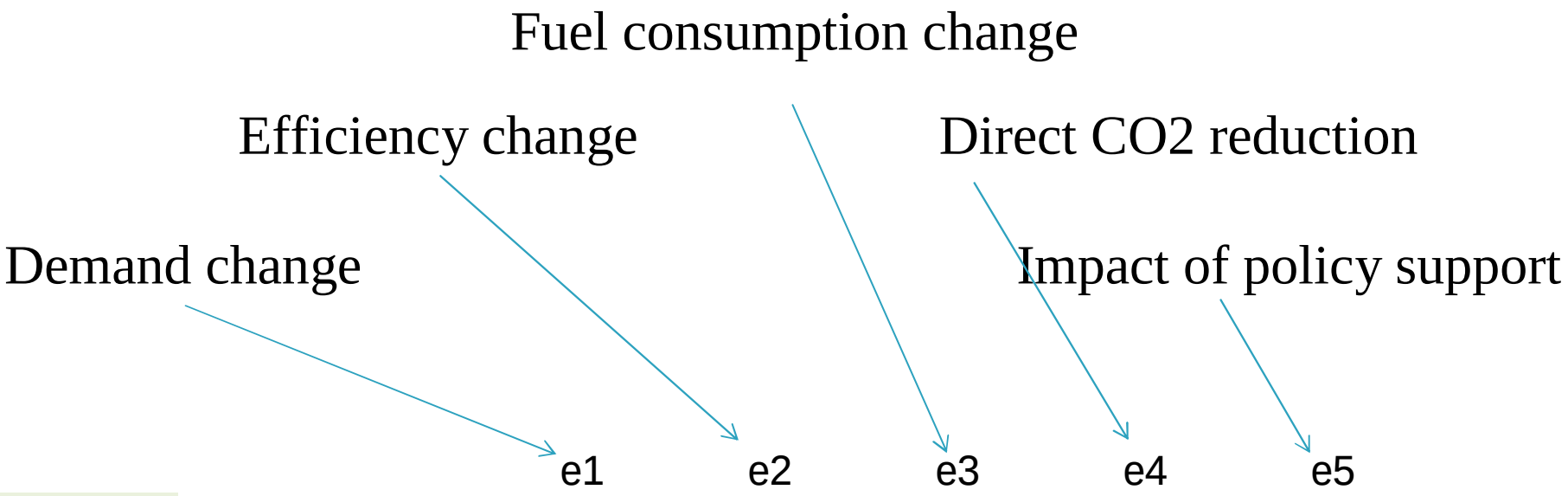
Life and Depreciation year

Additional cost

These information are same as AIM/Enduse (or bottom-up type technology selection model)

Input data sheet in the Backcast model (2/4)

Five types of effects are included in the model



		e1	e2	e3	e4	e5
m001	j2	-11.022				
m002	j1	-2.9406				
m002	j2	-6.5957				
m002	j5	-0.7568				
m002	j6	-1.6653				

Input data sheet in the Backcast model (3/4)

Future energy service demands (Base case)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
i1	j1	15.47	15.57	15.67	15.77	15.87	15.97	16.07	16.17	16.27	16.37	16.47	16.57	16.66	16.76	16.86	16.96	17.06	17.16
i1	j2	1.374	1.359	1.343	1.327	1.312	1.296	1.281	1.265	1.249	1.234	1.218	1.203	1.187	1.171	1.156	1.14	1.124	1.109
i1	j3	77.05	76.98	76.91	76.84	76.78	76.71	76.64	76.57	76.5	76.43	76.36	76.29	76.22	76.15	76.08	76.01	75.95	75.88
i1	j4	35.75	36.15	36.55	36.95	37.36	37.76	38.16	38.56	38.96	39.36	39.76	40.16	40.56	40.96	41.37	41.77	42.17	42.57
i1	j5	6.969	7.077	7.185	7.293	7.4	7.508	7.616	7.723	7.831	7.939	8.047	8.154	8.262	8.37	8.477	8.585	8.693	8.8
i1	j6	31.83	31.53	31.22	30.92	30.62	30.31	30.01	29.71	29.4	29.1	28.8	28.49	28.19	27.89	27.59	27.28	26.98	26.68
i1	j7	7.614	7.532	7.449	7.367	7.285	7.203	7.121	7.039	6.956	6.874	6.792	6.71	6.628	6.546	6.463	6.381	6.299	6.217
i1	j8	19.84	20.17	20.49	20.82	21.15	21.47	21.8	22.13	22.45	22.78	23.1	23.43	23.76	24.08	24.41	24.74	25.06	25.39
i1	j9	82.37	81.85	81.32	80.79	80.27	79.74	79.21	78.69	78.16	77.64	77.11	76.58	76.06	75.53	75	74.48	73.95	73.42
i1	j10	4.328	4.359	4.39	4.421	4.452	4.483	4.514	4.545	4.575	4.606	4.637	4.668	4.699	4.73	4.761	4.791	4.822	4.853
i1	j11	106.9	106.2	105.6	104.9	104.3	103.6	103	102.3	101.7	101	100.4	99.72	99.07	98.42	97.77	97.11	96.46	95.81
i1	j12	6.187	6.212	6.237	6.261	6.286	6.31	6.335	6.359	6.384	6.408	6.433	6.457	6.482	6.506	6.531	6.555	6.58	6.604
i1	j13	142.4	143.2	144.1	144.9	145.7	146.6	147.4	148.3	149.1	149.9	150.8	151.6	152.4	153.3	154.1	154.9	155.8	156.6
i1	j14	36.89	37.04	37.2	37.35	37.51	37.66	37.82	37.97	38.13	38.28	38.44	38.59	38.75	38.9	39.06	39.21	39.37	39.52

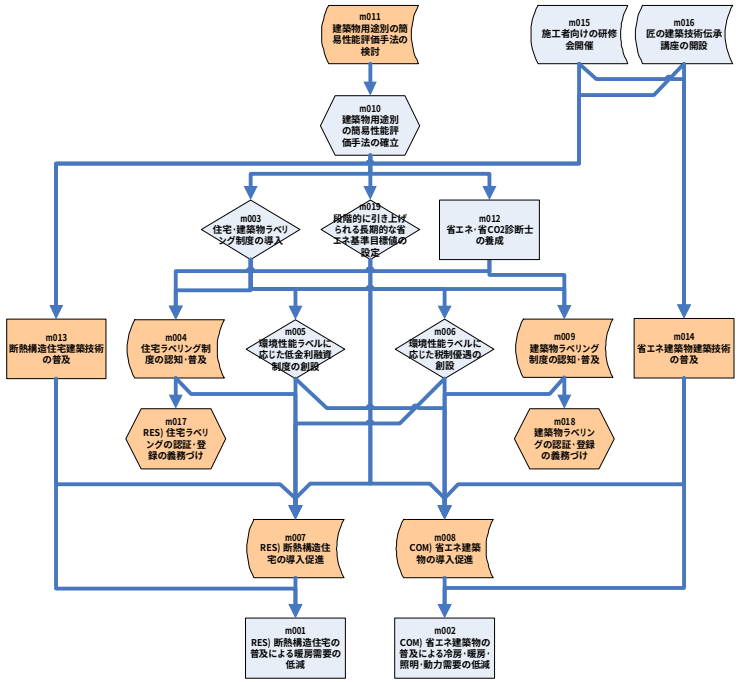
These information are same as Energy Snapshot Tool (ESS)

Input data sheet in the Backcast model (4/4)

Future energy service demands (Base case)

		DUMMY
m001	m007	1
m001	m013	1
m002	m008	1
m002	m014	1

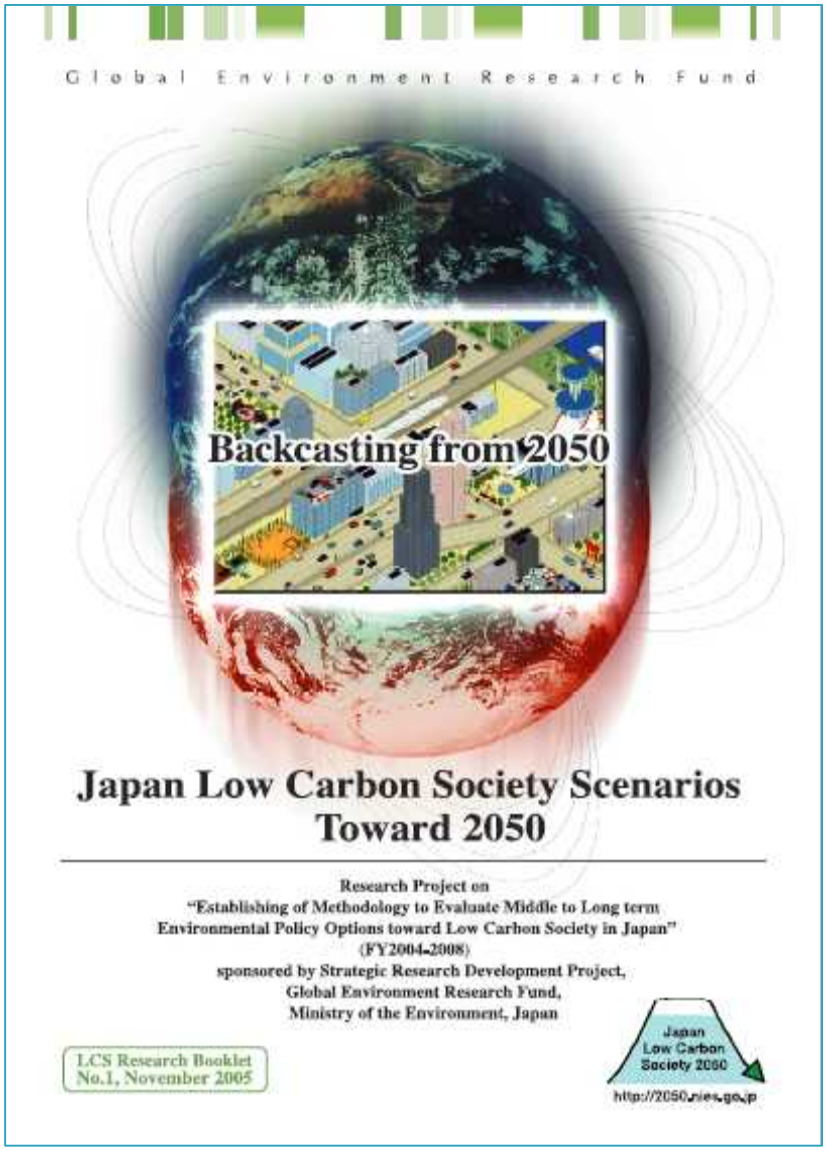
Main　　Prerequest option



This is JUST translation from the result of Step 3/4.

On next March or April…

- Manual of Backcast Model (and development of Narrative roadmaps?) with datasets for Japan LCS Study will be released.




Thank you
ashina.shuichi@nies.go.jp