Low-carbon development plan scoping-meeting
-Scientific approach to low-carbon development planning in Cambodia –
Organized by
Ministry of Environment Cambodia, International Low Carbon Society Research Network (LCS-RNet), Secretariat in Institute for Global Environmental Strategies (IGES), National Institute for Environmental Studies (NIES) and Kyoto University

Low Carbon Development in Asia

Mikiko Kainuma

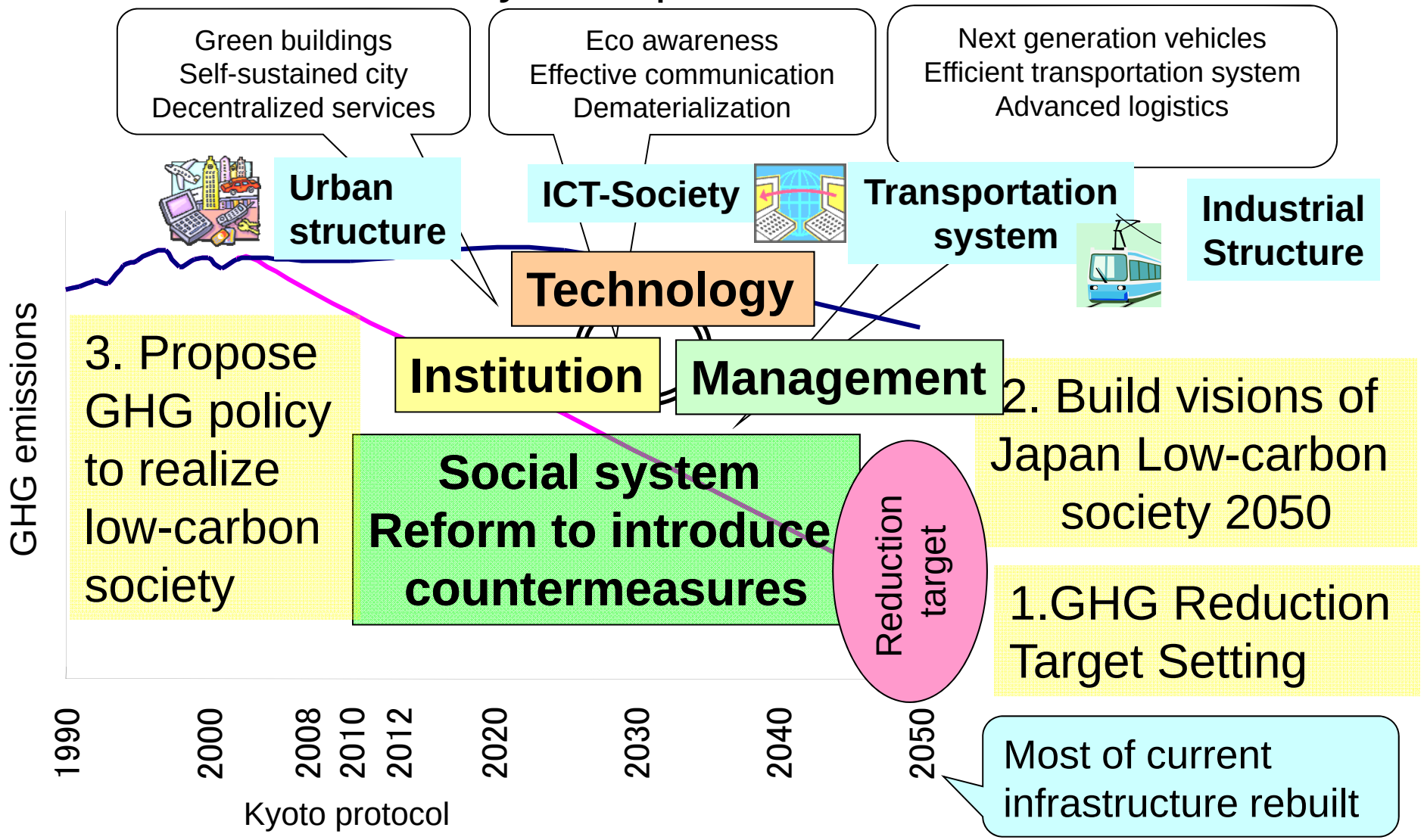
National Institute for Environmental Studies, Japan

10-11 January 2011
Sunway Hotel, Phnom Penh, Cambodia

AIM
ASIA-PACIFIC INTEGRATED MODEL

Research project on Japan Low-carbon society scenario

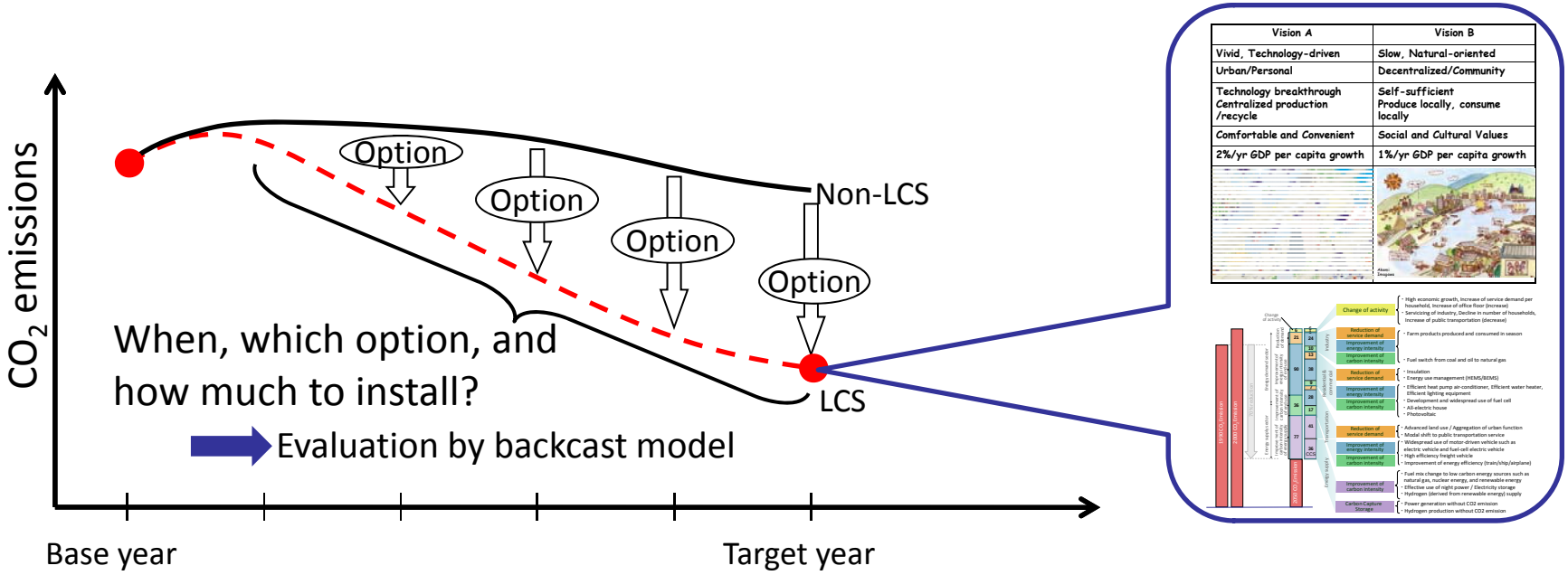
studied by 60 Japanese researchers



[FY2004-2009, funded by Global Environmental Research Program, MOEJ]

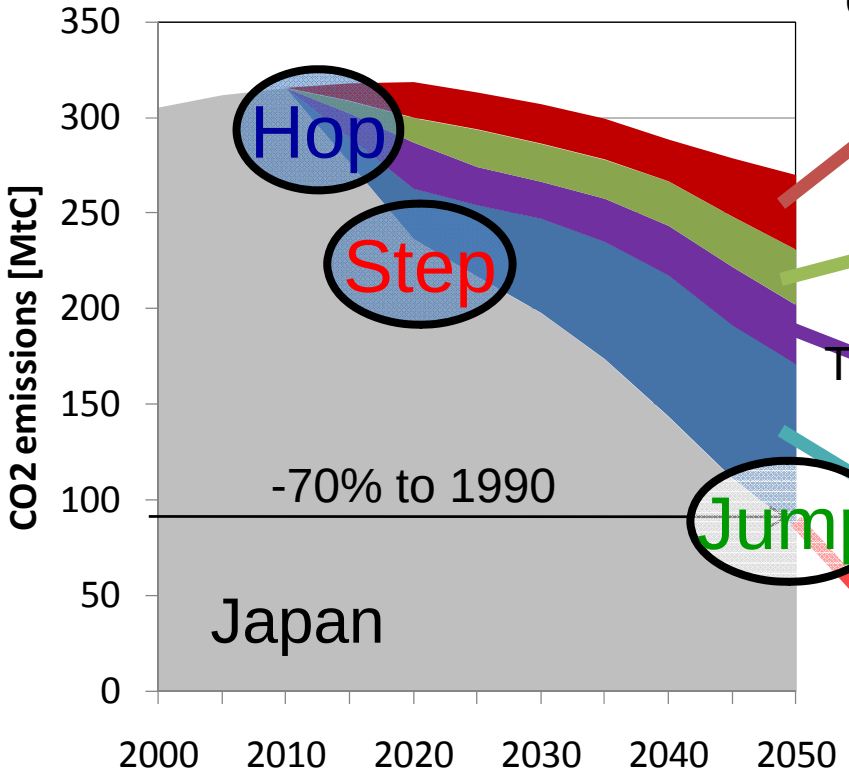
What Japan Low-carbon society scenario study has done

- We have shown feasibilities of Low-carbonization in Japan by 2050.
  - Some journal articles and reports have been published.
  - Our outcomes (probably) affects national policy/strategy about climate change (esp. CO2 reduction).



- We have made roadmaps: “How to reach the future”

A dozen actions make it possible to reduce 70% CO2 emissions by 2050



Residential/ commercial

Industrial

Transportation

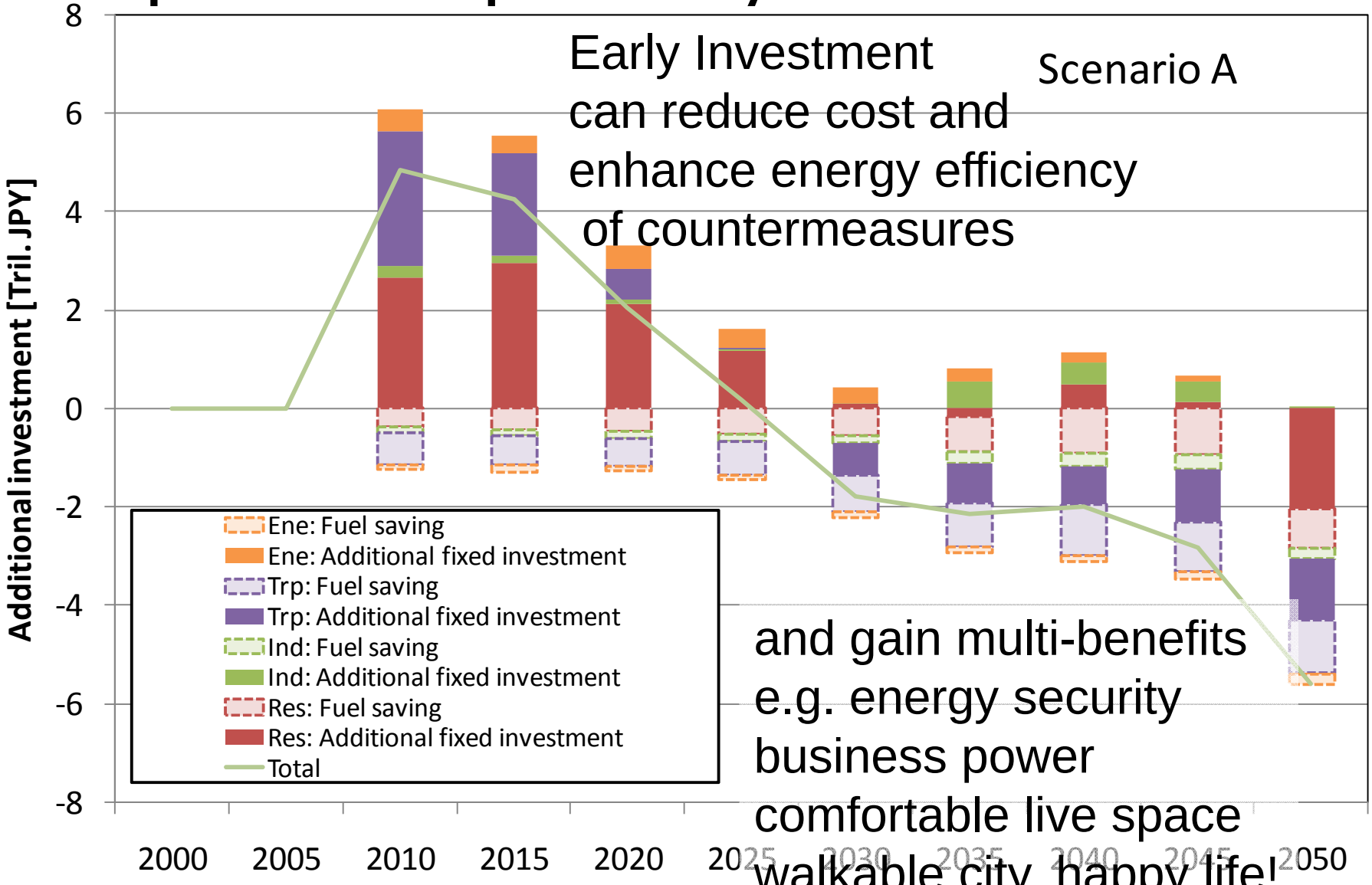
Energy supply

Cross-sector

Key Actions toward LCS in Japan

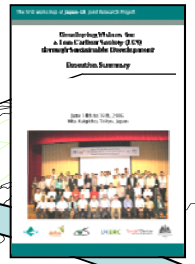
1. Comfortable and Green Built Environment
2. Anytime, Anywhere Appropriate Appliances
3. Promoting Seasonal Local Food
4. Sustainable Building Materials
5. Environmentally Enlightened Business and Industry
6. Swift and Smooth Logistics
7. Pedestrian Friendly City Design
8. Low-Carbon Electricity
9.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

Backcasting model can show optimized pathways towards LCS



Promoting LCS with International Collaboration

Japan-UK Joint Research Project LCS through Sustainable Development



NIES, UKERC, Tyndall Centre
1st Workshop, June 2006, Tokyo
2nd Workshop, June 2007,
3rd Workshop, Feb 2008,

G8 Env. 2008, Kobe

LCS-RNet was endorsed by G8 Env. 2009, Italy

EU

China

Japan

India

Low carbon society

Join research with countries in Asia

COP Side Events since COP11

EMF Workshop on future scenarios
Dec 2006, Tsukuba

AIM International Workshop
Since 1995

AIM Training Workshop: Model development with young scientists since 2002

Asia Low-Carbon Research Project
FY2009-2013, Global Environmental Research Program, MOEJ

Sustainable development through LCS

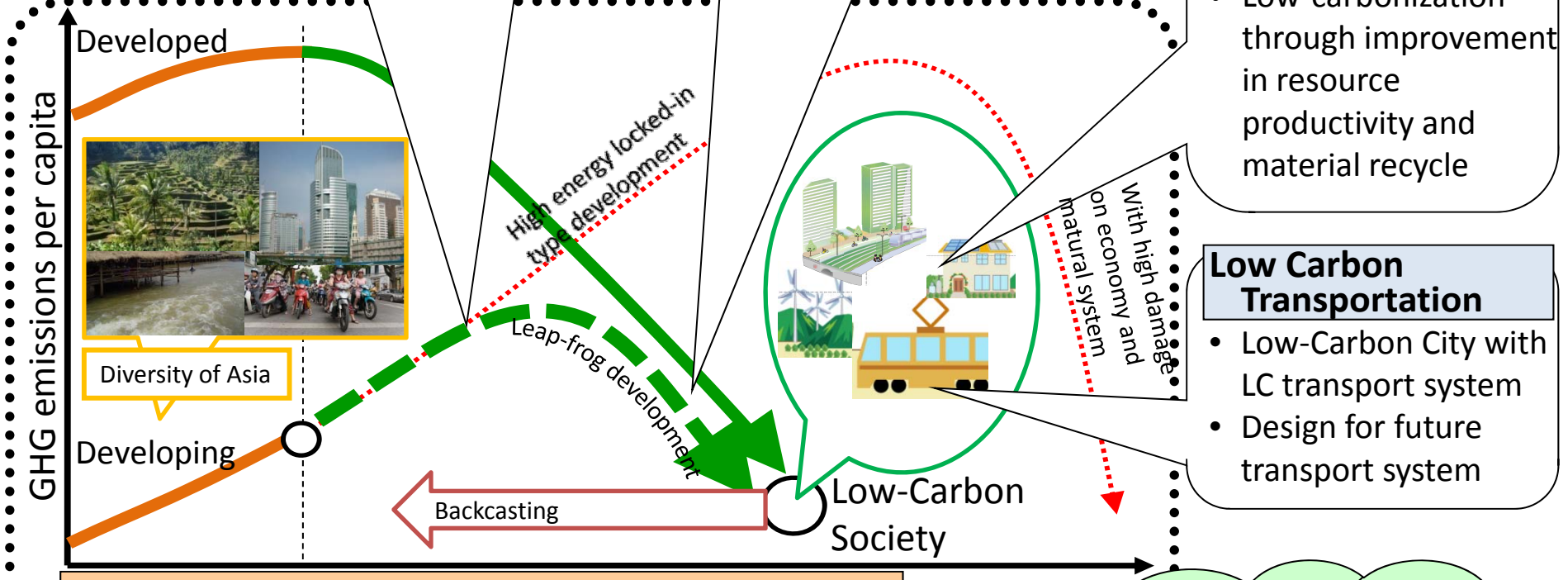
Future trends on socio-economic conditions, energy, resources, regional diversity, culture, lifestyle, etc.

Institutional design for international cooperation

Institutional design for international and regional cooperation regime

Sustainable resource management

- Constructing material accounts
- Low-carbonization through improvement in resource productivity and material recycle



Low Carbon Transportation

- Low-Carbon City with LC transport system
- Design for future transport system

Development of Asia LCS Scenarios

(1) Depicting narrative scenarios for LCS
(2) Quantifying future LCS visions
(3) Developing robust roadmaps by backcasting

- Encouraging the framing for LC policy in each Asian country
- Assistance for international negotiations with scientific basis
- Networking among LCS research in Asia

Policy Packages for Asia LCS

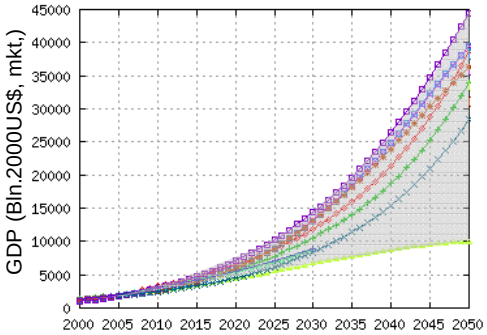
Why we need Sustainable Low Carbon Development in Asia?

- Developing in various aspects
  - Share of population & GDP will be more than 50% by 2050
  - Urbanizing rapidly
  - Increasing production and energy demands

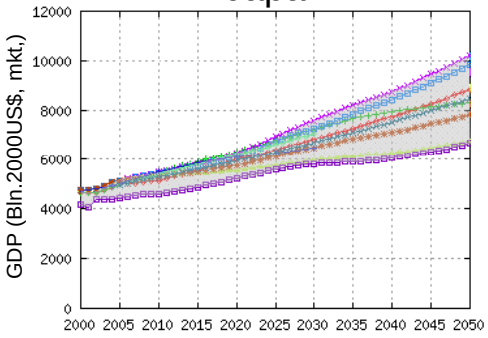
  → Significant impacts on economy & environment
- Needs to avoid lock-in high carbon infrastructures and energy systems
- Needs to improve quality of live
- Various possible pathways

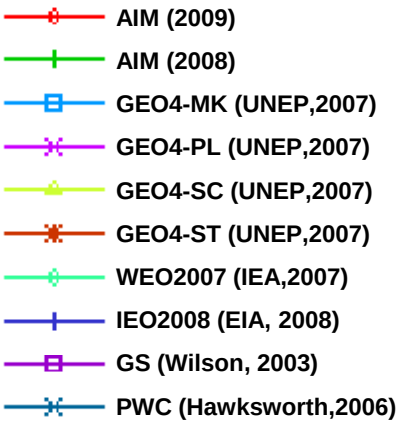
Previous studies reported very wide range of future prospects on Asian region

China

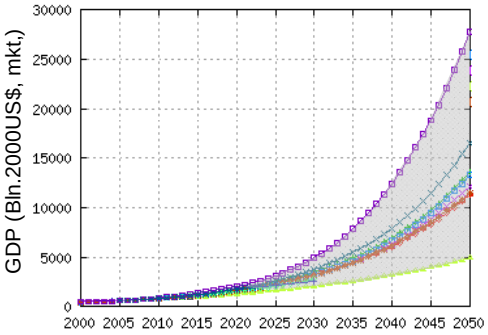


Japan

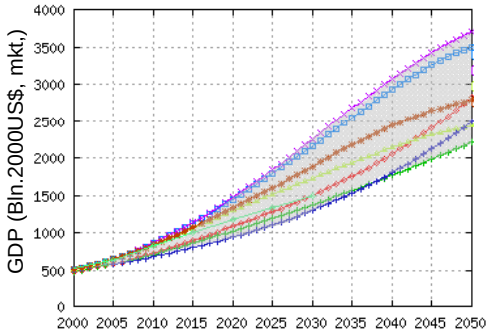




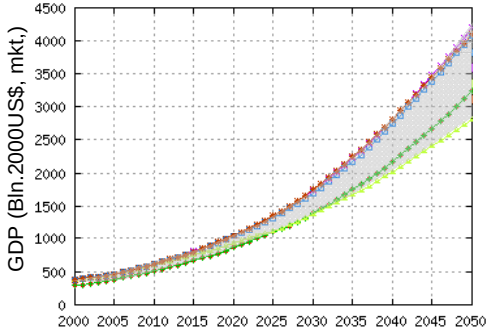
India



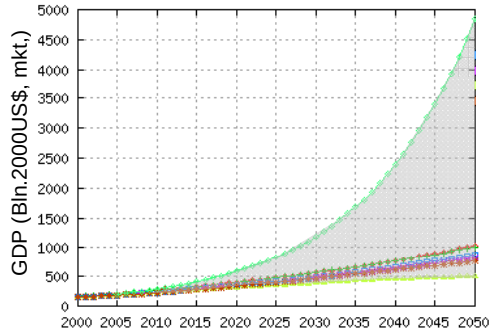
Korea



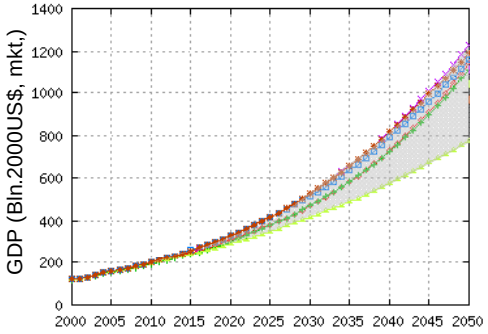
Other Southeast Asia



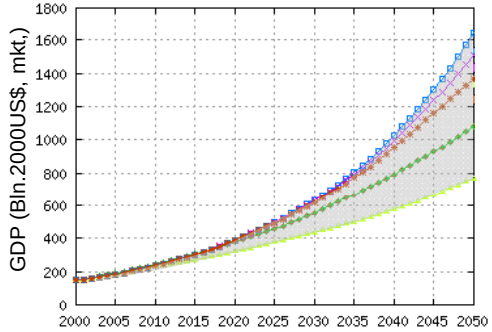
Indonesia



Thailand



Other South Asia



Asian LCS Study (2010)

New challenge is required to stabilize climate

	Emission/GDP Efficiency Improvement (per annual)	Expected Emissions in 2020*		Peak year and expected emissions		
		To 1990	To 2005	Year	To 1990	To 2005
China	-9.73%	+169%	+23%	2010	+248%	+59%
Indonesia	-7.16%	+76%	+6%	2010	+101%	+22%
India	-6.49%	+78%	+16%	2040	+110%	+36%
Japan	-6.20%	-42%	-47%	2010	-6%	-14%
Korea	-9.83%	+25%	-38%	2010	+108%	+3%
Malaysia	-7.84%	+89%	-13%	2010	+161%	+20%
Philippines	-4.06%	+84%	+11%	2040	+261%	+117%
Singapore	-8.27%	+7%	-27%	2010	+43%	-3%
Viet Num	-8.70%	+280%	+68%	2020	+280%	+68%
Thailand	-6.39%	+74%	-3%	2010	+124%	+25%
Taiwan	-7.73%	+45%	-31%	2010	+138%	+13%
Other Asia	-2.36%	+21%	+31%	2040	+64%	+77%
Asia Total	-5.88%	+93%	+9%	2010	+140%	+36%

*: Expected emissions to achieve 50% reduction by 2050 based on C&C

Key factors for higher economic growth (ex.China)

- Disparity:
  - Improved Rural problems (Low income farmer, less developed infrastructure, inefficient agriculture)
  - Increase capital mobility between west and east (Maturity of reallocation system)
  - Improved disparity in urban/rural rich-poor gap (overconcentration of wealth and income in urban area)
  - Provide educational opportunity for the poor
- Economy:
  - Shift from “extensive economy” based on mass consumption of resources
  - High presence of government owned company (Privatization?)
  - Trade conflict between west countries (Dependence on external demand)
  - Management of intellectual property rights
- Financial problem:
  - Financial reform (bad loans, risk of financial crisis)

Basic Data

Population: 1,311 mil (2006)

Nominal GDP: 2,263 bil. US$ (2005)

Land area：9,572,000 km^2

Key factors for higher economic growth (ex.India)

- Environment for the investment
  - Improvement of judicial system (transparency)
  - Corruption & public security issues
  - Confusion caused by decentralization
  - Improved labor system
  - Enhanced Investment promotion policy
  - Infrastructure development (transportation, water supply, electricity grid)
- Industry
  - Unstable agricultural sector (60% of the labor force)
  - Labor transfer to manufacturing sector from agricultural sector
- Finance
  - Recovery of financial intermediary function
  - Bloated inefficient public sector
- Other
  - Increased disparity among regions
  - Environmental pollution (Air, water)
  - Basic Education

Basic Data

Population: 1,119 mil (2006)

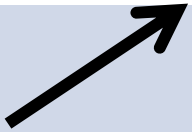
Nominal GDP: 793 bil. US$ (2005)

Land area: 3,166,414 km^2

Socio - economic state variables:

- Population & demographics
- Economic Growth
- Globalization
- Distribution/Equity
- Environmental Ethics & Values/commitment to Sustainability
- Institutions and Governance
- Technological change & access

Future trend: different pathways

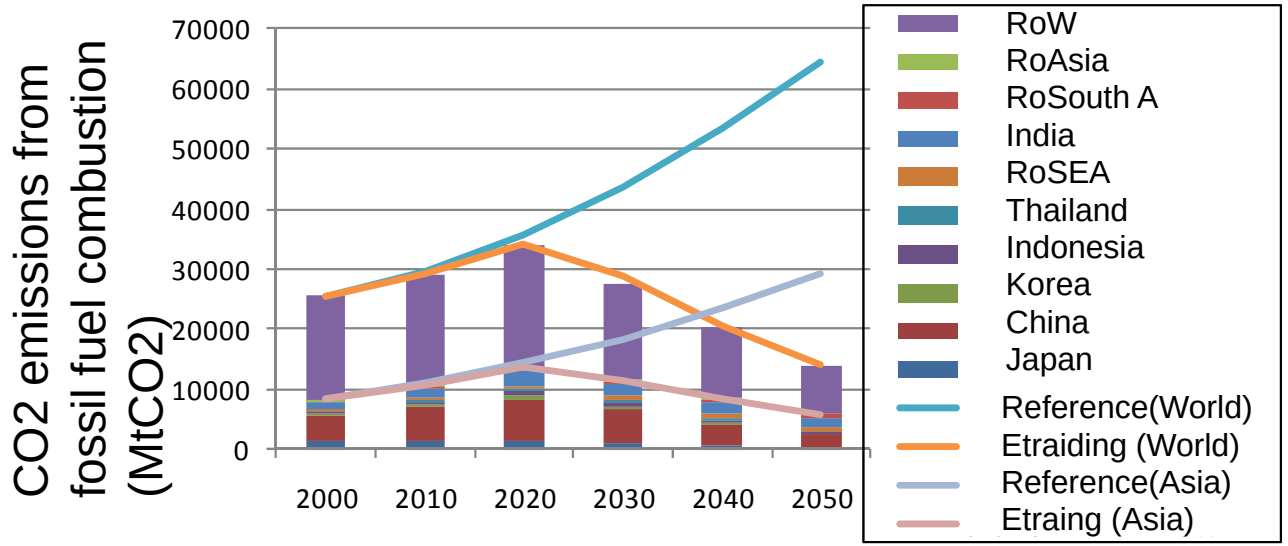
	Population	***Economy***	**Globalization**	**Distribution/Equity**	***Environment Ethics***	**Governance**	***Technology***
Future Pathways 1							
Future Pathways 2							
Future Pathways 3							
FP4							
FP5							

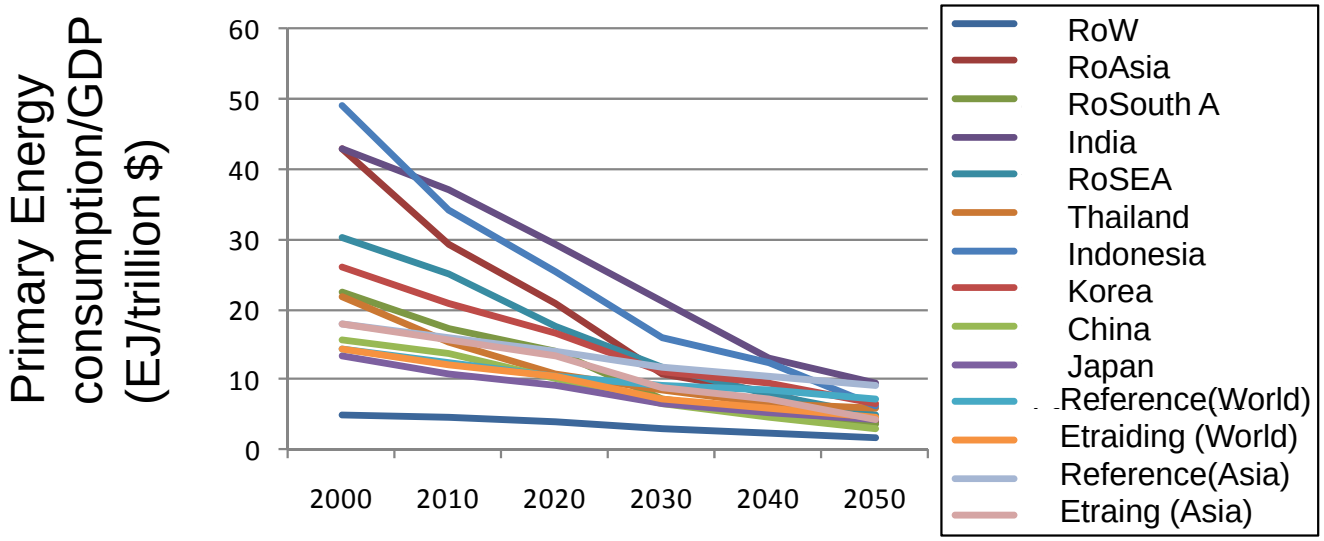
Which pathway will lead to a sustainable low carbon society?

How much Should/Could CO2 emissions be reduced

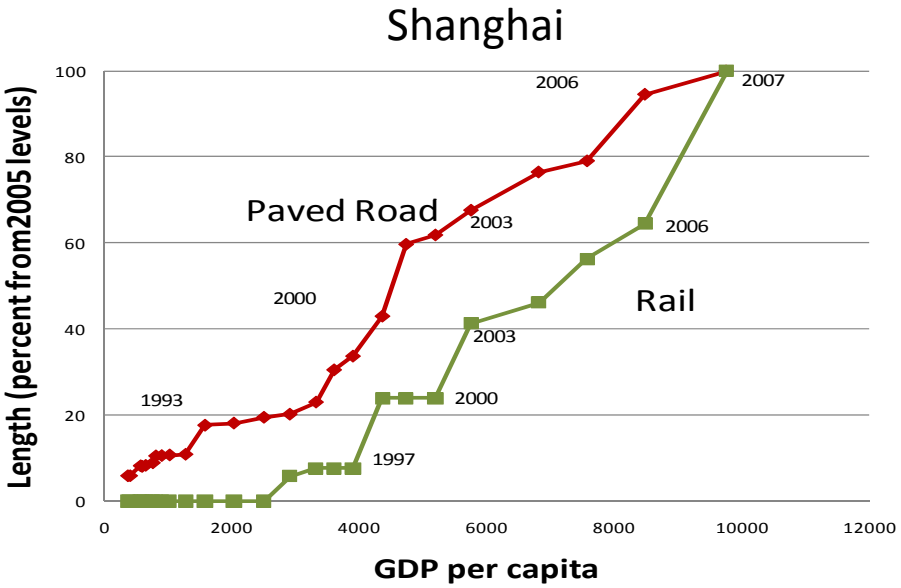
CO2 emissions and energy intensity

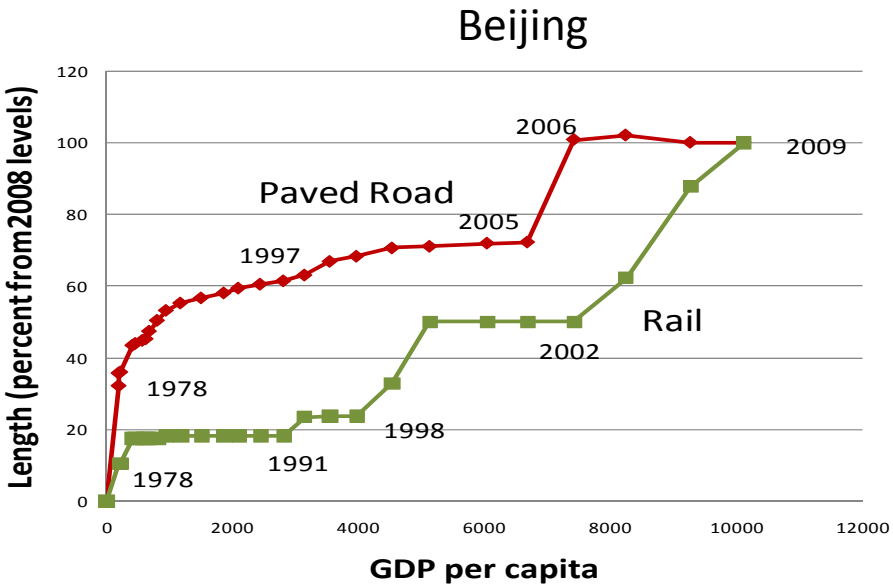
where global emissions will be reduced half by 2050

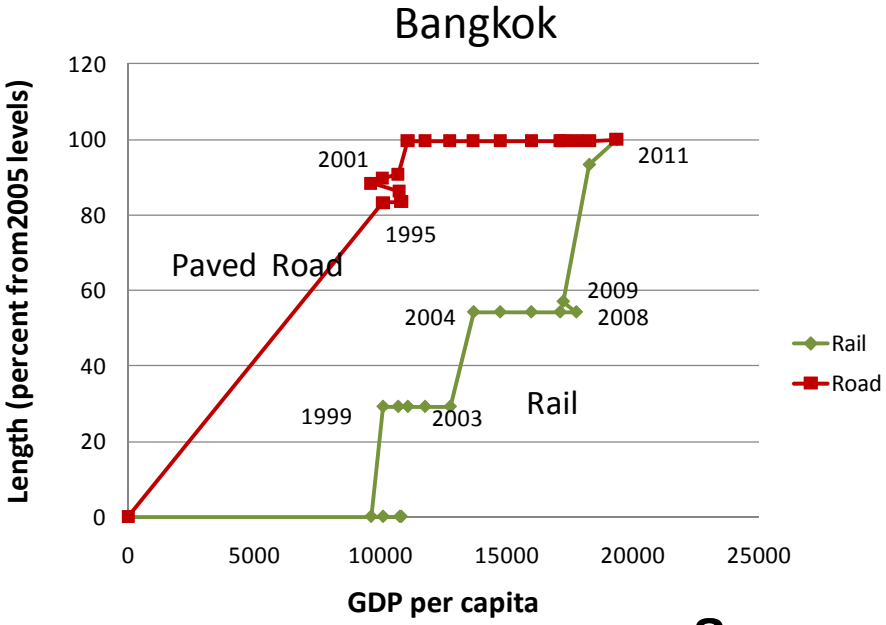


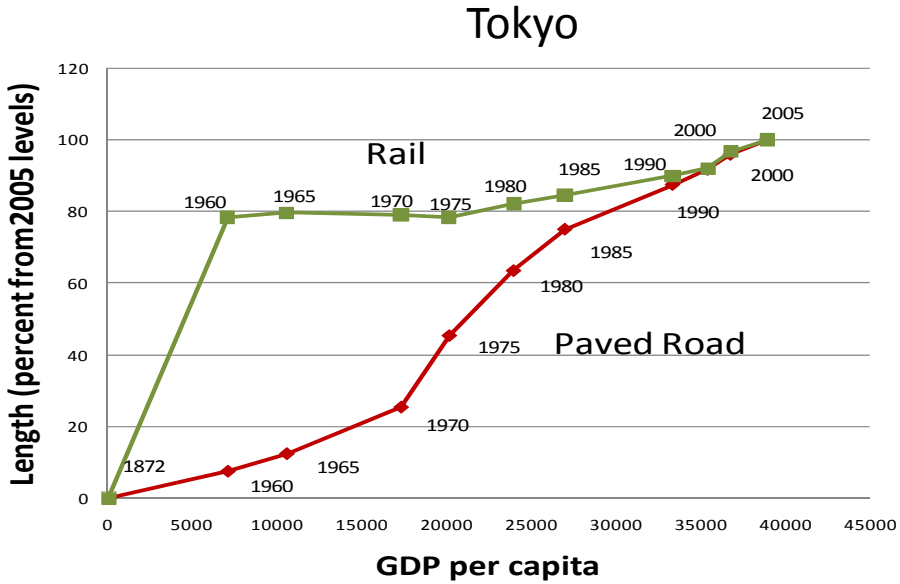


Timing of investment in railways and roads



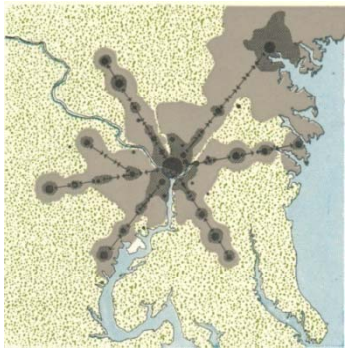






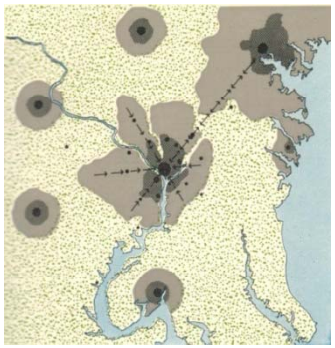
Source: Hayasi (Asia LCS Project Meeting, 2010)

Transportation Network in cities

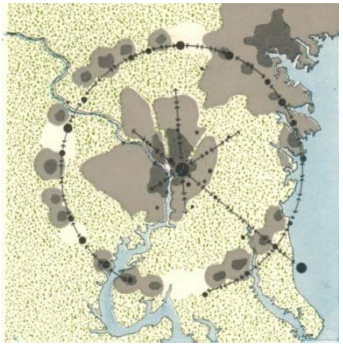


a circumferential ring of towns

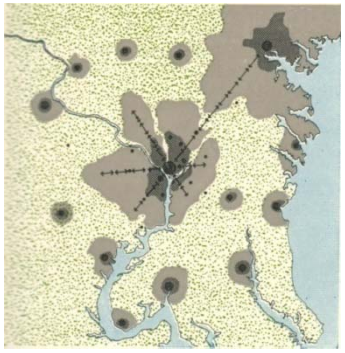
peripheral communities



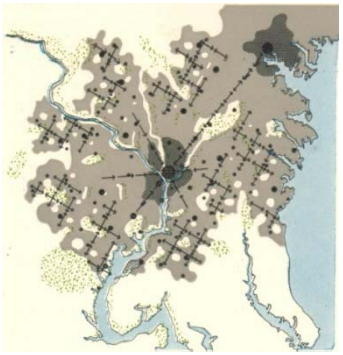
expansion by independent cities



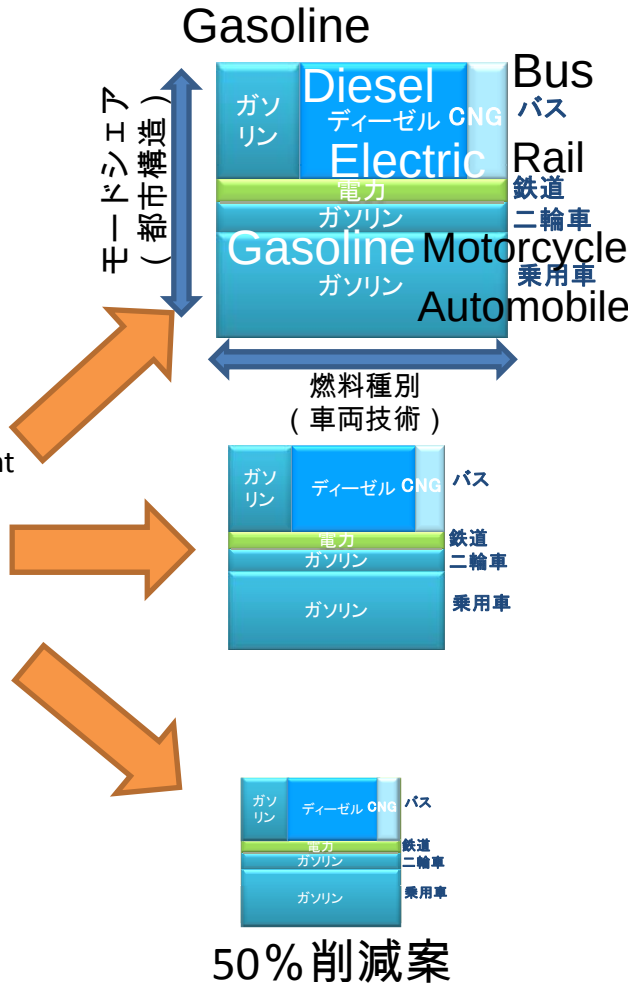
the recommended plan for expansion based on radial corridors



satellite new towns

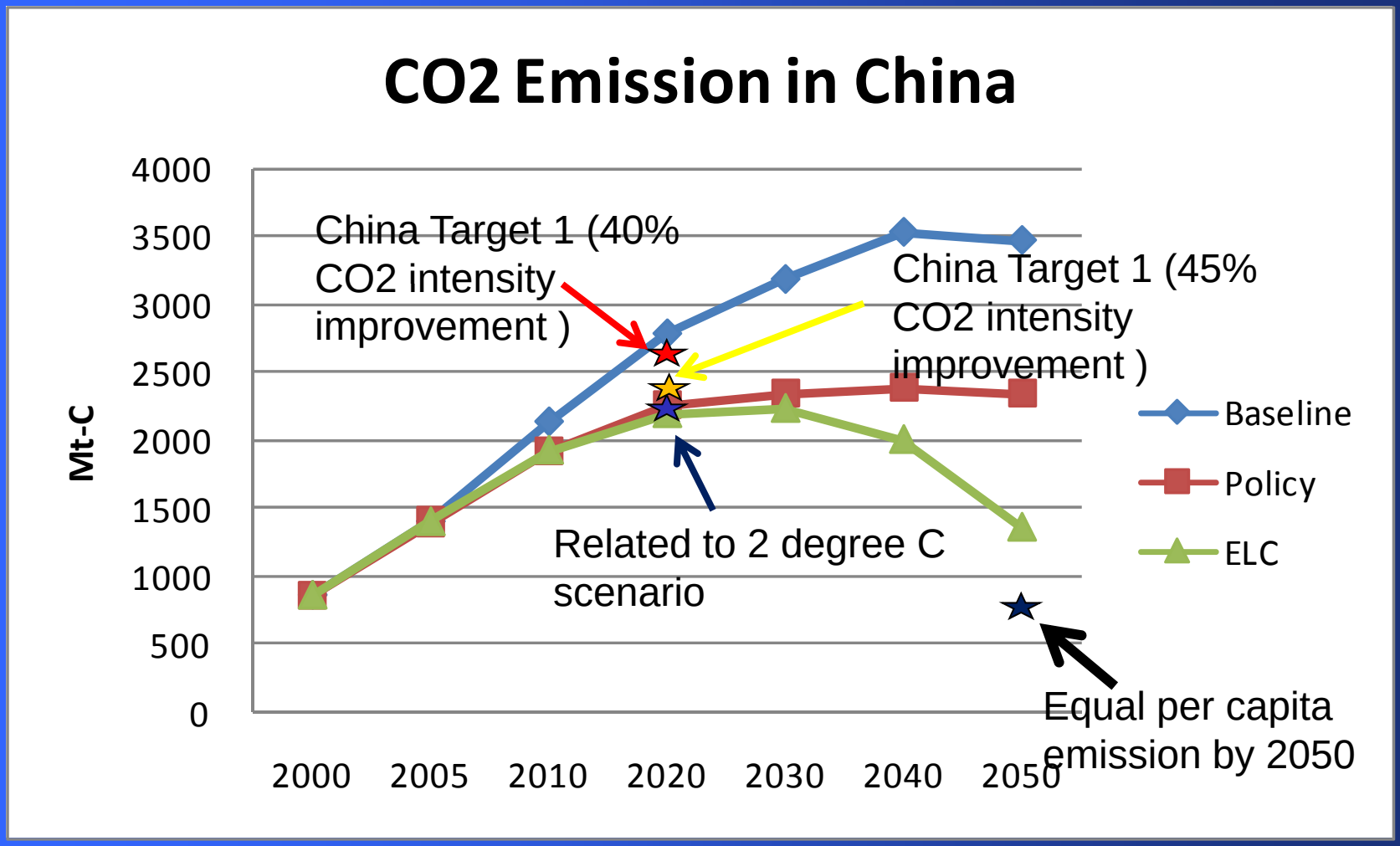


Planned sprawl



Energy service demands and CO2 emissions in the transportation sector depends on the transportation network.

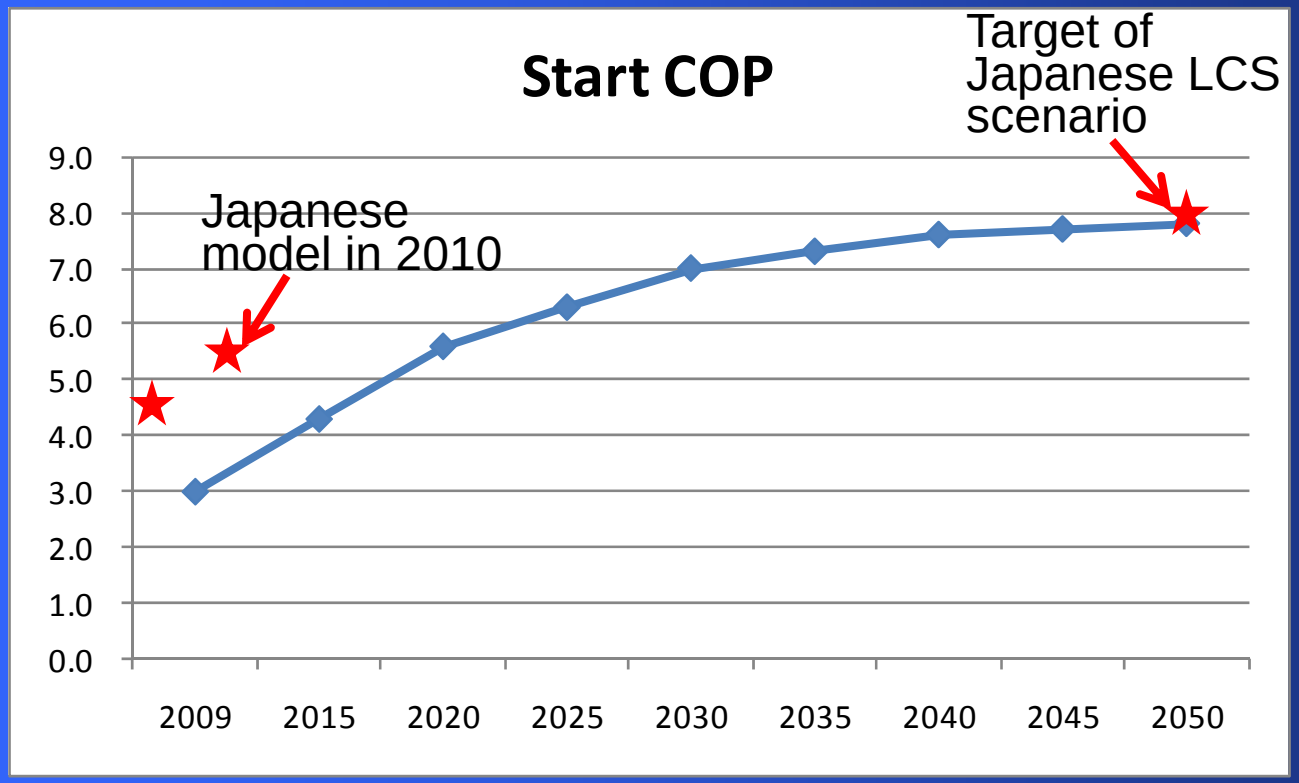
Source: Hayasi (Asia LCS Project Meeting, 2010)



Based on Jiang (2010)

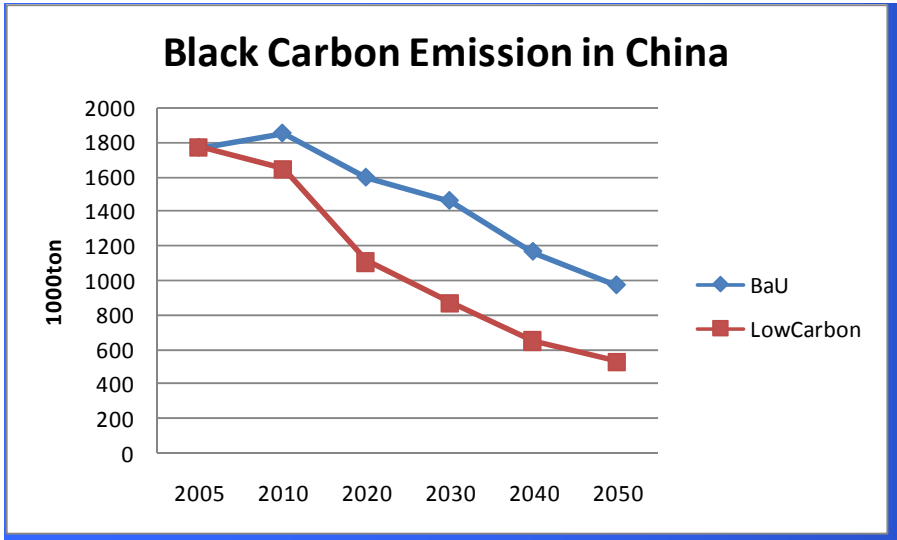
Policy roadmap: Super high efficiency air conditioner

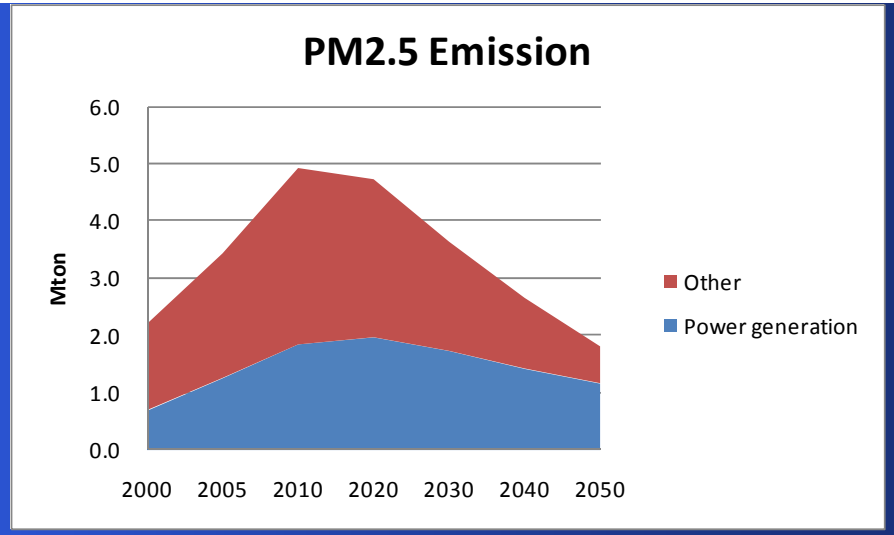
- Efficiency Standard: COP, MEPS
- Government Planning
- Subsidy

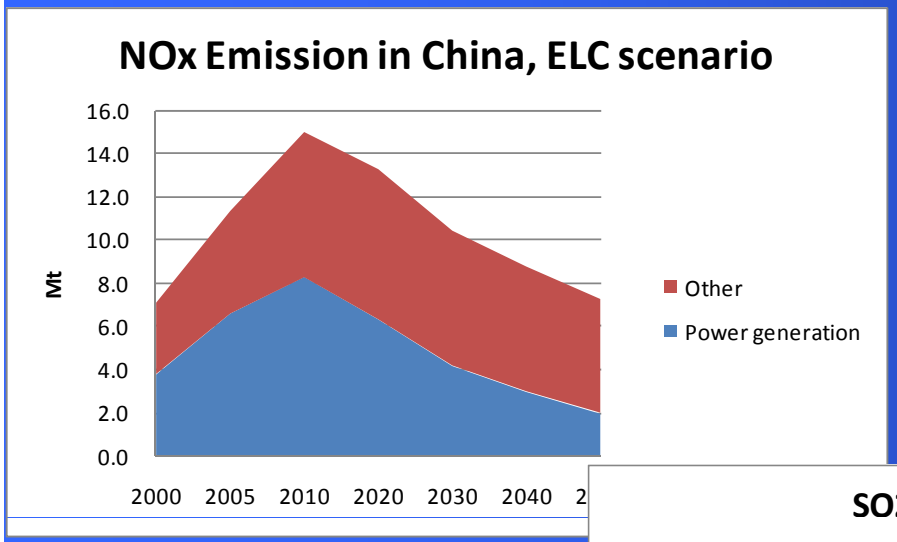


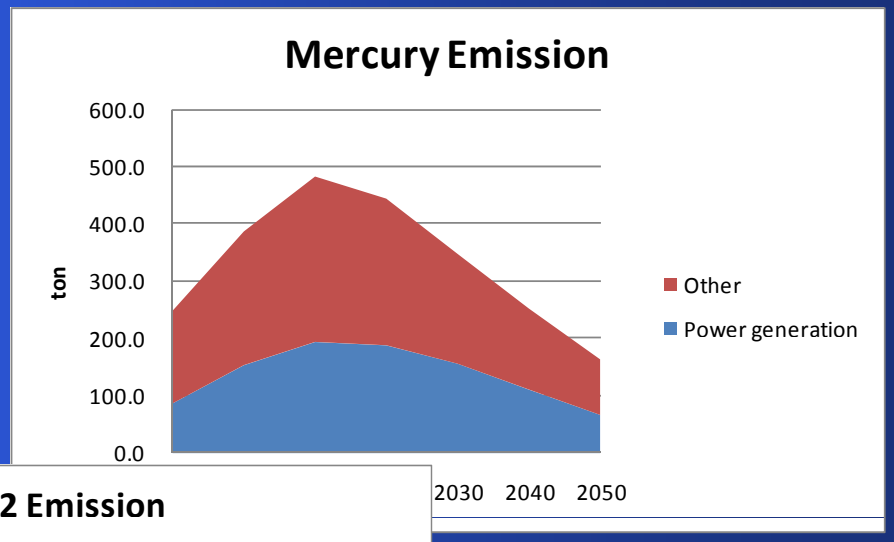
COP: Energy efficiency of air conditioner (Performance of air conditioning (kW) / Energy consumption (kW)

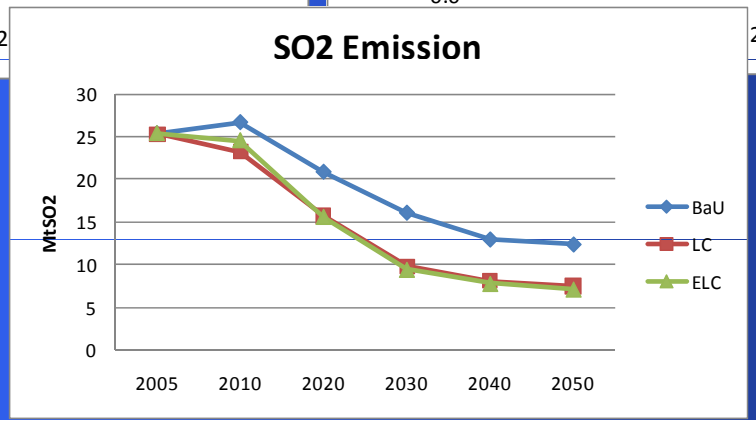
MEPS: Minimum energy performance standard











Source: Jiang (2010)

India: Commitments, Actions and Drivers

Commitments and Actions

Copenhagen Commitments

- 20 to 25% Emissions Intensity Reduction from 2005 to 2020
- Per Capita Emissions Below OECD Average (through 2100)

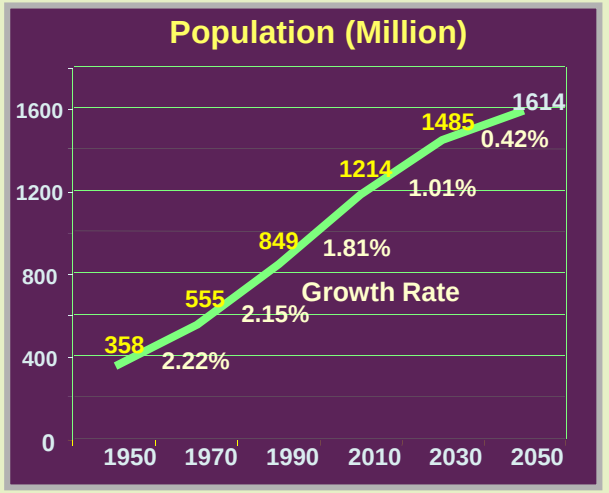
National Climate Change Action Plan - 8 National Missions

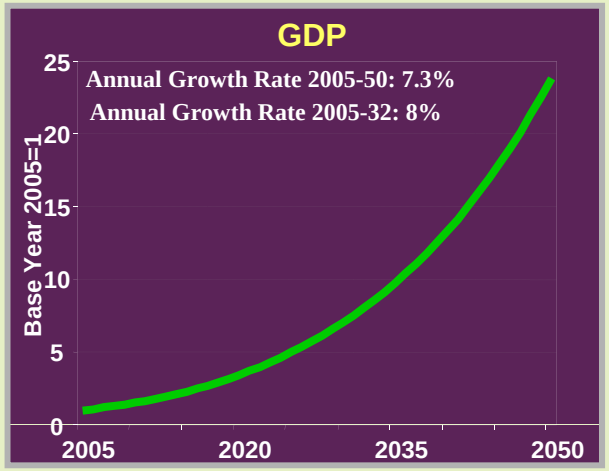
1. Solar Energy (20 GW by 2022; 2 GW off-grid; 20 m sq. m collectors)
2. Enhanced energy efficiency (Avoided capacity of 19000 MW by 2014-15)
3. Sustainable habitat
4. Water Sector (20% water use efficiency improvement)
5. Sustaining the Himalayan eco-system
6. A "Green India" (20 Mil. Hectare afforestation by 2020; Forest cover from 23 to 33%)
7. Sustainable agriculture (micro irrigation promotion in 40 m ha)
8. Strategic knowledge for climate change

Domestic Actions

- **Carbon tax on coal to fund clean energy**
  - US $1/ton on domestic & imported coal; funds to be use for Clean Energy
- **Enhanced Energy Efficiency measures**
  - **National Solar mission** (20 GW by 2022; 2 GW off-grid; 20 m sq. m collectors)
- **Mass Distribution of CFLs**
  - Potential reduction of 6 GW of electricity demand

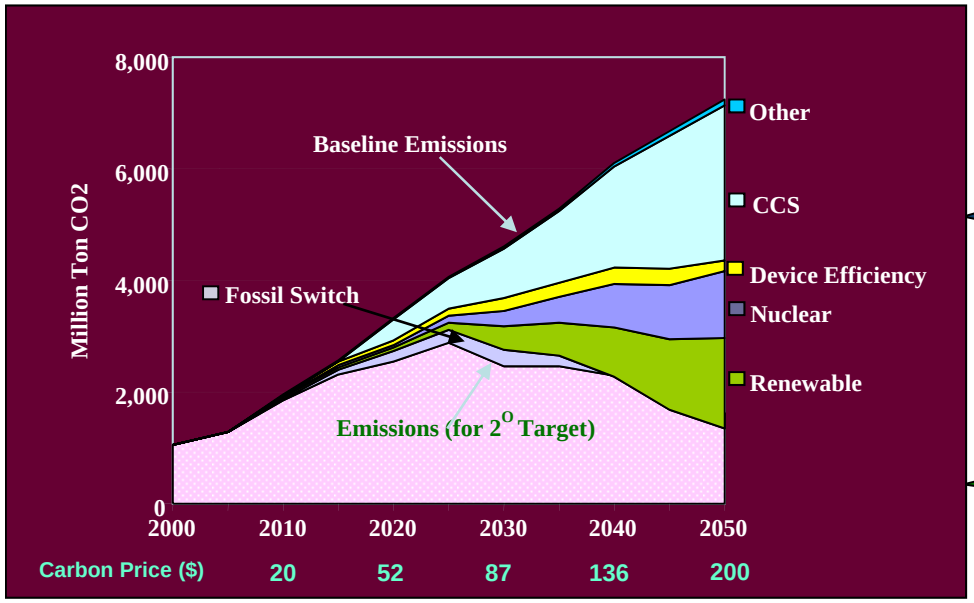
Drivers of Economy





Source: Shukla (2010)

2°C Stabilization: Mitigation Alternatives



Conventional Approach: transition with conventional path and carbon price

- High Carbon Price
- Climate Focused Technology Push
- Top-down/Supply-side actions

Technology Co-operation Areas

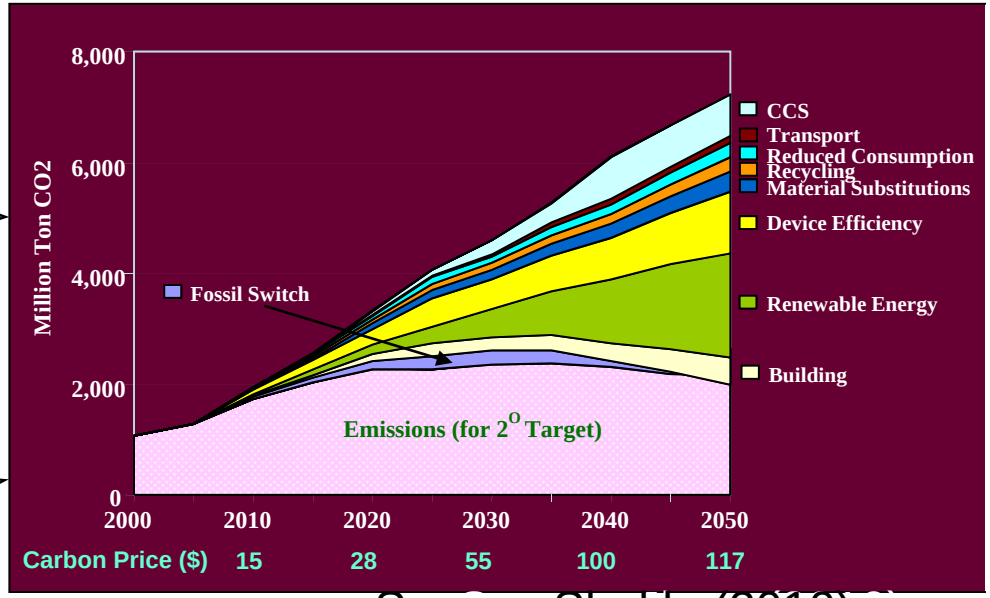
- Energy Efficiency
- Wind/Solar/Biomass/Small Hydro
- Nuclear/CCS

Sustainability Approach: aligning climate and sustainable development actions

- Low Carbon Price
- Bottom-up/Demand-side actions
- Behavioural change
- Diverse Technology portfolio

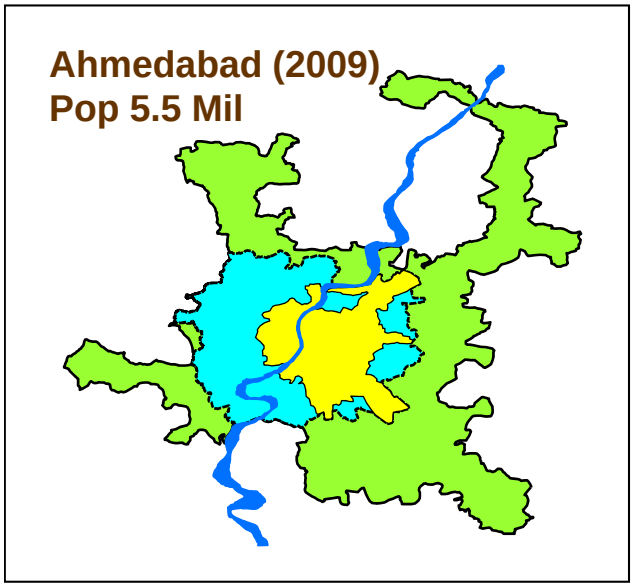
Technology Co-operation Areas

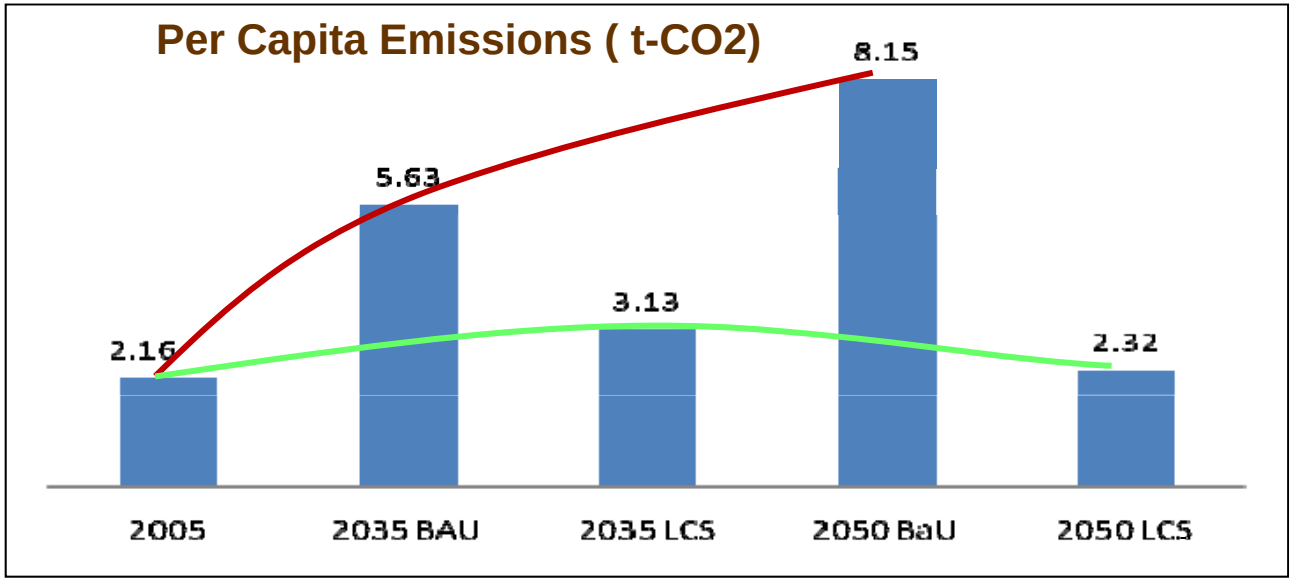
- Transport Infrastructure Technologies
- 3R, Material Substitutes, Renewable Energy
- Process Technologies
- Urban Planning, Behavioral Changes

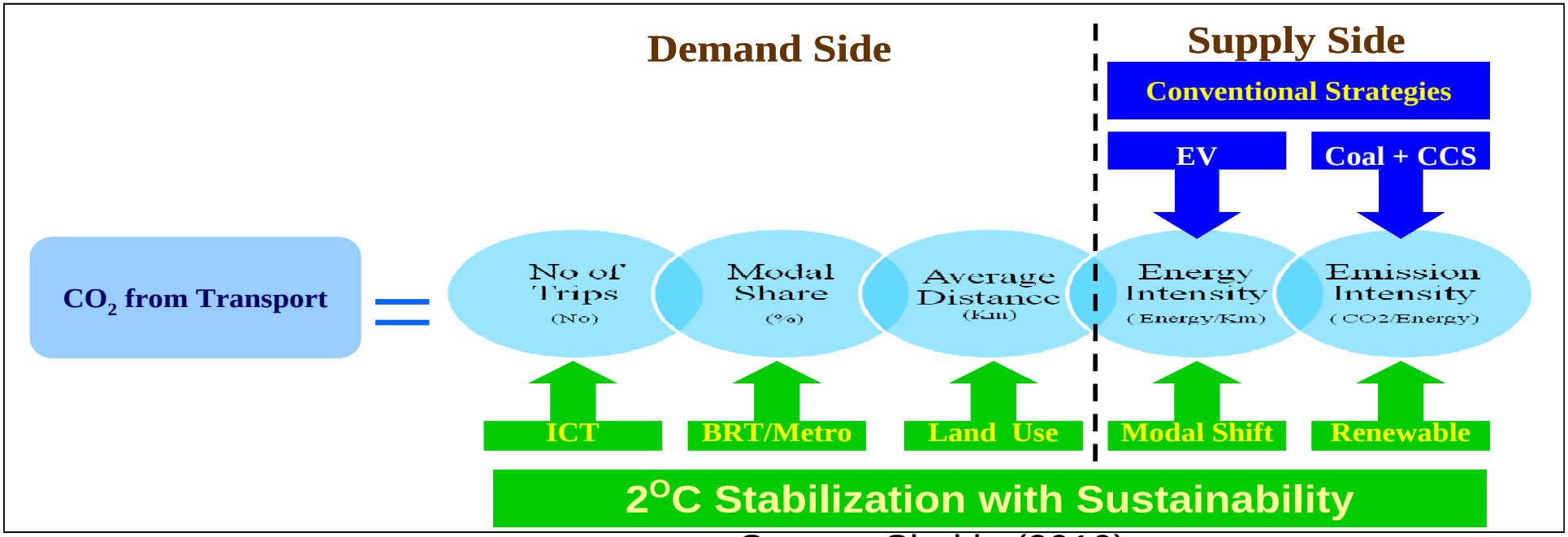


Source: Shukla (2010)

City Planning: Climate and Co-benefits







Source: Shukla (2010) Analysis with AIM/EXSS Model

Low Carbon Cities: Sustainable Iskandar Malaysia

Establishment of a sustainable low - carbon society in Iskandar Malaysia
Create awareness among local authorities, the State government, stakeholders and the community urgent and decisive actions to be taken to realize a robust growth and low - carbon Malaysia

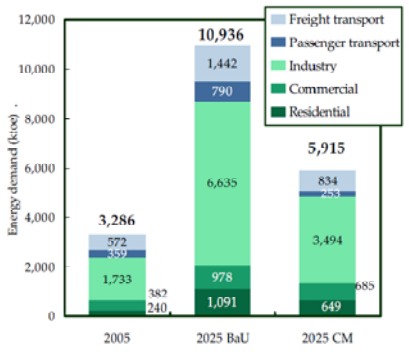


Figure 6. Final energy demand by sector

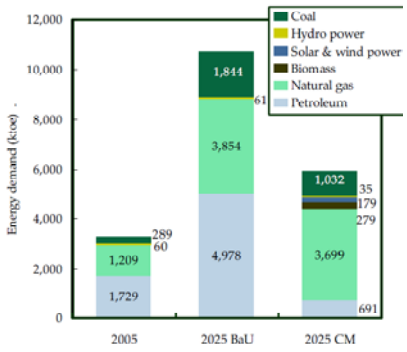


Figure 7. Energy demand by primary energy

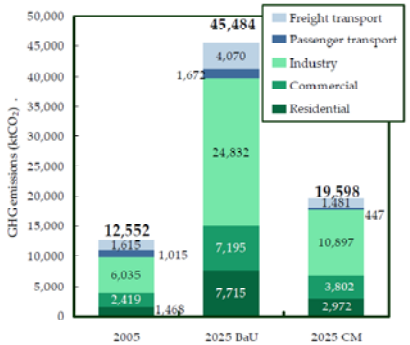


Figure 8. GHG emissions by sector

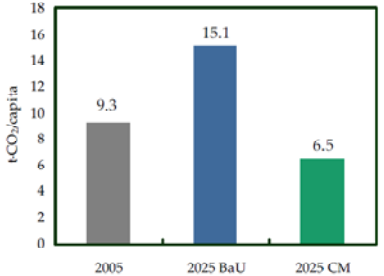
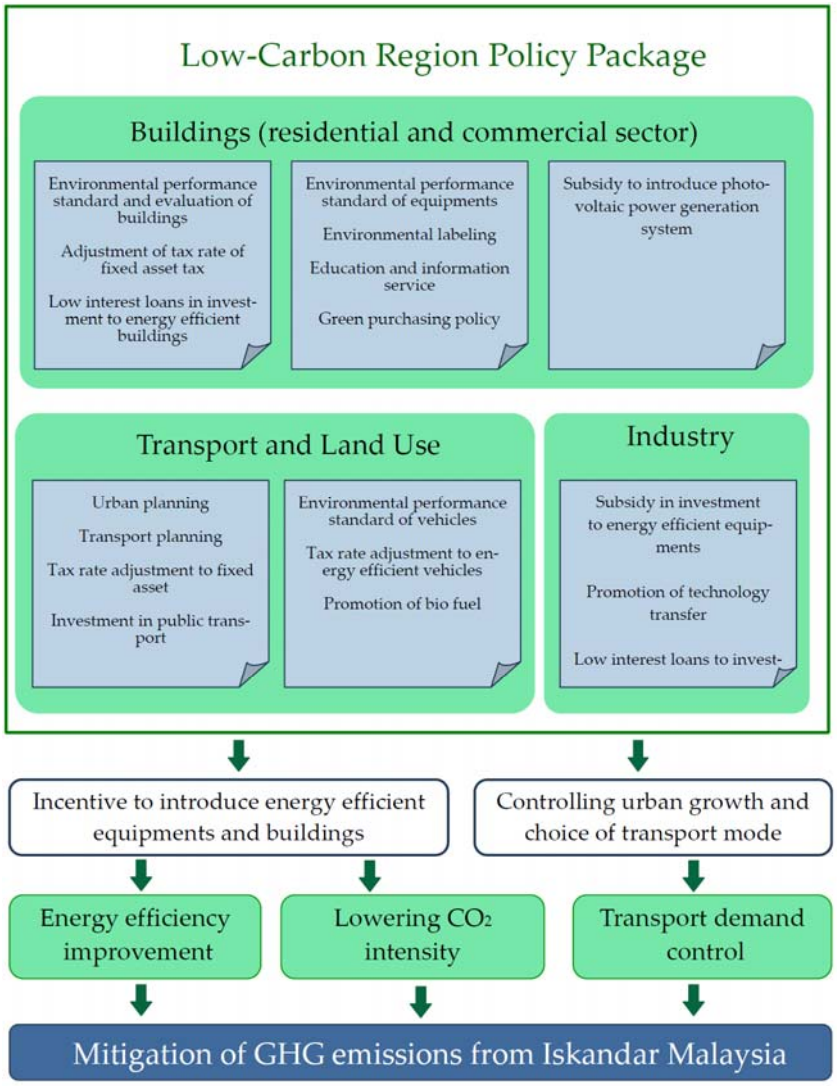


Figure 9. Per capita GHG emissions



AIM ASIA-PACIFIC INTEGRATED MODEL
NIES JAPAN
KYOTO UNIVERSITY
UTM

How to deploy our study to real world

Policy makers
Central/regional government administration
Development Agencies
NGOs

Collaboration for LCS scenario development and building roadmaps

Request of more practical, realistic roadmaps and also tractable tools for real world

Each country's domestic/ local research institute

Core research members

Application and development to actual LCS processes

Development and maintenance of study tools/models

http://2050.nies.go.jp/LCS

Consideration on how to approach LCS

1. Fundamental shifts in paradigms regarding economic development and life styles are required to achieve LCS. Most of these factors are exogenous to climate policy, but needs to be integrated.
2. Each city/ country/ region has its own background and characteristics. They have their own targets and ways of approach.
3. There are many common factors to be considered.
   - Global economy/ financial markets
   - Implementation of energy efficiency measures
   - Reducing the costs and accelerating the diffusion of renewable energy technologies like wind, solar and bioenergy,
   - Forest
   - Co-benefit
4. Participation from different stakeholders

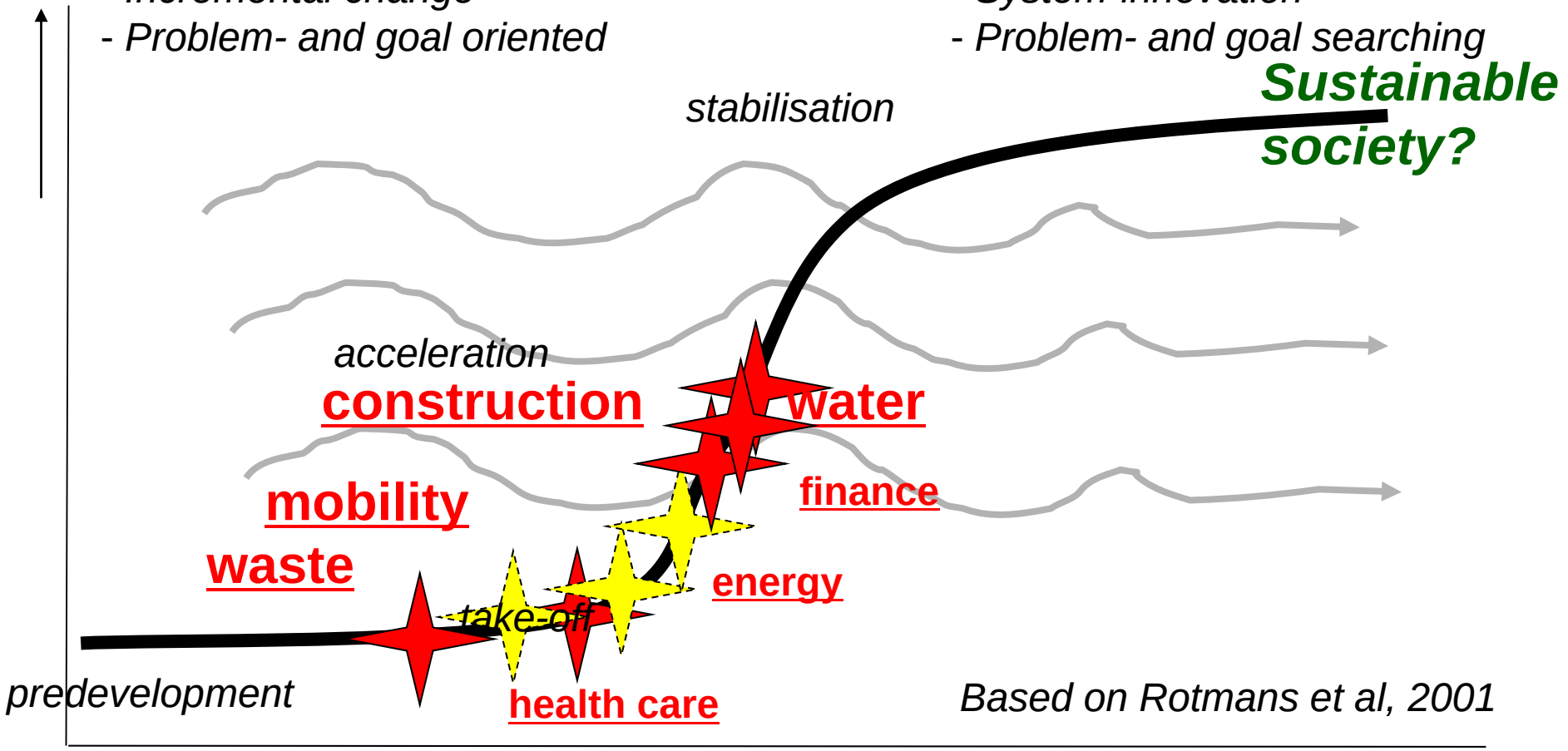
Barriers to overcome in LCS Pathways

- No common generalized policies can be developed, Individual solutions are needed for each of the city
- Success depends on the participation of local government / people
- Almost no awareness in smaller cities
- Capacity building is slow and time taking
- Good quality infrastructure and services are almost always necessary that are already stressed
- Development priorities may not be in line with LCS objectives
- Economic implications are not easy to anticipate

Transition phases

Regular policy arena
- *Short term*
- *Incremental change*
- *Problem- and goal oriented*

Transition arena
- *Long term*
- *System-innovation*
- *Problem- and goal searching*



Based on (Loorbach, 2010)

Timing is important!

Thank you for your attention!