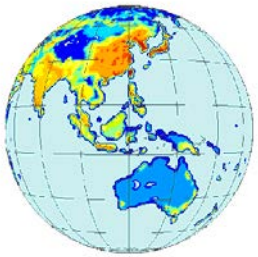


CSD-15 Learning Centre Course
30 April 2007, UN Headquarters, New York

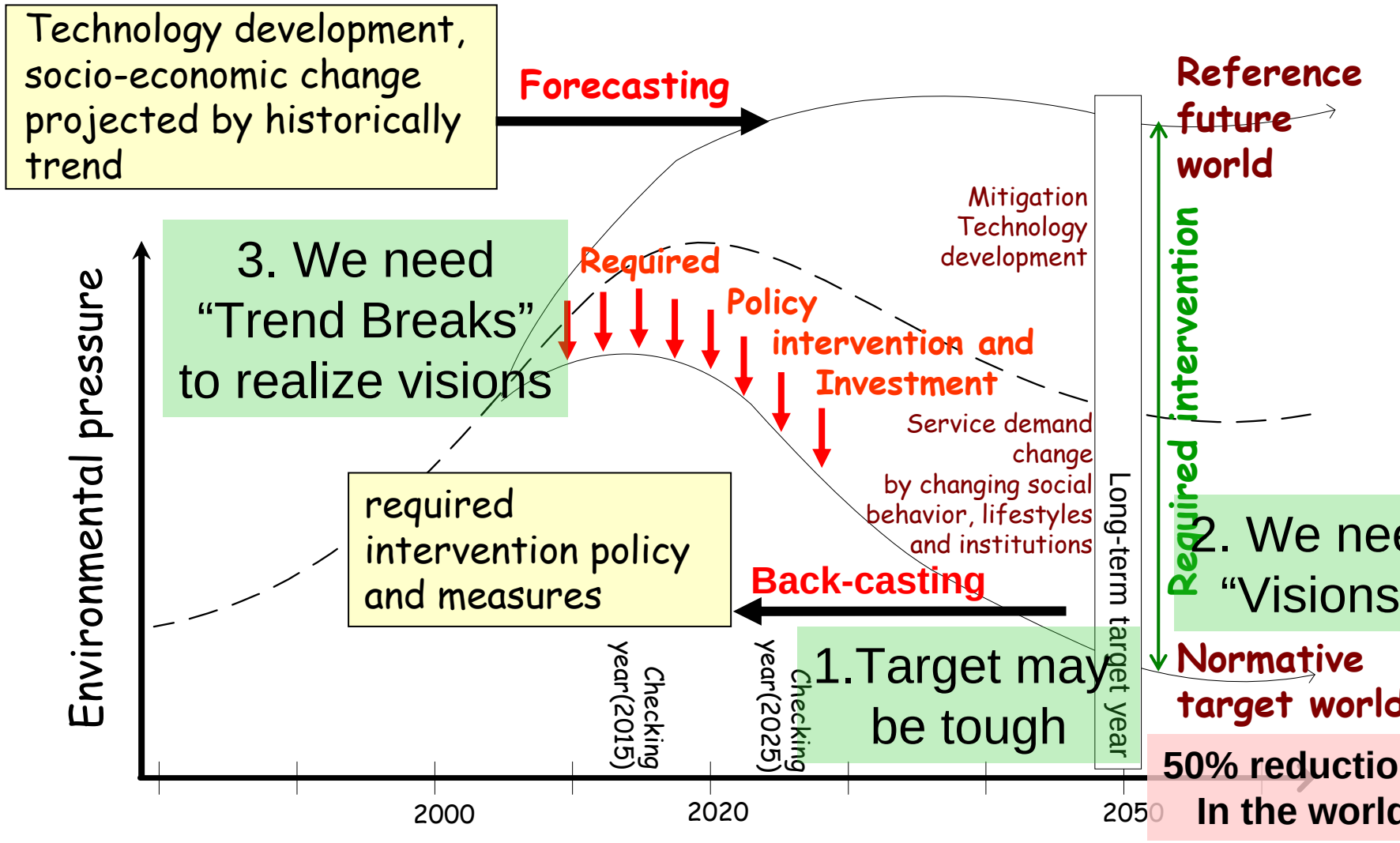
Climate Policy Assessment with Asia-Pacific Integrated Model (AIM)

- Introduction of scenario development methodologies -

Mikiko Kainuma

National Institute for Environmental Studies
http://www-iam.nies.go.jp/aim/

Forecasting from now and Backcasting from future prescribed/normative world



Aligning Climate Change and Sustainable Development
- Scenarios, modeling and policy analysis -

Presented by P.R. Shukla

Climate change and sustainable development

Chapter 1 Introduction

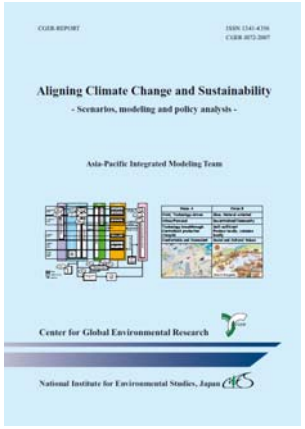
Aligning sustainable development and climate change actions can reduce the economic burden and facilitate the transition to a low-carbon society.

Presented by Maho Takimi

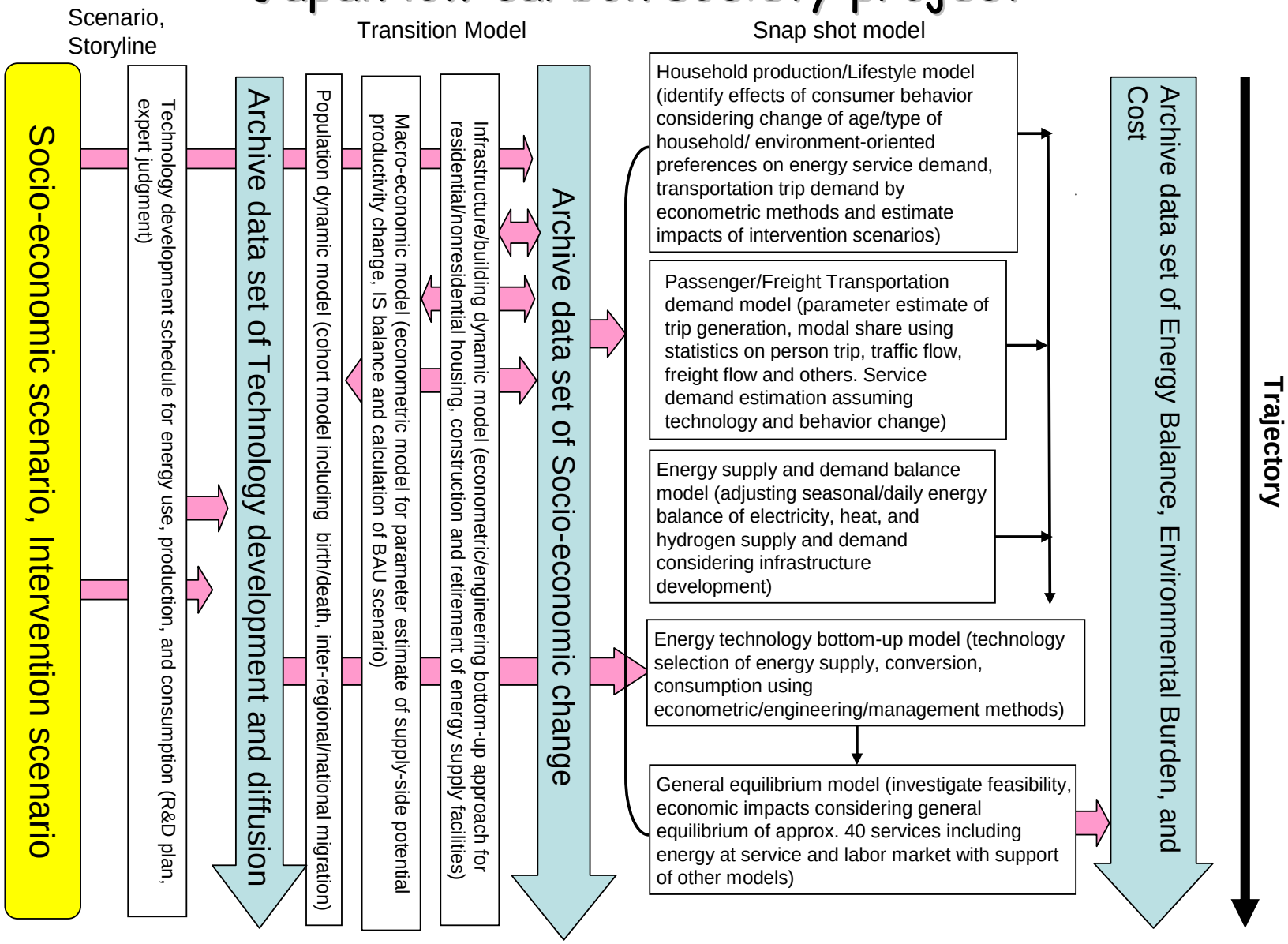
To describe vision/scenario

Chapter 2 Vision/ Scenario

Definition of vision/scenario and its description, scenario approach and its example, backcasting approach and its methodology, relationship between scenarios and models in the case study in Japan Carbon Society project, etc.



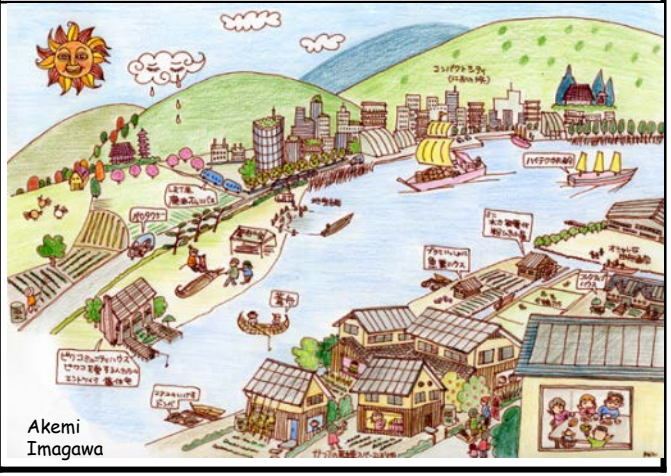
Element models for Japan low carbon society project



Yuzuru Matsuoka, Future AIM modeling ~Focused on mid-term national integrated assessment models~, The 11th AIM International Workshop 19-21, February 2006, Tsukuba Japan

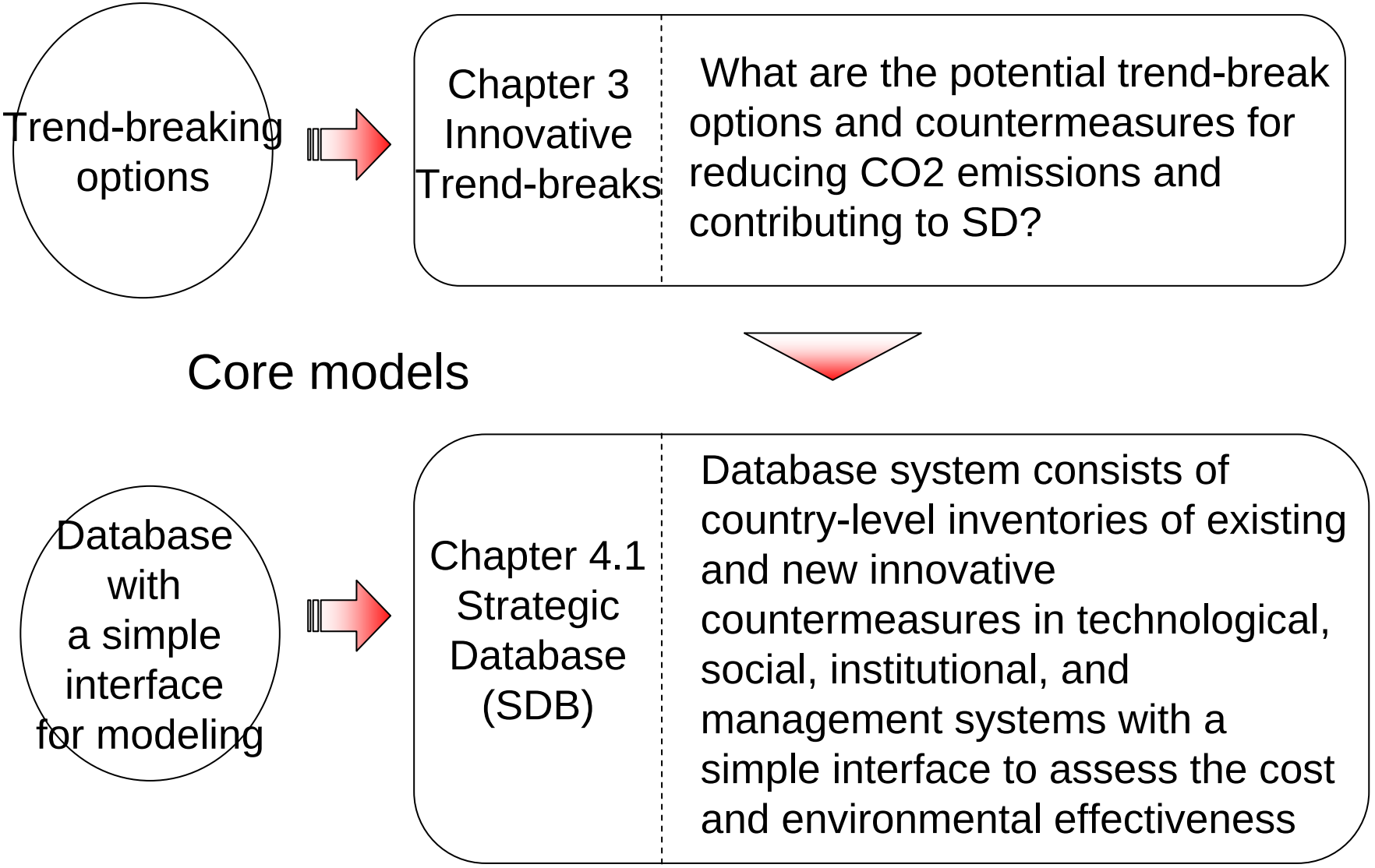
Step1

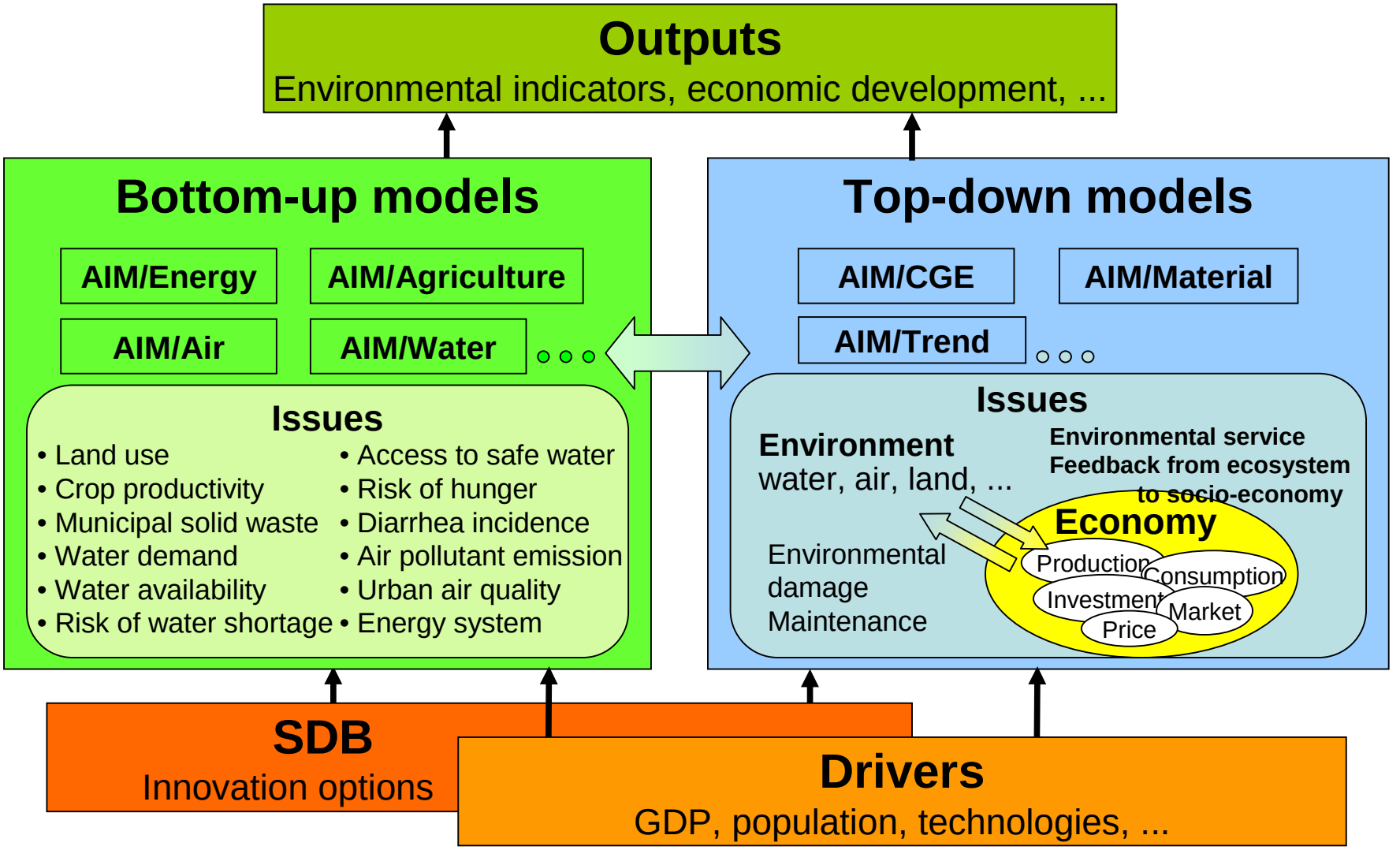
As for LCS visions, we prepared two different but likely future societies

Vision A "Doraemon"	Vision B "Satsuki and Mei"
Vivid, Technology-driven	Slow, Natural-oriented
Urban/Personal	Decentralized/Community
Technology breakthrough Centralized production /recycle	Self-sufficient Produce locally, consume locally
Comfortable and Convenient	Social and Cultural Values
	

Doraemon is a Japanese comic series created by Fujiko F. Fujio. The series is about a robotic cat named Doraemon, who travels back in time from the 22nd century. He has a pocket, which connects to the fourth dimension and acts like a wormhole.

Satsuki and Mei's House reproduced in the 2005 World Expo. Satsuki and Mei are daughters in the film "My Neighbor Totoro". They lived an old house in rural Japan, near which many curious and magical creatures inhabited.

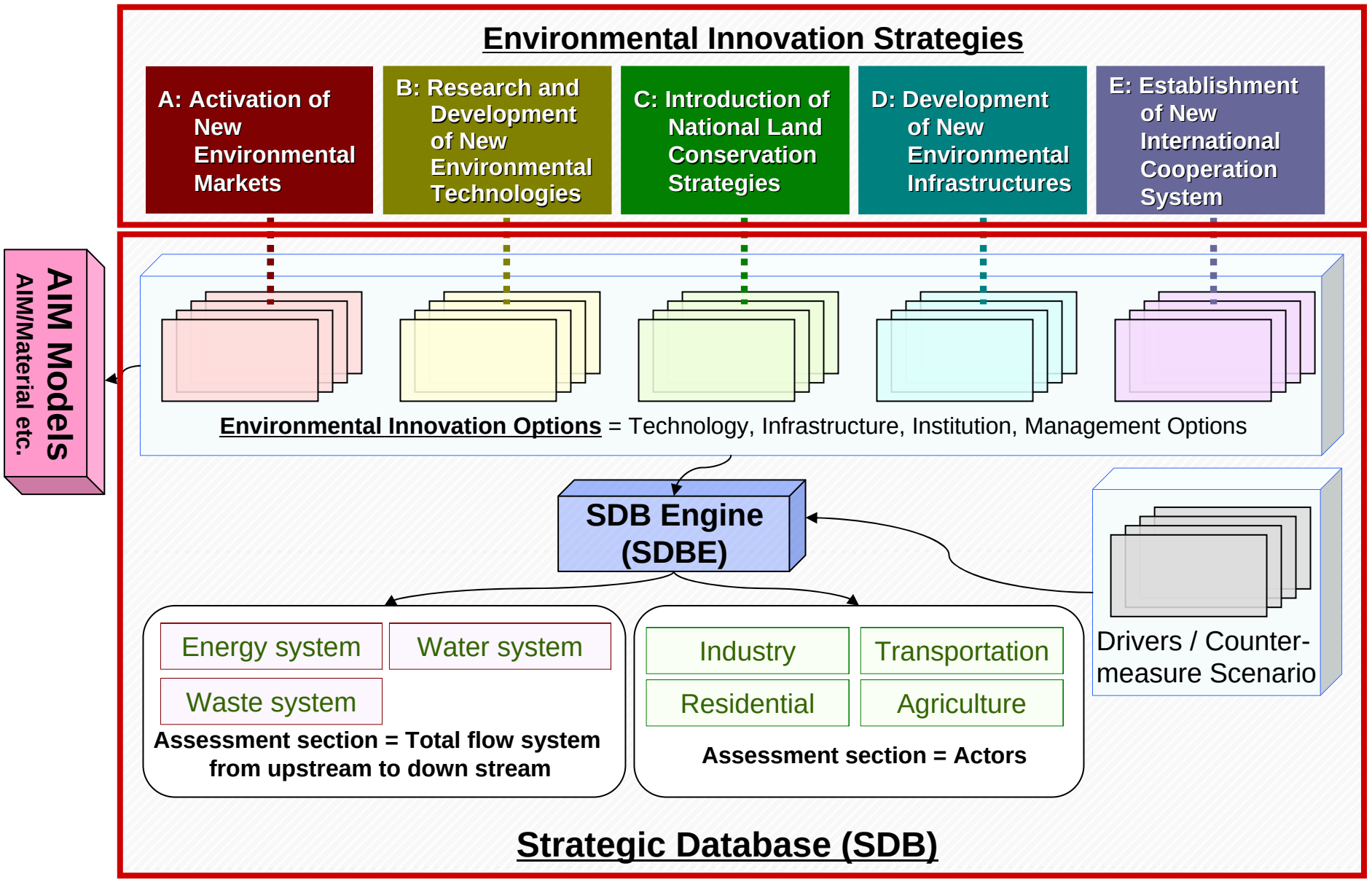

Trend-breaking options
Chapter 3 Innovative Trend-breaks
What are the potential trend-break options and countermeasures for reducing CO2 emissions and contributing to SD?
Core models
Database with a simple interface for modeling
Chapter 4.1 Strategic Database (SDB)
Database system consists of country-level inventories of existing and new innovative countermeasures in technological, social, institutional, and management systems with a simple interface to assess the cost and environmental effectiveness



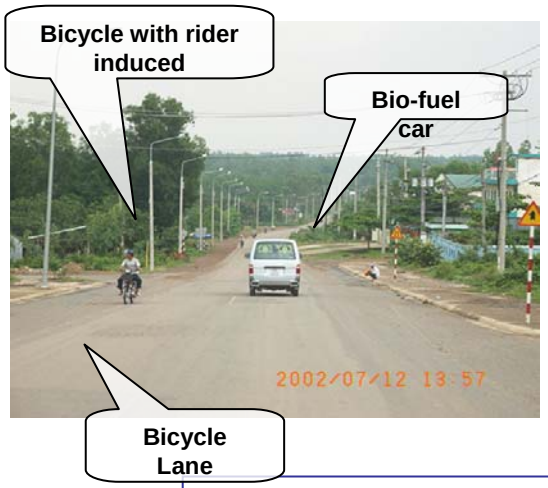
Models of the AIM family

Environmental Strategic Database (SDB)

Environmental Innovation Strategies & Strategic Database



Development of Strategic Database



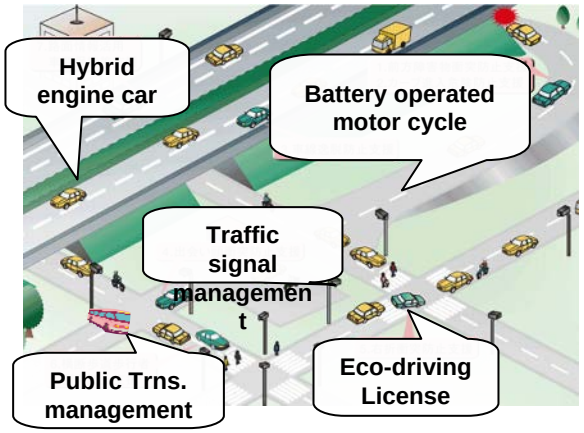
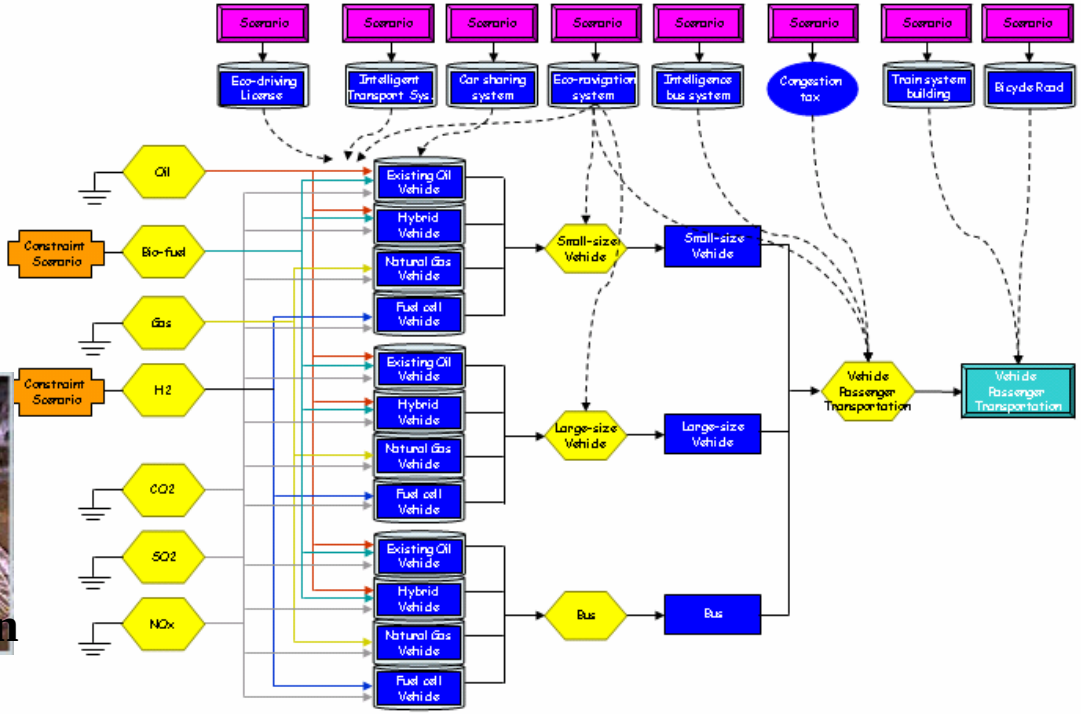


Illustration with environmental options

Diagram of environmental options

Battery-operated cycle-rickshaws

Battery operated pollution free Motor Cycle



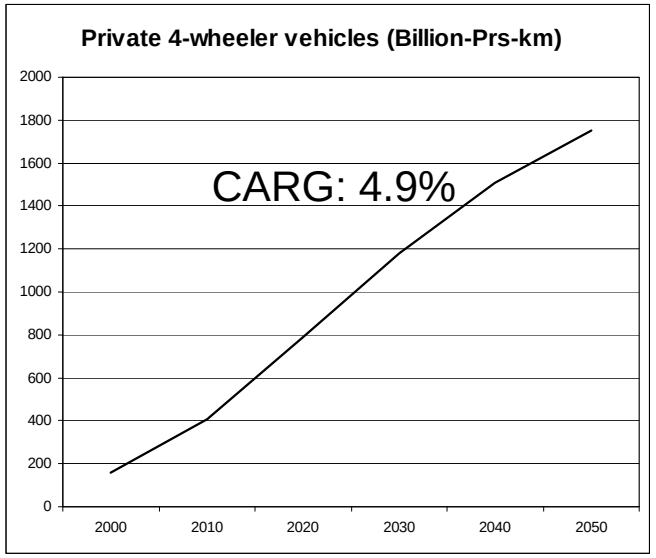
Some results of SDB application to India’s road passenger transport sector

India's Road Passenger Transport:
Demand scenario

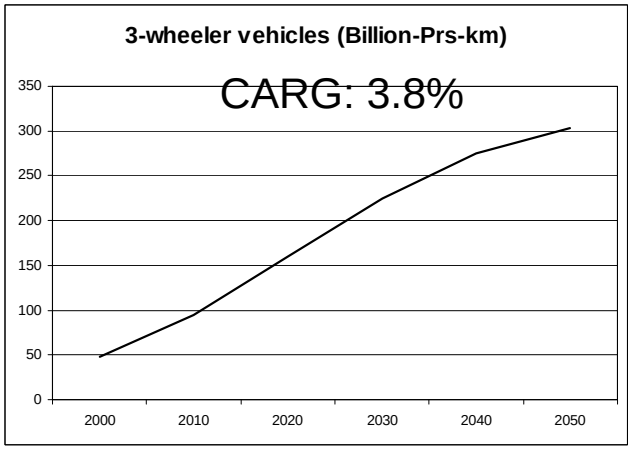
Factors considered implicitly for projecting road passenger demands in SDB and AIM/Enduse:

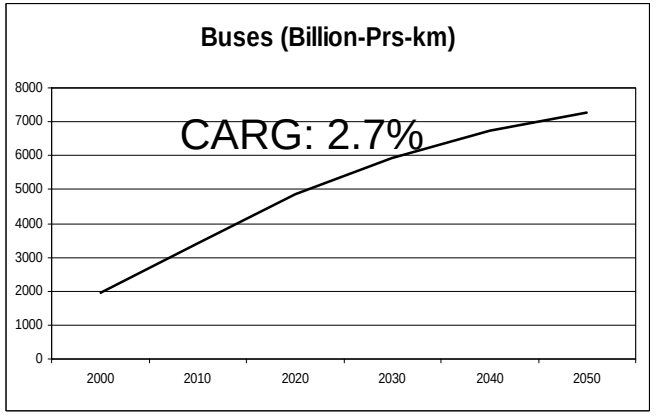
- GDP/capita growth
- Urbanization
- Improvement of roads/flyovers in cities

India's Road Passenger Transport: Demand scenario in SDB

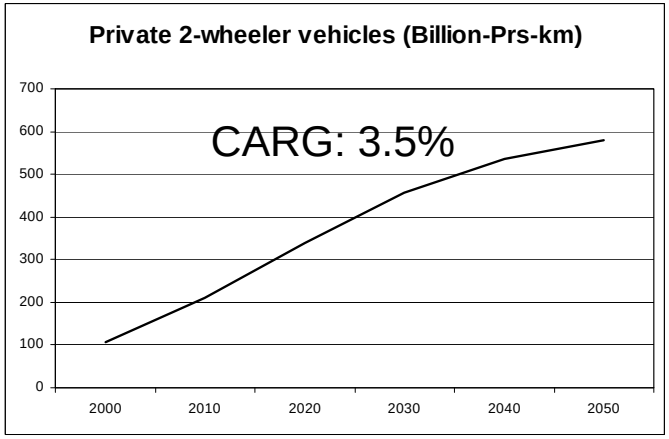


Mainly Urban and Semi-urban modes





Urban, Semi-urban and Rural modes



India's Road Passenger Transport: Innovative options considered in SDB

Technological Options:

- Electric vehicles
- Hybrid vehicles
- Biodiesel
- Ethanol

(Note: above technological options also require institutional/management interventions, e.g. to set up infrastructure for plug-in points; rural infrastructure for sourcing and transportation of biomass from farmlands to processing facilities, etc.)

Management Option:

- Improved management and countdown timer at traffic signals and railway crossings

Start form of SDB

Electric vehicle

Innovations and Prospect for Electric Vehicles in India:

•Reva Electric Car Company, headquartered in Bangalore, has designed a low-price electricity driven small car

•Cost of Indian electric car is low even at low volume production due to several product and process innovations like running chassis platform, body panel technology, process modifications to suit supplier capabilities in India (for example, one-piece rotationally molded bumpers), and computerized energy management and diagnostics system

• Currently the car has 80 km range (on a single charge) and therefore confined to markets in big cities where private charging facilities are available

•For expansion of markets for such electric cars in the future, infrastructure of plug-in points needs to be developed. If such an infrastructure is developed and the government provides incentives to customers in initial stage of market penetration, then electric vehicles have a good market potential in urban India.

1: Motor
2: Powerpack
3: Charger
4: Controller
5: Energy Management System

Biofuels

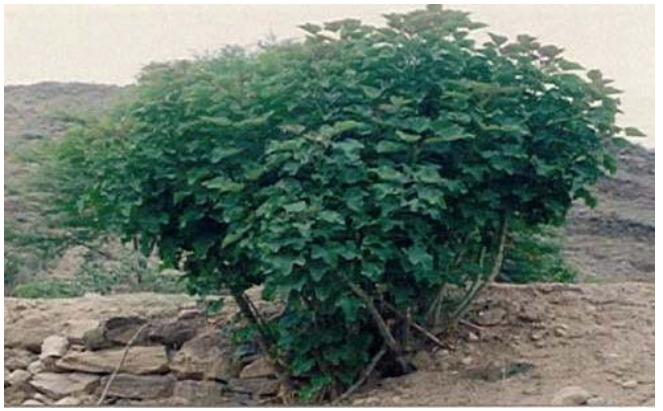
Innovations and Prospect for Biofuels in India:

•The Indian government is in the process of setting up a regulatory regime to promote biodiesel and ethanol

•Out of three possible biodiesel blends – B5, B20 and B100 – B5 and B20 may be used in the initial periods of regulatory introduction but the higher blends like B100 will begin to enter as markets for producing and distributing biodiesel become competitive with experience

•5% blend of ethanol with gasoline (E5) is being produced on pilot scale in some states; There are plans of producing higher blends like E15, E24, E85 and E100 in the future

•Several private companies including the largest energy sector firm – Reliance Industries Limited – have entered biodiesel and ethanol sector. Reliance has set up a pilot scale collection and processing (transesterification) facilities in the state of Andhra Pradesh for producing biodiesel. Some farmers gave begun to cultivate biodiesel crops like Jetropha and Pongamia



Jetropha – a widely available source of biodiesel in India

Countdown Timers at Urban Traffic Signals

Prospect for Traffic Light Countdown Timers in India:

•Countdown timers at traffic lights have been installed at major traffic junctions in a few big Indian cities like Mumbai and Bangalore

•This system indicates the time remaining for light to switch colour; It helps drivers to avoid unnecessary idling while waiting at traffic signals

•Expanding this system to all traffic signals in all cities and introducing other similar practices for improving traffic signal management can help reduce fuel combustion during the most inefficient stage (i.e. idling).

Timer at traffic light

SDB for Road Passenger Transport Sector in India: Scenarios

- **RF**: ***BaU or Reference Scenario***

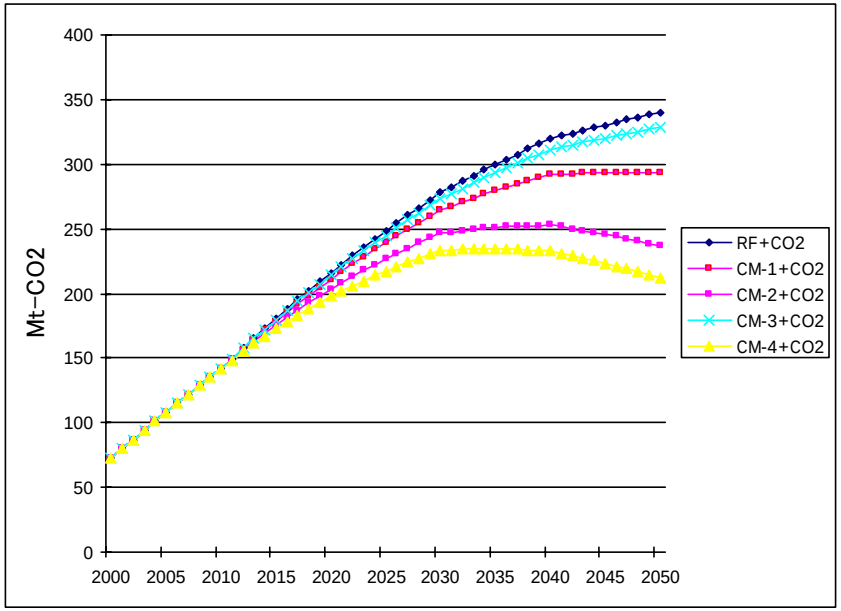
- **CM-1**: ***Higher Diffusion of Electric and Hybrid Vehicles***, with
  - share of electric vehicles increasing from 5% in 2020 to 20% in 2050, and
  - share of hybrid vehicles increasing from 10% in 2020 to 25% in 2050.

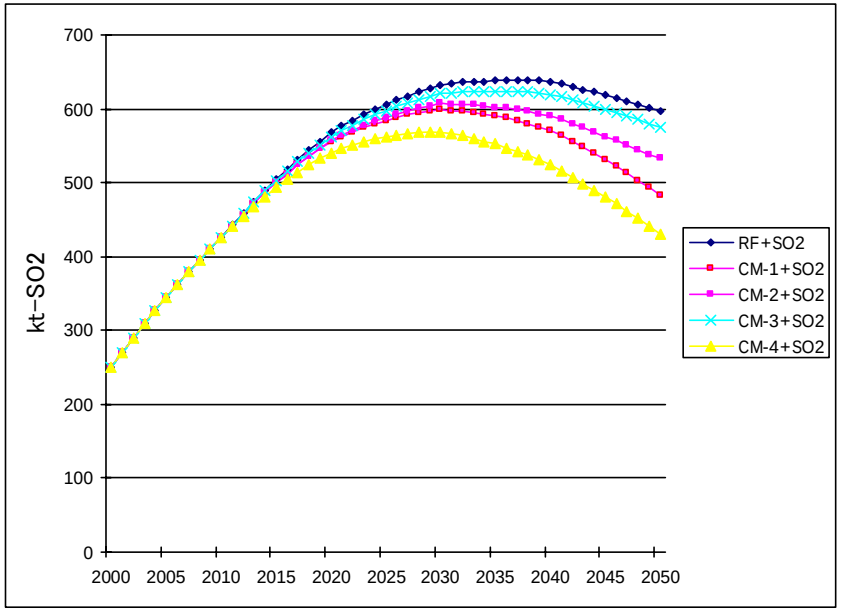
- **CM-2**: ***Higher Diffusion of Biofuels***, with
  - ethanol-gasoline 15% blend (E15) used in 5% of gasoline vehicles in 2020 and remaining at 10% from 2030 onwards,
  - pure ethanol (E100) used in 5% of gasoline vehicles in 2020, increasing to 30% in 2050,
  - biodiesel-diesel 20% blend (B20) used in 5% of diesel vehicles in 2020 and remaining at 10% from 2030 onwards, and
  - pure biodiesel (B100) used in 5% of diesel vehicles in 2020, increasing to 30% in 2050.

- **CM-3**: ***Improved Management and Countdown Timer at Traffic Signals***, with
  - 5% resultant reduction in fuel use, and covering 20% of all vehicles in 2020, increasing to 80% in 2050.

- **CM-4**: ***Simultaneous introduction of all measures*** outlined in scenarios CM-1, CM-2 and CM-3.

Results of SDB for Road Passenger Transport in India





CO_2 emissions:

- Maximum reduction w.r.t. BaU (30.4% in 2050) occurs in Biofuels Scenario (CM-2)
- Simultaneous introduction of all measures leads to 18.4% reduction over 50 years and 37.6% in 2050 (w.r.t. BaU)

SO_2 emissions:

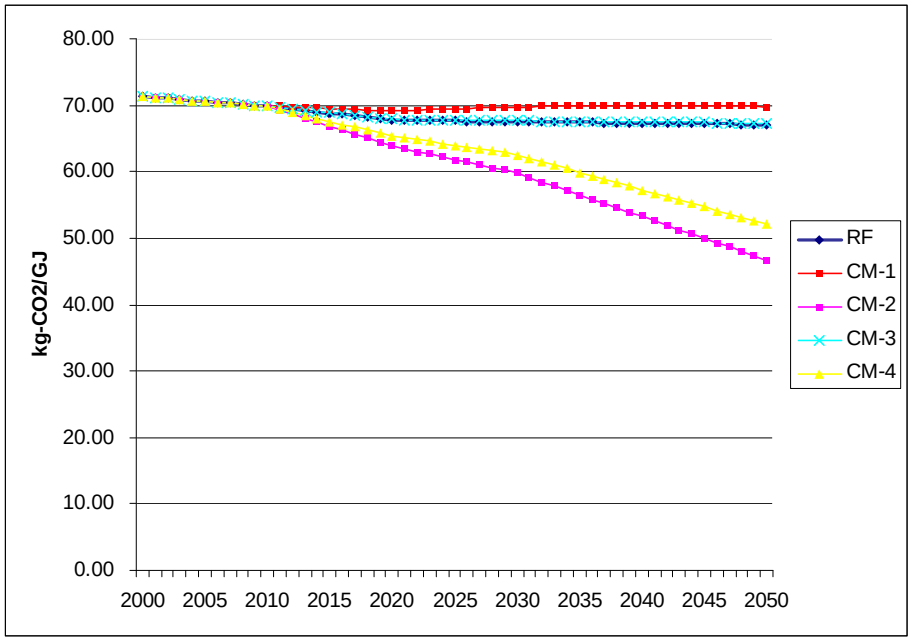
- Maximum reduction w.r.t. BaU(18.9% in 2050) occurs in Electric/Hybrid Vehicles Scanerio (CM-1)
- Simultaneous introduction of all measures leads to 10.5% reduction over 50 years and 27.8% in 2050 (w.r.t. BaU)

Co-benefits: Very high correlation between CO2 and SO2 reduction is observed in scenarios with Electric/Hybrid Vehicles Introduction (CM-1) and Traffic Signal Management (CM-3)

Results of SDB for Road Passenger Transport in India

•In Biofuels Scenario (CM-2), CO2 emissions reduction is achieved mainly by decline in carbon intensity of energy use (34.5% decline from 2000 to 2050, and by 30.4% in 2050 as compared to BaU)

•In Electric/Hybrid Vehicles Scenario (CM-1), CO2 emissions reduction is achieved mainly by decline in energy use (by 17% in 2050 as compared to BaU), and carbon intensity of energy use does not change much (due to carbon intensity of electricity generation)



Carbon intensity of energy use in road passenger transport in India

Presented by
Maho Takimi

To estimate energy Balance under a certain constraint

Chapter 4.2 Energy SnapShot Tool (ESS)

Part II Manual

Accounting tool which calculates the energy balance and CO2 emissions with keeping consistency among sectors, by giving service demand, share of energy and energy improvement, energy in the base year and the target year.

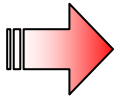
To estimate CO2 reduction and mitigation costs

Chapter 4.3 AIM/Enduse Model

Part III Manual

Energy technology bottom-up optimization model minimizing total system costs, with detail technology selection framework. It estimates CO2 emissions, reduction potentials, mitigation costs, and evaluates policy countermeasures.

To estimate CO2 emissions, material balance, economic impacts, etc.



Chapter 5 Element Models

Element model as a tool for social, economical and environmental development

-CGE Model
-Population and Households Model
-Building Dynamics Model
-Transportation Demand Model
-Material Stock and Flow Model
-Energy Supply Model
-Household production and lifestyle model
-Water Management Model
-End-use (Air) Model

Models for analyzing low-carbon society and sustainable development