Progress of AIM/Material

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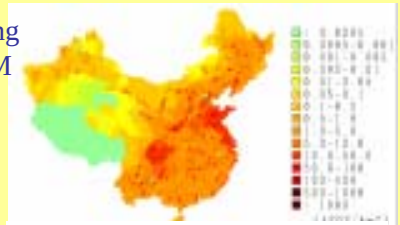
Position of AIM/Material

AIM/Local

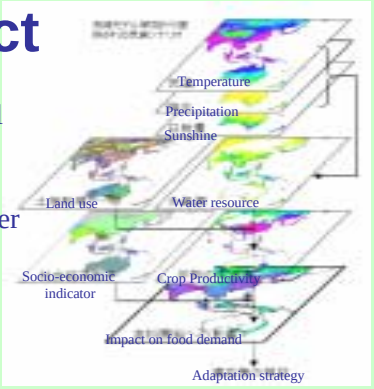
Developed for linking CO_2, SO_2, NO_2, SPM reduction program



Emission Intensity of SO_2 in China

AIM/Impact

Detailed process model for climate change impact assessment focused on surface water recycling, crop productivity and vegetation



AIM Family

AIM/End-use

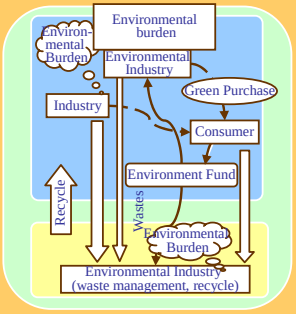
Country Based Technology Model

AIM/Top-down

World Economic Model

AIM/Material

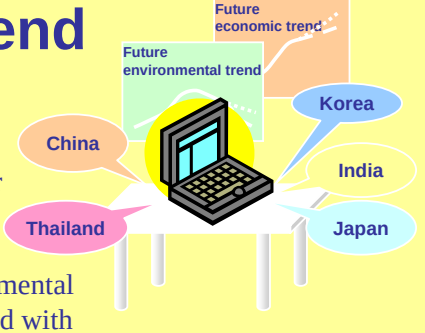
One country CGE model with CO2 and material balance, interface with environmental technology model



Technology assessment ⇧ ⇩ Technology needs

Research on new technologies

AIM/Trend



Developed as a communication platform in order to construct Asia-pacific regional environmental outlook supported with multi-regional environment-economic CGE model

Background of AIM/Material

- Not only **CO2 reduction** but also **solid wastes & other pollutants** should be managed simultaneously.
- Not only **environmental preservation** but also **economic progress** should be achieved.

Relationship between environment & economy is described through **environmental investment** and **environmental industry**.

Objects of AIM/Material

- For environmental policies in Japan
  - CO2 reduction strategies
  - Solid waste management for recycling society
  - Environmental industry & investment and environmental constraint
- For environmental policies in Asian region
  - Economic growth & material flow change

    Domestic flow & International flow
  - Role of environmental industry & investment

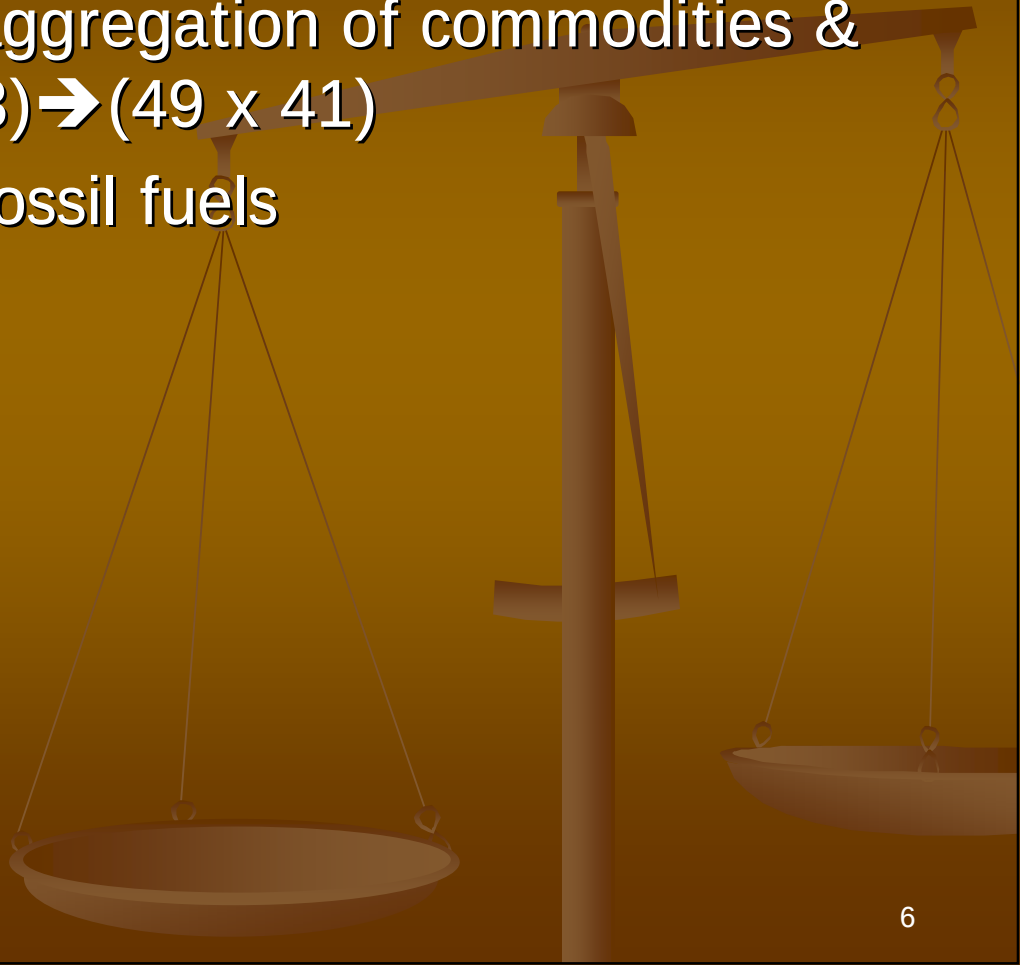
Features of AIM/Material

- CGE model with recursive dynamics
- Time period: 1995-2010
- Region: Japan
- Consistent material balance
- Carbon emissions
- Solid waste generation & treatment

What's new in 2001

- More detailed disaggregation of commodities & activities; (31 x 33)➔(49 x 41)

  Esp. detailed fossil fuels



New economic activities & commodities

AGR	Agriculture, forestry and fishery	ELM	Electrical machinery and equipment	IWM	Industrial waste management sector
MIN	Mining except fossil fuel	TRE	Transport equipment	*COL	Coal production and refinement
*M_C	Coal mining	PRI	Precision instrument		
#MCC	Coking coal	OTH	Others except plastic	#CCK	Coke
#MSC	Steam coal, lignite and anthracite	CNS	Construction	#CCG	COG
		HET	Heat	#CBF	Other coal products
*M_O	Oil mining	WTR	Water supply	*OIL	Oil production and refinement
#MCO	Crude oil	SAL	Wholesale and retail trade		
*M_G	Gas mining	FIN	Finance and insurance	#OGL	Gasoline
#MNG	LNG, Natural gas	EST	Real estate	#OJF	Jet fuel oils
FOD	Food and beverages	TRS	Transportation and communication	#OKR	Kerosene
TEX	Textiles			#OLO	Light oils
PLP	Pulp, paper and wooden products	PUB	Public service	#OHO	Heavy oil
		RNT	Renting and leasing	#ONP	Naphtha
CHM	Chemicals	REP	Reparing	#OLP	LPG
PLS	Plastic	PRS	Other service	#OOT	Other oil products
NMM	Non-metallic mineral products	GOV	Producers of government services	*GAS	Gas production
				#GTG	Town gas
STL	Steel	EMC	Environmental capital products	#ELE	Electricity supply
NSM	Non ferrous metal			*THE	Thermal electric generation activity
FMT	Fabricated metal	SEW	Sewage sector		
MCH	Machinery	MWM	Manicipal waste management sector	*HYD	Hydro power generation
				*NUC	Nuclear power

* only activity
\# only commodity

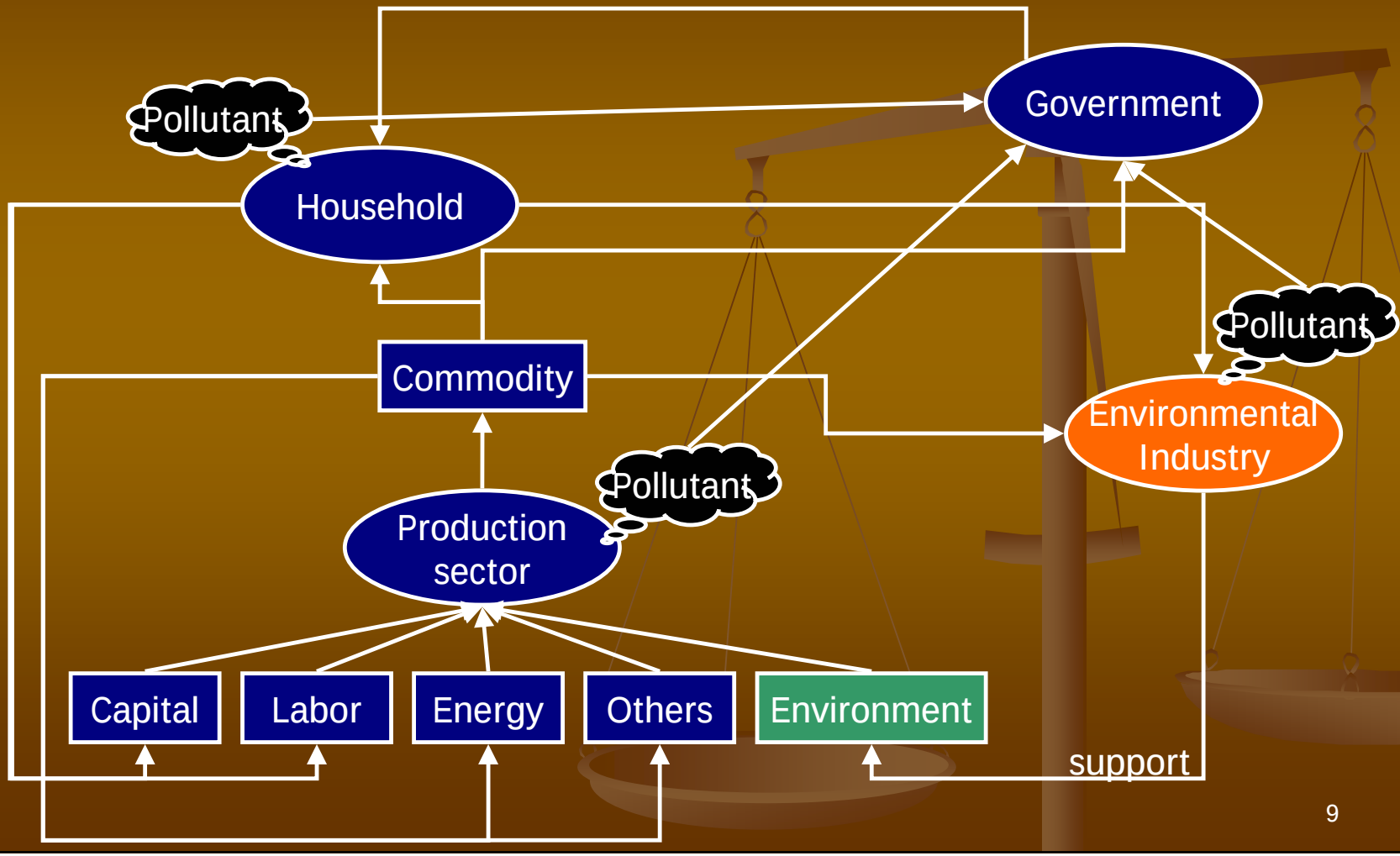
What's new in 2001

- More detailed disaggregation of commodities & activities; (31 x 33)➔(49 x 41)

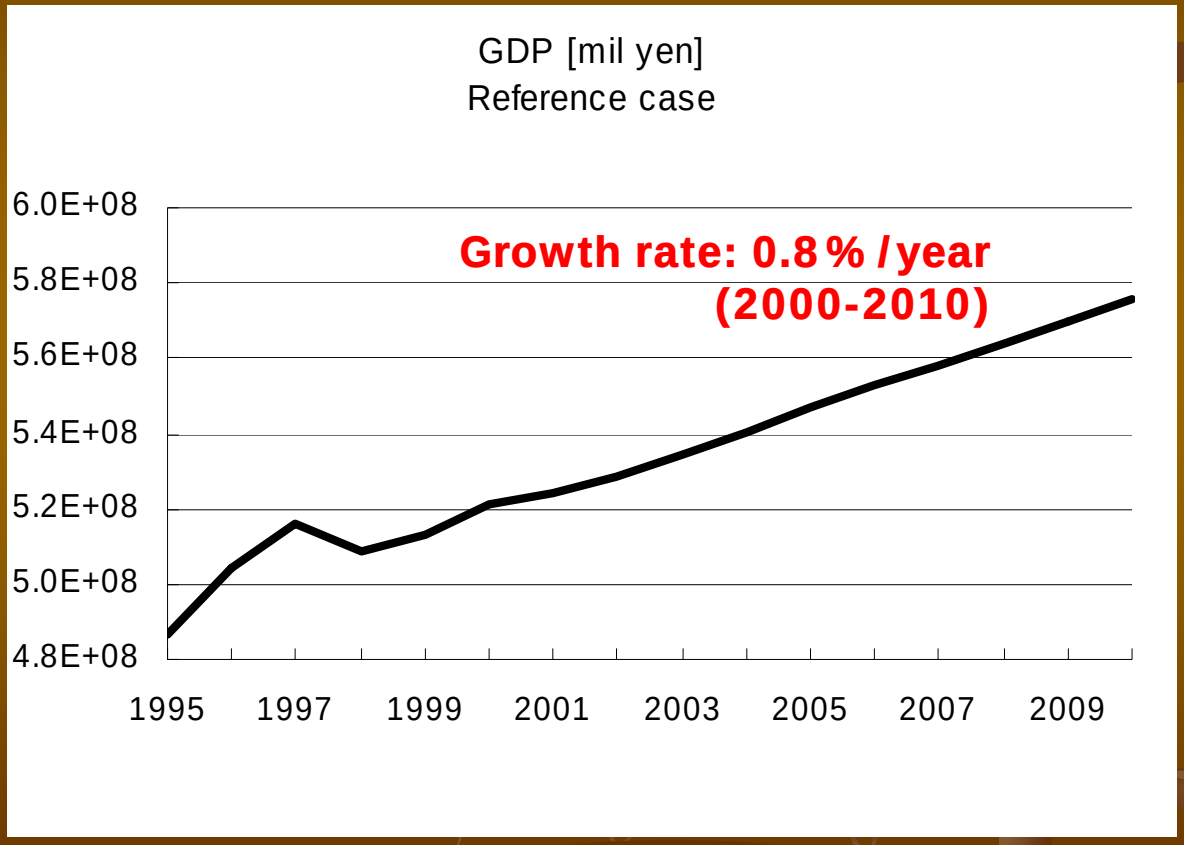
  Esp. detailed fossil fuels
- Structural change in waste treatment
- Detailed waste flow in Japan
- Link top-down (AIM/Material) & bottom-up (sludge treatment)

- Application to India ⇒ Dr. Rana

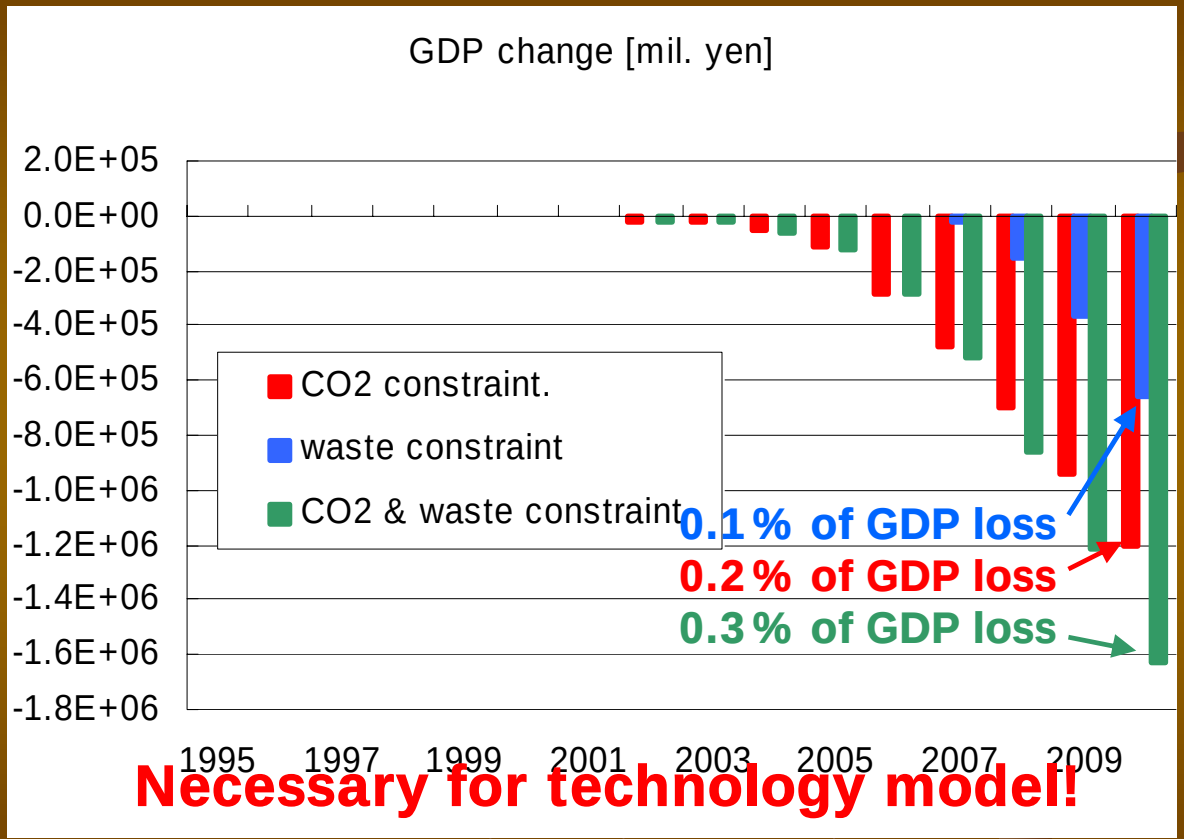
Overview of AIM/Material



Tentative simulation results



Tentative simulation results



➔Some assumptions such as waste reduction affect the results.
➔Exogenous parameters should have meaning.

Necessary for bottom-up model

- Elasticity of substitution in AIM/Material

  = 0 or ∞

  ← to keep material balance

  ex. produced pulp and waste pulp → 0

  produced energy and by-product energy → ∞

→ Need scenarios on structural change

→ For support scenarios, bottom-up model to represent the technology change has been constructed.

Overview of bottom-up model

Simple linear model (Sewage sludge treatment);

Minimizing Total Cost =

initial cost + running cost + final disposal cost

s.t. $D \leqq \Sigma_i X_i$: service demand of sewage sludge

$X_i \leqq A_i \cdot l_i$: treated sewage sludge

$R_j = X_i \cdot r_{ij} = rd_j$: Recycle demand

$\Sigma_i D_i = X_i \cdot d_i$: final disposal

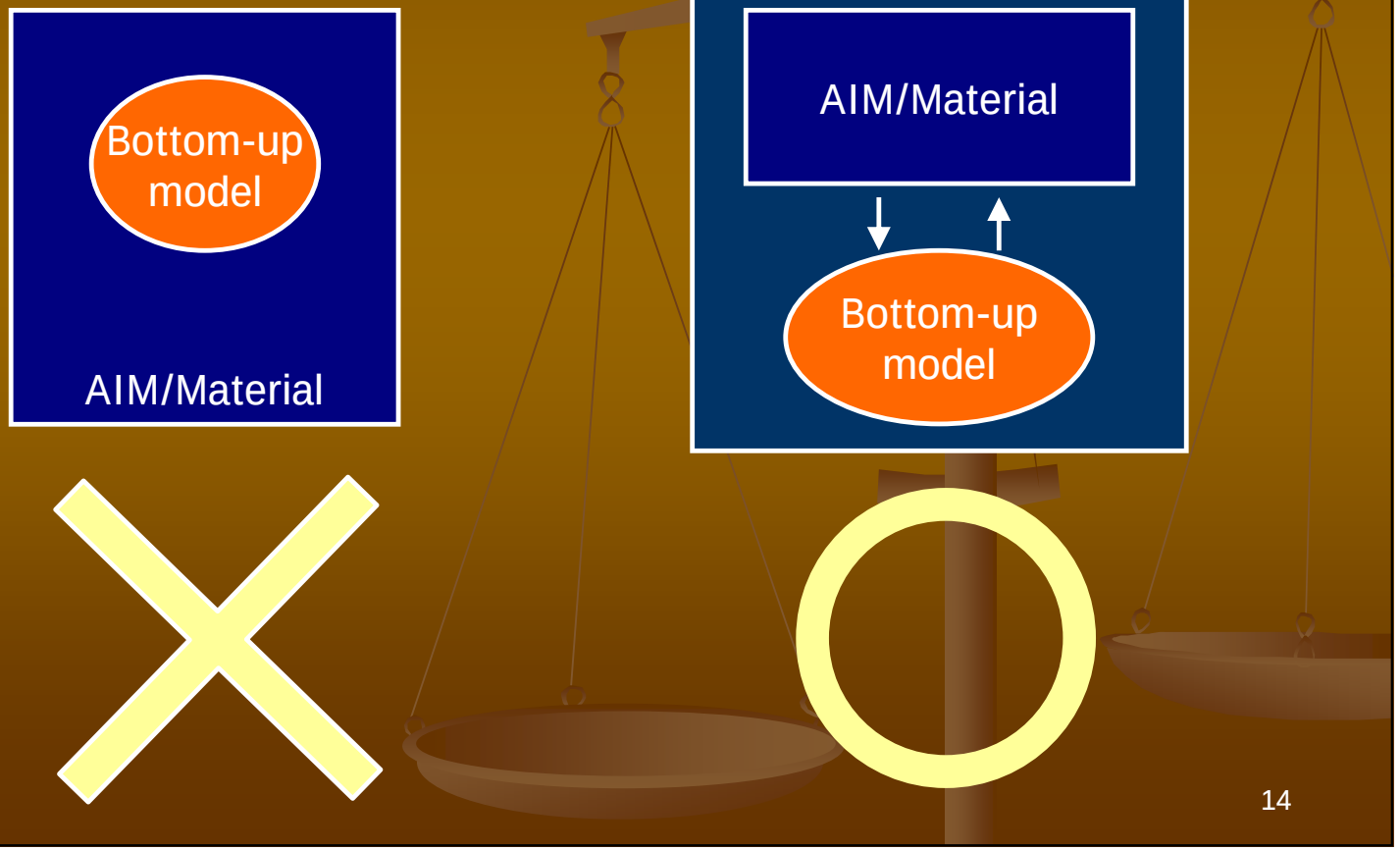
i: technologies,

X: treated sludge, A: capacity of sludge treatment,

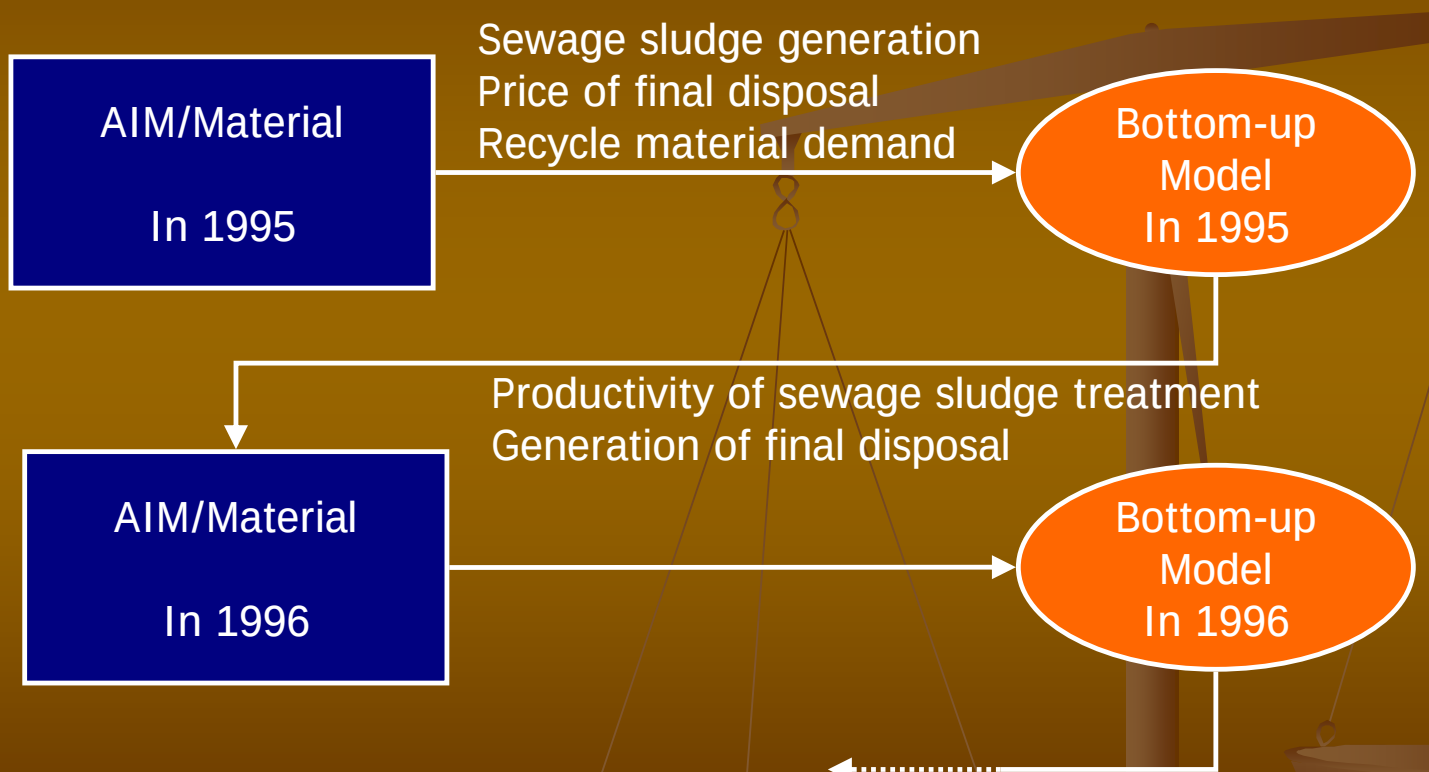
R: recycled products, D: other residual

l, r, rd, d: parameters

How to link 2 models?

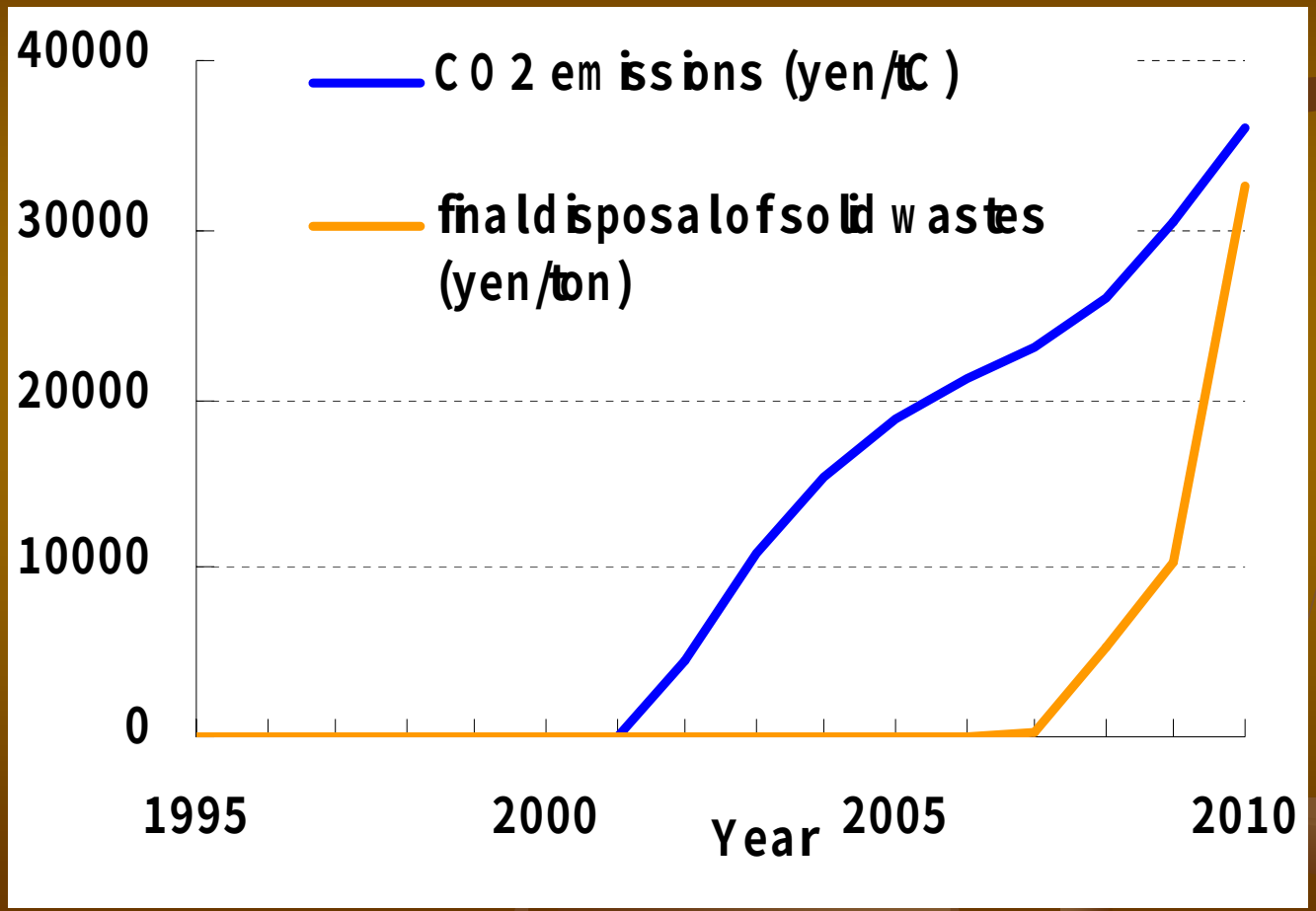


Linkage of 2 models
- sewage sludge treatment -



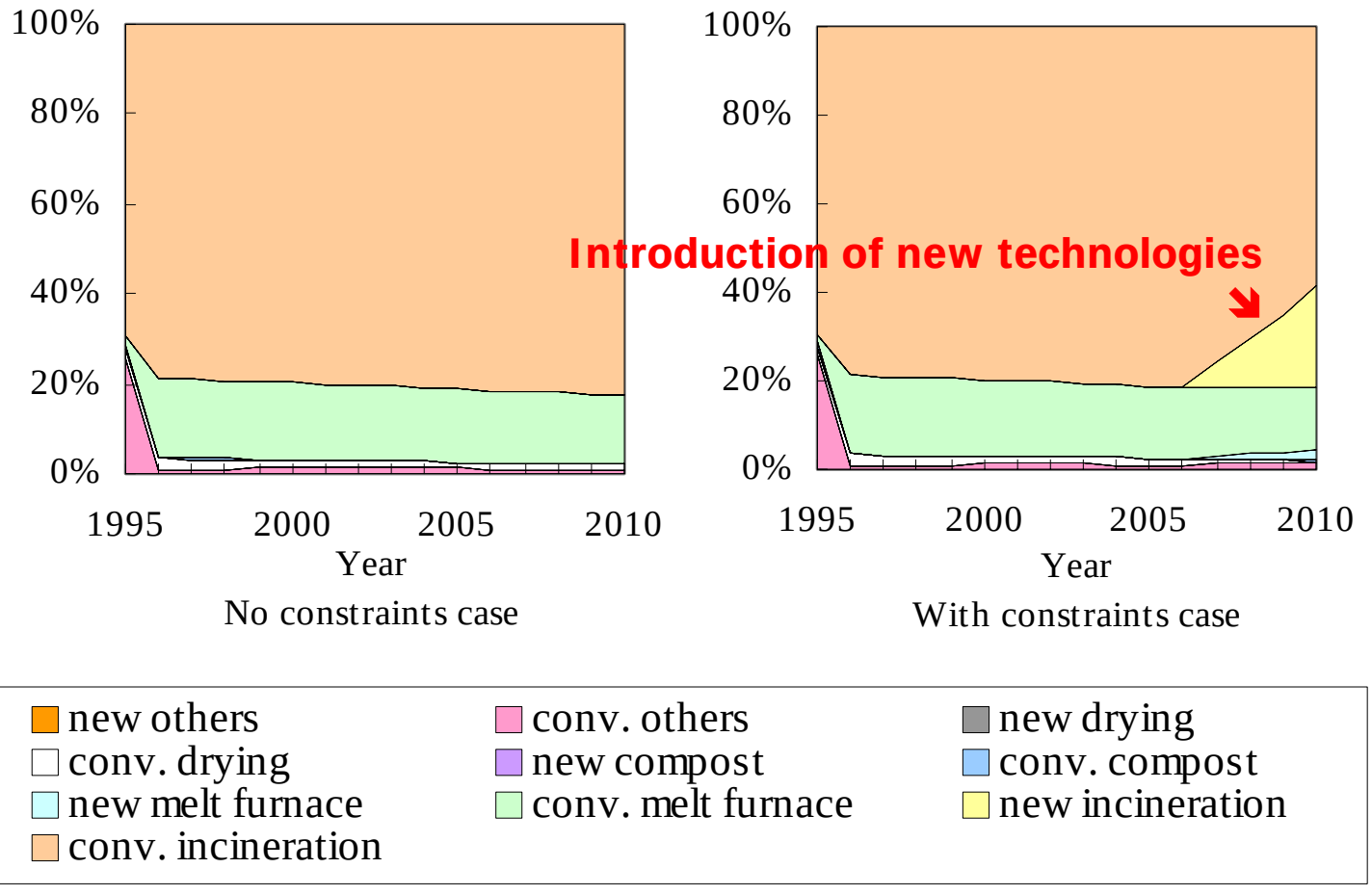
Results of 2 models

- Marginal cost of pollutants -



Results of 2 models

- technology change -



Results of 2 models

- Economic impact of constraints & technologies -

- In 2010
  - **Environmental constraints on CO2 emissions and final disposal of solid waste will bring 1.8 trillion yen of GDP loss.**

    In case of no constraints, GDP in 2010 will be 638 trillion yen.
  - **By introducing new technologies (systems) in sewage sludge management, 10 billion yen of GDP will be recovered.**
  - **Both increase of recycle material demand and introduction of new technologies will make GDP loss will be mitigated by 200 billion yen.**

Tax reform in Japan

- Present tax rates on gasoline & light oil are tentative for road construction.

  ➔Change tax rate on gasoline & light oil;

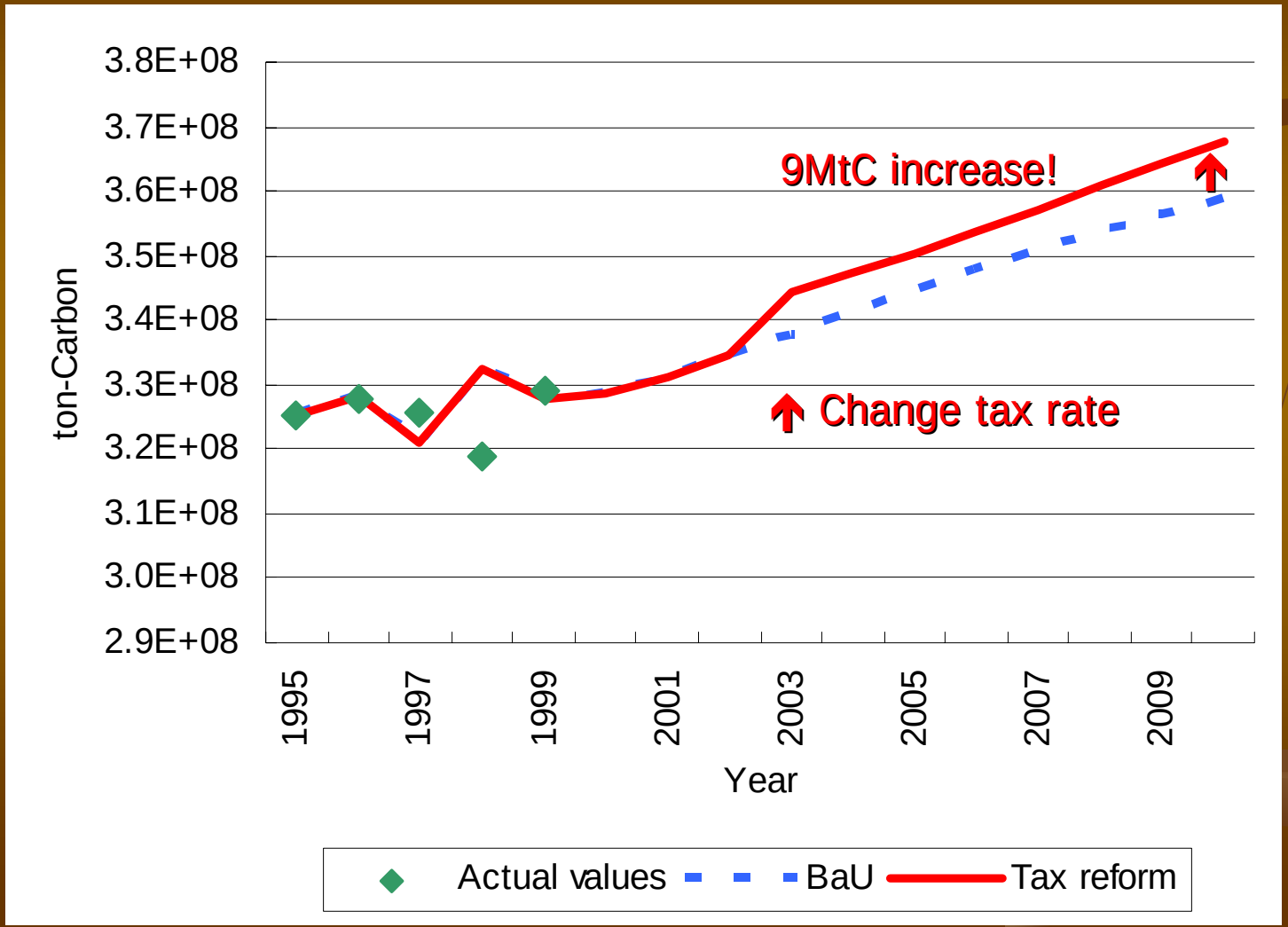
  gasoline 53.8yen/l ⇨ 28.7yen/l

  light oil 32.1yen/l ⇨ 15.0yen/l

  ➔**Opposite effects to carbon tax!**

  ➔How much of CO2 emissions increase?

Tax reform


3.8E+08
3.7E+08
3.6E+08
3.5E+08
3.4E+08
3.3E+08
3.2E+08
3.1E+08
3.0E+08
2.9E+08
ton-Carbon
1995
1997
1999
2001
2003
2005
2007
2009
Year
9MtC increase!
Change tax rate
Actual values
BaU
Tax reform

Future works

- Revise for developing countries
  - Simplify model structure
    - Impossible to prepare detailed dataset
    - Flexible structure for different environmental problems
  - Aggregation of economy data (ex. GTAP) & physical data (ex. ITC UNCTAD)
    - Fossil fuels, steel, wood, …

⇒Link CGE model (by Dr. Fujino)

- Bottom-up model development
  - Municipal waste treatment in Japan