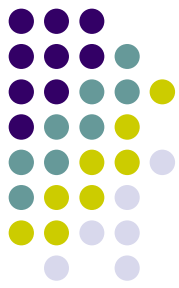




Modeling for Emission of Domestic Waste in China

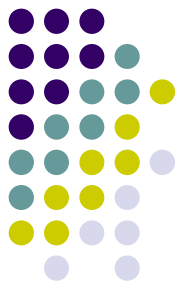
Takeshi Fujiwara
February 20, 2006

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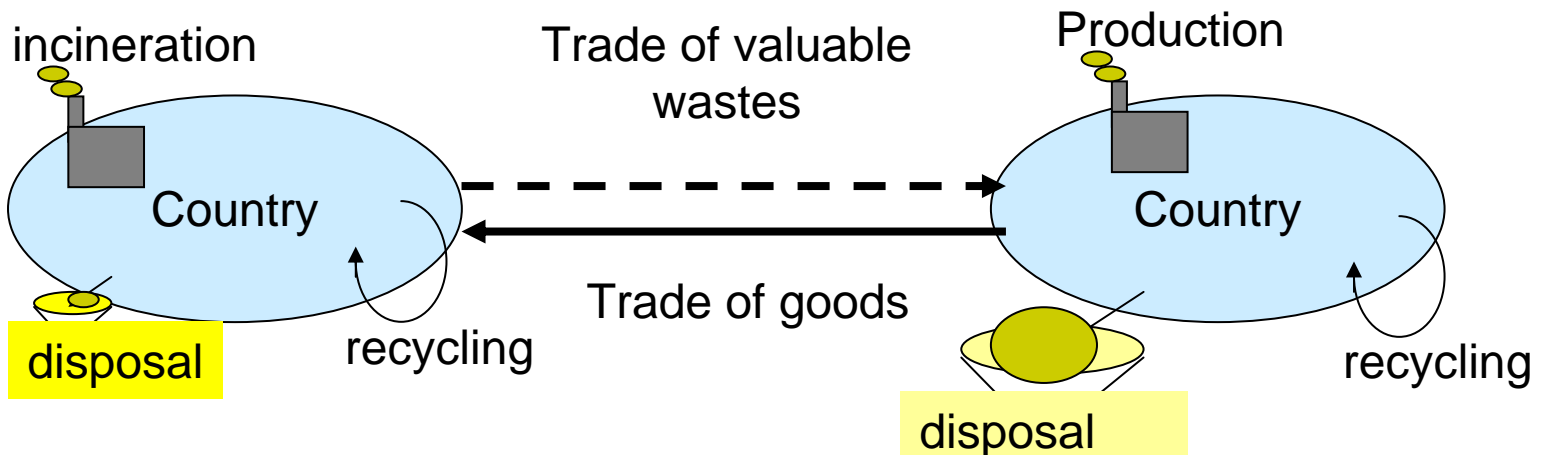
Background (1)

- Waste emission increases in Asian countries, especially in urban area, according to economic development.
- Generally, increase in income promotes consumption of goods and makes the amount of domestic waste large.
- On the other hand, building waste disposal sites near the town becomes difficult because of opposition by the residents (NIMBY), therefore, new disposal sites tend to be built at farther place.
- As people desire sanitary life and clean city, waste collection becomes frequent and waste transportation becomes longer, therefore, the larger number of waste collection cars and more fuel are necessary.
- Since such the waste problem in the developing city is imperative, it is important to estimate waste emission in future and to design an appropriate waste management plan.



Background (2)

- Not only goods and but also waste goods (including secondhand goods) are traded between Asian countries.
- The developing country which has labor power by low wage imports the waste goods to reuse or extract valuable things. It is pointed as a serious problem that the residual of the waste, possibly including hazardous materials, is not adequately treated.
- This means developing sound material cycle is not a subject of one country but a subject of the world.

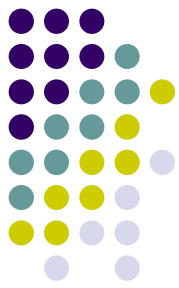


Background (3)



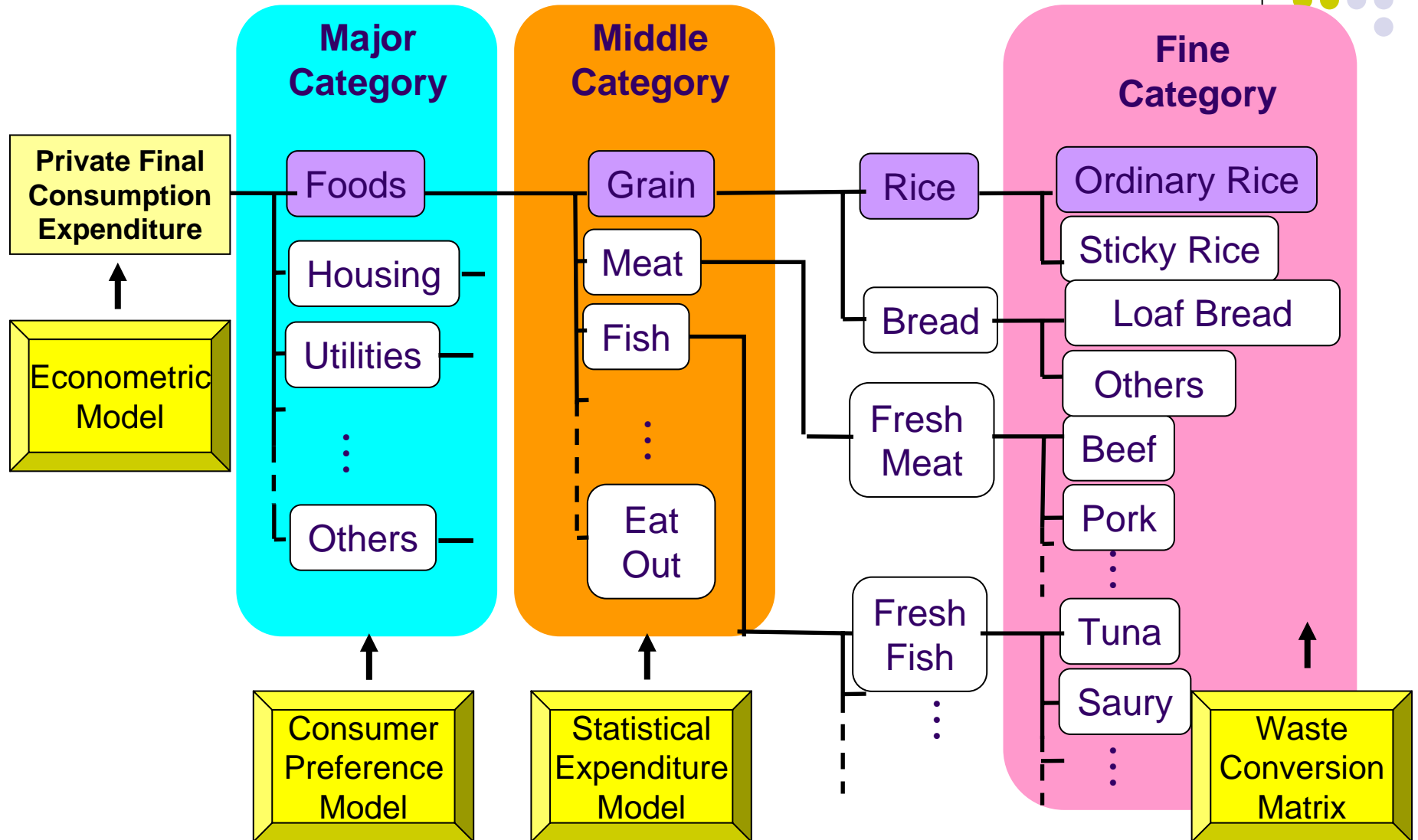
- From the viewpoint of climate change problem, emission of CO₂ from waste collection cars and CH₄ from landfill sites should be focused on.
- Recently, CH₄ gas is recovered in some landfill sites through equipped gas collection pipes, and such activity is often conducted as a CDM project.
- Adoption of waste recycling facility, such as composting and biogas generator, should be considered in the waste management plan.
- (To develop sound material society, actions of Reduce, Reuse, and Recycle [3R] are essential.)
- We are tackling not only waste estimation but also material flow analysis.

Objectives

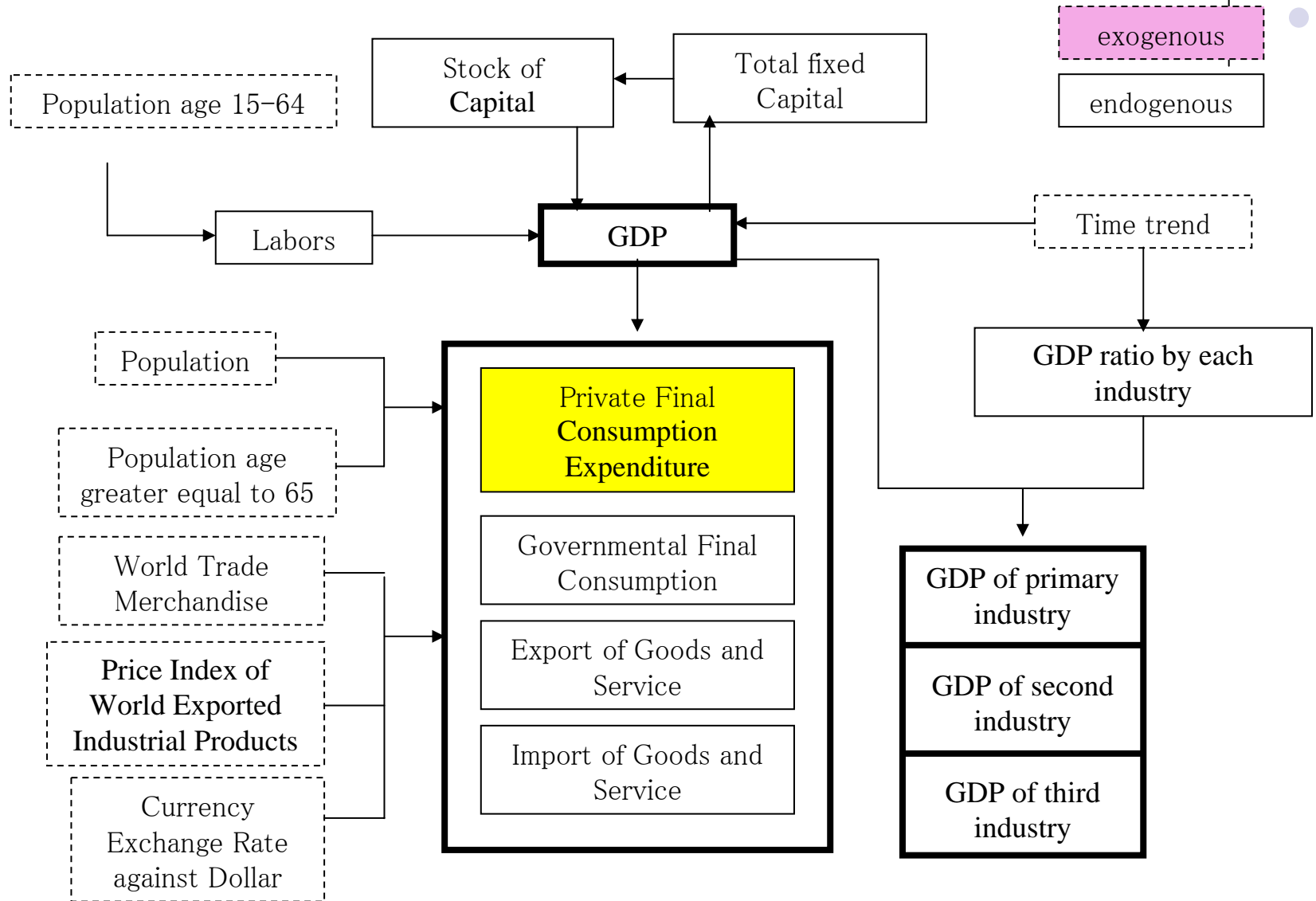
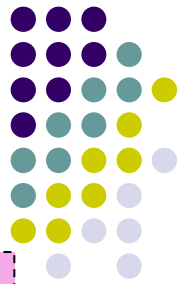


- Comprehension of material flow in the country and material transportation between countries by using statistics of monetary and material flow and stock is the first step.
- Consumer's purchasing power and preference drives production activity of industry, and the household generates domestic waste and the industry generates industrial waste. We develop such driving mechanism by using economic model.
- Using social and economic scenarios, future material flow in the world (specially Asian countries) is figured out and waste emission is also projected.
- Appropriate waste management system including waste collection, treatment and disposal, corresponding to the country is considered.

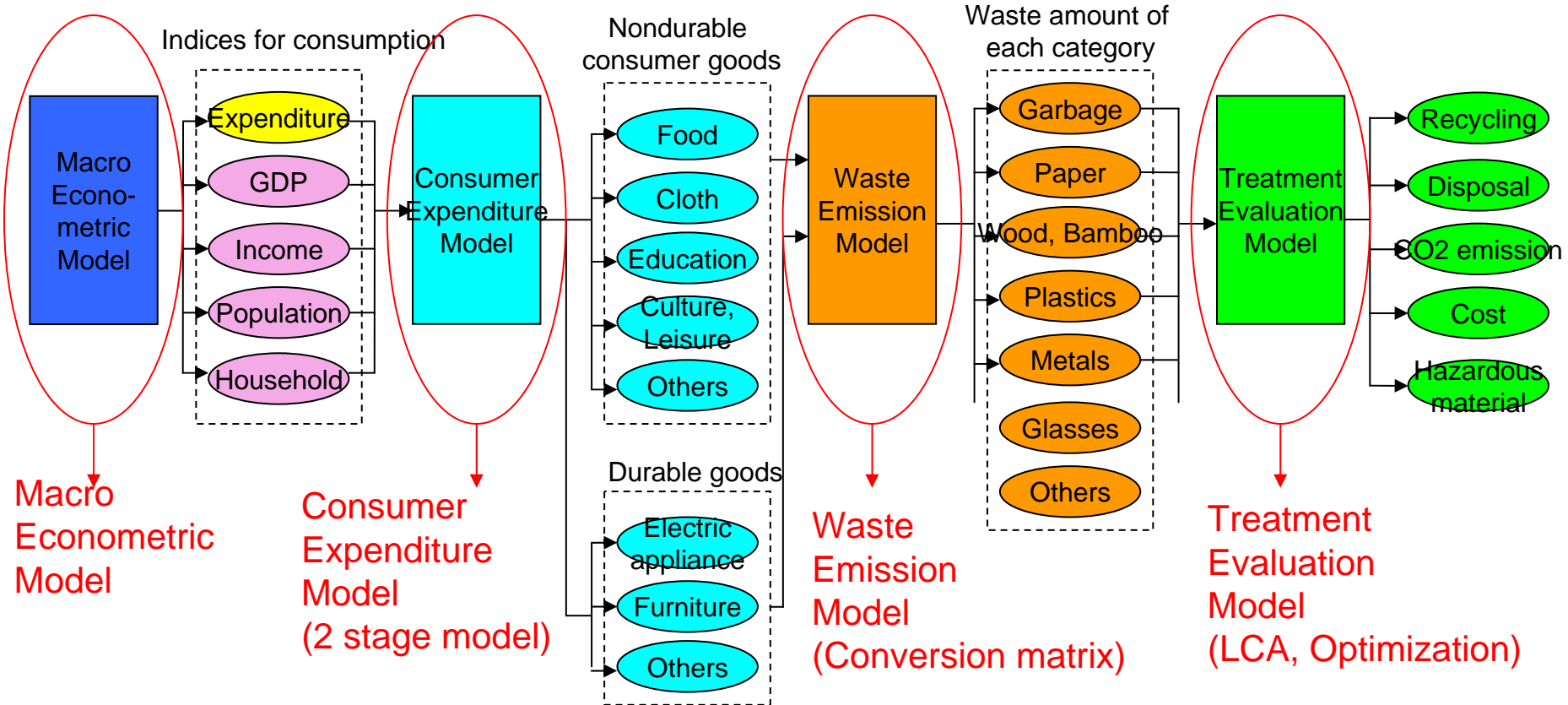
Classification of consumer expenditure

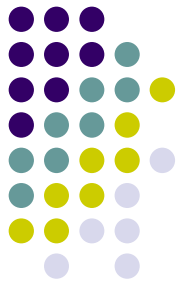


Macro Econometric Model

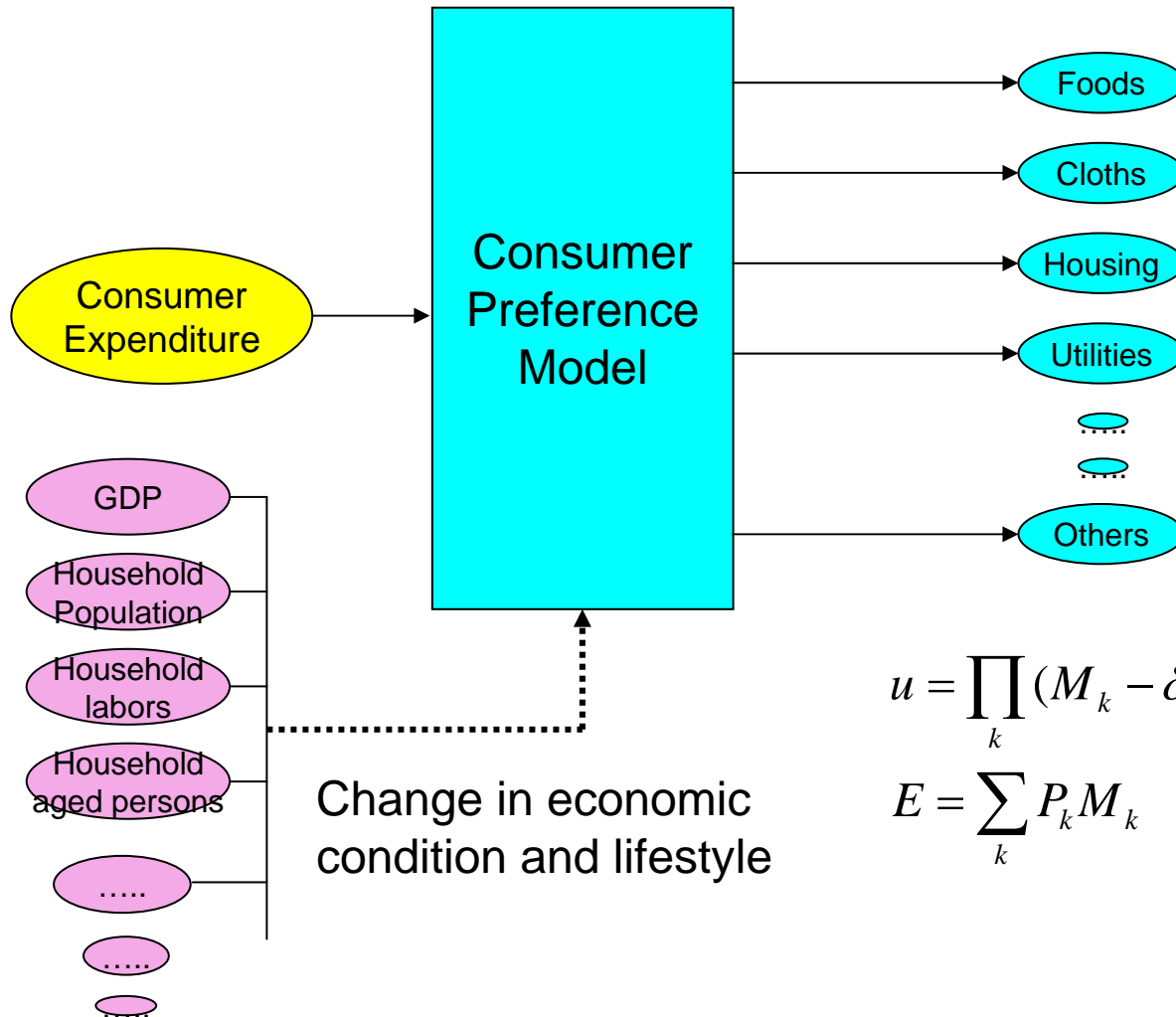


Estimation of Waste Emission, Evaluation of Waste Treatment, for Domestic Waste



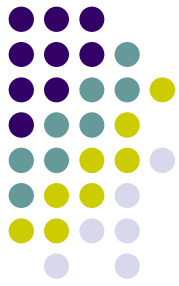


Consumer Preference Model



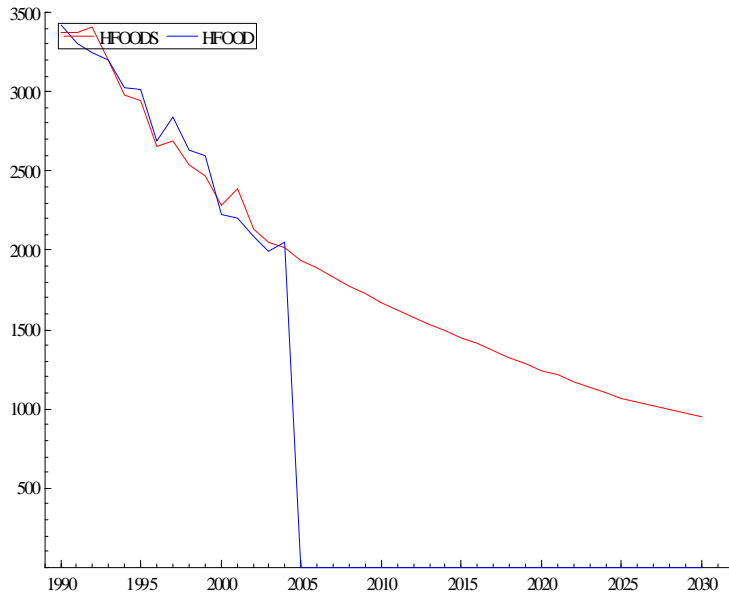
$$u = \prod_k (M_k - \delta_k)^{\alpha_k}$$

$$E = \sum_k P_k M_k$$

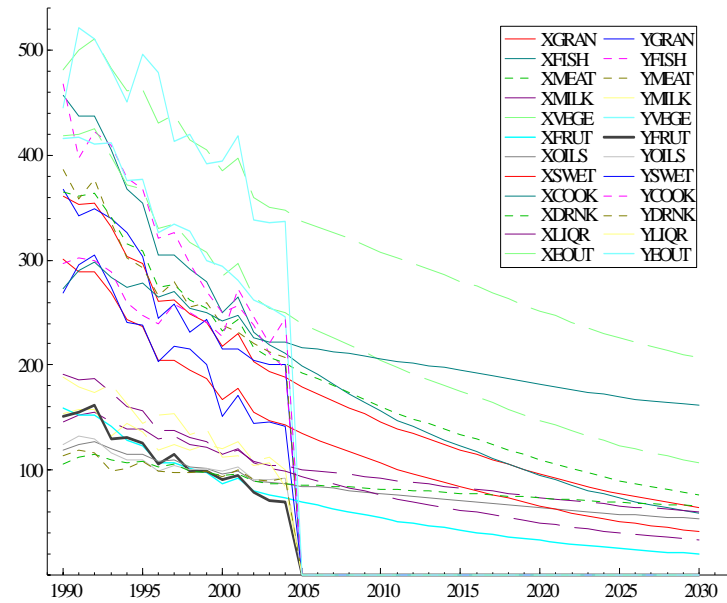


Example of Model Output

Output of expenditure estimation (“O city” in Japan)



Consumer preference model



Statistical expenditure model

Current Status of Modeling Work

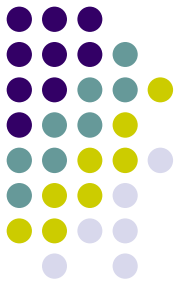


- The estimation model of domestic waste will be validated by applying it to Japan case and Siga prefecture case.
- We collaborate with a Chinese scholar to collect waste statistics data and to apply the model to Chinese major cities.
- Impact of 3R activity in waste management on reduction of GHG emission will be assessed.



Future Research

- Industrial waste emission model will be developed. This model uses IO table and special knowledge of industrial process.
- The model of domestic waste estimation will be applied to Asian countries.
- Utilization of bio waste, such as agricultural waste, food industry waste, kitchen waste and so on for energy production and also reduction of GHG emission will be evaluated.



Thank you for kindly attention