

## Global Environmental Policy Making on Technology

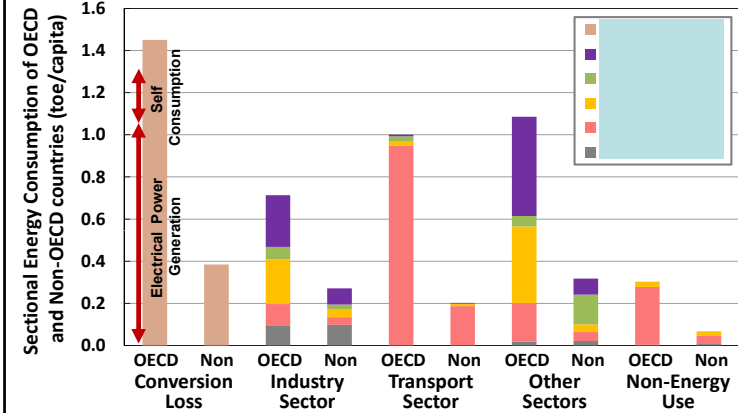
### 環境・エネルギー技術政策

17th and 24th, October, 2011  
Jun TAKAHASHI

- ✓ Global energy balance
- ✓ How to read statistics data ?
  - ✓ Long-term viewpoint
  - ✓ Suspect an interpretation and the data itself !
- ✓ How to make a policy ?
- ✓ Quiz

### Sectional Energy Consumption of OECD and Non-OECD countries

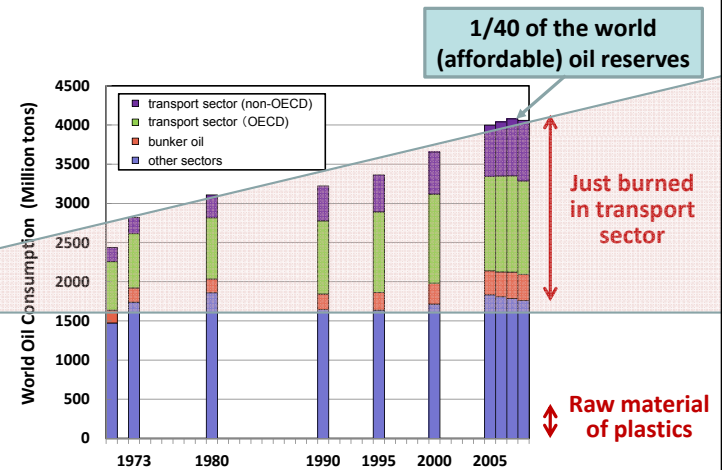
2008	Population	Total Primary Energy Supply	Total Final Energy Consumption
OECD	1190 million	4.56 toe/capita	3.11 toe/capita
Non-OECD	5498 million	1.24 toe/capita	0.86 toe/capita



### Annual World Material Production

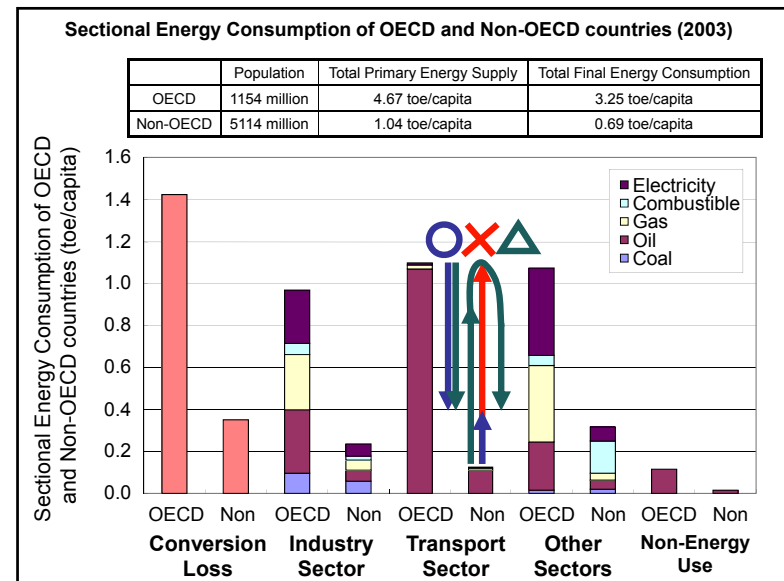
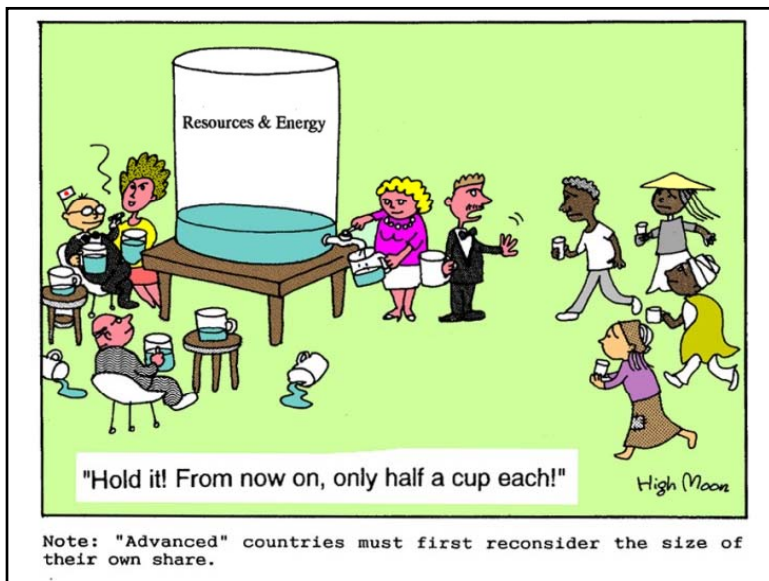
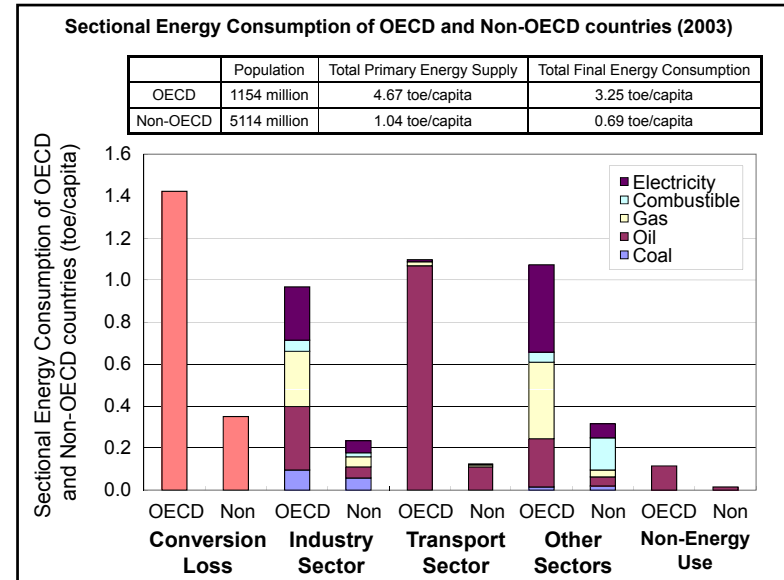
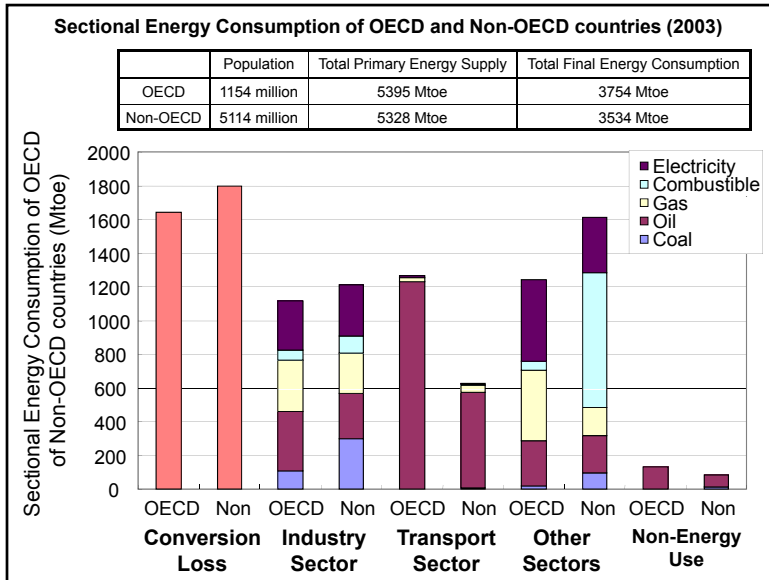
- Crude steel production: 1.4 billion tons
  - Coking coal for steel production: 0.7 billion tons (= 0.1 tons per capita)
  - World coal consumption: 3.3 billion tons (2.5 billion tons for fuel)
- Plastics production: 0.25 billion tons
  - Oil consumption for plastic production: 0.5 billion tons
  - World oil consumption: 4 billion tons (2.1 billion tons for transport)

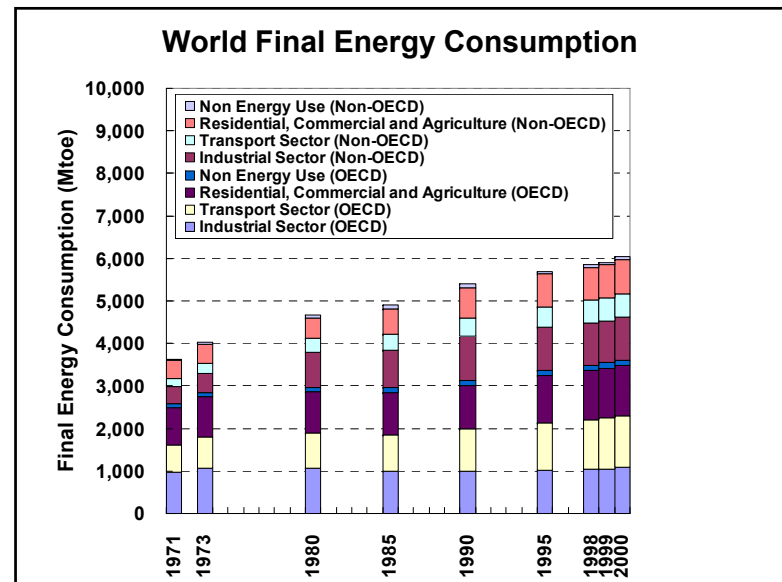
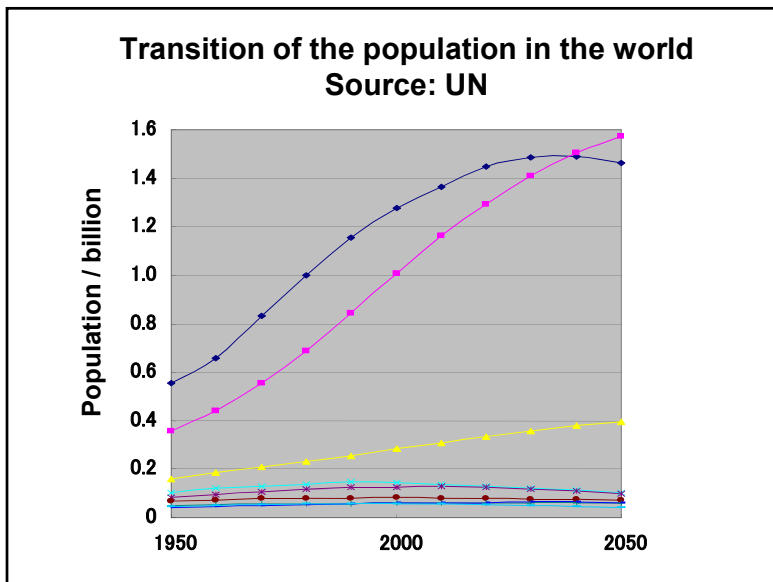
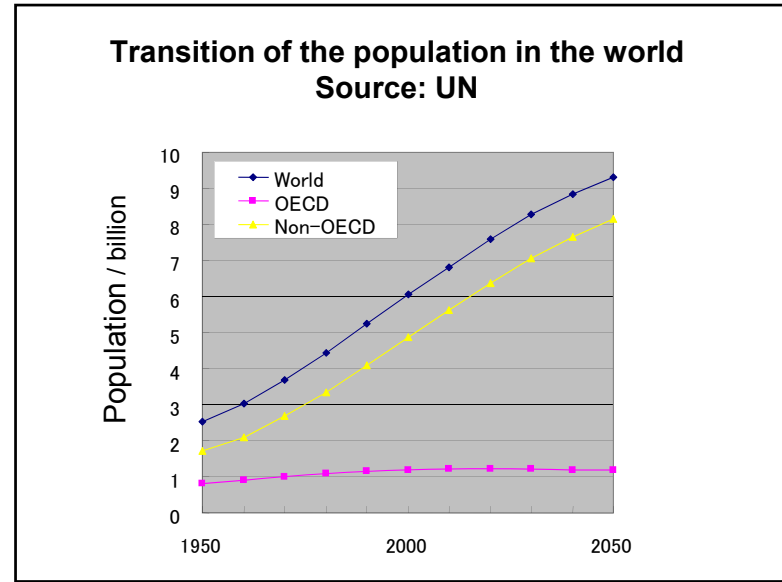
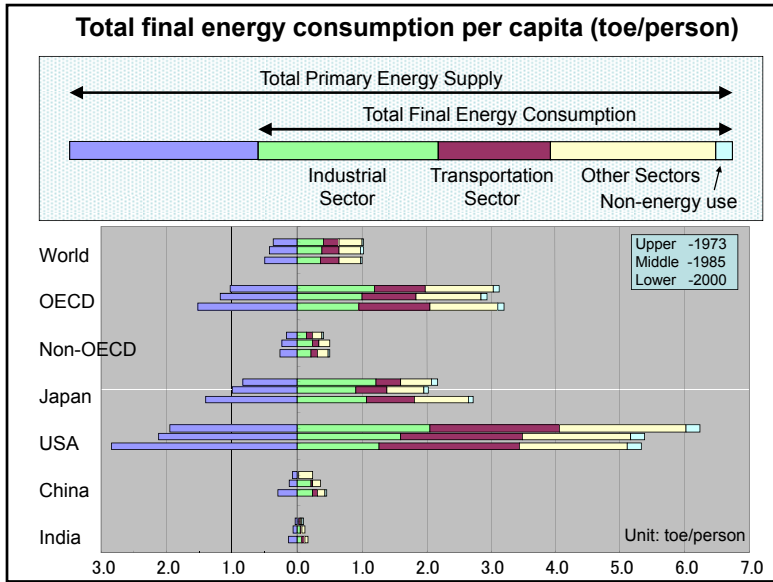
### Oil consumption of the world and transport sector

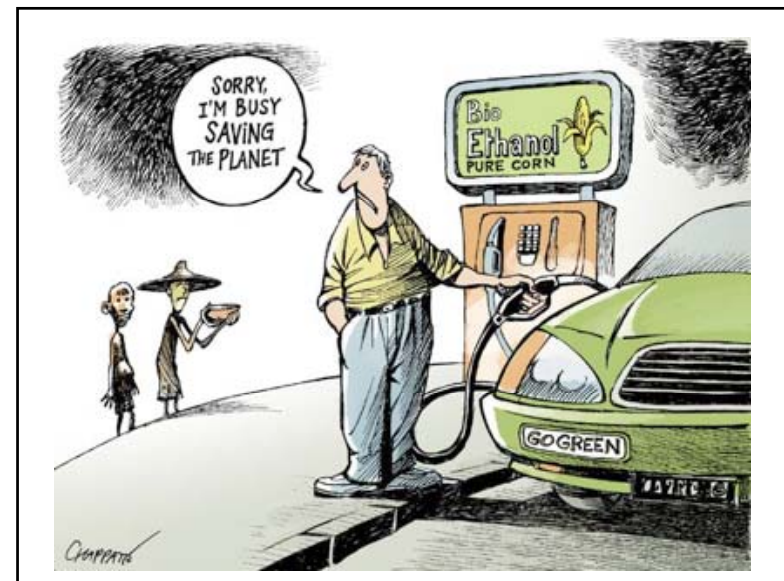
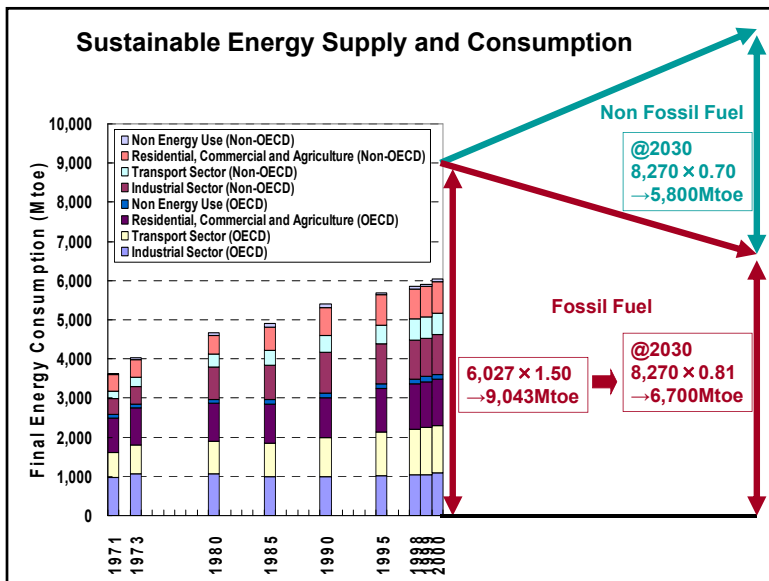
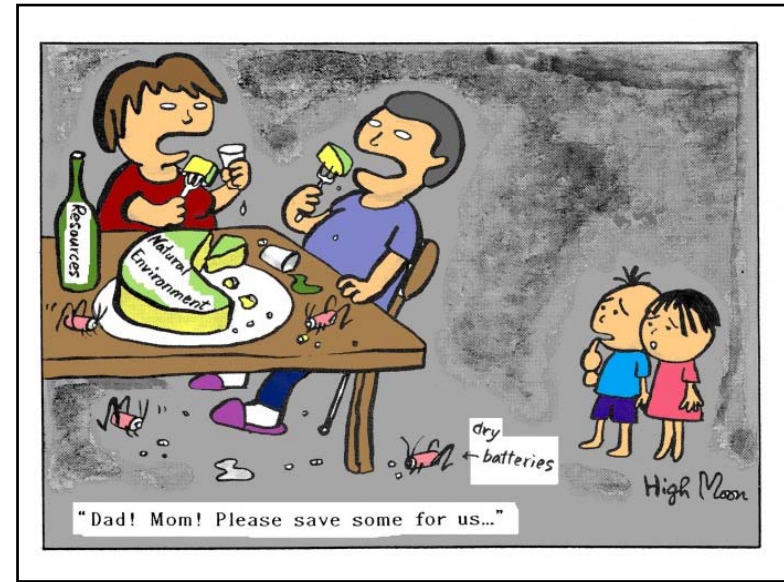
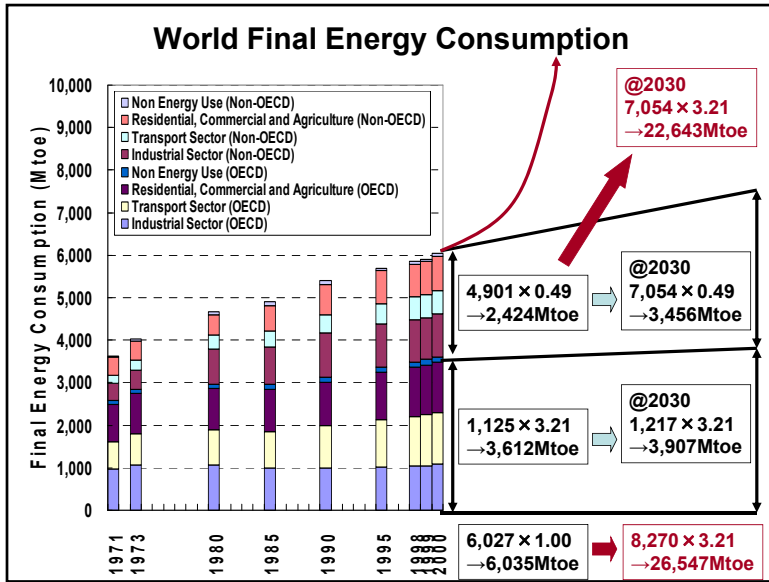


Source: EDMC, Energy & Economic Statistics 2011









## Calculation of the amount of solar energy

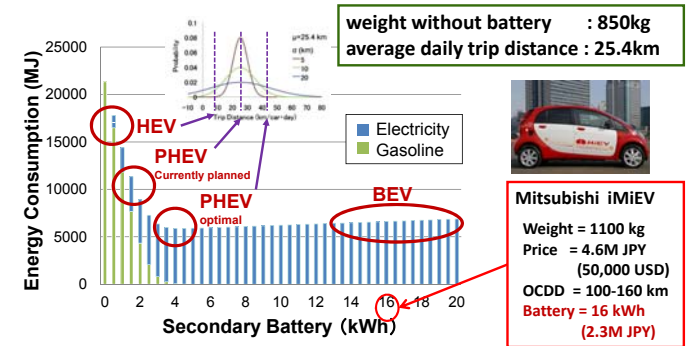
### Reference

- World primary energy supply is about 1.5 toe/ year par capita
  - 1.5 [toe/ year par capita] = 40000 [kcal/day par capita]
- Human need energy of 2000 [kcal/day par capita] to live.

### Solar energy flowing into the earth

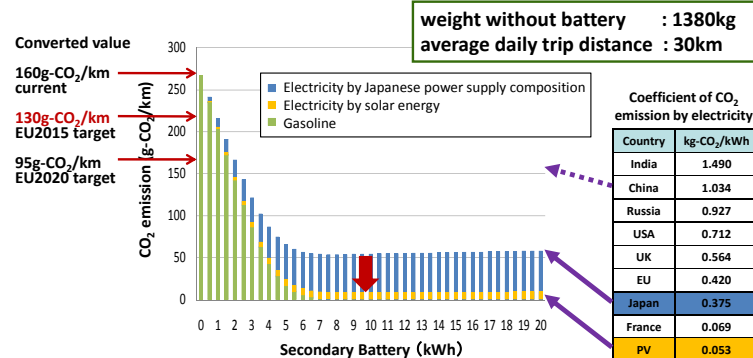
$$\begin{aligned}
 &0.7 \times \pi R^2 [\text{m}^2] \times 1367 [\text{J/m}^2\text{s}] \\
 &= 0.7 \times 1.286 \times 10^{14} [\text{m}^2] \times 1367 [\text{J/m}^2\text{s}] \\
 &= 1.23 \times 10^{17} [\text{J/s}] \\
 &= 2.94 \times 10^{13} [\text{kcal/s}] \quad (= 40000 \times 10^4 [\text{kcal/day par capita}]) \\
 &= 2.94 [\text{Mtoe/s}] \quad (= 1.5 \times 10^4 [\text{toe/year par capita}])
 \end{aligned}$$

## Energy Consumption Structure of mini-PHEV



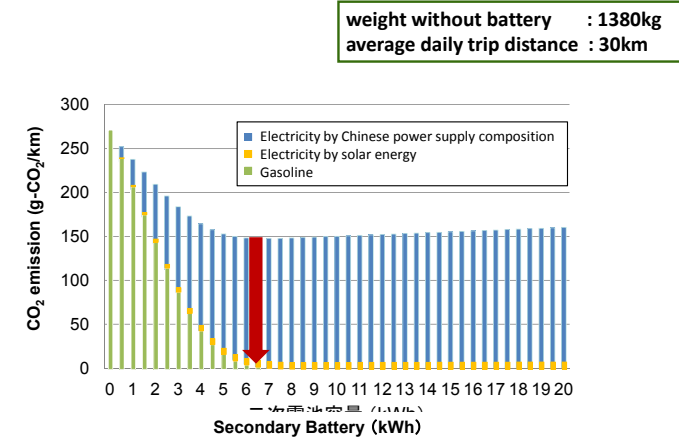
- There is an optimal amount of secondary battery depends on the weight of vehicle and average daily trip distance.
- Hence, the spread of such an optimal PHEV must be difficult in case of heavier cars and countryside.

## CO<sub>2</sub> Emission Structure of Japanese PHEV



- Combination of solar and PHEV shows a significant effect !!!
  - 3m<sup>2</sup> of PV generates 2kWh daily, hence PV-PHEV is possible.
  - The amount of secondary battery is more important from a viewpoint of CO<sub>2</sub> emission.

## CO<sub>2</sub> Emission Structure of PHEV in China





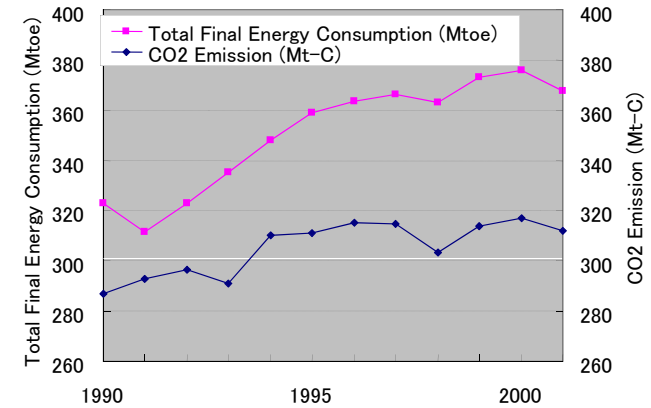
## Global Environmental Policy Making on Technology

### 環境・エネルギー技術政策

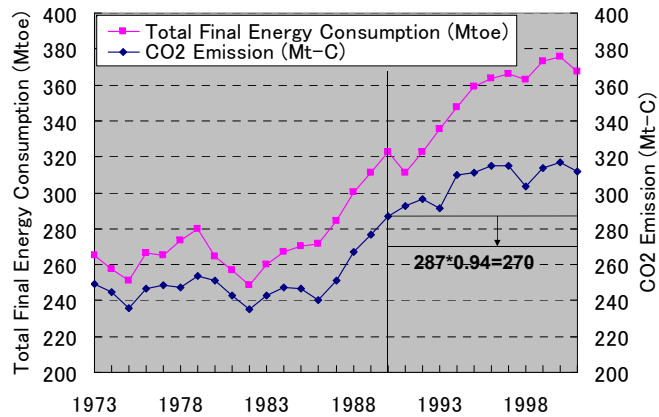
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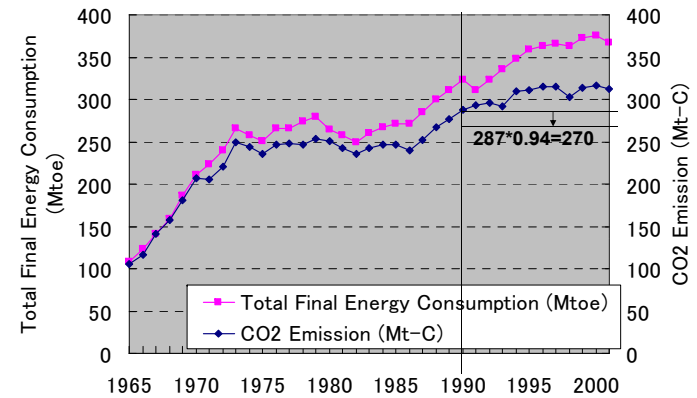
### Japanese TFC and CO2 Emission (1990-2001)

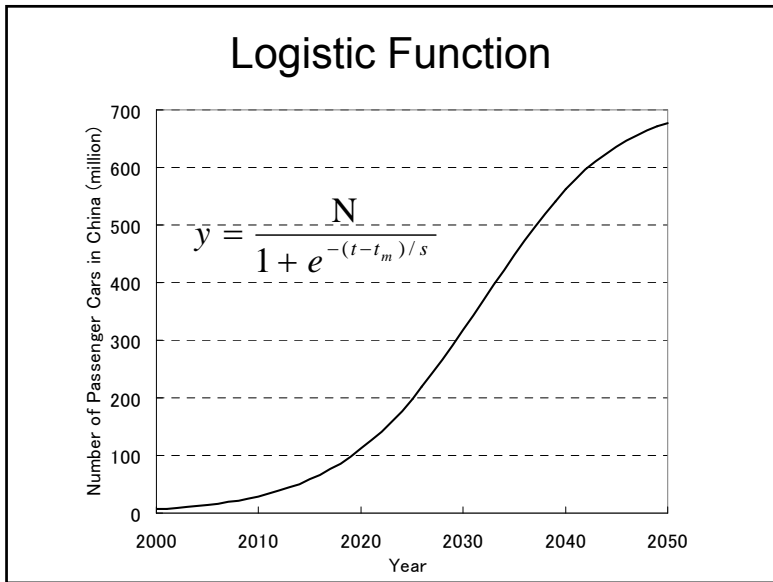
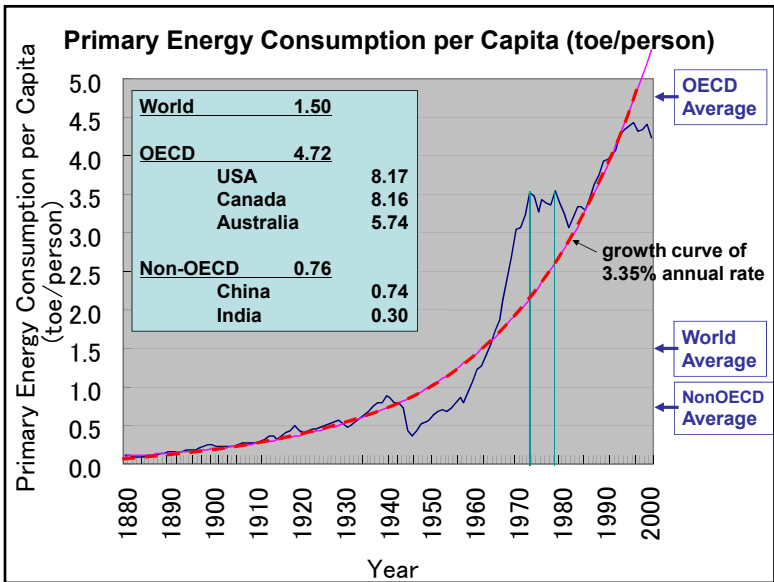
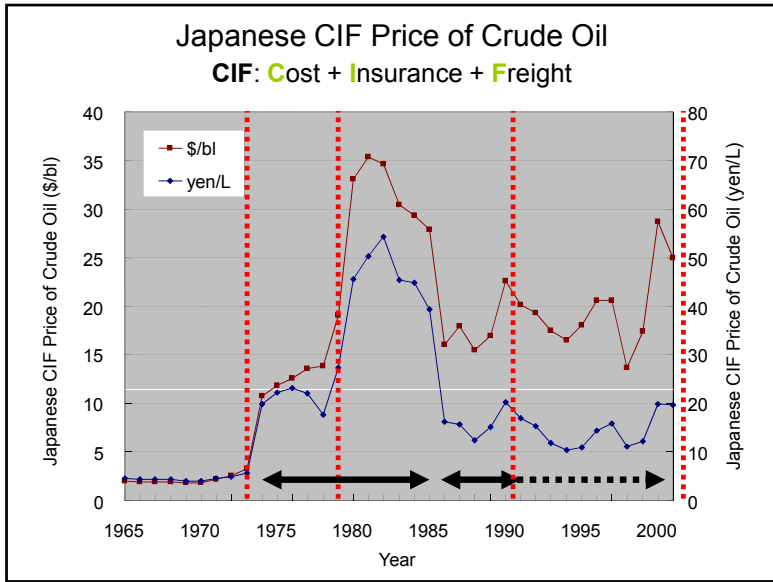
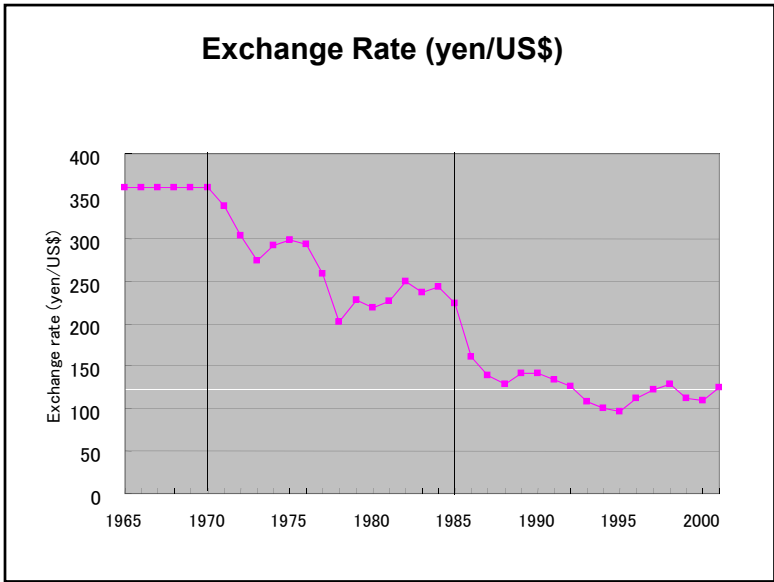


### Japanese TFC and CO2 Emission (1973-2001)

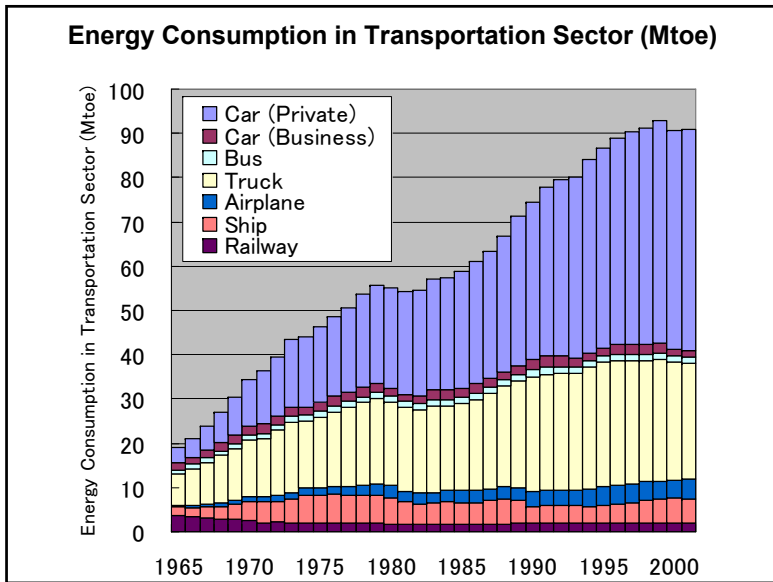
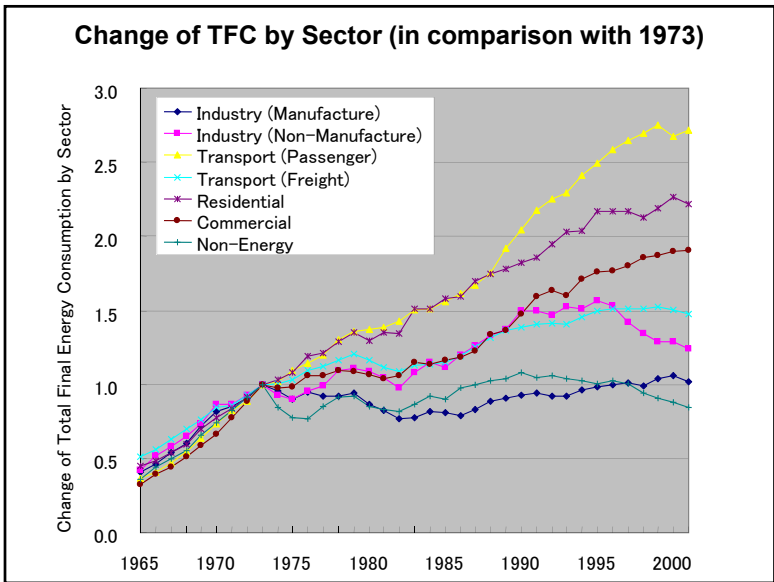
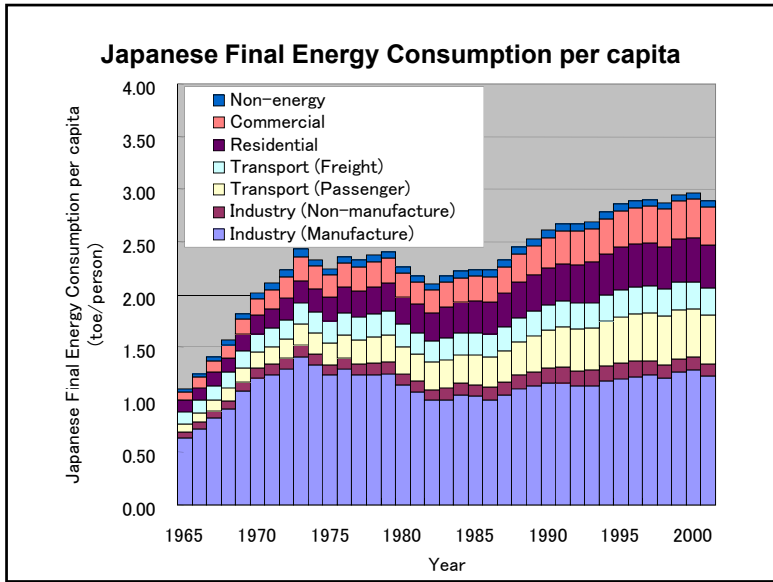
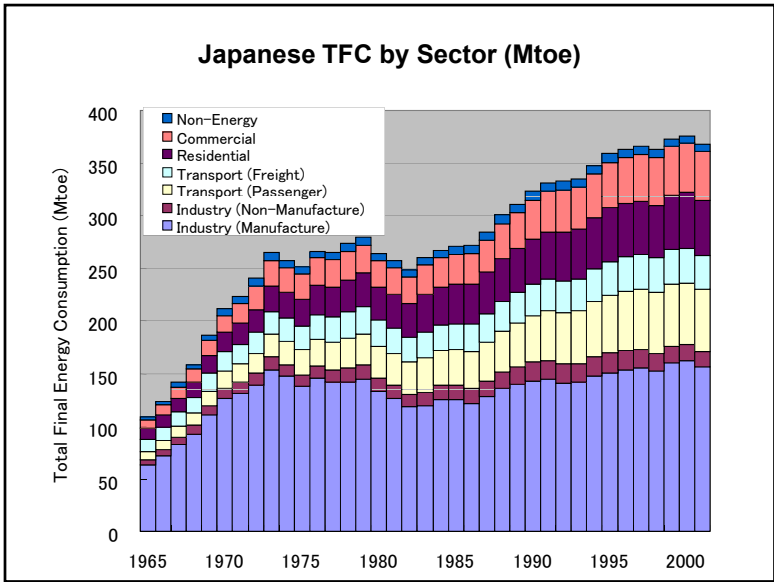


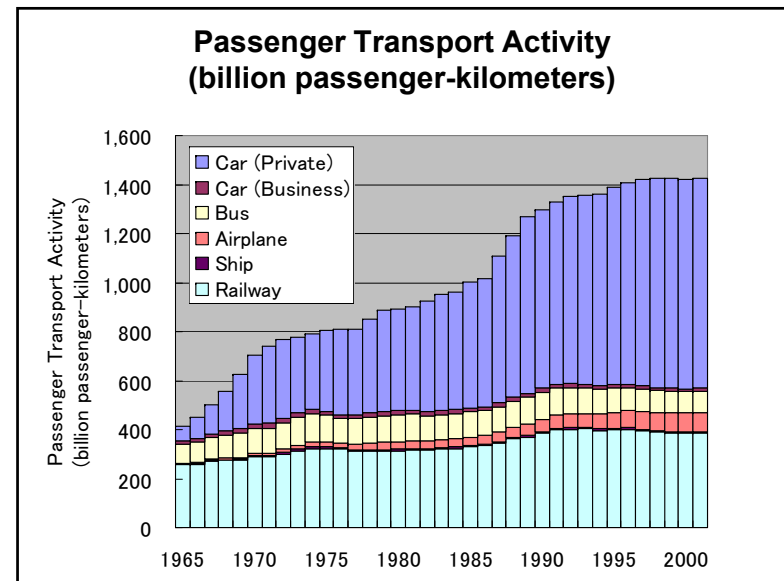
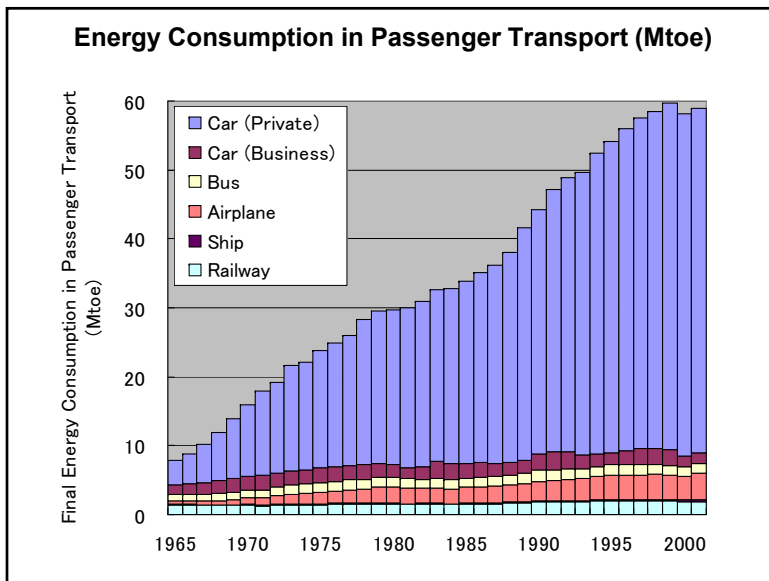
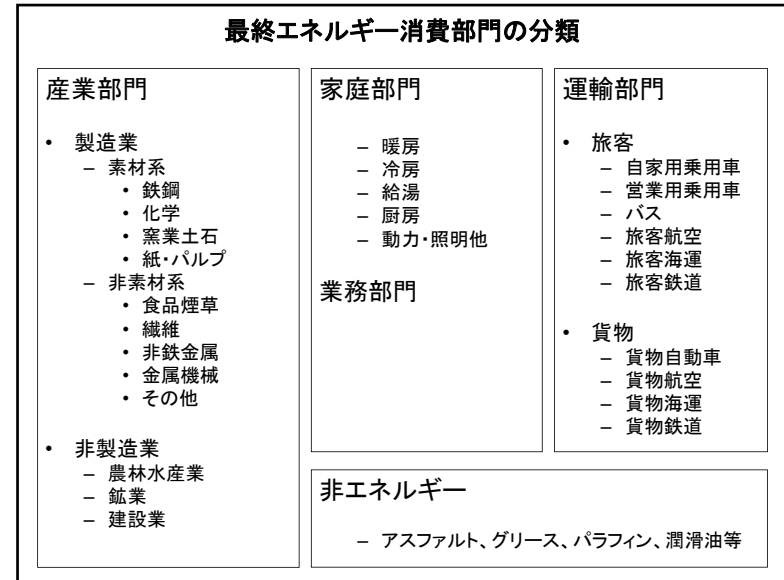
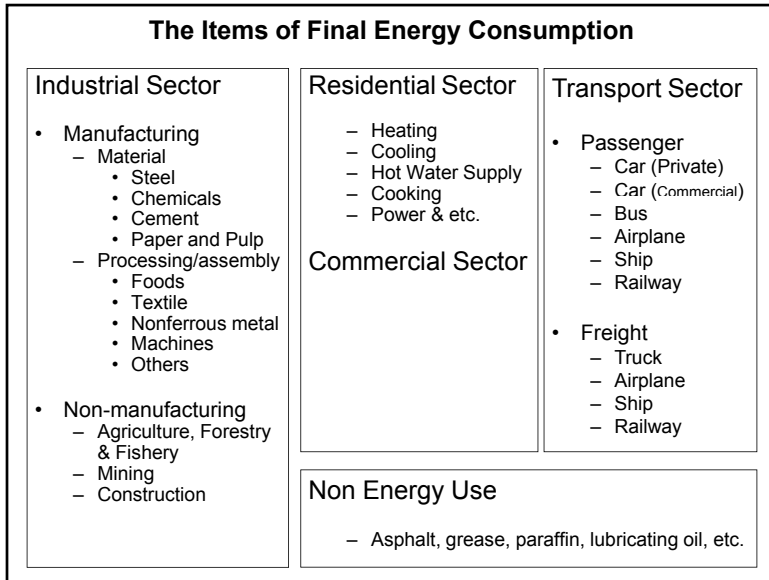
### Japanese TFC and CO2 Emission (1965-2001)

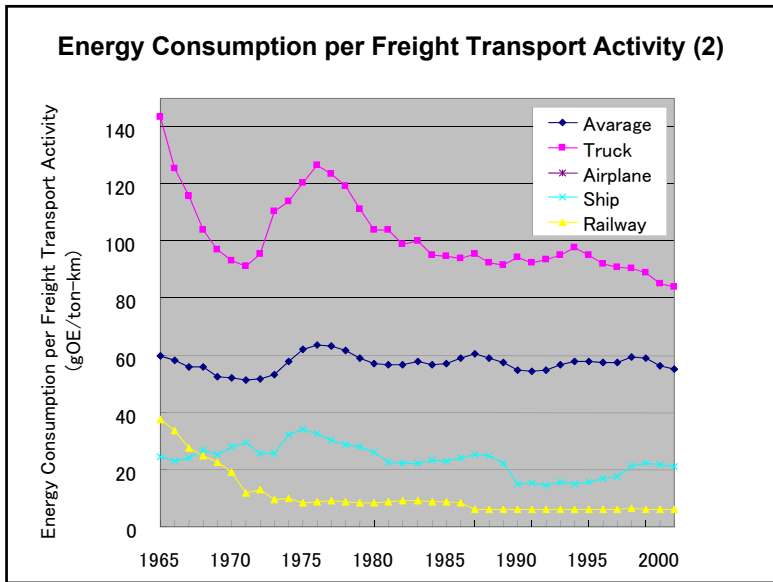
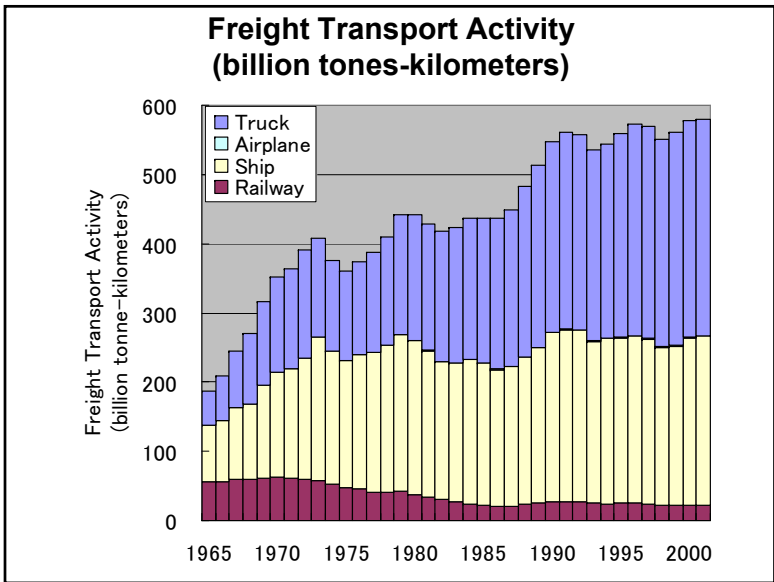
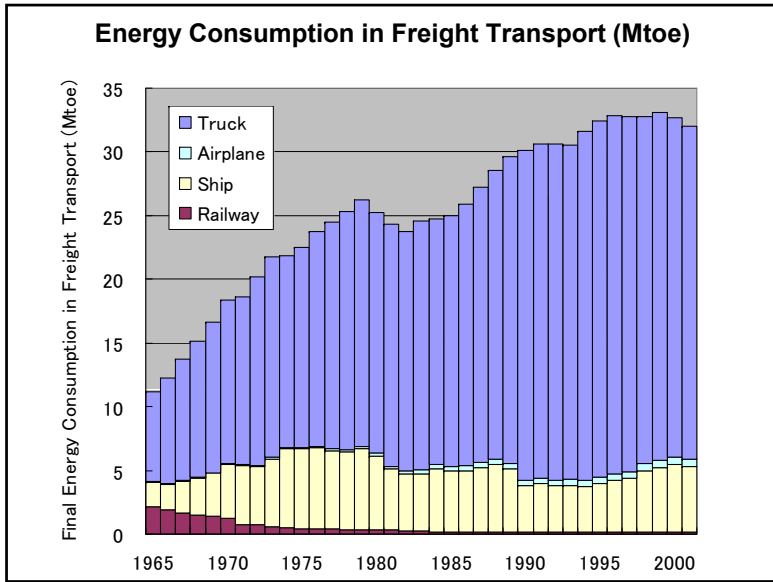
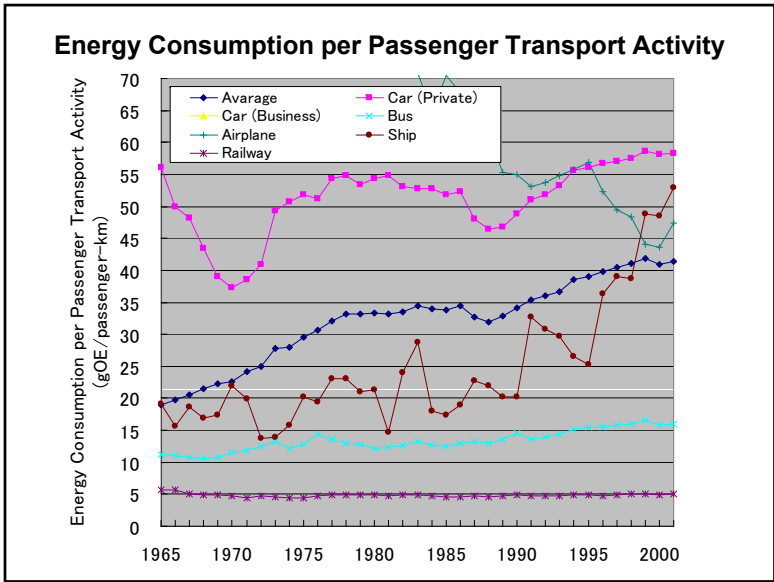




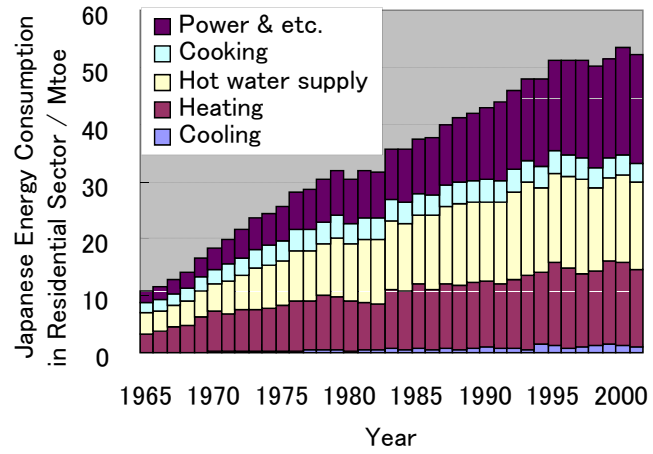




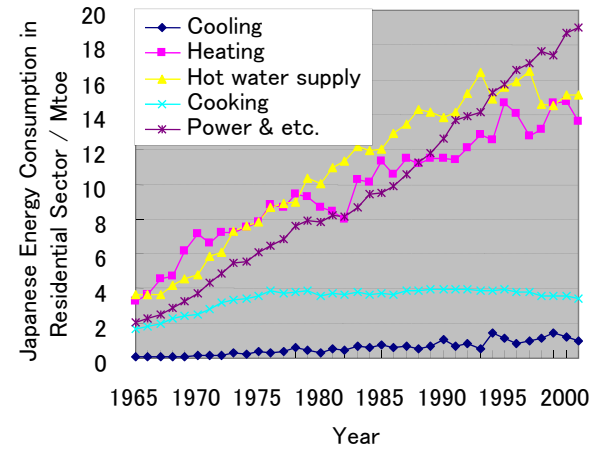




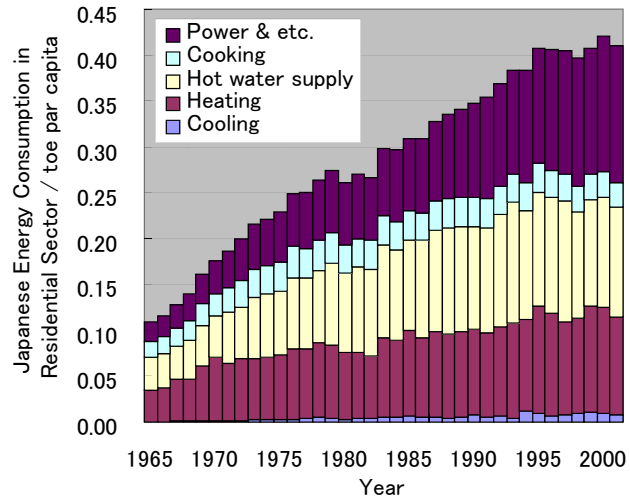
**Japanese Energy Consumption in Residential Sector**



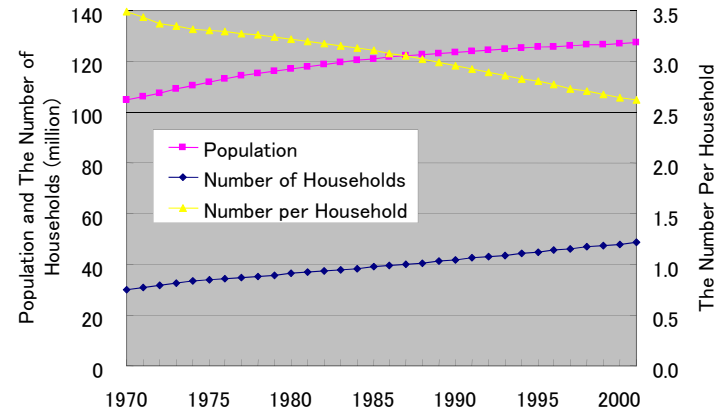
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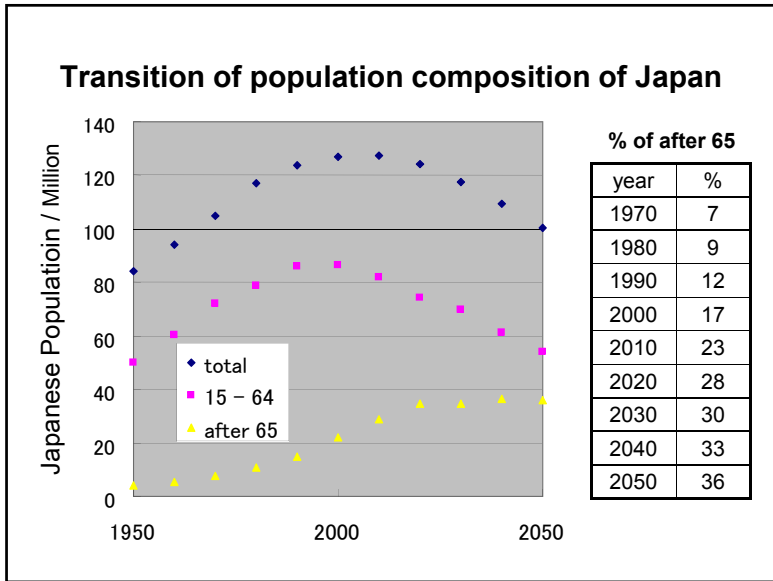
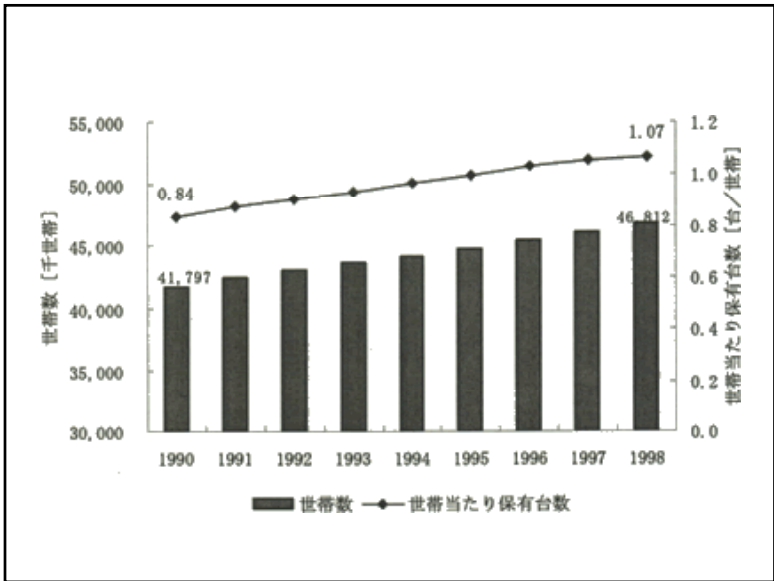
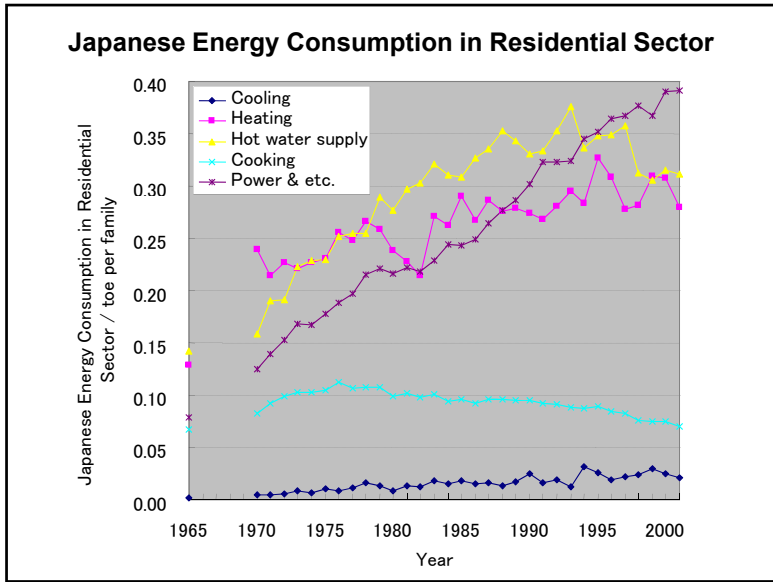
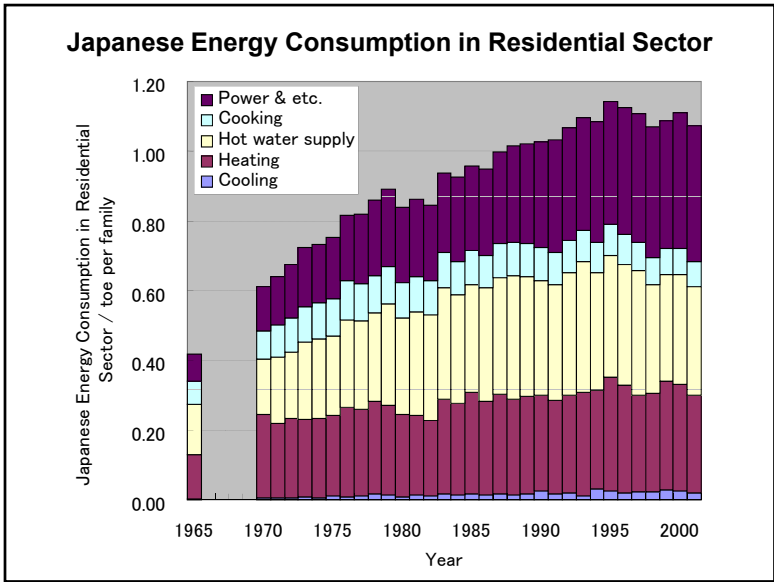


**Japanese Energy Consumption in Residential Sector**



**Japanese Population and The Number of Households**





## Student's Presentation at 24<sup>th</sup> October

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### ✓ Theme

- ✓ Consider effective policy to reduce world's fossil fuel consumption by using statistics shown in today's lecture or following website first.
  - ✓ <http://www.iea.org/>
- ✓ Then, show your assumption about technological development, i.e. electric vehicle, and introducing schedule of the technologies to our society.
- ✓ Evaluate the long term effect of the technologies on the reduction of fossil fuel consumption till 2050 quantitatively based on your assumption.

### ✓ Presentation and Submission at 24<sup>th</sup> October

- ✓ You have to make a group which consists of 2 to 5 students.
- ✓ Discuss well about your presentation in your group.
- ✓ Every group have to make a 15 to 20 minutes presentation by using Microsoft powerpoint. After the class, the slide which includes names of the group member have to submit by e-mail to [jun@sys.t.u-tokyo.ac.jp](mailto:jun@sys.t.u-tokyo.ac.jp).
- ✓ If you can't contribute any presentation, you should submit more than 10 pages PPT file by e-mail to [jun@sys.t.u-tokyo.ac.jp](mailto:jun@sys.t.u-tokyo.ac.jp) by 24<sup>th</sup> October.