

Global Environmental Policy 環境・エネルギー技術政策

<http://sunshine.naoe.t.u-tokyo.ac.jp/jun/kougi/gep/gep.html>

9, November, 2009
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

Student's Presentation at 16th November

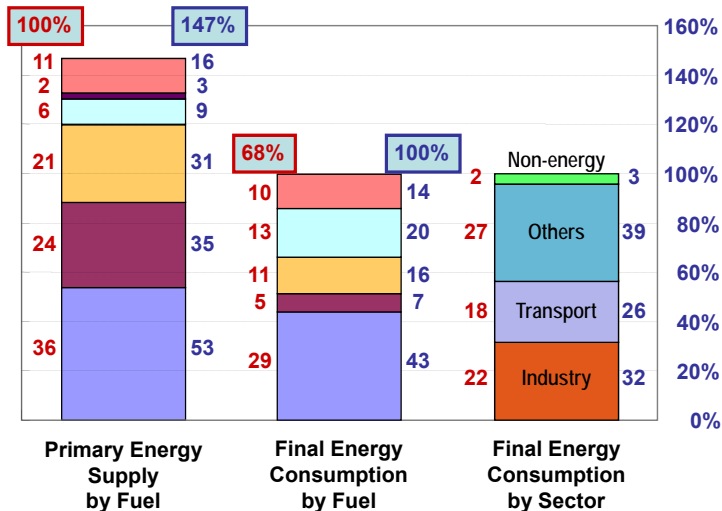
◆ Theme

- ◆ Consider effective policy to reduce world's fossil fuel consumption by using statistics shown in today's lecture first.
- ◆ 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.

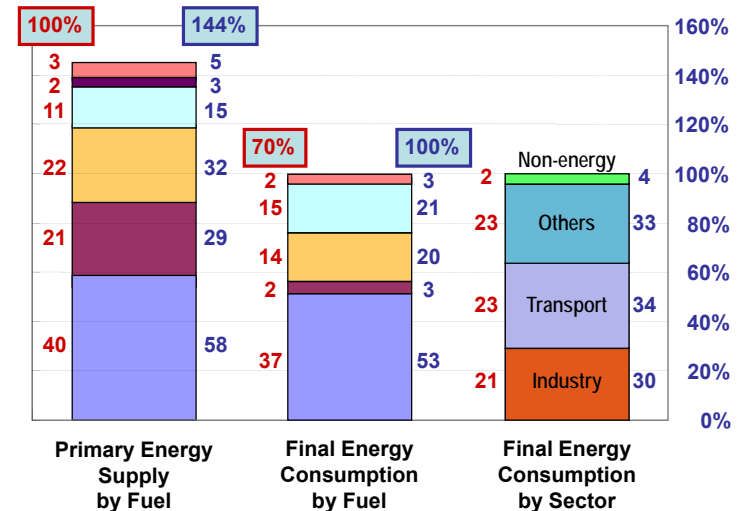
◆ How to get the credits from this class.

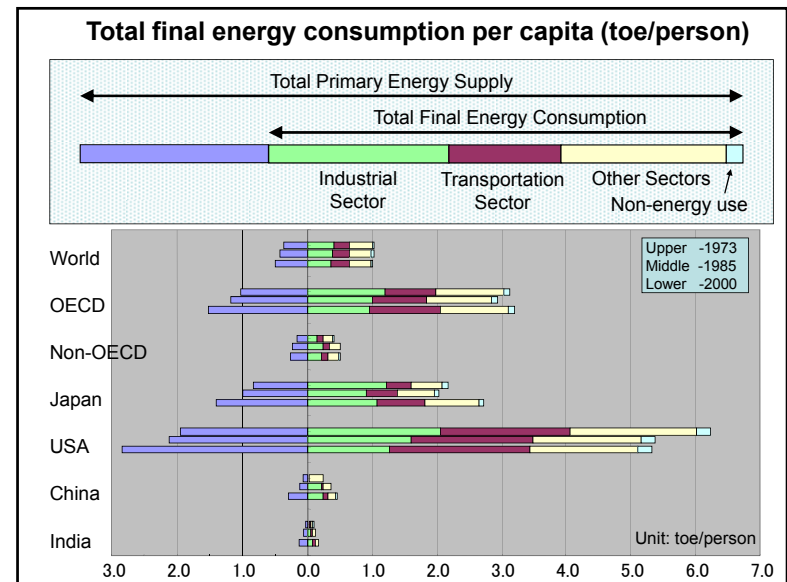
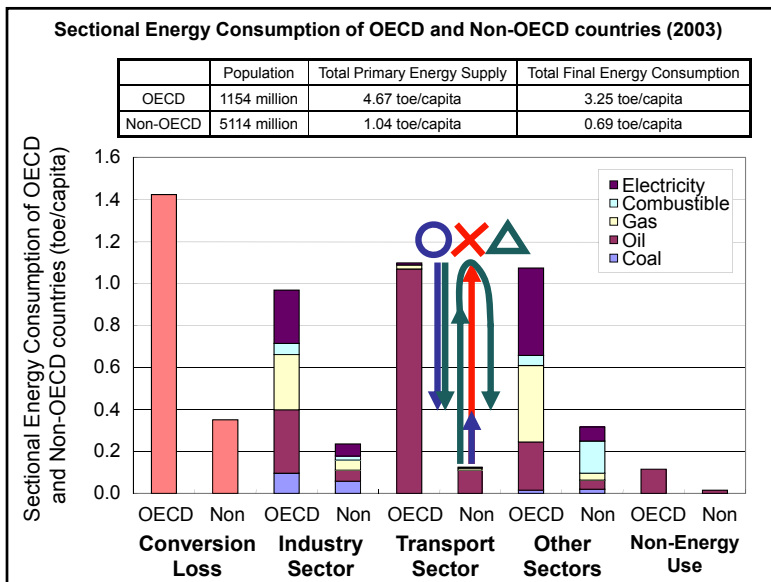
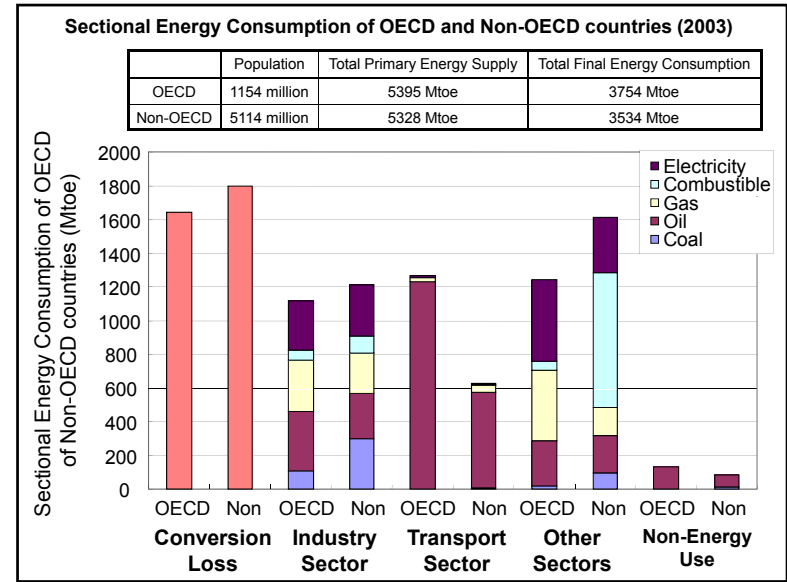
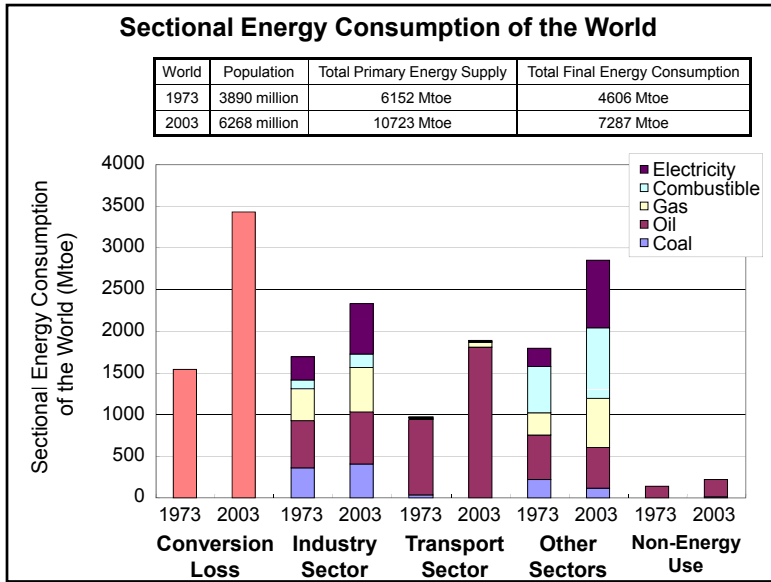
- ◆ You have to make a group which consists of 2 to 5 students.
- ◆ Discuss well about your presentation in your group.
- ◆ Every group have to make a 15 to 20 minutes presentation by using Microsoft powerpoint.
- ◆ If you can't contribute any presentation, you should submit more than 10 pages PPT file by e-mail to jun@sunshine.naoe.t.u-tokyo.ac.jp.

World Energy Balance on 2003 (Source IEA statistics)

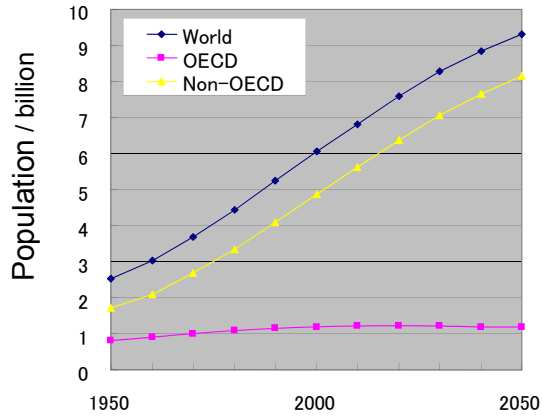


OECD Energy Balance on 2003 (Source IEA statistics)

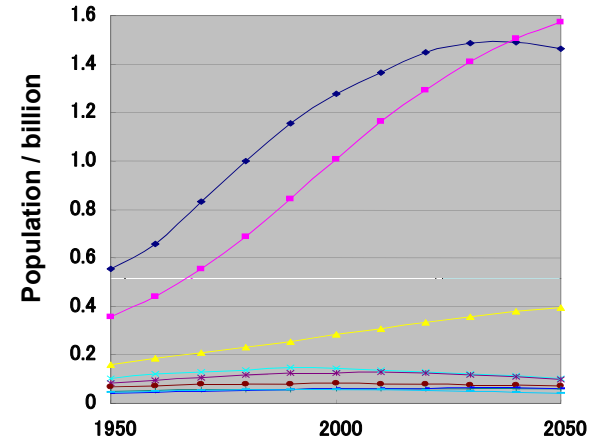




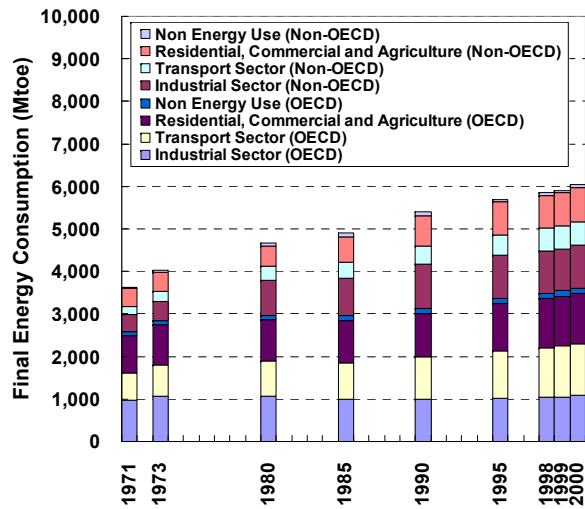
Transition of the population in the world
Source: UN



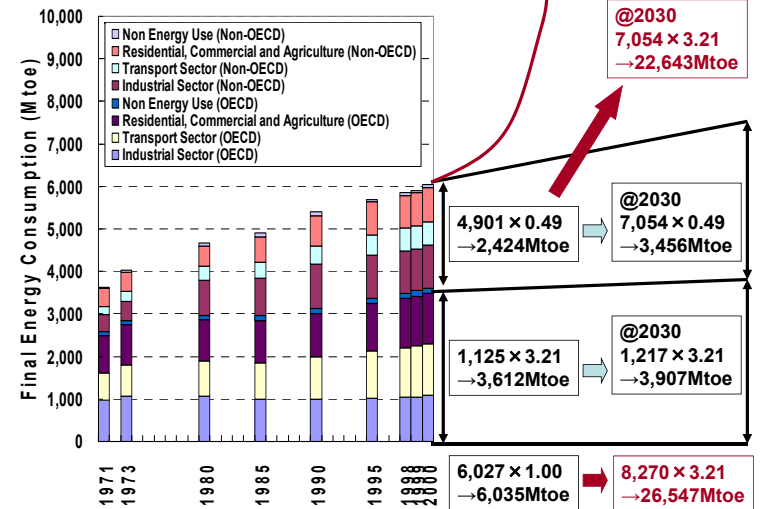
Transition of the population in the world
Source: UN



World Final Energy Consumption



World Final Energy Consumption



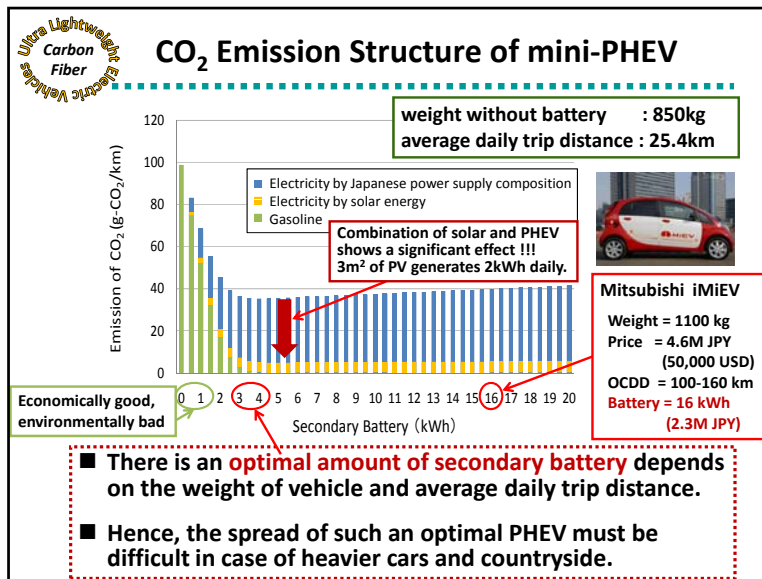
Calculation of the amount of solar energy

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

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



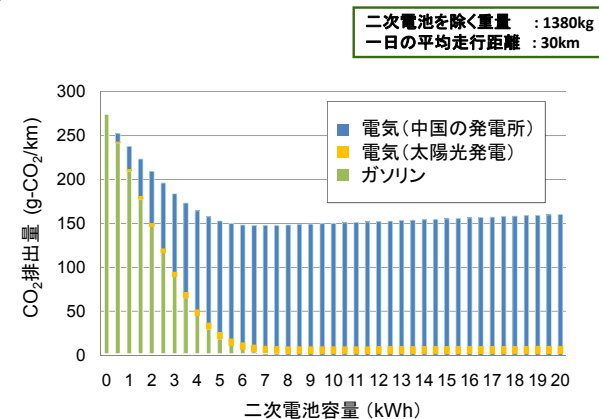
国別の発電時のCO₂排出量

国名	発電時のCO ₂ 排出係数 (kg-CO ₂ /kWh)	日本の排出係数との比較	太陽光発電との比較
太陽光発電	0.053	0.14	1.0
フランス	0.069	0.18	1.3
日本	0.375	1.00	7.1
EU	0.420	1.12	7.9
イギリス	0.564	1.50	10.6
アメリカ	0.712	1.90	13.4
ロシア	0.927	2.47	17.5
中国	1.034	2.76	19.5
インド	1.490	3.97	28.1

- CO₂排出量削減の観点からは、インド、中国、ロシアでは最適化したPHEVでも効果は小さく、太陽光発電の導入効果がより顕著になる



中国でのPHEVのCO₂排出量



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最終エネルギー消費部門の分類

産業部門

- 製造業
 - 素材系
 - 鉄鋼
 - 化学
 - 窯業土石
 - 紙・パルプ
 - 非素材系
 - 食品煙草
 - 繊維
 - 非鉄金属
 - 金属機械
 - その他
- 非製造業
 - 農林水産業
 - 鉱業
 - 建設業

家庭部門

- 暖房
- 冷房
- 給湯
- 厨房
- 動力・照明他

業務部門

運輸部門

- 旅客
 - 自家用乗用車
 - 営業用乗用車
 - バス
 - 旅客航空
 - 旅客海運
 - 旅客鉄道
- 貨物
 - 貨物自動車
 - 貨物航空
 - 貨物海運
 - 貨物鉄道

非エネルギー

- アスファルト、グリース、パラフィン、潤滑油等

The Items of Final Energy Consumption

Industrial Sector

- Manufacturing
 - Material
 - Steel
 - Chemicals
 - Cement
 - Paper and Pulp
 - Processing/assembly
 - Foods
 - Textile
 - Nonferrous metal
 - Machines
 - Others
- Non-manufacturing
 - Agriculture, Forestry & Fishery
 - Mining
 - Construction

Residential Sector

- Heating
- Cooling
- Hot Water Supply
- Cooking
- Power & etc.

Commercial Sector

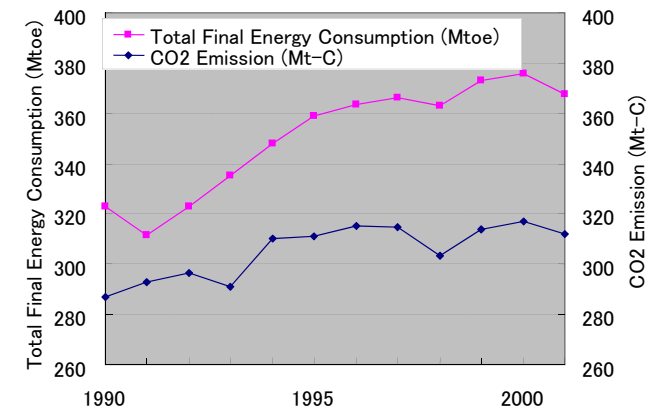
Non Energy Use

- Asphalt, grease, paraffin, lubricating oil, etc.

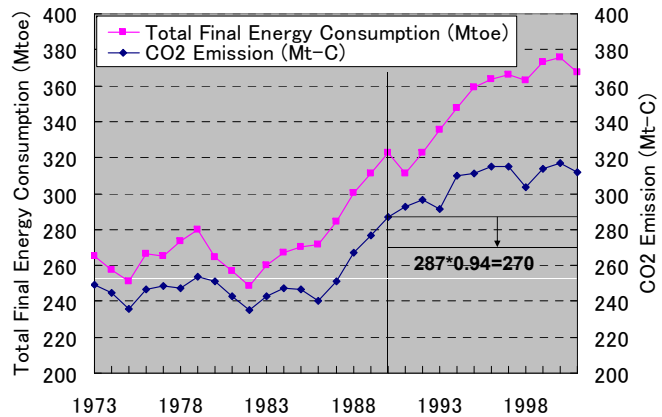
Transport Sector

- Passenger
 - Car (Private)
 - Car (Commercial)
 - Bus
 - Airplane
 - Ship
 - Railway
- Freight
 - Truck
 - Airplane
 - Ship
 - Railway

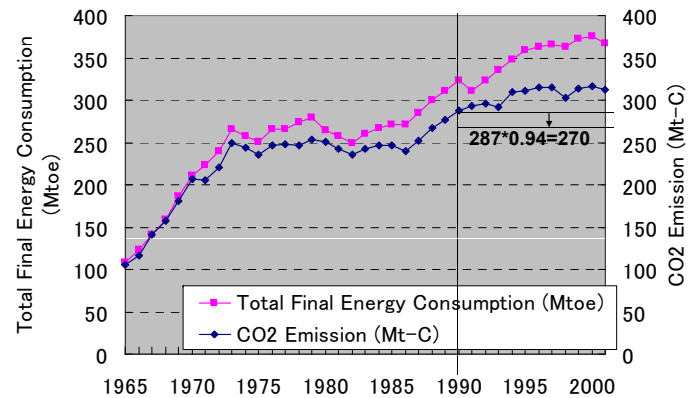
Japanese TFC and CO2 Emission (1990-2001)



Japanese TFC and CO2 Emission (1973-2001)

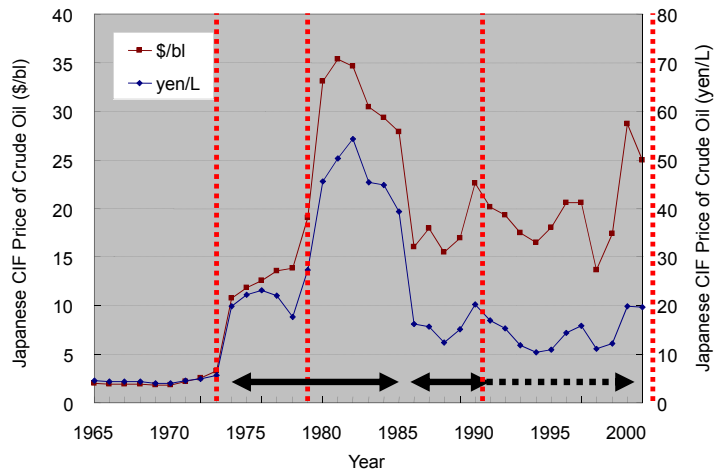


Japanese TFC and CO2 Emission (1965-2001)

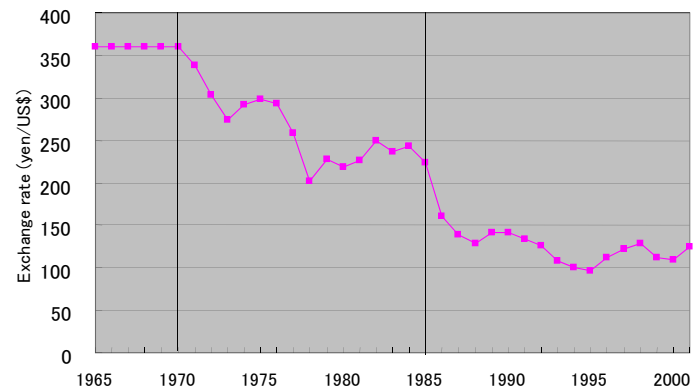


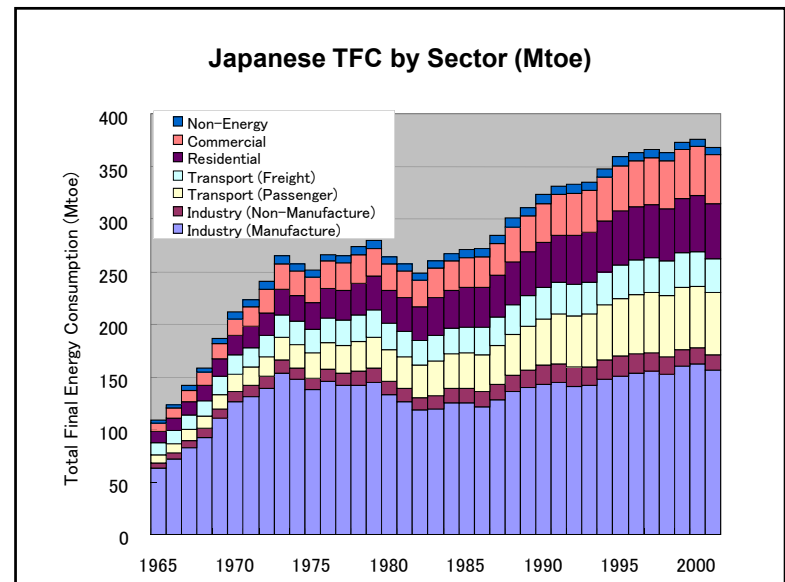
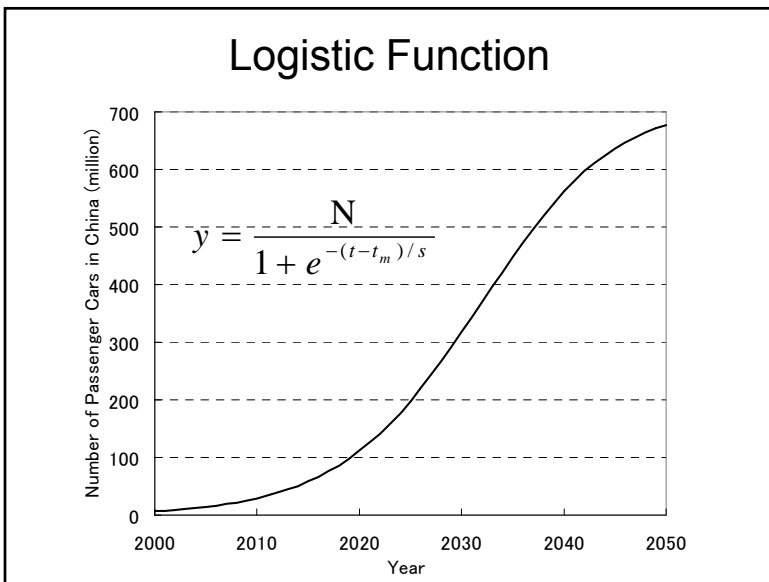
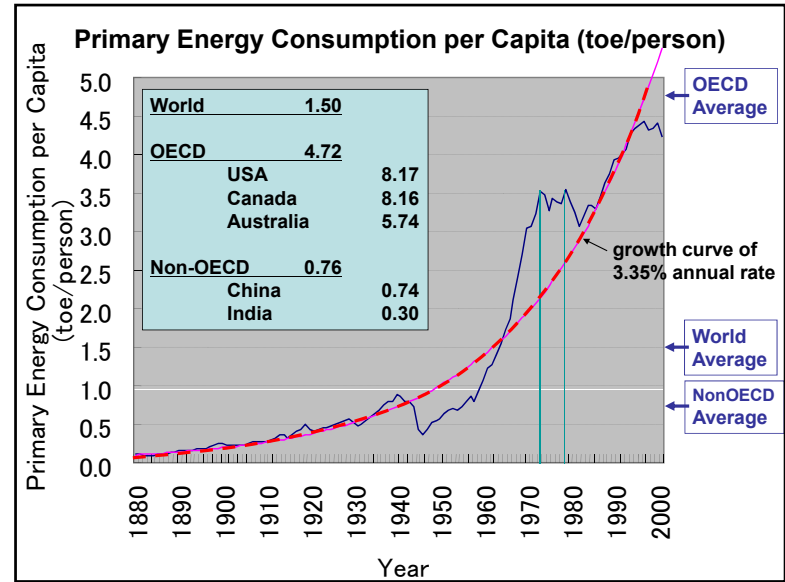
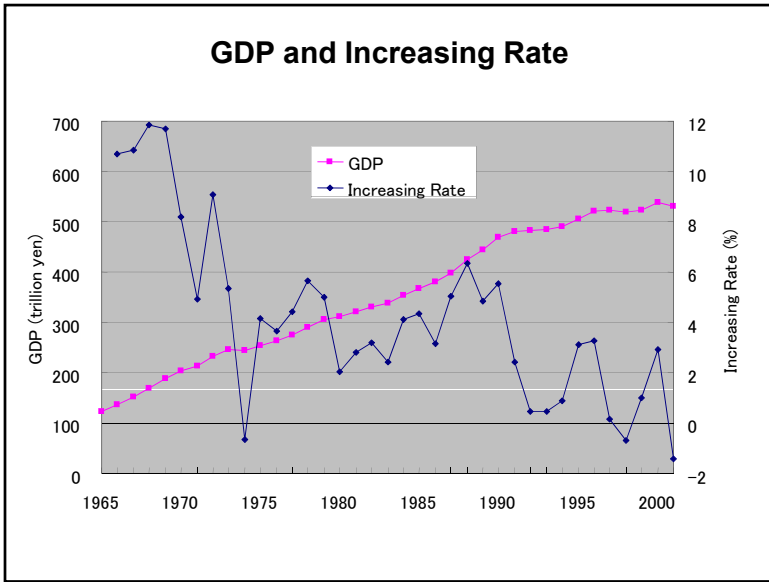
Japanese CIF Price of Crude Oil

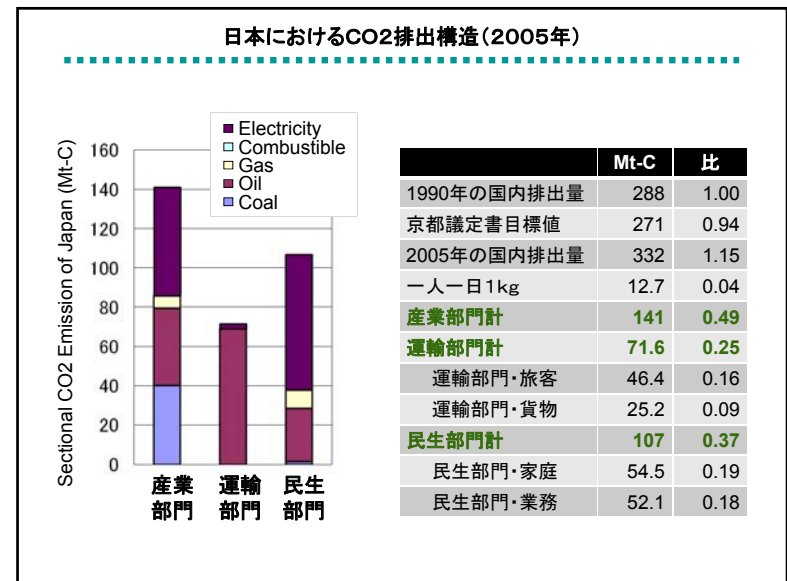
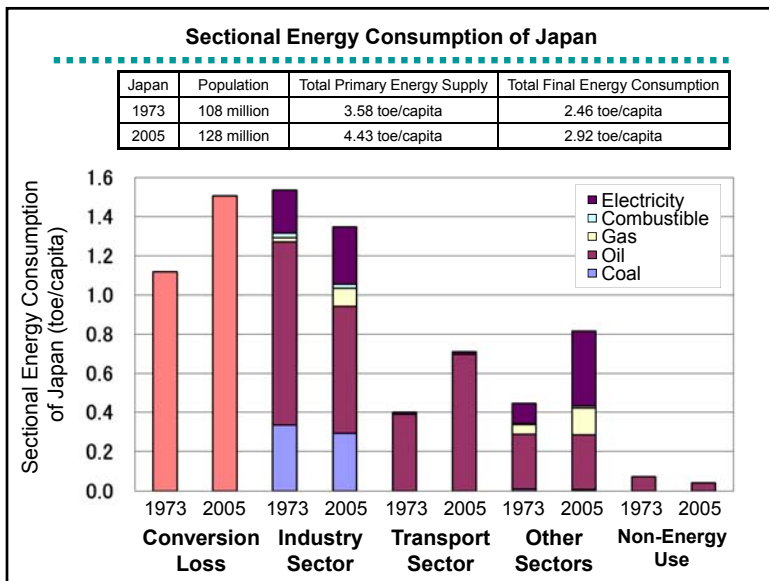
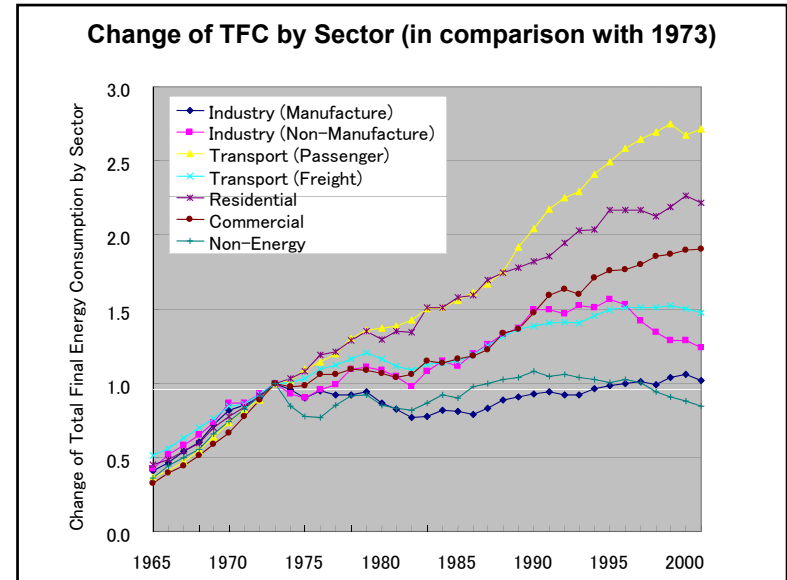
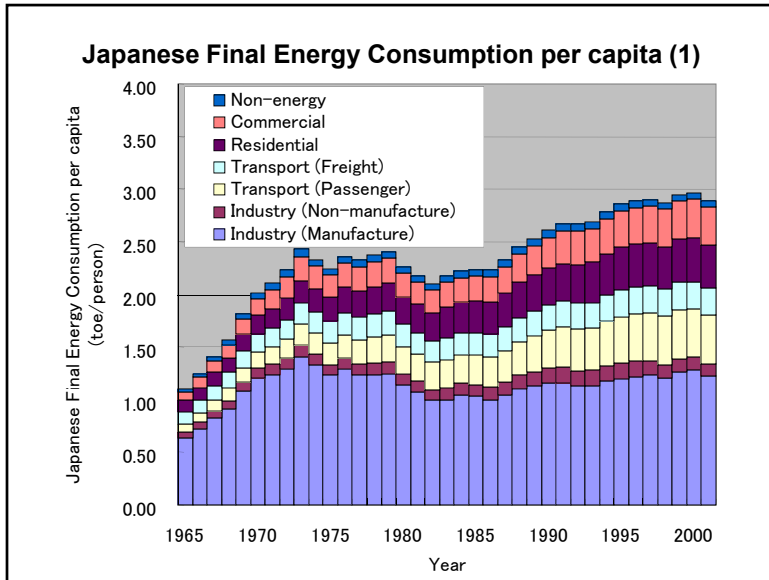
CIF: Cost + Insurance + Freight

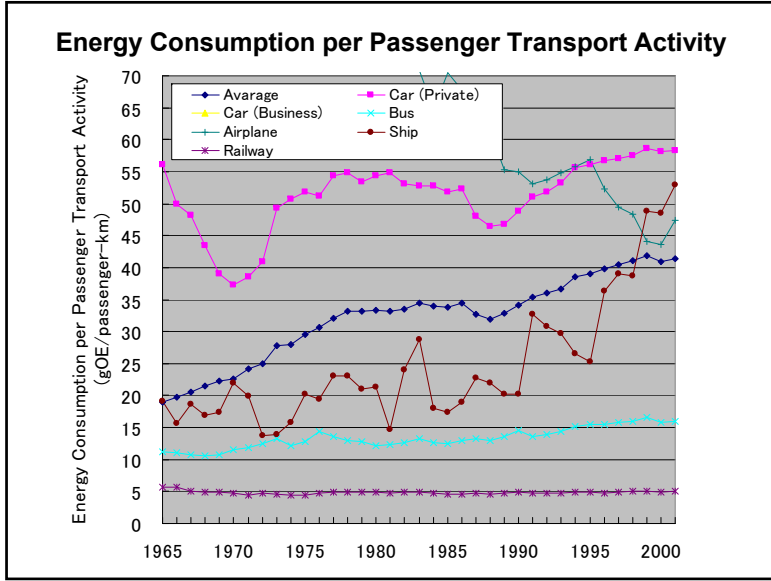
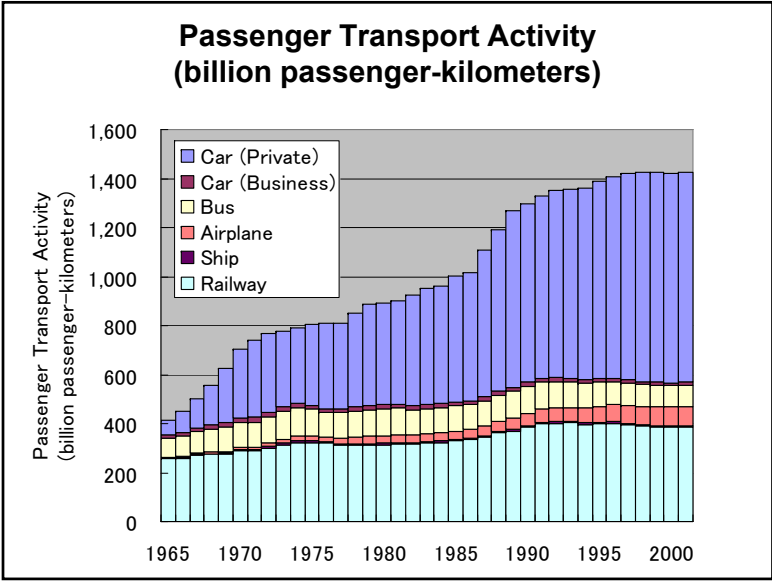
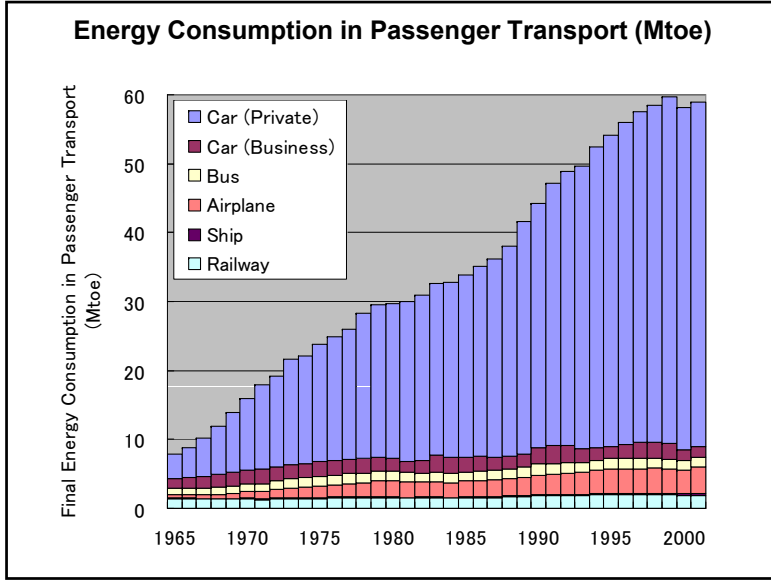
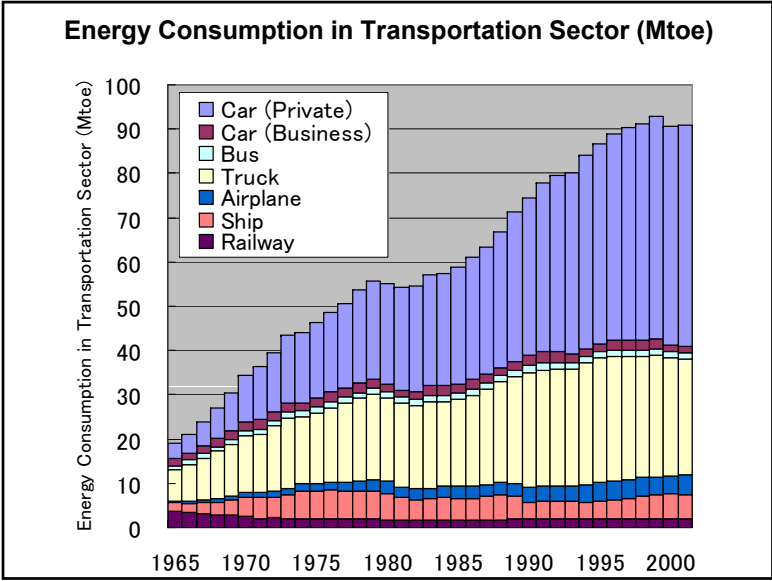


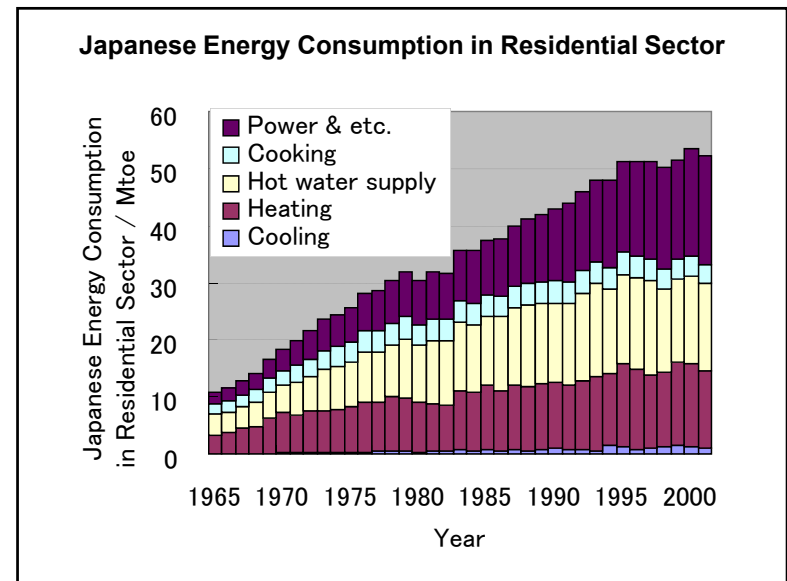
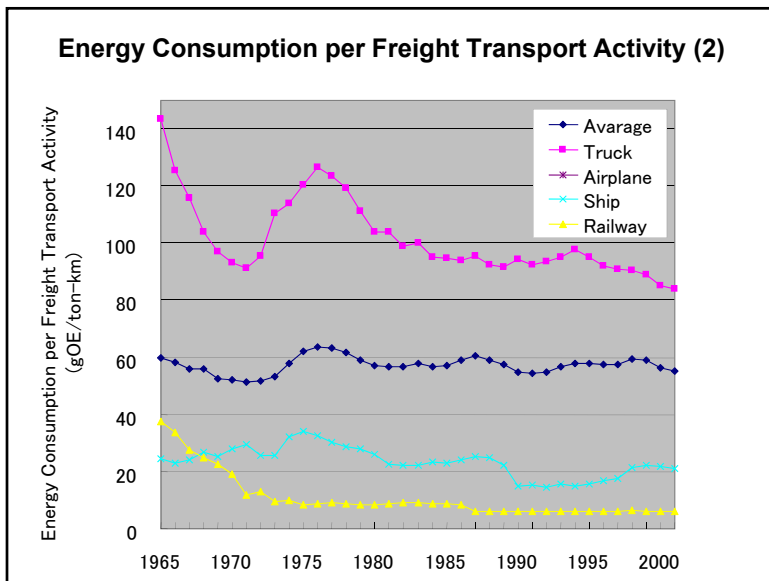
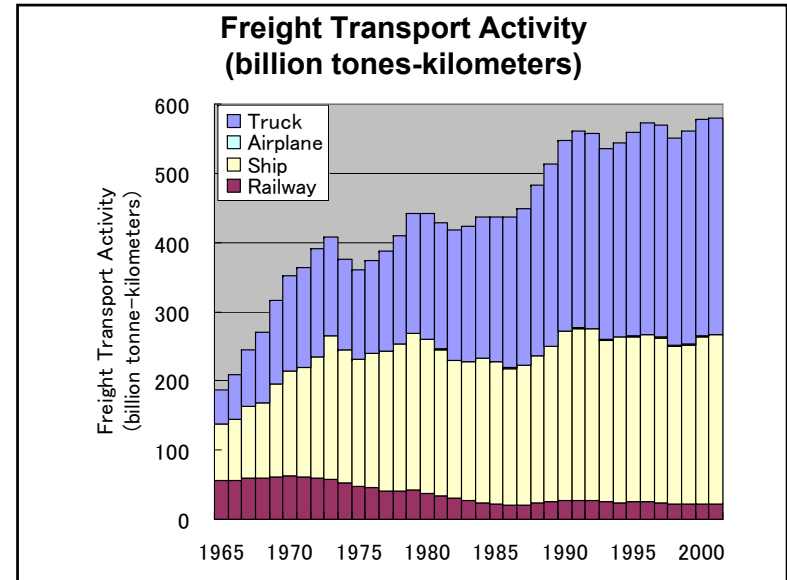
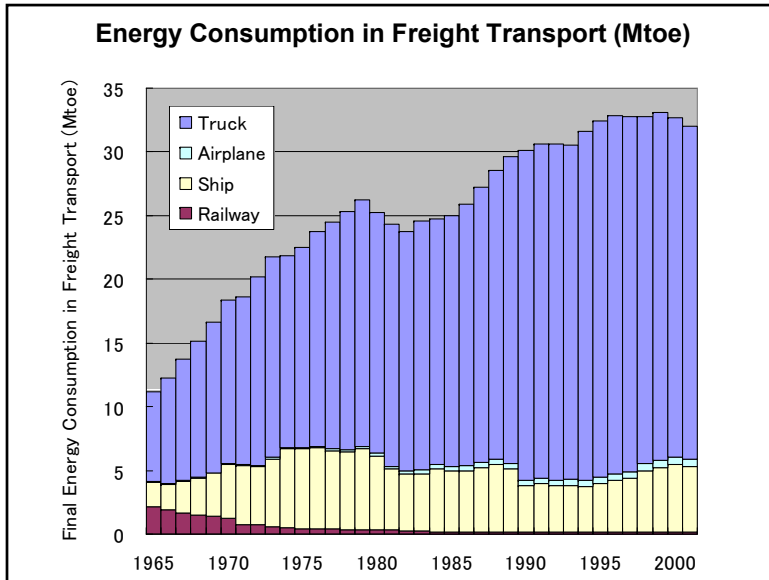
Exchange Rate (yen/US\$)



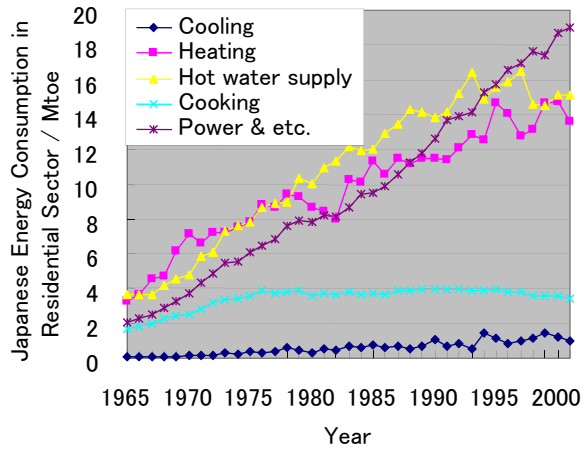




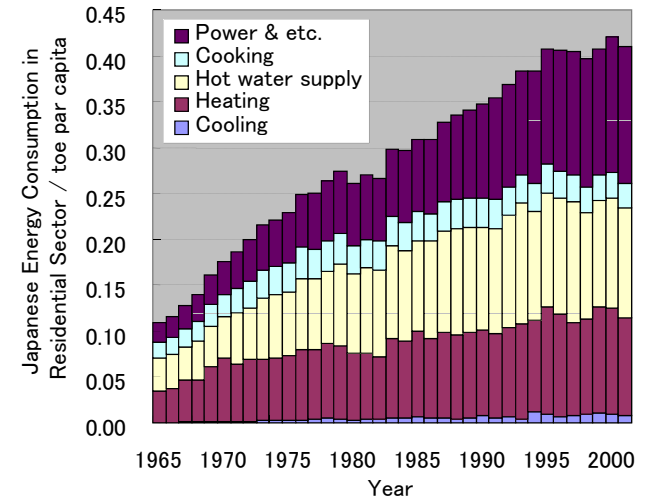




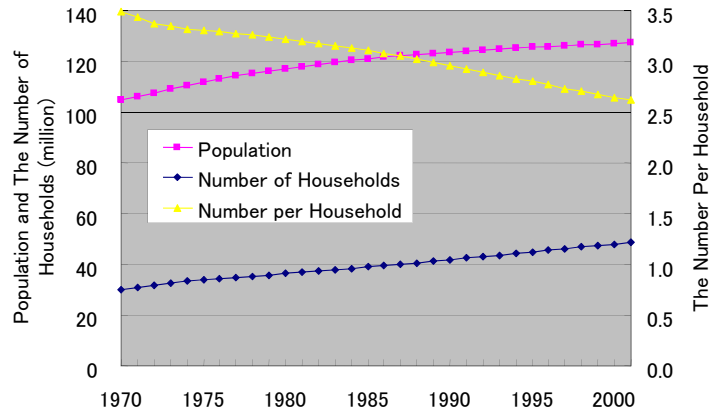
Japanese Energy Consumption in Residential Sector



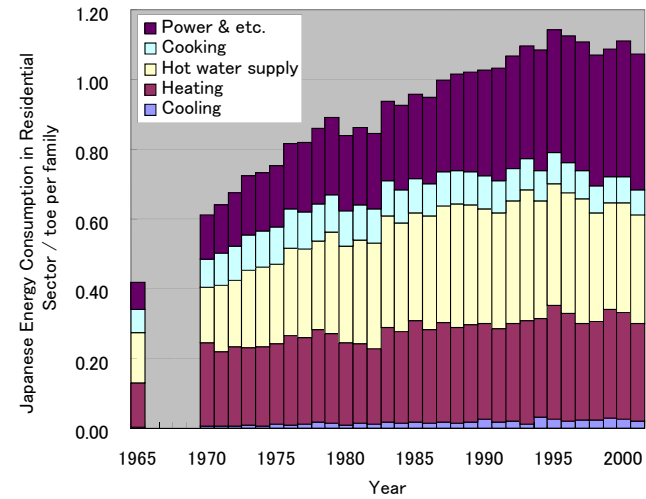
Japanese Energy Consumption in Residential Sector



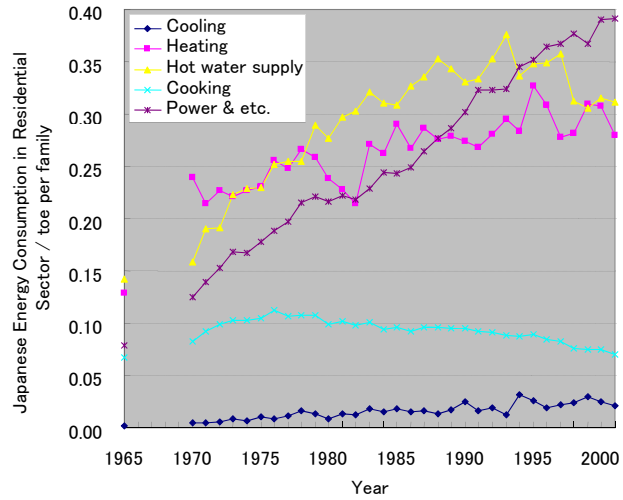
Japanese Population and The Number of Households



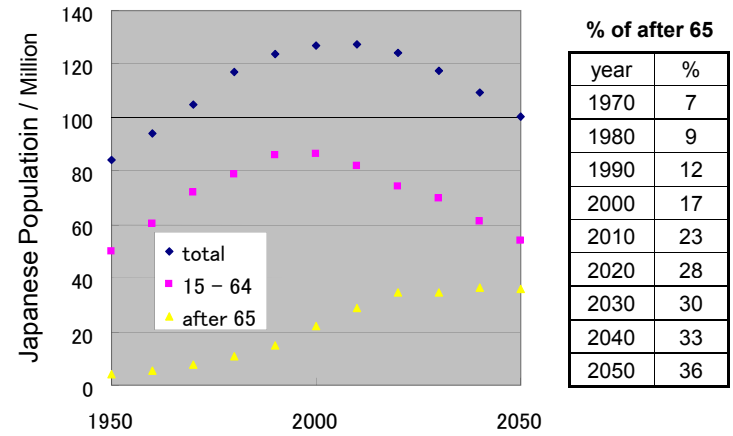
Japanese Energy Consumption in Residential Sector



Japanese Energy Consumption in Residential Sector



Transition of population composition of Japan



Japanese Energy Consumption in Industry Sector

