



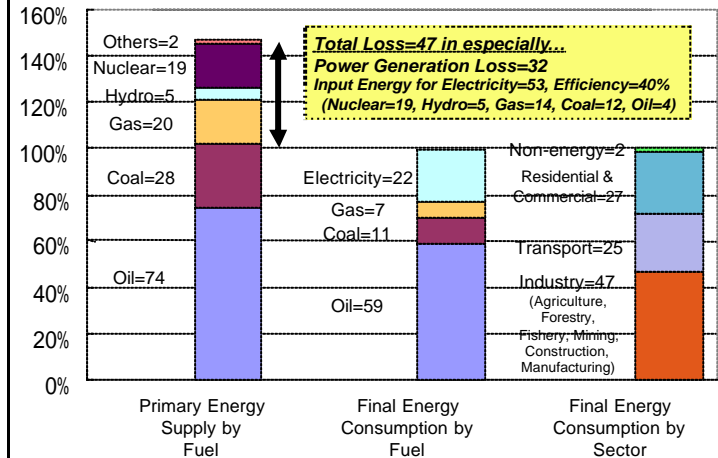
# Global Environmental Policy

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

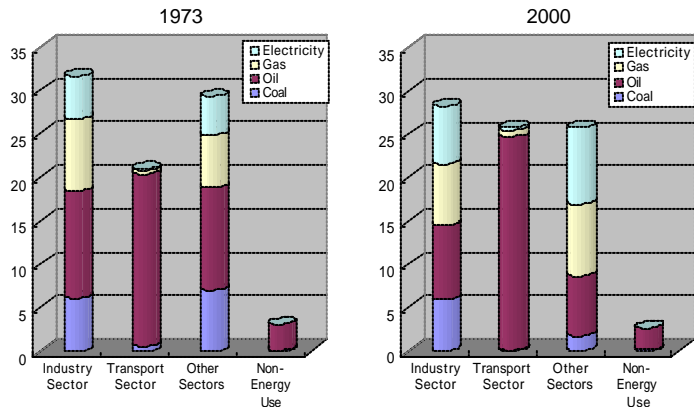
19, April, 2005  
Jun TAKAHASHI

- ✓ Outline of this lecture series.
- ✓ How to read statistics data ?
  - ✓ Long-term viewpoint
  - ✓ Suspect an interpretation and the data itself !
- ✓ How to make a policy ?
- ✓ Quiz

## Japanese Energy Balance on 2001 (Source EDMC2003)



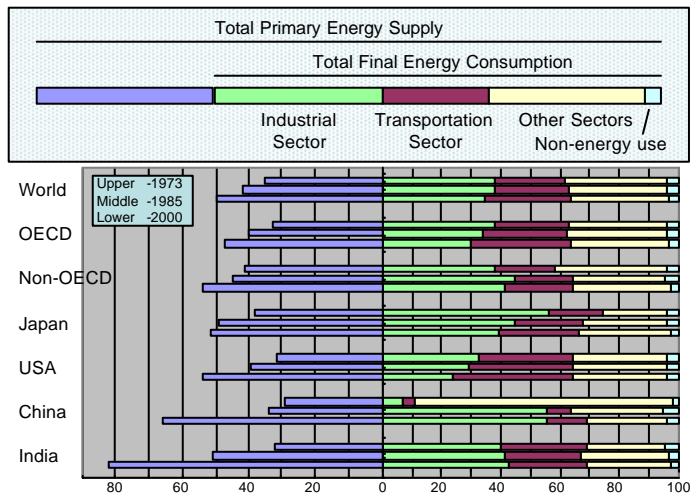
## Sectoral shears of the world total final energy consumption (Unit: %)



## Total Primary Energy Supply and Final Energy Consumption

Statistics of 2000 by EDMC2003		World	OECD	Non-OECD	Japan	USA	China	India
Population	Million	6,027	1,125	4,901	127	282	1,262	1,016
GDP	1995 USG\$	34,199	27,675	6,525	5,688	9,009	1,040	482
CO2 Emission	Mt-C	6,422	3,470	2,952	328	1,580	881	266
Total Primary Energy Supply	Mtoe	9,043	5,317	3,726	525	2,300	928	300
	%	149.8	147.2	153.7	151.3	153.4	166.0	181.8
Total Final Energy Consumption	Mtoe	6,035	3,612	2,424	347	1,499	559	165
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Industrial Sector	Mtoe	2,088	1,087	1,004	137	360	311	70
	%	34.6	30.1	41.4	39.6	24.0	55.6	42.6
Transportation Sector	Mtoe	1,780	1,221	560	94	610	74	44
	%	29.5	33.8	23.1	27.1	40.7	13.3	26.8
Other (Residential, Commercial, Agriculture, etc.) Sectors	Mtoe	1,986	1,188	795	106	474	153	46
	%	32.9	32.9	32.8	30.5	31.6	27.4	27.7
Non-energy use	Mtoe	184	117	67	10	56	22	5
	%	3.0	3.2	2.8	2.8	3.7	3.9	3.1

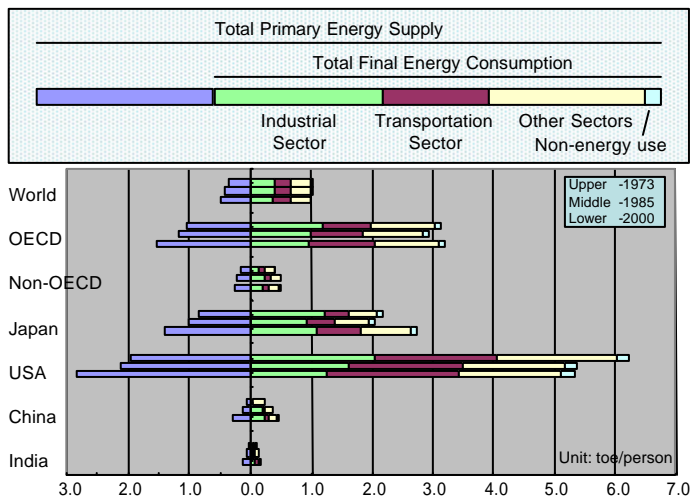
### Sectoral shears of the total final energy consumption (%)



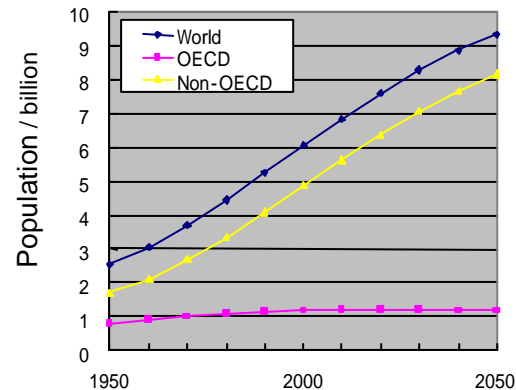
### 2000's world statistics rearranged by per population Source: EDMC2003

		World	OECD	Non-OECD	Japan	USA	China	India
Population	Million	6,027	1,125	4,901	127	282	1,262	1,016
GDP	1995US\$ /person	5,674	24,600	1,331	44,787	31,947	824	474
CO2 Emission	t-C /person	1.07	3.08	0.60	2.58	5.60	0.70	0.26
Total Primary Energy Supply	toe /person	1.50	4.73	0.76	4.13	8.16	0.74	0.30
Total Final Energy Consumption	toe /person	1.00	3.21	0.49	2.73	5.32	0.44	0.16
Industrial Sector	toe /person	0.35	0.97	0.20	1.08	1.28	0.25	0.07
Transportation Sector	toe /person	0.30	1.09	0.11	0.74	2.16	0.06	0.04
Other (Residential, Commercial, Agriculture, etc.) Sectors	toe /person	0.33	1.06	0.16	0.83	1.68	0.12	0.04

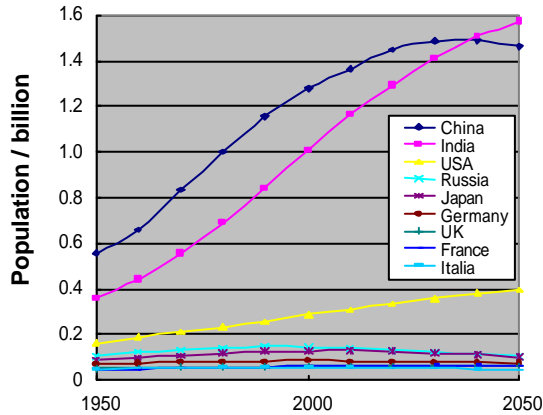
### Total final energy consumption per capita (toe/person)



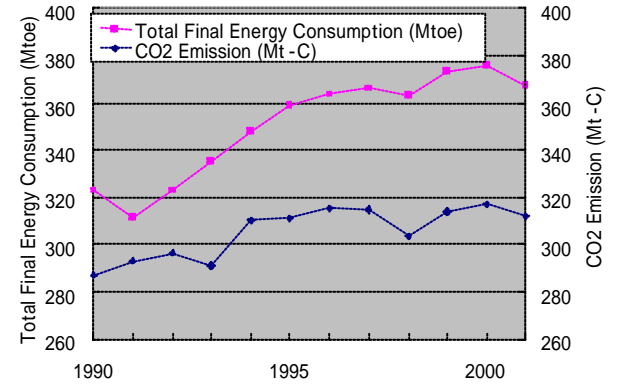
### Transition of the population in the world Source: UN



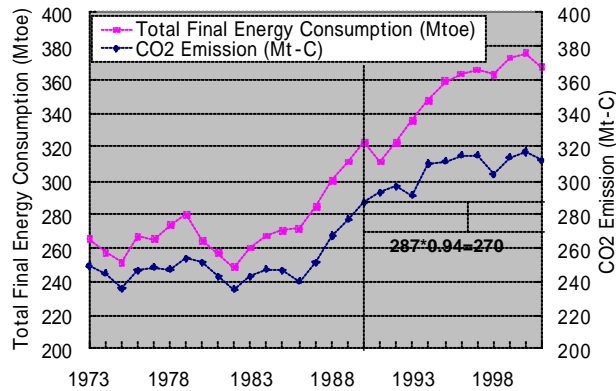
### Transition of the population in the world Source: UN



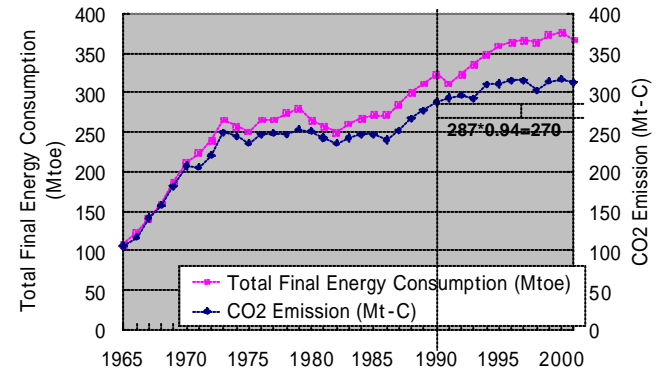
### Japanese TFC and CO2 Emission (1990-2001)



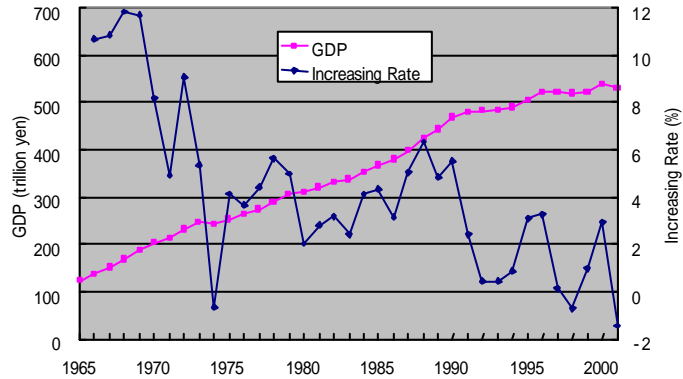
### Japanese TFC and CO2 Emission (1973-2001)



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

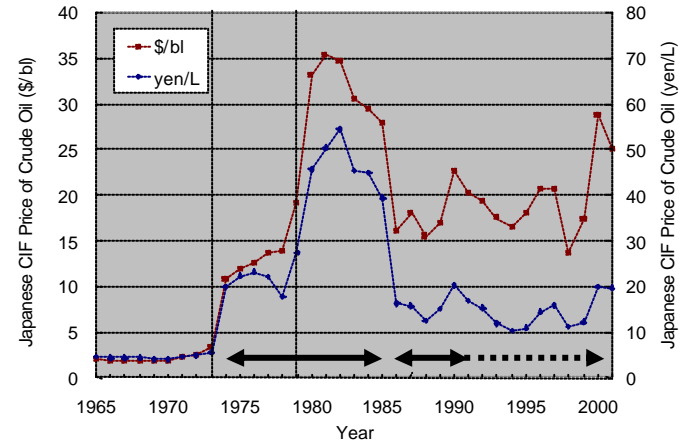


### GDP and Increasing Rate

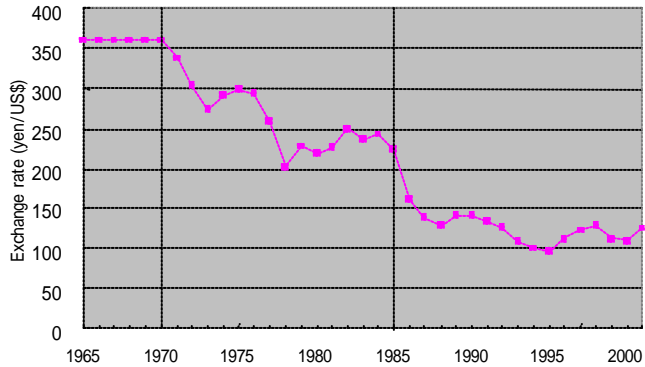


### Japanese CIF Price of Crude Oil

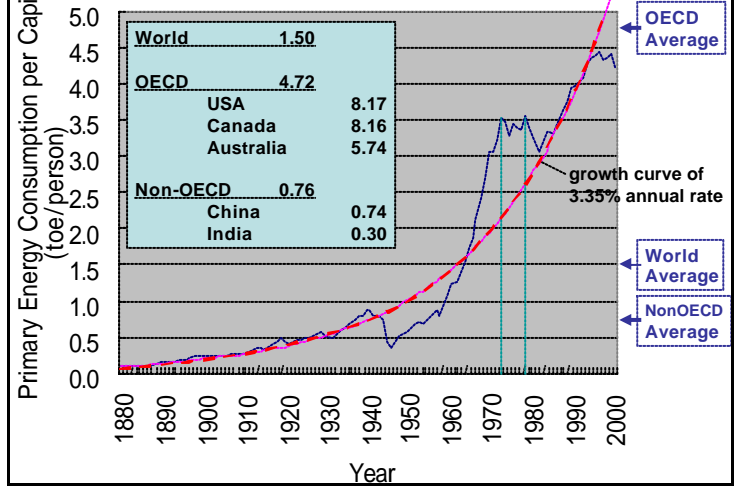
CIF: Cost + Insurance + Freight



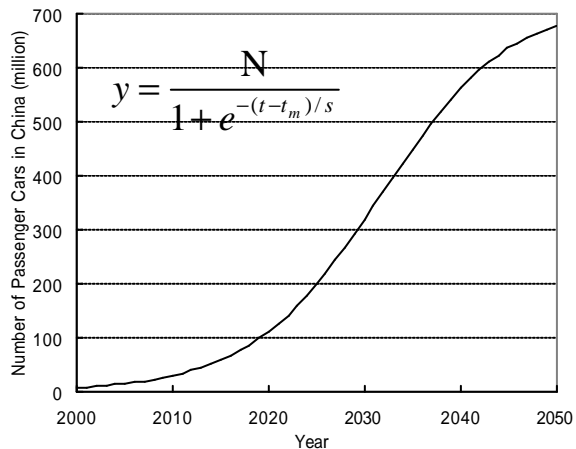
### Exchange Rate (yen/US\$)



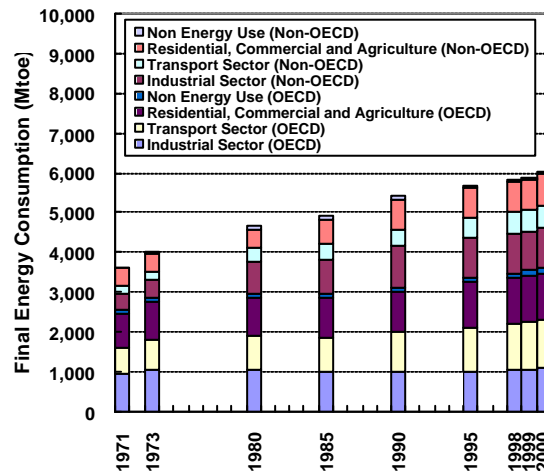
### Primary Energy Consumption per Capita (toe/person)



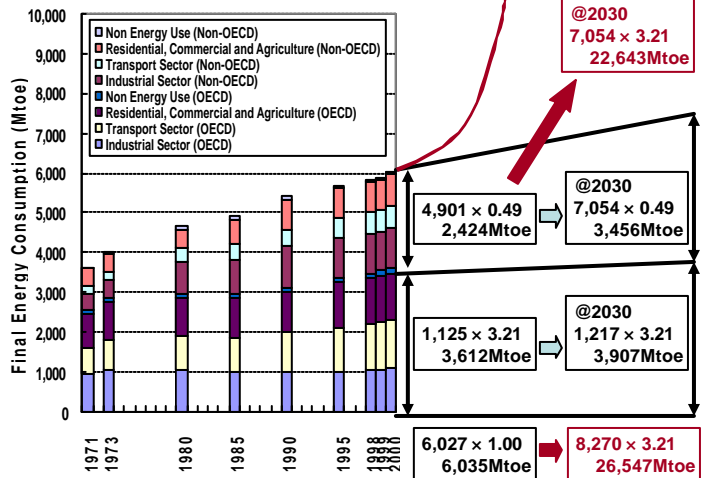
# Logistic Function



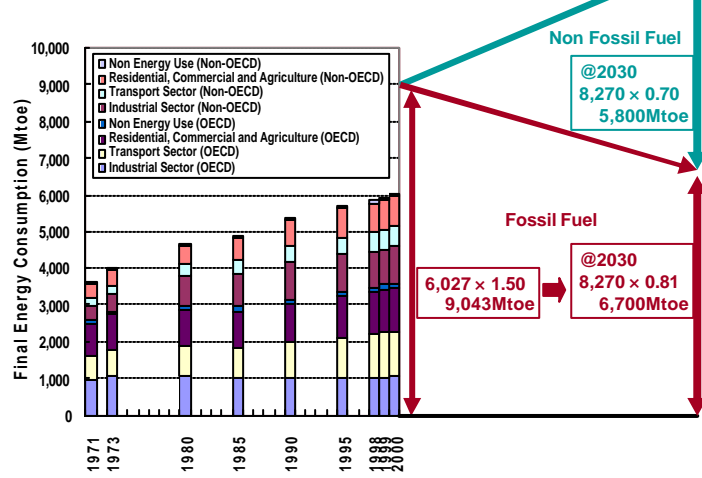
# World Final Energy Consumption



# World Final Energy Consumption



# Sustainable Energy Supply and Consumption



## Target to Sustainable Society (Energy Supply)

- Residential, Commercial and Agriculture : 1.06 toe/person@OECD2000
  - Save 50% (0.53 toe/person) by co-generation etc.
  - Supply 0.53 toe/person by renewable energy
- Transport Sector : 1.08 toe/person@OECD2000
  - Save 65% (0.70 toe/person) by fuel efficient technology etc.
  - Supply 0.38 toe/person by fossil fuel
- Industrial Sector : 0.97 toe/person@OECD2000
  - Save 0.17 toe/person (50% of processing) by co-generation
  - Save 0.33 toe/person (50% of material production) by recycle and renewable materials
  - Supply 0.17 toe/person by renewable energy
  - Supply 0.33 toe/person by fossil fuel as raw material
- Non Energy Use (0.10 toe/person@OECD2000) is assumed to be kept.
  - Supply 0.10 toe/person by fossil fuel as raw material
- As a result, final energy consumption per capita will be 1.51
  - This is less than half of 3.21 toe/person@OECD2000
  - However, 0.70 toe/person will be supplied by renewable energy
  - Then, consumption of fossil fuel will be 0.81 toe/person
    - This is only 17% of primary fossil fuel consumption @OECD2000

## Target to Sustainable Society (Energy Supply)

- At 2000, 1.50 toe/person of fossil fuel is supplied for 6,027 million people.
  - Then, 9,043 Mtoe of fossil fuel is consumed annually.
- In the sustainable society,
  - Final energy consumption is 1.51 toe/person
    - 0.81 toe/person is supplied by fossil fuel
    - 0.70 toe/person is supplied by renewable energy
- Then, at 2030, when the world population is 8,270 million,
  - About 6,700 Mtoe of fossil fuel is consumed annually.
    - This is 74% of current fossil fuel consumption
  - About 5,800 Mtoe is supplied by renewable energy.
    - This is more than 5 times of current electric power generation
- **THIS IS JUST A SET OF TARGETS.**
  - How to realize?
    - How is cost effectiveness?
    - In which turn should it perform?

## HOW TO MAKE A POLICY ?

- |      |    |       |        |
|------|----|-------|--------|
| Plan | Do | Check | Action |
|------|----|-------|--------|

Plan	Do	Check	Action
------	----	-------	--------

### Improvement

- Step1: Information gathering      Council, etc.
  - Global and individual problem
  - Related statistics
- Step2: Policy decision      Government
  - Vision (ideal target) decision
  - Examination of the realization method
    - Bottom-up approach; Industry respect type
    - Top-down approach; Target achievement by innovation or integration
    - How to execute and what cost effectiveness is expected?
      - Law creation, administrative guidance, etc.
      - Budget application (Control by the subsidy and the taxation system)
  - Reconsideration of a realizable vision



# Global Environmental Policy

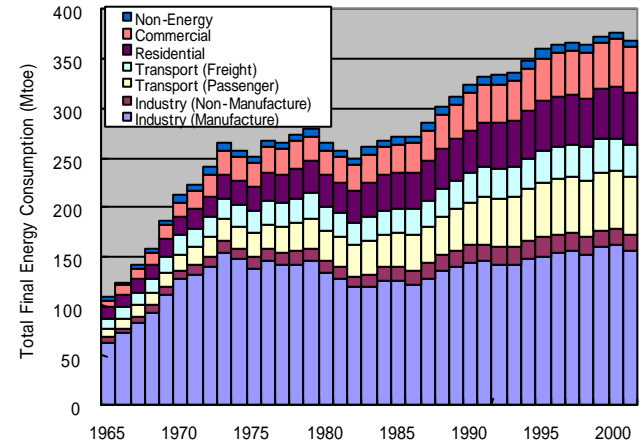
<http://sunshine.naoe.t.u-tokyo.ac.jp/jun/kougi/gep/gep.html>

12, July, 2005  
Jun TAKAHASHI

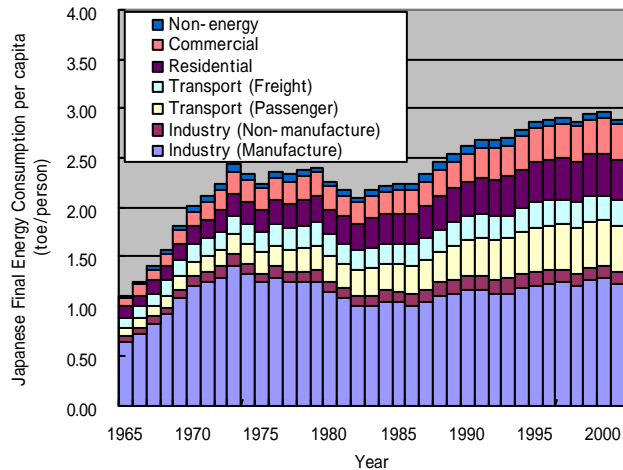
## ✓ Energy saving and policy making

- Industrial sector
- Residential and Commercial sector
- Transport sector

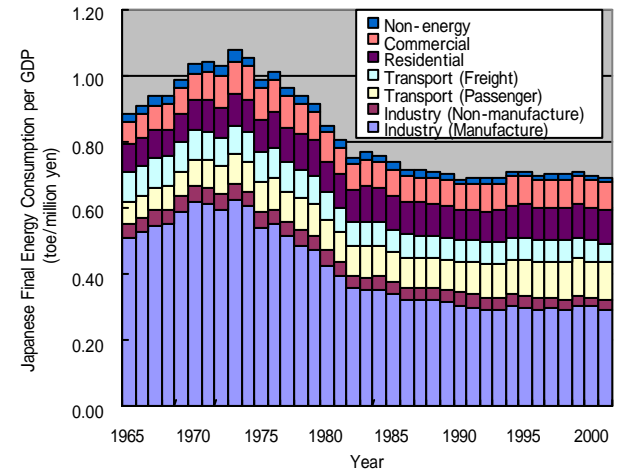
### Japanese TFC by Sector (Mtoe)



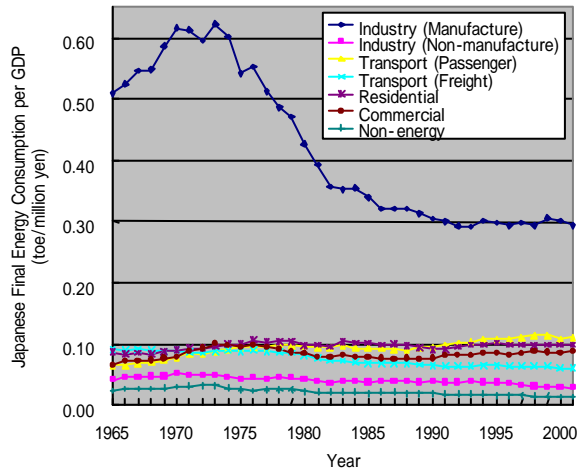
### Japanese Final Energy Consumption per capita (1)



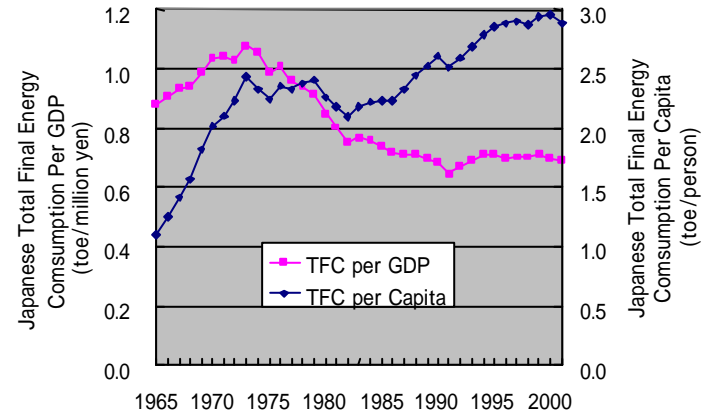
### Japanese Final Energy Consumption per GDP (1)



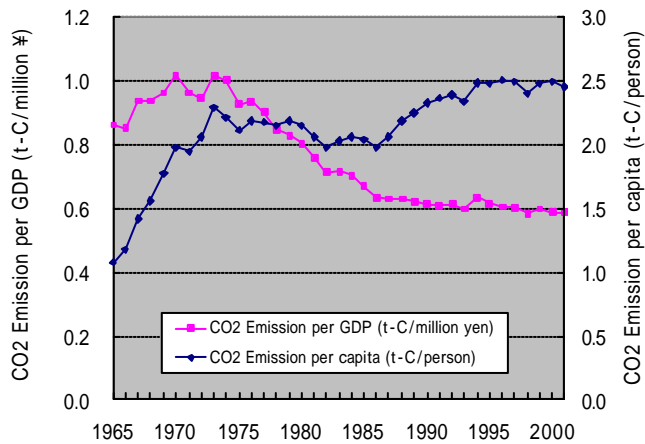
**Japanese Final Energy Consumption per GDP (2)**



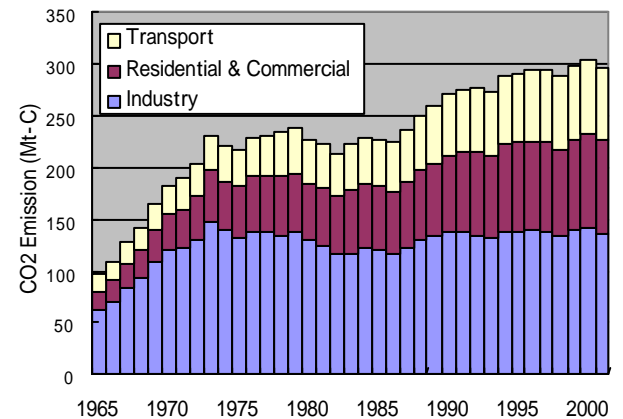
**Japanese Total Final Energy Consumption per GDP and Capita**



**CO2 Emission per GDP and Capita**

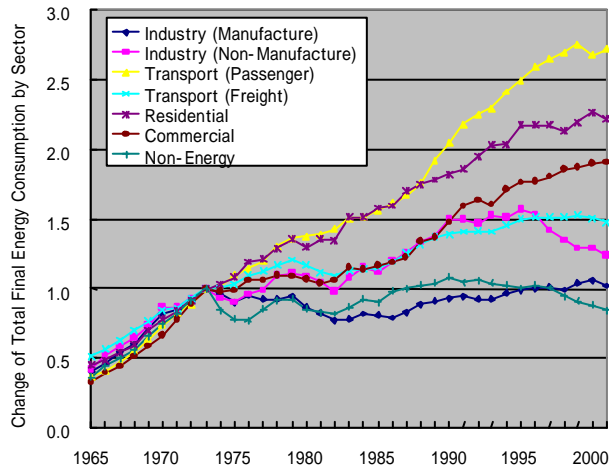


**Japanese CO2 Emission by Sector (Mt-C)**





### Change of TFC by Sector (in comparison with 1973)



### The Items of Final Energy Consumption(368Mtoe/100%)

#### Industrial Sector(171/47)

- Manufacturing(156/42)
  - Material(112/30)
    - Steel(40/11)
    - Chemicals(51/14)
    - Cement(11/3)
    - Paper and Pulp(10/3)
  - Processing/assembly(44/12)
    - Foods(6/2)
    - Textile(3/1)
    - Nonferrous metals(3/1)
    - Machines(10/3)
    - Others(23/6)
- Non-manufacturing(15/4)
  - Agriculture, Forestry & Fishery
  - Mining
  - Construction

#### (99/27)

- Residential Sector(52/14)
  - Heating(14/4)
  - Cooling(1/0)
  - Hot Water Supply(15/4)
  - Cooking(3/1)
  - Power & etc.(19/5)
- Commercial Sector(47/13)

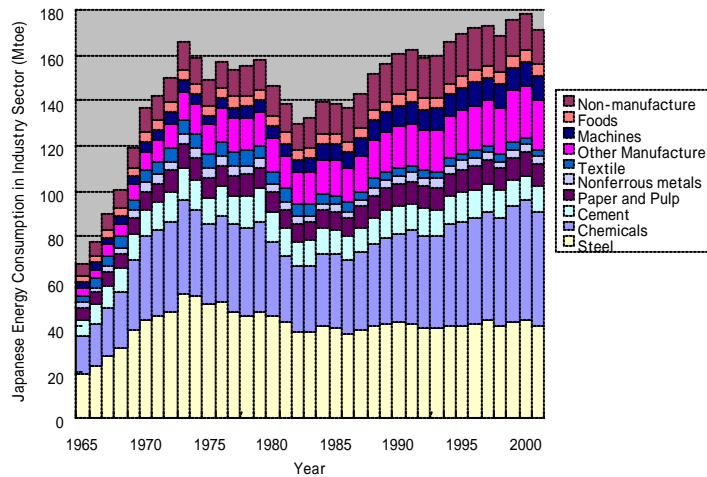
#### Transport Sector(91/25)

- Passenger(59/16)
  - Car (Private)(50/14)
  - Car (Commercial)(2/0)
  - Bus(1/0)
  - Airplane(4/1)
  - Ship(0/0)
  - Railway(2/1)
- Freight(32/9)
  - Truck(26/7)
  - Airplane(1/0)
  - Ship(5/1)
  - Railway(0/0)

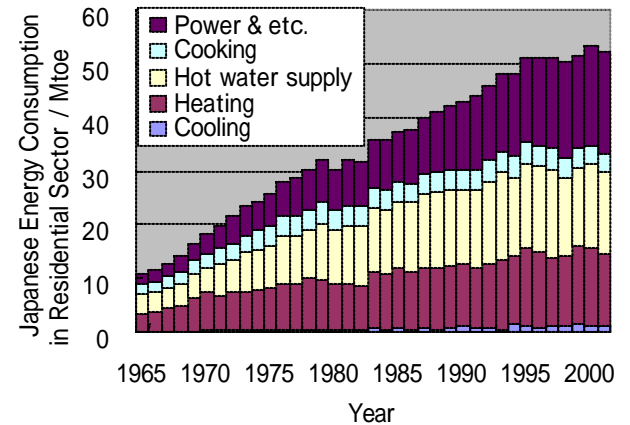
#### Non Energy Use(7/2)

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

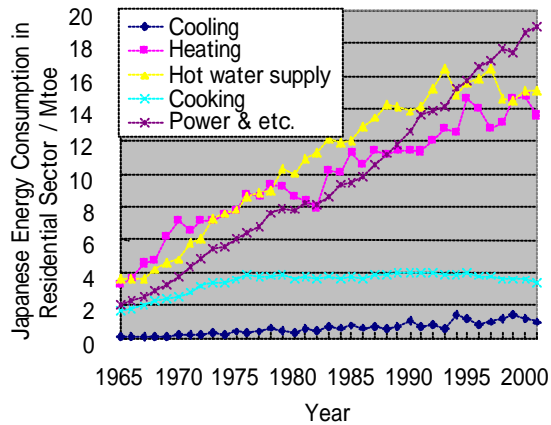
### Japanese Energy Consumption in Industry Sector



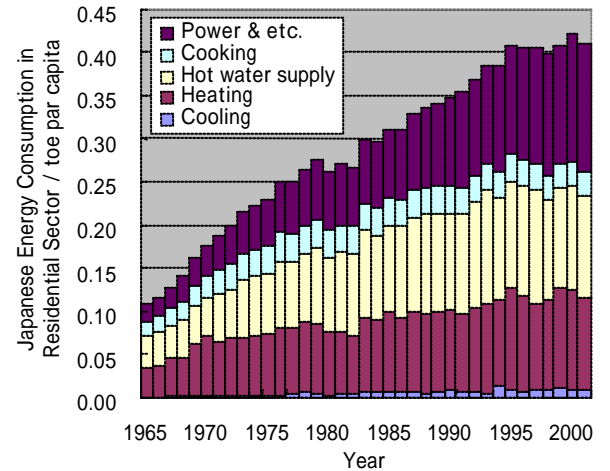
### Japanese Energy Consumption in Residential Sector



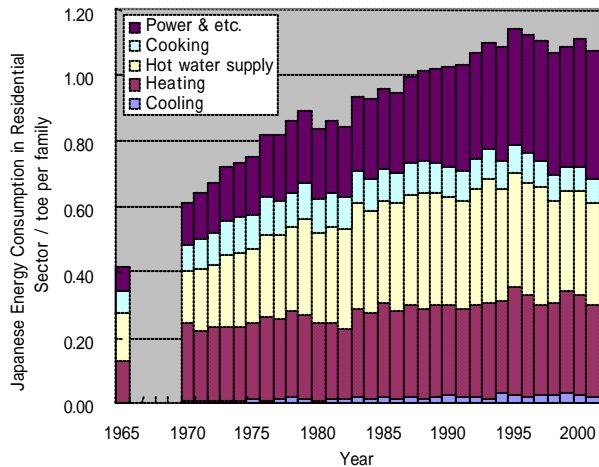
**Japanese Energy Consumption in Residential Sector**



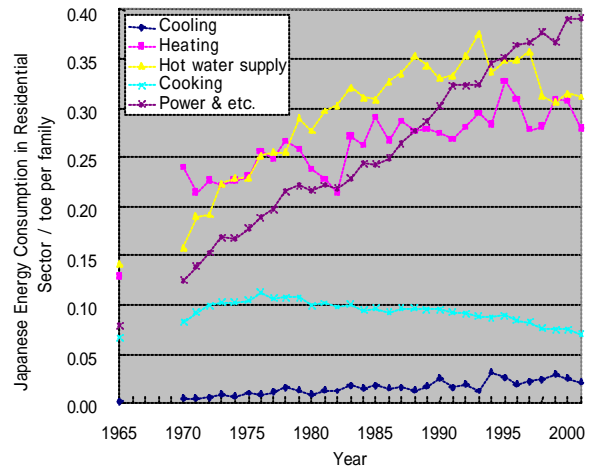
**Japanese Energy Consumption in Residential Sector**



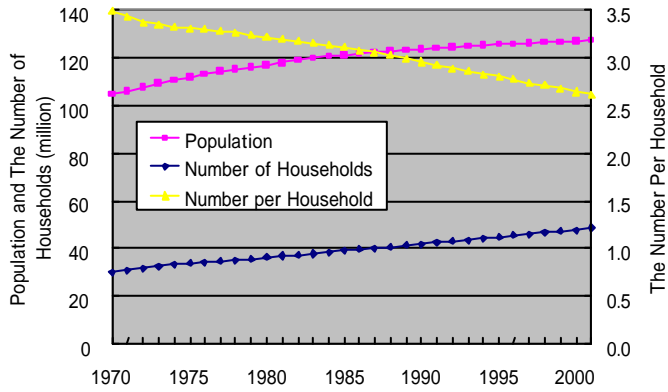
**Japanese Energy Consumption in Residential Sector**



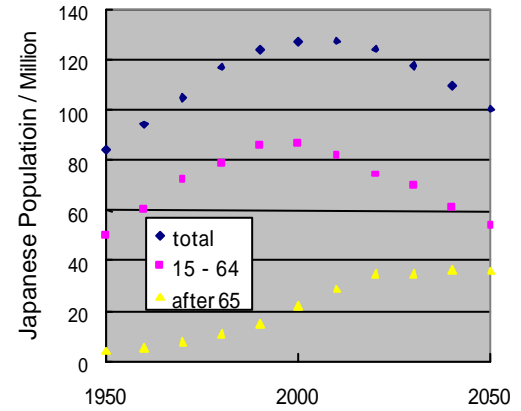
**Japanese Energy Consumption in Residential Sector**



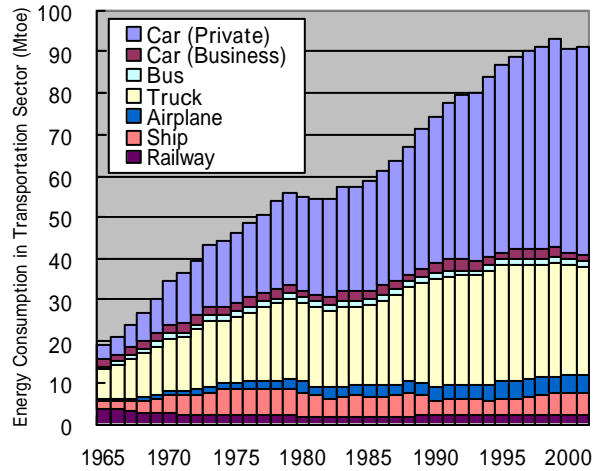
### Japanese Population and The Number of Households



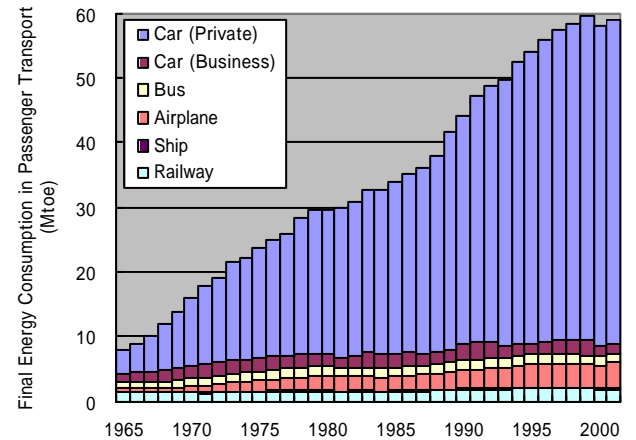
### Transition of population composition of Japan



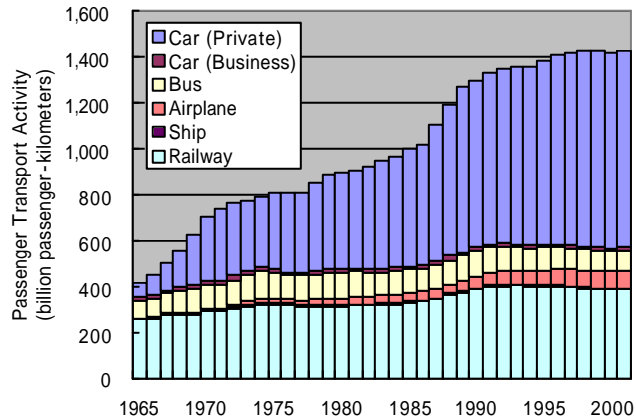
### Energy Consumption in Transportation Sector (Mtoe)



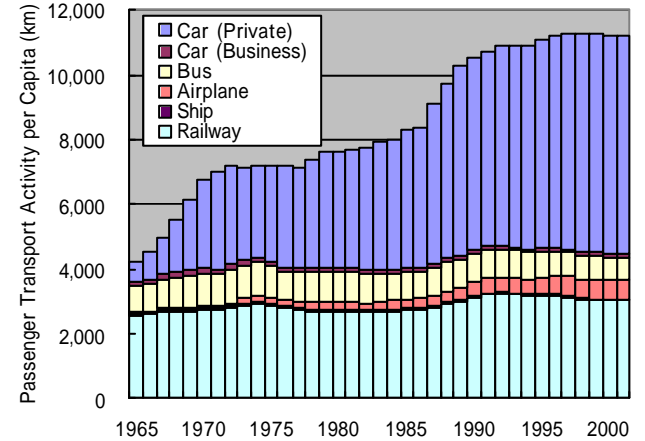
### Energy Consumption in Passenger Transport (Mtoe)



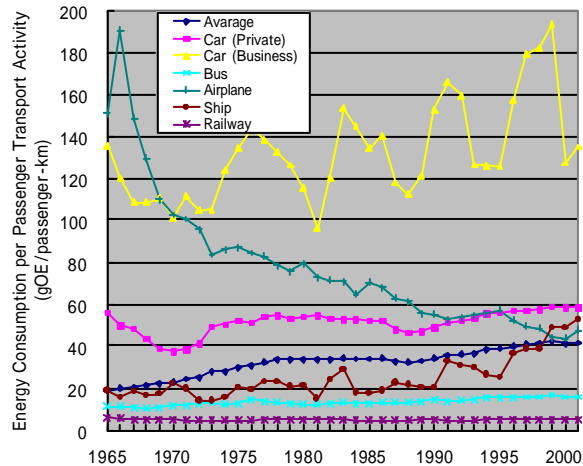
### Passenger Transport Activity (billion passenger-kilometers)



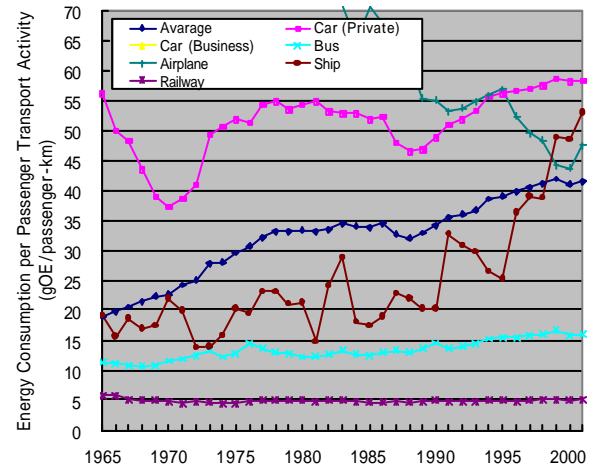
### Passenger Transport Activity per Capita (km)

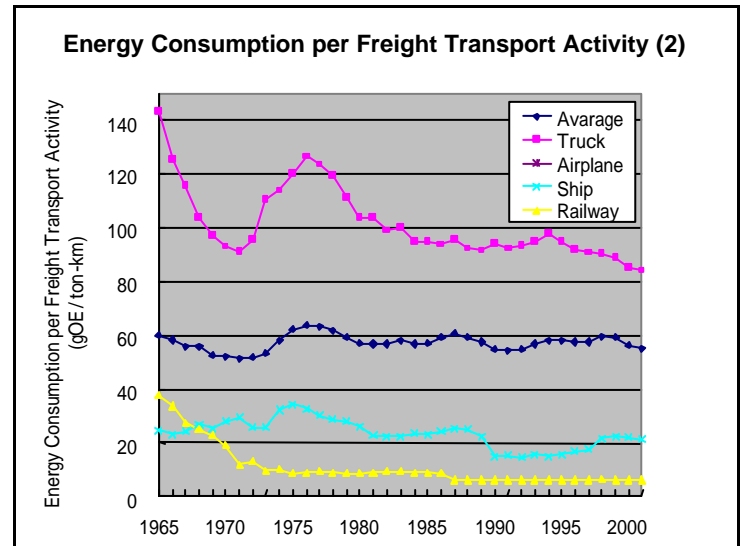
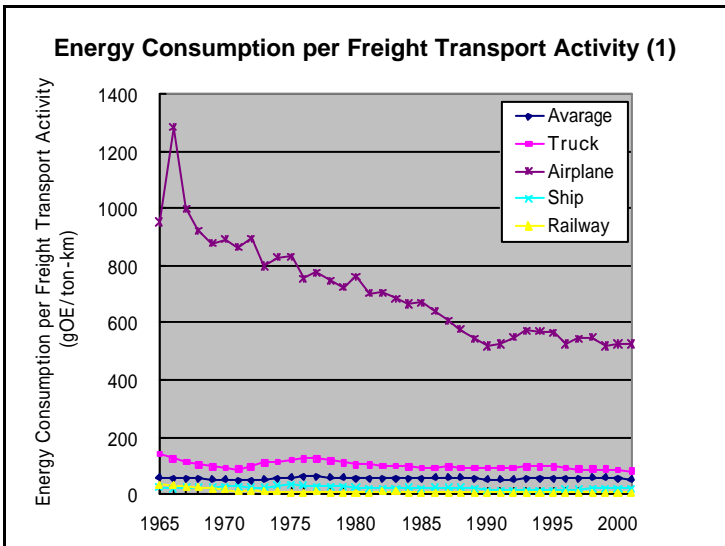
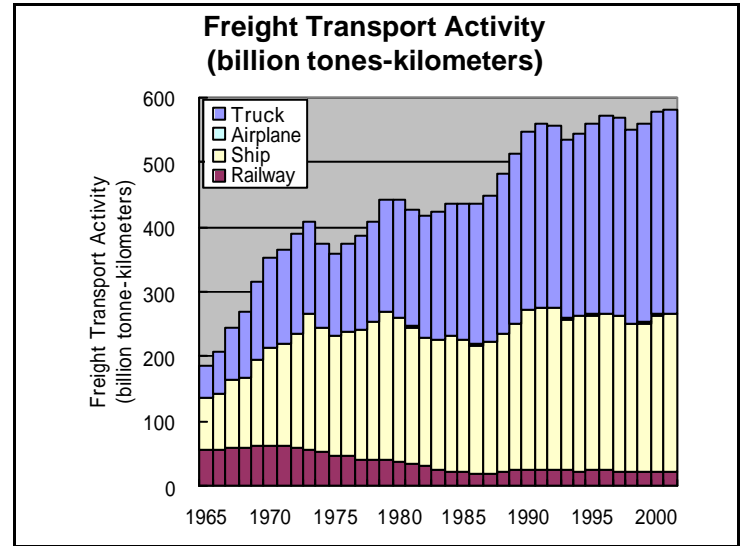
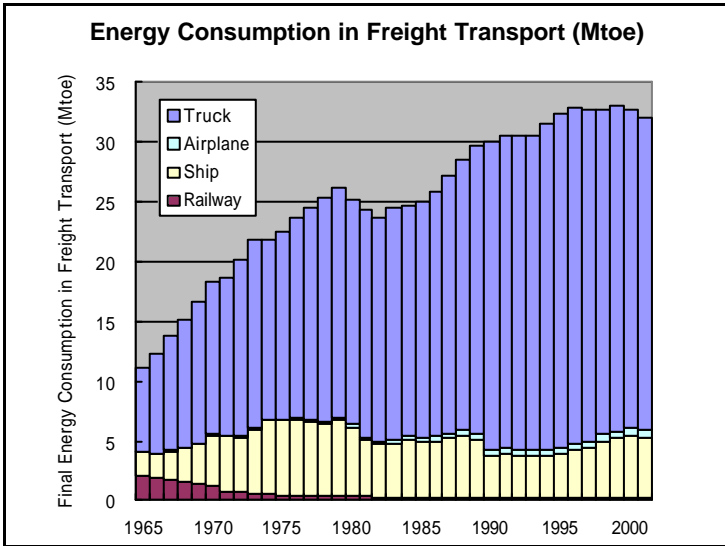


### Energy Consumption per Passenger Transport Activity

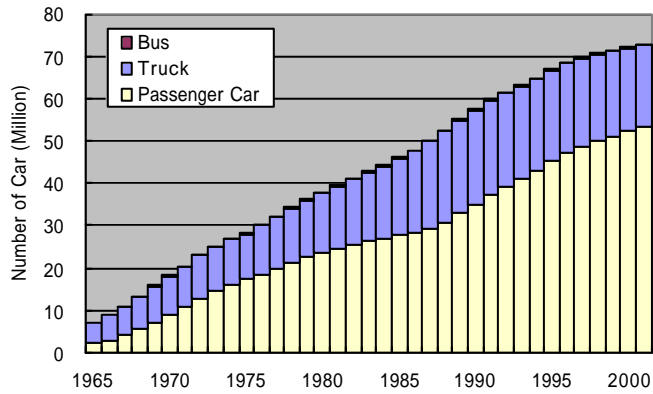


### Energy Consumption per Passenger Transport Activity

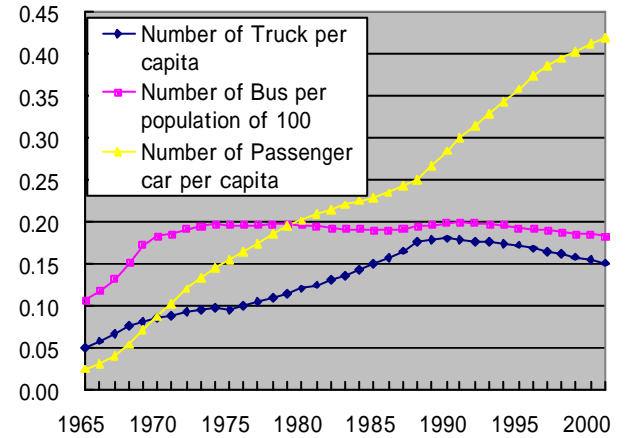




### Japanese Number of Cars (1-1)



### Japanese Number of Cars (1-3)



### Japanese Number of Cars (1-4)

