

J A P A N Report for GEO Project

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Introduction

Geography

Total land area

377,200 square kilometers

Classification of Land:

Mountainous area	61.0
Hill	11.8
Plateau	11.9
Lowland	13.8
Water area and others	2.4

(1996, National Land Agency)

Landholders

National	23.7 %
Public	6.0 %
Private	55.8 %
Others	14.5 %

Land use

Agricultural land	13.7 %
Forests	66.6 %
Fields	0.7 %
Water area	3.5 %
Roads	.31 %
Dwelling area	4.5 %
Residential area	2.7 %
Industrial area	0.5 %
Others (including commercial area)	1.3 %
Others	7.9 %

Natural coastal area
(as of 1993) 55.2 %

Natural Resources

Most energy supply such as coal, petroleum and LNG relies on imports. Mineral resources are scarce. Most metal ores are imported, while a portion of non-metals such as limestone is locally procured.

Demography**Population**

125.9 million (as of 1996)

Population density

334 persons per square kilometer (1996)

Number of households

45 million (1996)

Rate of population increase

0.21 % (1996)

Birth rate

9.6 per 1,000 persons (1995)

Mortality

7.4 per 1,000 persons (1995)

Percentage of population over age 65

14.5 %

Number of deaths caused by road traffic accidents

9900

Number of persons with officially recognized pollution related illnesses:

77,000 (1995)

Human Development Index is rated rather high (0.940) and ranked seventh in the world due to Japan's high income level, long life expectancy and high school enrollment rate.

Relevant Indices

Average Life Expectancy at Birth

Male 76.36 Female 82.84 (1995)

Adult literacy rate 99.9 %

Combined primary, secondary and tertiary enrollment ratio 78 %

Other indices

Gender-related Development Index

Japan's GDI is relatively high at 0.901 and ranked 12th in the world although its position is somewhat lower in comparison with HDI.

Relevant index

Average Life Expectancy at Birth

Male 76.36 Female 82.84 (1995)

Adult literacy rate 99.0 %

(both male and female, 1994)

Rate of enrollment at elementary, secondary, and high school

Female 77 % Male 79 % (1994)

Income level

Female 33.9 % Male 66.1 % (1994, source: UNDP)

Economic development

measured by GDP and GDP per capita, at current prices and at Purchasing Power Parity (source: the World Bank), alongside the Index of Sustainable Economic Welfare devised by Herman Daly. This will allow a discussion of income distribution, of its bias and of progress in alleviating poverty.

GDP

503 trillion yen

Per capita GDP

4 million yen

Distribution

Salary income 72.8 %

Assets 6.8 %

Corporate income 20.4 %

Eight indicators of sustainability

A . Environmental Sustainability

1. Global environmental impacts

CO2 emissions from fuel combustion

1990 287.2 ton (carbon equivalent) **1995** 310.5 ton (same as above)

1996 314.2 ton (same as above flash)

CO2 emissions per capita

1990 2.32 ton (carbon equivalent)

1995 2.47 ton (same as above)

1996 2.50 ton (same as above flash)

CO2 emissions from fuel combustion have increased by 8.1% in 1995 and by 9.4 % in 1996 of the 1990 level.

Japanese Energy Policies

The Japanese government foresees the increase in the total energy consumption in the future. By increasing the number of nuclear power plants, the government plans to cut CO2 emissions to the 1990 level by 2010, while reduction due to technological innovation and national conservation efforts is estimated at 2 %. These figures are well below the level of 6% stipulated in the Kyoto Protocol. No policies which would enable 90 % reduction has ever been formulated.

CASA proposed an alternative plan to reduce the production of goods and transportation volume by 2010 to the 1995 level. According to its estimate, 20 % reduction by 2010 would be possible with increased energy efficiency. CASA also proposed necessary legislative reforms which would enable further emission reduction.

2. Local environmental impacts

SOx and NOx emissions from power plants

SOx emissions due to energy conversion (such as the production of coke and gas)

1990/243Gg **1994/258Gg**

Percentage in Japan overall SOx emissions

1990/25% **1994/30%** (substantial increase)

NOx emissions due to energy conversion (such as the production of coke and gas)

1990/282Gg 1994/285Gg

Percentage in Japan overall NOx emissions

1990/13% 1994/13%

Major cause: increased use of coal in generating power

Amount of coal sold to power plants:

1990/26.28 million ton 1994/38.35 million ton 1996/41.92 million ton

Electricity supply by coal based thermal plants

1990/37.3 billion kWh 1994/58.5 billion kWh 1996/68.6 billion kWh figures from nine big Electric Power Company in Japan .

Japanese Energy Policies

Policies of the Japanese government promote the use of coal at thermal power plants. Only coal is non-taxable of all fossil fuels.

B . Social Sustainability

3. Rural electrification

Electricity consumed for household use

1990 38.1% 1996 40.3

Ownership rate of electric appliances	1990	1996
electric radiators	50.2 %	66.1 %
air conditioner	68.1 %	79.3 %
microwave oven	75.6 %	90.8 %
refrigerator	98.9 %	98.7 %
refrigerator (300 liter capacity or more)	54.7 %	65.5 %
clothes dryer	15.8 %	20.8 %
bedding dryer	30.6 %	38.7 %
color TV	99.3 %	99.2 %
color TV - 29 inches or bigger	30.5 %	43.1 %
Video Tape Recorder	71.5 %	75.7 %
word processor	28.4 %	41.6 %
personal computer	11.5 %	22.1 %
Ownership rate of electric appliances	1990	1996
air conditioner	126.5 %	179.3 %
refrigerator	119.4 %	120.5 %
color TV	201.3 %	219.8 %

Japanese Energy Policies

Consumption of electricity increases by 2 to 3 % per annum in Japan. According to the estimates of the The Electricity Utility Industry Council, an advisory body for the Minister of International Trade and Industry, Japan, the consumption will increase by 43 % by 2010 of the 1990 level. No effective measures against this trend have yet to be formulated.

The increased household consumption of electricity is partly due to the increased size of electric appliances and lack of policies to prevent it. Although the The Law Concerning the Rational Use of Energy will set efficacy standards of electric appliances according to their sizes, it does not prevent the production of bigger sized appliances.

4. Employment intensity

Output of electricity, gas, water supply industry
12.869 trillion yens (1990 census) =99 billion dollar (\$1=130 yens)

Number of employees in electricity, gas, water supply industry:
331,000 (0.5 % of the total employment, 1990 census)
3.3 jobs per one million dollars (1995)

Output of electricity, gas, water supply industry is
15.449 trillion yen in 1995 (=119 billion dollars, 1\$=130 yens)

Number of employees in electricity, gas, water supply industry is
312,537 (0.5 % of the total employment in 1995)
2.6 jobs per one million dollars

Although the figures above use the nominal GDP, the data clearly show that the number of employees per output is low and decreasing in recent years.

Japanese Energy Policies

Renewable energy industry will generate more jobs. Renewables only consist 1 % in Japan's official predictions on Long-Term Energy Supply and Demand Outlook. The government does not promote the use of renewable energy by introducing policies to persuade electric companies to expand its production (such as official guarantee to its purchase).

C . Economic Sustainability

5. Resilience to external impacts

Japan is an energy-importing country.
95 % of coal, more than 99 % of petroleum, 95 % of LNG, and more than 99 % of uranium are imported. Major sources of imports are as follows.

Coal

Coal (figures show the percentage in total imports in 1996)
Australia 58.0%
Coal for steel (same as above)
Australia 49.1%

Canada 23.8%

Crude oil (same as above)

- Middle East 81%
- Breakdown
 - UAE 27.3%
 - Saudi Arabia 20.4%
 - Iran 10.5%
 - Southeast Asia 14.8%

LNG (same as above)

- Indonesia 38.3%
- Malaysia 21.1%
- Australia 15.6%

6. Burden of energy investments

The government investment in energy development is relatively insignificant in Japan. 200 billion yen is spent annually primarily in nuclear power plants, 200 billion yen for the development and dissemination of new technologies in petroleum industry, and another 400 billion yen for the development of nuclear power technologies.

Japanese Energy Policies

About 1.2-trillion-yen Special Account Budget is allocated for two energy special accounts: Special accounts for coal, petroleum and alternative energy policies and Special accounts for development of electric power sources. Part of the budget is allotted for expenditure on renewable energy though the majority is spent on fossil fuels and nuclear power.

D. Technological Sustainability

7. Energy productivity

Primary energy supply (source: Agency of National Resources and Energy)

GDP in **1990** 436,044 billion yen (adjusted in 1990 value)

GDP in **1996** 503,041 billion yen (nominal)

GDP in **1995** 480,481 billion yen (adjusted in 1990 value)

1990 486,310[10¹⁰kcal](486 million ton petroleum equivalent)

1996 551,822[10¹⁰kcal](552 million ton petroleum equivalent)

GDP divided by primary energy consumption in 1990

- 897,000 yen/ton petroleum equivalent
- 6,900 dollars/ton petroleum equivalent

Nominal GDP divided by primary energy consumption in 1996

- 911,000 yen/ton petroleum equivalent
- 7,010 dollars/ton petroleum equivalent

Adjusted GDP divided by primary energy consumption in 1996

- 870,000 yen/ton petroleum equivalent
- 6,690 dollars/ton petroleum equivalent

Energy productivity has decreased over this past six years.

Japanese Energy Policies

Efforts to improve energy productivity by 1 % each year in factories is prescribed in the Save Energy Bill although the figure is hardly achieved. MITI, the judiciary body of the Bill, has never recommended strong adherence for its position is that even if the goal is not achieved, it is not necessarily against the law. During the current Diet session, the number of applicable factories has been increased, while setting a mid-term goal became mandatory for large-scale factories. Effect of this revision remains to be seen.

The Law Concerning the Rational Use of Energy also set energy efficiency standards for residential and commercial machinery. The standards are low and easily achievable by all companies, and the rule has too many loopholes. The revision made during the current Diet session introduced "top runner" system. However, how to select "top runner" is not decided, and loopholes in the rule is not yet clear.

The Japan Federation of Economic Organizations (Keidanren) has released its own plan to improve the energy efficiency. NGO watchdogs such as Kiko Network reviewed reports of MITI's advisory councils and found Keidanren's plan far from satisfactory. Keidanren estimates more than 10 % increase in CO₂ emissions by 2010 of the 1990 level if not taking account the nominal emission reduction by building more nuclear power plants.

8. Sustainable energy deployment

Solar thermal utilization

in **1990** : $1,167 \times 10^{10}$ kcal (1.2 million ton petroleum equivalent)

in **1996** : 958×10^{10} kcal (1.2 million ton petroleum equivalent)

The most significant renewable energy in Japan is solar power (99 % of the total in 1990).

Japanese Energy Policies

Renewables consist of a mere 1 % in Japan's "Long-Term Energy Supply and Demand Outlook." The development of renewables is not promoted by the government with the exception of photovoltaic power generation (excess power is purchased by the government). No policies are implemented to persuade electric power companies to expand renewable energy production and use.

Prices of renewables are arbitrarily set by electric power companies. The low, instable prices discourage suppliers of renewables. For instance, recent decline in the wind power price hinders its promotion and development.

Conclusions

Japan has succeeded in much energy conservation after the oil crisis. In addition, various regulations and standards to prevent air pollution have been introduced following many lawsuits and public complaints against air pollution by industry. As a result, Japanese electric power companies achieved high standards in environment control and technology development. However, as the oil price declined to the 1973 level in real terms, the industry failed to continue their efforts and has regressed in environmental, social, economic and technological aspects since 1990.

The government policies in recent years further aggravated the situation. The promotion of mega power plants, notably of nuclear power, and the development of nuclear related technologies by the government allow the Japanese industry to forego energy conservation and reduction of CO₂ emissions. Tension between industry and citizens/NGOs has become

more intense as NGOs demand policies that support sustainable, smaller-scale power supply structure as well as energy and electricity conservation.