Chapter 3

Aiming at a Socio Economic System for Sustainable Development

<Summary of Chapter 3>

Based on the world's economic growth and population increase, we can predict further increase of environmental load on the global scale so that the current socio economic system faces environmental constraints.

This Chapter clarifies the necessity for active immediate environmental measures to avoid such environmental constraints. The Chapter also clarifies that the efforts for environmental measures bring various economical benefits and international contribution by Japan is important to secure sustainability on the global scale under the current situation in the lead-up to the Johannesburg Summit. It also examines the process towards structuring of a sustainable society in Japan.

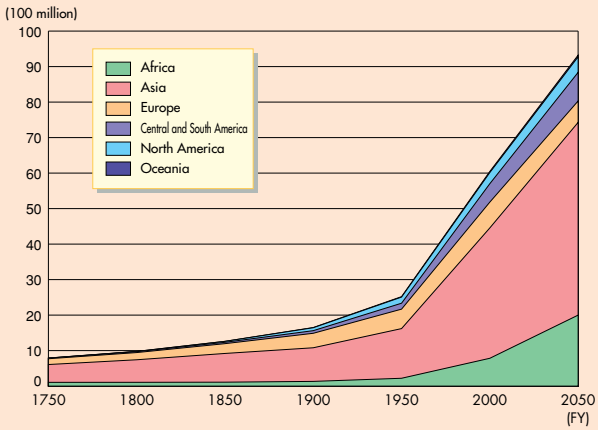
1. Actualization of Environmental Constraints and Possibility of New Measures

1) Necessity for handling environmental constraints

In spite of annual fluctuations, the world economy is consistently growing over the long term and the world population is expected to reach 9.3billion by 2050, which is an increase of 50% from 2001. Such future economic development and population growth lead to an increase of various environmental loads and increases the possibility for the current socio economic system to face some environmental constraints. For resources, the major mineral resources are expected to last for the next 30 to 40 years only; oil and natural gases are expected to be exhausted in the next 40 years and 60 years respectively. Thus, a definite reduction of the absolute amount for global resources is concerned.

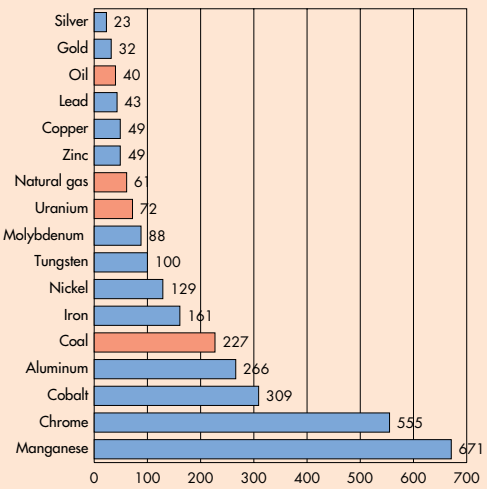
Regarding the influence on the environment, for global warming, the average temperature of the entire Earth is expected to rise by 1.4℃ to 5.8℃ during the period from 1990 to 2100 and the sea level is expected to rise for 9cm to 88cm. It is feared that such changes impose serous influences on people's livelihood and production foundations including increase of drought and flood, unstable grain production, and various influences on health and related issues in Japan are expected. For water resources, due to an increase of population and the amount of water extracted, the population of about 5billion is expected to suffer water restriction by 2025. For food production, it is expected that the increase of demand for meat in developing countries will cause a dramatic production increase; the demand for grains for livestock feed is expected to be doubled during the period from 1995 to 2020. Expansion to the lands unsuitable for cultivation may cause deterioration of soil and water quality, particularly in developing countries. For biological diversity, 60,000 species of plants, which account for one quarter of all the species in the world are assumed to become extinct by 2025.

Transition of world population



Source: "Revisions of the World Population Estimates and Projections" (1998) by United Nations

Number of years available in terms of reserves of major energy resources and mineral resources

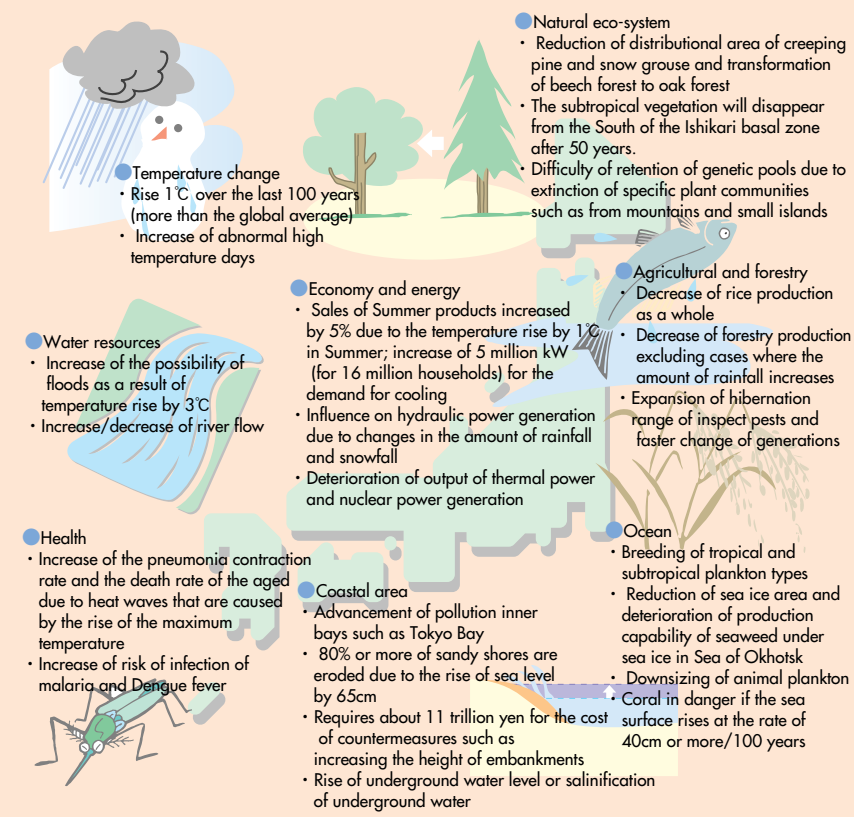


As of 2000 (however, 1997 for Uranium and 1999 for aluminum)
Number of years available = Amount of reserve/production amount
Presentation: Prepared by the Ministry of the Environment based on "Statistical Review of World Energy 2001" by BP Amoco and "Mineral Commodity Summaries 2001 (partly 2000)", and "World Metal Statistics 2001" by OECD/NEA-IAEA.

The result of calculations, called as ecological footprint regarding the degree of load imposed on the environment by the socio economic activities such as supply of food and timbers, and energy consumption indicates that the socio economic activities of the entire world including Japan had already exceeded the global environmental capacity, that is the sustainable level, in 1970.

The future environmental problems in the OECD countries in 2020 that were forecast by the OECD indicate stagnation or further deterioration in many areas such as use of water resources, emission of harmful wastes, agricultural pollution, and emission of greenhouse gases. Thus, the OECD countries commonly recognize the urgency of environmental constraints.

Influence of global warming that is predicted in Japan



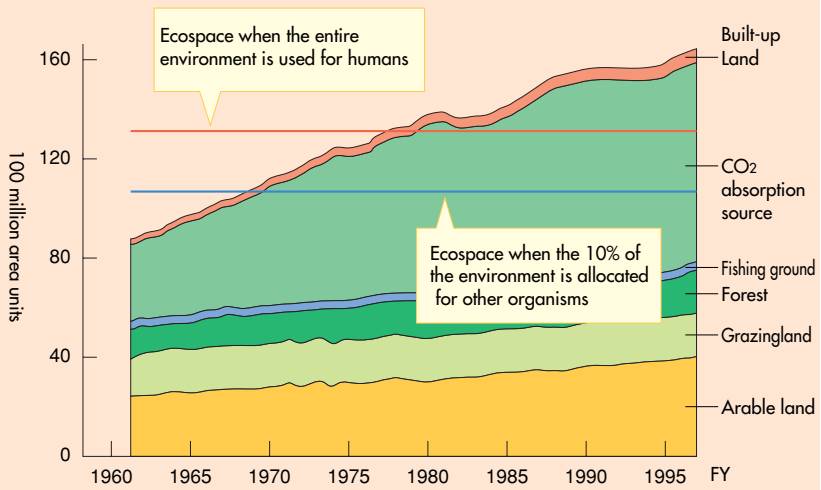
Presentation: "Influence of Global Warming in Japan 2001" by Ministry of the Environment (2001)

2) Avoiding environmental constraints

To avoid such situations, further efforts for environmental measures are inevitable.

As discussed in Chapter 1, through the severe pollution experiences and two oil crises, Japan has rapidly enhanced energy productivity and resource productivity and enhanced eco-efficiency. It is possible to promote environmental measures further.

Transition of world ecological footprint



Ecological footprint: The following items are converted to the common unit called "area unit"; area unit indicates how much load the socio economic activities impose on the global environment and the total area unit has increased by about 50% (about 1.5% annually) since 1970, reaching 16,4 billion area units in 1996. (1) Cropland required for food production(2) GrazingLand required for production of meat and diary products(3) Forest required for manufacturing of paper and timbers(4) Fishing ground required for marine products(5) Forests required for absorption of carbon dioxide that is emitted as a result of energy consumption(6) Land required for housing and infrastructure
The global ecospace in 1996 accounts for 12,600 million area units (ecospace accounts for 11,3 billion area units when 10% of the environment is allocated for other organisms). The world ecological footprint exceeded the ecospace in the 1970's and currently exceeds it by about 30% (about 45%).
Source: "Living Planet Report 2000" (2000) by WWF

Regarding reduction of emission of carbon dioxide, new energies such as solar power generation, wind power generation, and biomass account for only 1% of the total supply of primary energy and the proportion of the number of low-emission vehicles such as hybrid vehicles to the total number of vehicles is still low (about 1%). For these reasons, various additional measures are expected to be introduced.

For resource utilization, consumption control of natural resources and reduction of environmental load require efforts for reduction, reusing, recycling, heat recovery, and proper treatment in that order. For recycling, the amount of material produced by subtracting the amount recycled from the emission amount for each resource or container package shows further implementation possibility of resource recycling.

Amount produced by subtracting the recycled amount from the emission amount among the main nonferrous metals

(1997)

	Emission amount (ton) (A)	Recycling rate (%) (B)	A×(1−B/100) (ton)
Aluminum	1,662,000	54	766,000
Copper	598,000	66	202,000
Zinc	364,000	20	291,000
Lead	277,000	66	93,000
Cadmium	1,080	28	780

Source: Prepared by Ministry of the Environment based on the "Examination and research relating to 'Recycling economy system in nonferrous metal materials (March 1999)" by Clean Japan Center

Amount produced by subtracting the recycled amount from the emission amount among major container packages

(2000)

	Emission amount (ton) *1 (A)	Recycling rate (%) *2 (B)	A×(1−B/100) (ton) *1
Steel can	1,215,357	84.2	192,026
Aluminum can	167.5	80.6	32
PET bottle	362,000	34.5	237,110

*1 100 million cans for aluminum cans only
*2: Recovery rate for PET bottles
Source: Prepared by Ministry of the Environment based on the data provided by the Clean Japan Center

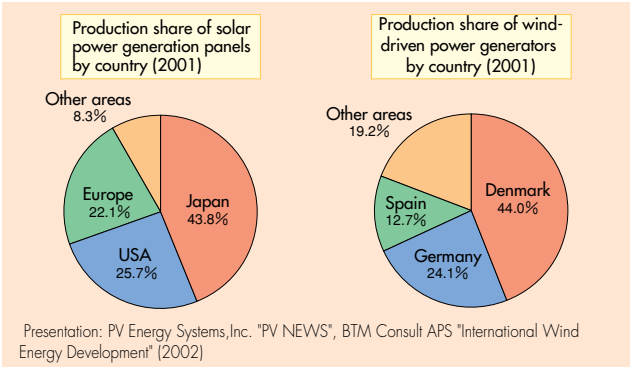
2. Economical Effects Achieved by Environmental Measures

1) Environmental measures and technical innovation

To avoid environmental constraints discussed in Section 1, it is necessary and vital to start the new measures in such an economic recession age as this for planning of sufficient handing before the occurrence of any adverse influence of the environment. Such measures can give a positive effect to the economy when taken property through various effects such as avoidance of future damage in addition to technical innovation, employment creation, and ripple effects.

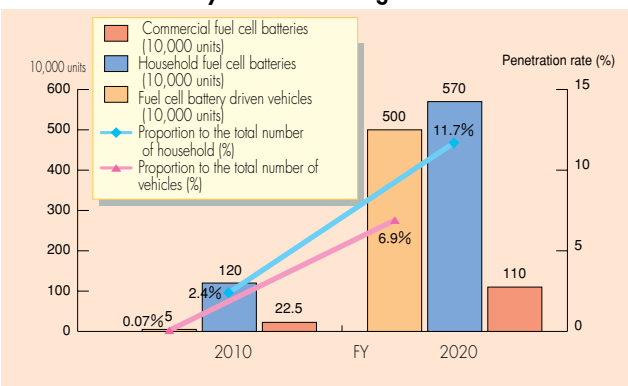
For technical innovation, proper measures of automobile and solar energy generation as discussed in Section 2 Chapter 1 have stimulated domestic technology development, and Japanese enterprises are now proud of their top-level technical power in the world, while Denmark has started development and sales of wind-driven power generation to be first in the world and currently holds 40% share of the world market. Fuel cell batteries are also one of the major projects that are to be tackled by the giant world enterprises as a joint development and in Japan also, a trillion-yen market is expected to be born in 2010.

Production share of solar power generation panels and wind-driven power generators by country



Presentation: PV Energy Systems,Inc. "PV NEWS", BTM Consult APS "International Wind Energy Development" (2002)

Fuel cell battery introduction target and market scale



	2010	2020
Market scale	1 trillion yen	8 trillion yen

(Reference)		1995
Market scale	Agriculture	8.4 trillion yen
	Beverage	8.5 trillion yen
	Petrochemical product	7.5 trillion yen
	Railway transport	6 trillion yen
	Accommodation	7 trillion yen

Presentation: Prepared by Ministry of the Environment based on the data supplied by Ministry of Economy, Trade, and Industry:research comniffee for fuel cell battery practical use in the strategy (2001) and inter-industry relstions table (1995).

Current situation of eco-business market scales of Japan and future forecast

Eco-business	Market scale (100 million yen)		Employment scale (persons)	
	1997	2010	1997	2010
A. Environment pollution control	142,140	188,430	311,258	340,350
Manufacturing of devices and pollution prevention materials	13,475	17,860	22,346	21,893
1. Air pollution prevention	3,052	3,660	4,826	4,286
2. Waste water treatment	9,824	10,828	15,550	12,593
3. Waste processing	89	387	201	611
4. Soil and water purification (including underground water)	15	2,408	24	2,962
5. Noise and vibration prevention	142	104	254	145
6. Environment measurement, analysis, and assessment	352	473	1,491	1,295
7. Others	—	—	—	—
Providing services	86,098	103,607	246,005	256,139
8. Air pollution prevention	—	—	—	—
9. Waste water treatment	9,569	12,111	8,575	7,991
10. Waste processing	73,904	85,202	226,174	231,496
11. Soil and water purification (including underground water)	356	3,225	1,290	5,223
12. Noise and vibration prevention	—	—	—	—
13. Research and development regarding environment	—	—	—	—
14. Engineering regarding environment	—	—	—	—
15. Analysis, data collection, measurement, and assessment	2,197	2,186	9,517	9,469
16. Education, training, and information distribution	21	348	133	806
17. Others	51	534	316	1,154
Construction and equipment installation	42,567	66,964	42,906	62,318
18. Air pollution prevention	0	59	0	72
19. Waste water treatment	33,942	57,884	30,515	52,040
20. Waste processing	7,196	6,421	11,107	7,868
21. Soil and water purification (including underground water)	—	—	—	—
22. Noise and vibration prevention	1,429	2,599	1,285	2,337
23. Environment measurement, analysis, and assessment	—	—	—	—
24. Others	—	—	—	—
B. Environmental load reduction technology and products (Manufacturing devices and providing technology, materials, and services)	2,256	5,464	3,516	8,774
1. Environment load reduction and energy conservation technology, and associated processes	0	2,500	0	5,747
2. Environment load reduction and resource conservation products	2,256	2,964	3,516	3,027
C. Effective use of resources (Manufacturing devices, providing technology, materials and services, construction and installation of equipment)	103,031	207,049	380,371	517,883
1. Prevention of indoor air pollution	—	—	—	—
2. Water supply	288	1,051	337	1,710
3. Renewable material	37,451	88,506	87,081	169,119
4. Recyclable energy facility	1,690	7,109	6,302	11,946
5. Energy conservation and energy control	7,560	24,949	12,619	25,777
6. Sustainable agriculture and fisheries	—	—	—	—
7. Sustainable forestry	—	—	—	—
8. Natural disaster prevention	—	—	—	—
9. Eco-tourism	—	—	—	—
10. Others (nature protection, eco-environment, bio diversity, etc.)	56,041	85,434	274,032	309,330
Grand total	247,426	400,943	695,145	867,007

While market globalization is progressing, the technologies that were developed by advanced enterprises are acquiring large market shares throughout the world. Since environmental problems are common world issues, the superiority of Japanese technology can also be developed further in the market relating to environmental measures, which is expected to expand further in the future.

Notes:
1. Column A contains the items that are difficult to assume by distinguishing "manufacturing of devices and pollution prevention materials" and "construction and equipment installation." Therefore, those that are assumed to be ordered as individual devices only were classified as "manufacturing of devices and pollution prevention materials" and those that are assumed to be ordered as plants were classified as "construction and equipment installation."
2. Some items are marked as " - " due to unavailability of data.
3. Data of 1996 is used for some of the market scale of 1997.

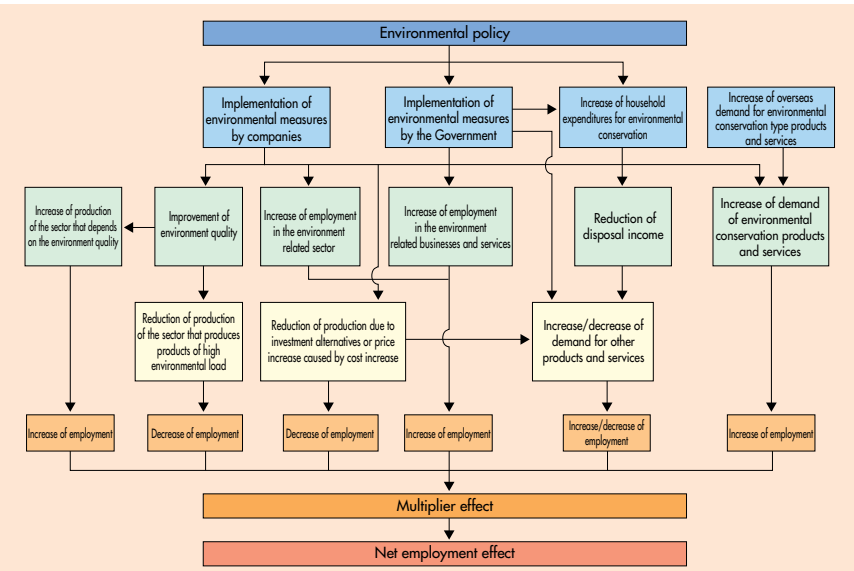
Presentation: Ministry of the Environment

2) Environmental measures and employment

The report regarding "environmental policies and employment" that was announced by the OECD in 1997 indicates a slight positive effect of the influence of environmental measures on employment as a whole, although it is very small.

Regarding the employment creation condition in the environment field in each country, Germany provided employment for about 1.3 million in the environment field, which exceeds that of the machine manufacturing industry or the food related industry. In the USA also, the recycle and reuse industries created about 1.12 million jobs, which is equivalent to the automobile manufacturing industry.

Latent influence of environmental policies on employment



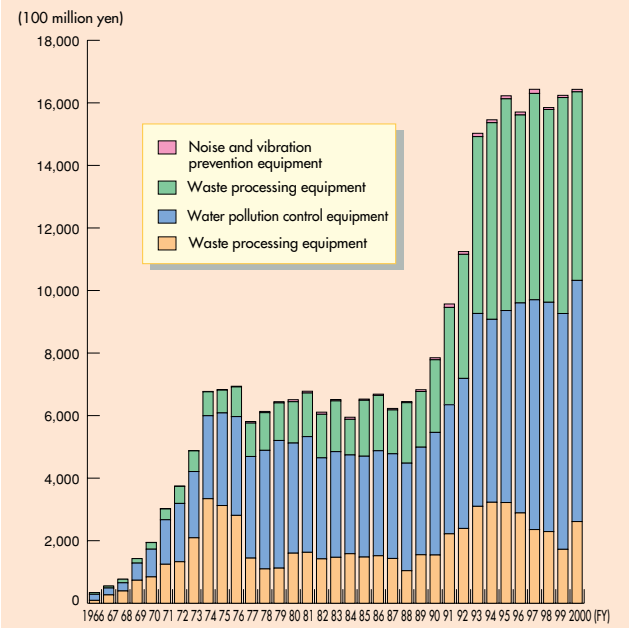
Sources: Prepared based on the "Environmental Protection and Employment" (1998) (modelled on OECD "Environmental Policies and Employment" (1997) by Ministry of the Environment in Germany

In Japan also, the employment scale in the environment field as of 1997 reached about 700,000 and the number is estimated to reach about 870,000 in 2010. For the employment measures that are taken by Prefectures, the result of urgent regional employment special grants shows that the environment and recycling fields account for about 30%, which is the highest proportion.

3) Ripple economical effects by environmental measures

Environmental measures are considered to be expenditures for enterprises, however, for enterprises that manufacture facilities required for implementation of environmental measures, environmental measures are sales. The environment related market is expanding; the environment-related equipment production performance has increased from about 34.1 billion yen in 1966 to 1,643.2 billion yen in 2000. The result of the analysis of the production induction effects and employment creation effects through investments in the environment field estimated by using an inter-industry relations table indicates that environment-related businesses have approximately the same production ripple effects as those of the construction sector industry.

Transition of production of environment-related equipment in value



Presentation: Prepared by Ministry of the Environment based on the data supplied by Japan Industrial Machine Association.

4) Avoidance of future damage

We tend to become hesitant over the implementation of measures under the current difficult economic situation. For environmental measures, the effects appear in the future while the cost occurs immediately and the benefit spread to the entire society, not to the individual enterprise. Therefore, since the cost bearer does not necessarily gain the benefit associated with the cost, the burden is sometimes avoided or delayed. However, we have already experienced bitter lessons in recent history; when people's health is damaged by environmental pollution, the damage cannot be reversed, the environment is difficult to recover or recovery of the environment is extremely expensive once it is lost.

Cost of damage in pollution-related experiences in Japan and estimated cost for countermeasures

	Annual cost of damage	Annual cost for measures
Air pollution in Yokkaichi	21,007 million yen	14,795 million yen
Minamata disease	12,631 million yen	123 million yen
Itai Itai disease	2,518 million yen	602 million yen

Presentation: Prepared by Ministry of the Environment based on "Pollution Experiences of Japan" by Global Environment and Economy Research Institute

For the problems on the global scale, the amount of damage becomes vast and UNEP estimates the total amount of damage will reach 304.2 billion dollars over the entire world when the density of carbon dioxide in the atmosphere reaches twice that of the pre-industrial revolution level in 2050.

As discussed adobe, the effects of environmental measures on the economy have various facets. When taken properly, these environmental measures result in economical benefits such as technical innovation, securing of employment and ripple effects. In addition In the sense of avoiding future damage, environmental measures may give positive effects to the economy.

3. New Measures by International Society and Japan's Contribution

1) Factors of instability of the international society caused by deterioration of the natural environment

The current background of frequent regional disputes has produced a vast number of refugees worldwide. In addition, "environmental refugees" who were forced to leave their residences due to destruction of the environment are estimated to reach 25 million. Thus, environmental problems have become serious problems.

Population shifts caused by the environmental problems and cross-border environmental problems such as acid rain, and pollution of international rivers have become the factors of instability in the international society.

2) Securing stability of environment, society, and economy

With these conditions forming the background, recently the environment and security issues are often associated in discussions. For example, the subject of "Environment and Security" was included in the final communique of the G8 Environment Minister's Meeting held in 1999. Under the recent climate where mutual dependency beyond borders has become increasingly stronger worldwide due to globalization of the world economy, recent apprehension regarding spread of instability of some regions in the world due to environment destruction is increasing. To secure sustainability on the global scale, the approach from each facet of the environment, society, and economy is necessary. For Japan, which largely depends for its resources, energy, and food on overseas countries, active contribution is important to secure sustainability on the global scale, considering the size of the environmental load.

Dependency of Japan on imports for its major resources

	1980			2000 (*1)		
	Production amount	Import amount	Overseas dependency (%)	Production amount	Import amount	Overseas dependency (%)
Timber <raw material> (1,000 m³)	34,051	43,892	56.3	17,987	19,511	52.0
Grains <including feeds> (1,000 tons)	10,750	26,120	70.8	10,450	26,810	72.0
Coal (1,000 tons)	18,095	72,711	80.1	3,126	145,278	97.9
Crude oil (1,000 kl)	503	256,833	99.8	740	249,814	99.7
Natural gas (million m³)	2,197	22,854	91.2	2,431	103,225	97.7
Iron ore (1,000 tons) (*2)	477	133,721	99.6	4	131,733	100.0
Copper (1,000 tons)	53	867	94.2	1	4,469	100.0
Bauxite (1,000 tons)	0	5,708	100.0	0	2,096	100.0

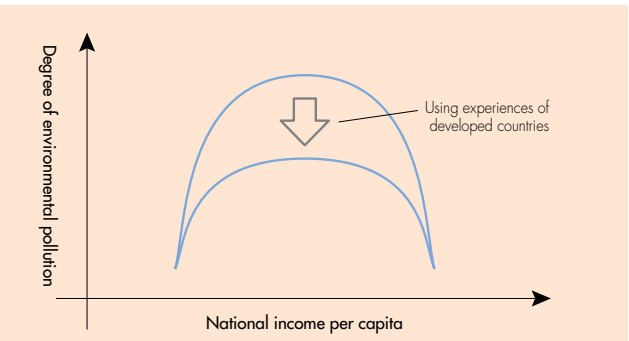
Source: "Raw materials demand and supply statistics", "Food demand and supply table" by the Ministry of Agriculture, Forestry, and Fisheries of Japan, and "Trend of Mineral Industry of Japan" and "Trade White Paper" by the Ministry of Economy, Trade, and Transport
Notes
1. The data of timber and grains is that of 2000
2. The values of 2000 were estimated using the average grade of iron ore as 38.9% based on the statistics survey of the amount of mineral reserves.

3) Significance of "World Summit On Sustainable Development"

From the end of August, 2002, the "World Summit On Sustainable Development" will be held in Johannesburg (South Africa). For the significance of the meeting, the following items are expected :
<1> Political decisions made by the world leaders indicate the guideline of international efforts associated with sustainable development in the 21st Century.
<2> New challenges and opportunities that the international society is facing are verified and international agreements are made regarding the future practical measures.
<3> Participation of various concerned stakefolder over a wide range, as well as the Governments, further promotes the realization of sustainable development.

Constructive discussions by world leaders in one place regarding actualization of sustainable development, in particular, environmental prosection and poverty eradication in developing countries are extremely meaningful in securing worldwide sustainability. For Japan, which depends significantly on overseas countries, this is a good opportunity to make active contributions.

Environment Kuznets curve



Presentation: Prepared by Ministry of Environment

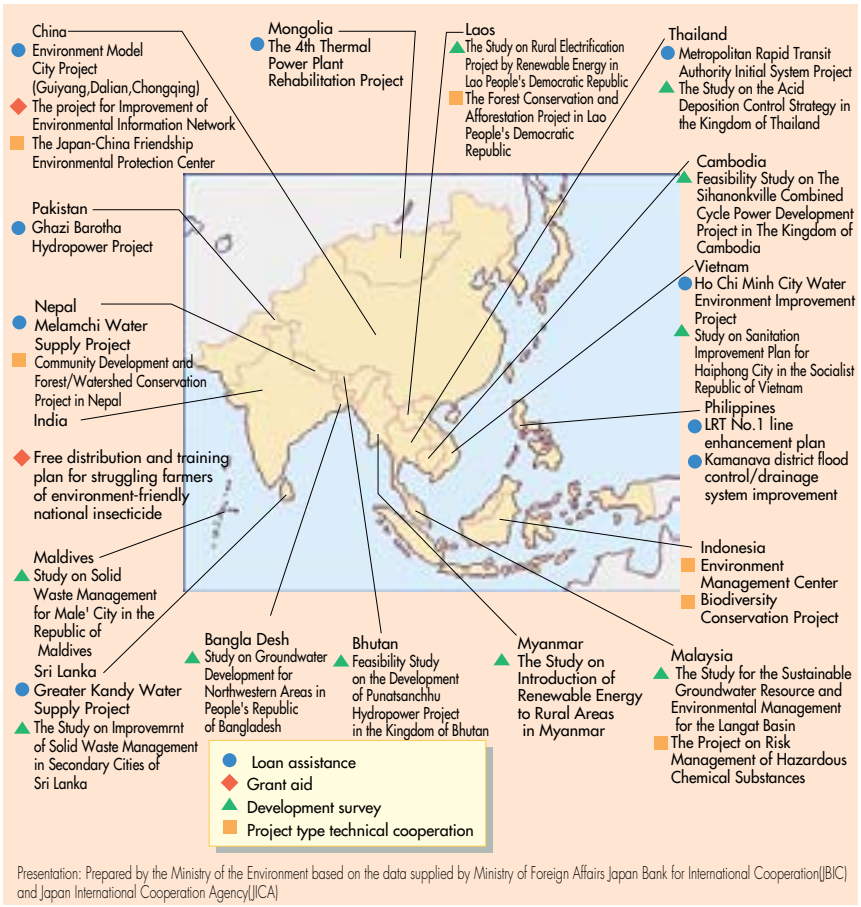
4) International contribution in the environmental field

According to the analysis result of the relationship between

economic growth and environmental load, the environmental load is low at the initial stage of economic growth and increases as the economic growth progresses, and after the economic growth reaches a certain stage, the environmental load decreases due to the development of environmental measures. Such a reverse U curve is called an environmental Kuznets curve. To achieve sustainable development, it is extremely effective for developing countries to reduce the degree of the reverse U curvature, instead of following the same development path as developed countries. For this reason, it is important for developing countries to actively tackle environmental measures and at the same time to gain the cooperation of developed countries that have the knowledge of such measures.

In particular, in the Asian region, future rapid population increase and economical development are expected, resulting in increase of environmental load causing instability of the regional society. The Japanese government, which is closely related to the Asian region in terms of the society, economy as well as environment ,must make efforts for securing environmental, social and economical stability in the Asian region by allocating 30% of its official development assistance (ODA) to environmental proposals.

Actual examples of the Official Development Assistance (ODA) in the Asian region by the Japanese Government



Presentation: Prepared by the Ministry of the Environment based on the data supplied by Ministry of Foreign Affairs Japan Bank for International Cooperation(JBIC) and Japan International Cooperation Agency(JICA)

4. Movement towards Construction of Sustainable Society

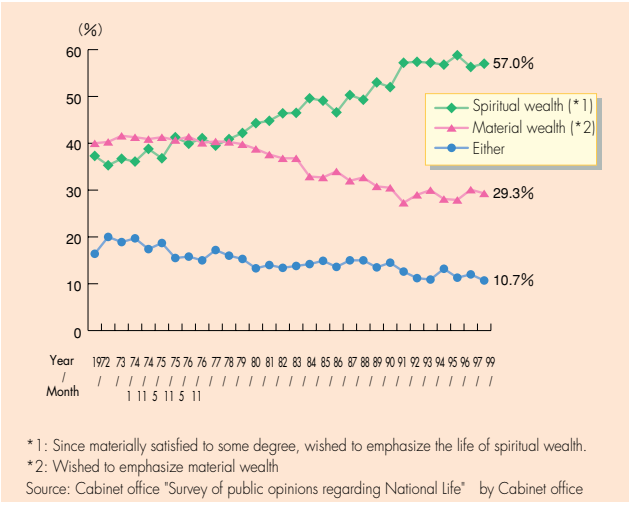
As discussed above, we are required to take further measures for reducing the environmental load. In the measures based on the current mass production, mass consumption, and mass waste producing socio economic system, the effects are limited. To build a sustainable society within the limited ecospace, it is necessary to review the current socio economic system itself.

Based on this concept, the Government established a "Harmonious Coexistence Conference" hosted by the Prime Minister in order to transform the society to the "sustainable simple society that emphasizes quality" and examined the measures for realization of Japan as the country of harmonious coexistence with the earth. In the discussions held in the conference, various suggestions were submitted under the recognition that "harmonious coexistence" is to reform the current socio economic structure, our livelihood, and our sense of value based on the environment viewpoint. The discussions suggested that the conventional socio economic system is to be changed to minimize the use of resources by economic activities, recycle the resources, and shift the contents of economic development from quantitative expansion to qualitative improvement.

As for the actual image of the new socio economic system, all the entities such as citizens, enterprises, and governments are to collectively make efforts and examine in reduction of the environmental load so that such a system is created.But some of the measures taken by the entities may lead to review of the current socio economic system.

For instance, the recent trend shows that consumers started to move away from the adherence to new items, to extended use of consumer durable goods and sharp increase of the used item retail industry, increase of consumers desiring "spiritual wealth" rather than "material wealth" and valuing having sufficient time for oneself. Thus, the sense of value towards the richness of society is changing. As discussed in Section 2 Chapter 2, a transformation may occur from utilization of materials to utilization of services that is de-materialization across the entire society, as seen in the increase of lease and rental services in many enterprises. This may produce the result that cannot be achieved by efficiency improvements of individual products. Vitalization of regions through improvement of voluntary measures relating to environment in regions indicates a direction different from the socio economic system based on the existing overconcentration on mass production.

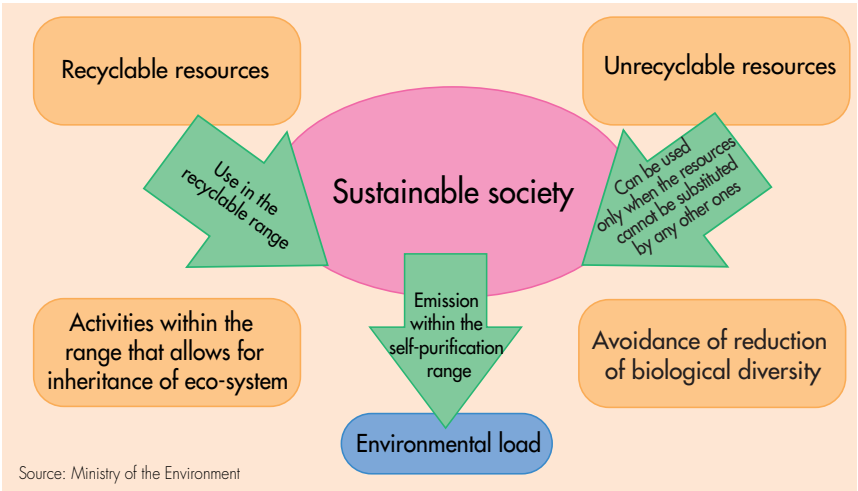
Material wealth or spiritual wealth



*1: Since materially satisfied to some degree, wished to emphasize the life of spiritual wealth.
*2: Wished to emphasize material wealth
Source: Cabinet office "Survey of public opinions regarding National Life" by Cabinet office

As discussed adobe, the environment as the foundation of the world socio economic system is in a serious condition in many fields. In fact, measures by enterprises and citizens have gradually started to penetrate and attempts are being made to improve eco-efficiency so that reduction of environmental load exceeds economic growth. However, to restrict the total environmental load to a certain range, it is necessary to fundamentally review the socio economic system based on the current concept of mass production, mass consumption, and mass waste production and aim for transformation to a society of a new stage independent of resources and energy mass consumption with the maturing of the economy.

Definition of "Sustainable Society" in the Environmental Basic Plan



Source: Ministry of the Environment

In this year as the 10th year from the Earth Summit, the Johannesburg Summit will be held and the meaning of sustainable development will be discussed again. In this opportunity, we must contemplate what choice is to be made to start the first step for construction of a sustainable society and proceed with structural reform of the society based on the viewpoint of the environment for the future.