Whether developing countries increase dependence on natural gas or coal is an important issue. However, many of the countries that have so far increased the use of local natural gas are planning to increase their use of coal, especially in the power generation sector.

(5) Atomic energy option that will become necessary in East Asia in the long run

In OECD Asia, Taiwan, and ASEAN, energy supply is largely accounted for by oil, while the use of natural gas is increasing. For these countries and areas, developing infrastructure, such as pipelines, to increase the use of natural gas is an important issue. In the longer term, where East Asia will position atomic power will become an important issue. Japan first introduced atomic power before the first oil crisis and since then has developed atomic power as the pillar of domestically produced energy and alternative energy resource to oil. South Korea and Taiwan have drastically increased atomic power since the beginning of the 1980s. China activated its first atomic power plant early in the 1990s and has been promoting the construction of more plants.

In addition, Indonesia and Thailand are considering introducing atomic power in around 2010. For instance, in the case of Thailand, though domestically produced brown coal is currently one of the main fuels for power generation, it is expected to become necessary for the country to introduce atomic power in around 2010, after increasing imports of coal from around 2000 to meet growing electric power demand.

For East Asian developing countries that are expected to show fast economic growth and a sharp increase in energy consumption, atomic power is certainly an important source for electric power generation. However, in order to use the giant technology safely, above all, it is important to develop and establish a solid infrastructure, including engineers and social structure. There are strong oppositions against atomic power in Western countries. However, given the long-term increase in Asia's energy demand, it is vital that Asia keeps the atomic power option.

4. Response to Regional Environmental Issues in East Asia and Problems

(1) Response to worsening immediate problem of environment – air pollution by fixed sources

Due to accelerated increase in energy consumption in the 1990s, immediate environment problems, centering on air pollution, have deteriorated in East Asia. The seriousness of the environment problem differs from one country to another depending on the country's economic standard and on the kind of energy it uses. The problem is a national issue in South Korea and Taiwan, while it remains an urban issue in Thailand

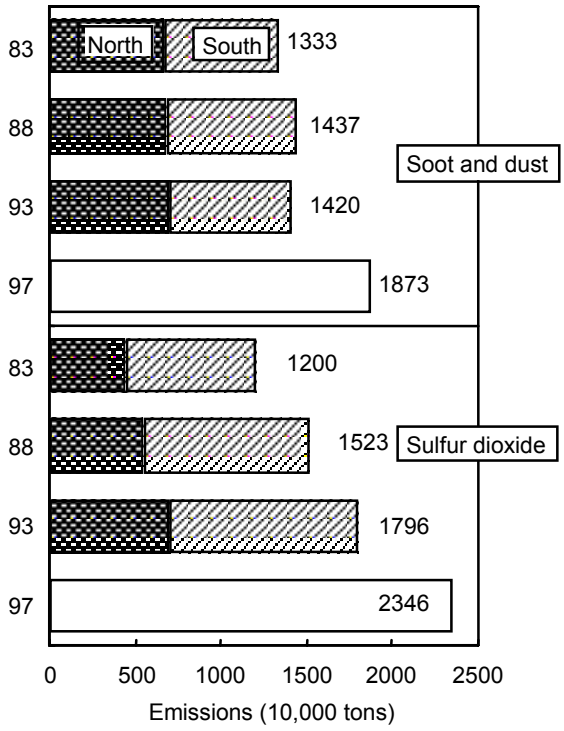
and Indonesia. But in East Asia, local environment problems are issues that need to be addressed immediately.

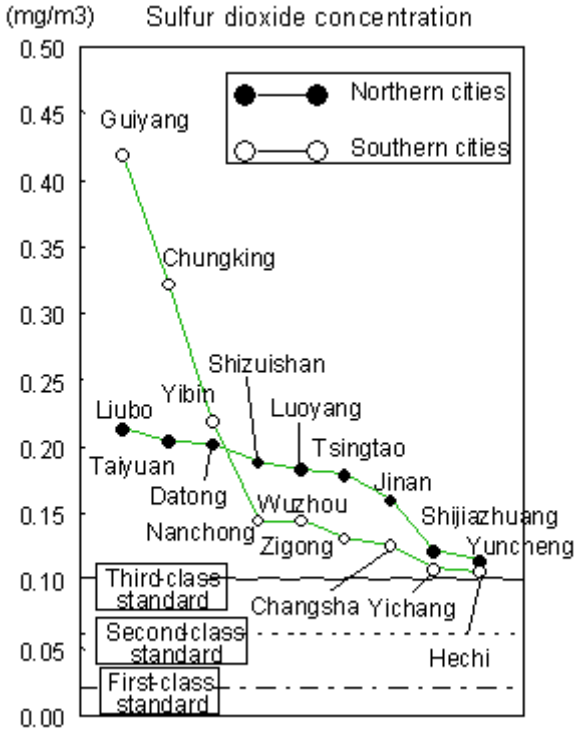
One of the reasons why immediate environment problems have become serious in East Asia is that the countries in the region have to depend on domestically produced coal. While the share of coal in primary energy (excluding non-commercial energy) averaged 26% in the world as a whole in 2000, the average share of coal in East Asia stood at 43% in the same year. In particular, the share of coal is high, at 69%, in China, which depends largely on domestic coal to meet growing energy consumption.

In a low-income country, electricity consumption begins with lighting, as the country believes liberating people from darkness is the first step toward the civilized world.

Asian developing countries were early to promote the electrification of rural areas without light as a symbol of civilization. It is undeniable that they chose mass consumption of coal, mainly in the power generation sector, in order to meet the relatively high electricity demand for their economic standards. The use of low-quality domestic coal, such as brown coal and lignite, has aggravated the environment problem.

Figure 10 Sharply Increasing Air Pollutant Emission and Worsening Environment Problem in China





In China, which depends on coal for 70% of primary energy, pollution caused by floating dust and sulfur dioxide from fixed sources, such as power plants, is severe. There are 14 Chinese cities in the north and 7 in the south that do not meet the third-class criteria for sulfur dioxide concentration, the level that does not cause either acute nor chronic poisoning to the human body and that animals and plants can grow normally (Figure 10). Pollution is particularly serious in two southern cities of Guiyang and Chungking. The annual emissions of sulfur dioxide in Chungking exceed 1 million tons, posing serious health hazard, such as respiratory diseases.

In Beijing and Shanghai car exhaust emission poses a problem, but is not so serious as to appear in measurement results. In addition to causing air pollution, consumption of coal also causes other immediate environment problems, such as water pollution. This is because pollutants leak from the piles of coal waste left out in the open.

It is feared that the immediate environment problems in Asia may worsen, as energy consumption increases along with economic recovery. For example, if China fails to take appropriate environment measures air pollutant emissions, which in 1990 stood at 16.23 million tons in sulfur dioxide, 9.11 million tons in nitrogen oxide, and 11.49 million tons in floating dust, will more than double or triple in 2020. China and all of the other Asian developing countries are under pressure to solve local environment problems arising from increased consumption of energy.

(2) Problem of car exhaust emission in metropolises – air pollution by mobile emission sources

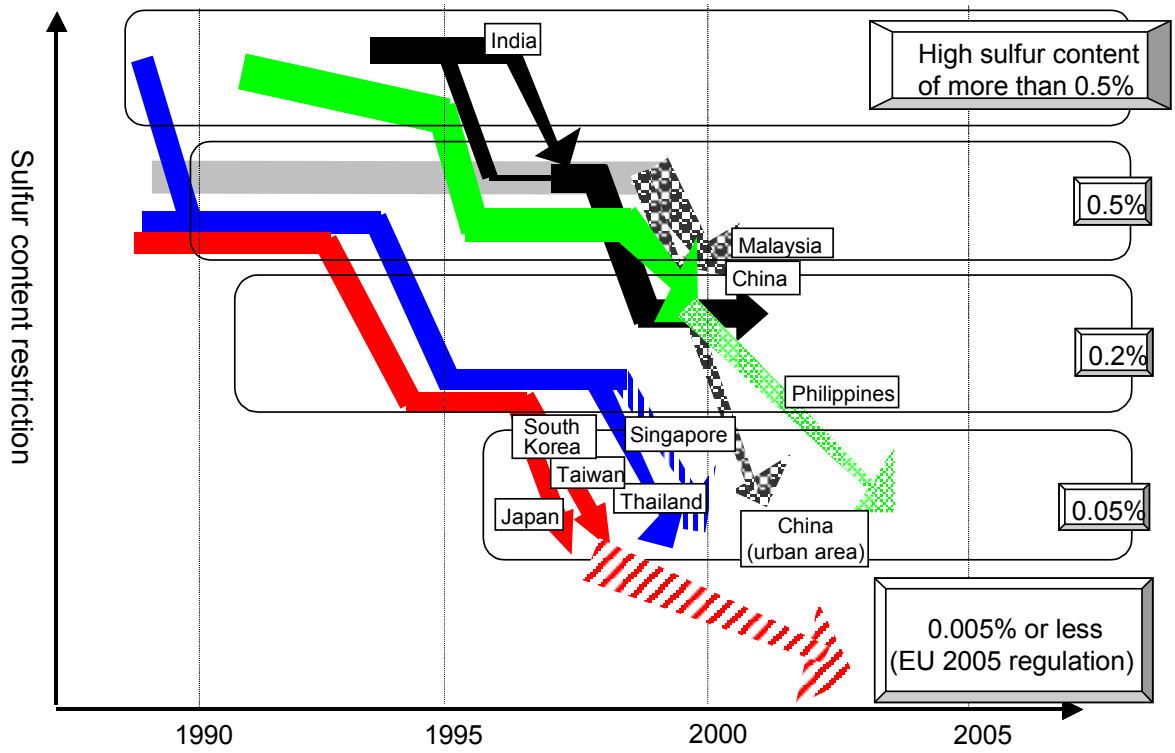
In East Asian countries, the use of automobiles has expanded rapidly in recent years. The automobile, or mobile emission source, has much to do with the air pollution in major cities in these countries, including Bangkok, Jakarta, Kuala Lumpur, and Manila. Due to the worsening air pollution in urban areas, people’s environment conservation awareness has gradually increased. For instance, Singapore enforced new emission regulations based on Euro 2 in March 2000. China has announced that it aims to raise its emission regulations to the same level as Euro 2 by 2010.

Car ownership in Asia is made up of used cars and new cars imported from advanced countries and new cars manufactured by emerging domestic car makers. Since an increase in car ownership in the initial stage of motorization is usually brought about by the purchase of new cars by wealthy people and used cars by middle-income people, the ratio of used cars in total car ownership is expected to increase in East Asia. In view of the expected sharp increase in the number of used cars, it is not enough to take measures only for new cars, to which exhaust gas purifying technology can be attached.

Measures to enhance the quality of fuels will also become necessary.

From this viewpoint, East Asian developing countries promoted the use of lead-free or low-lead gasoline and reduction in the sulfur content of light fuel oil throughout the 10 years of the 1990s. South Korea, Taiwan, Singapore, Thailand and the Philippines have completed their shift to lead-free gasoline. Indonesia and China are moving toward that direction. As to the regulation to limit the sulfur content of light fuel oil for automobiles to 0.05% or less, South Korea, Taiwan, Thailand, and Singapore have already adopted (Figure 11). The Philippines plans to adopt it at an early date, and China is considering introducing the regulation to urban areas. Most of the East Asian countries have enforced at least a regulation to limit the sulfur content of light fuel oil for automobiles to 0.2% or less.

Figure 11 Changes in the Sulfur Content of Light Fuel Oil for Automobiles in Asian Countries and its Outlook



(Note) Since Figure 11 is based on the results in 1991 and 1995 and plans for and after 2000, the timing of the change of regulation and regulation value are different even among the same category of countries.

(Source) Institute of Energy Economics

Japan, the United States, and European advanced countries are about to implement regulations to limit sulfur content of gasoline and light oil for automobiles to 50 ppm (0.005%) and the discussion has shifted to whether or not they will implement a sulfur-free (5~10 ppm or less) regulation by 2010. It can be said that East Asian developing countries are following the moves of advanced countries at an accelerated speed.

(3) Extensive environment problems – acid rain in East Asia

If sulfur oxides, like sulfur dioxide, and nitrogen oxides are released into the atmosphere in large quantity, it causes not only local air pollution but also an extensive acid rain problem. The International Institute for Applied Systems Analysis (IIASA) made an analysis of precursors of extensive acid rain in Northeast Asia as of 1995 and announced its estimates [7] (Table 5).

Table 5 Estimates of the Amount of Acid Rain Precursors in Northeast Asia

	China	Japan	North Korea	South Korea	Mongol	Taiwan	Russia	Grand total
SO_2								
Power plant	9,554	292	47	263	44	82		10,282
Industry (Large fixed source)	10,326	469	205	543	28	318		11,888
Mobile emission source	305	119	4	171	0	31		630
Civil (Small fixed source)	37,304	77	1	109	1	14		3,932
Total	23,914	957	256	1,086	74	444	231	26,959
Nox								
Power plant	2,541	273	62	134	13	99		3,121
Industry (Large fixed source)	2,971	356	183	217	6	144		3,877
Mobile emission source	3,382	1,343	55	908	4	268		5,959
Civil (Small fixed source)	750	150	0	62	3	11		976
Total	9,645	2,121	300	1,230	25	521	242	14,174
NH_3								
Animals like domestic livestock and pig	4,916	230	26	90	96	78		5,433
Fertilizer application and manufacturing	6,086	49	35	52	0	64		6,285
Others	736	76	13	27	1	13		866
Total	11,738	355	73	168	96	154	--	12,585

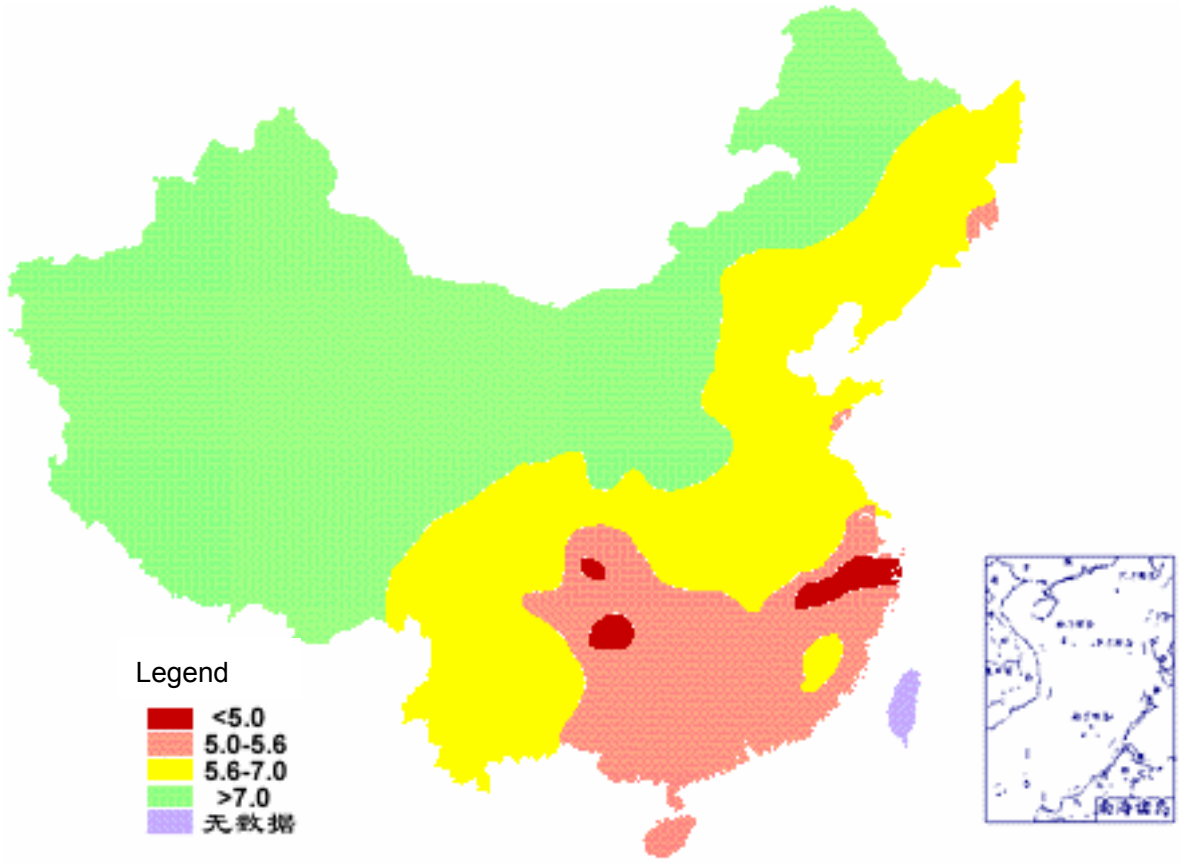
(Source) IIASA, 'A Comprehensive Assessment of Large-scale Environmental Problems in East-Asia," 2000

In Northeast Asia, the amount of SO2 emergence is about 27 million tons a year, with China accounting for lightly less than 90%. Although the weight of each source varies from one country to another, on the whole fixed sources account for more than 97% and mobile emission source's contribution is small. The annual amount of NOx emergence is about 14.2 million tons, with 68% of them accounted for by China, 15%

by Japan, 9% by South Korea and 4% by Taiwan. Although the weight of each source also varies from one country to another, on the whole mobile emission sources account for about 43% and fixed sources for 57%. As far as NOx is concerned, we cannot solve the problem unless we take measures against pollutants from fixed sources. The annual amount of NH3 emergence is 12.6 million tons, with China accounting for 93%.

Acid rain has emerged as a major problem in China. In Emeishan, Sichuan Province, which is one of the most heavily air-polluted areas in China, the impact of acid rain can be clearly observed in plants. Figure 12 shows China's acid rain situations in 2000. The level of acid rain is particularly high in the coastal region of Yangtze River downstream, such as Shanghai and Nanking, and in the region of the Yangtze River basin, such as Chungking and Guizhou. It can be attributed to several reasons, including a) mass consumption of high sulfur-content coal in southern China, b) soil in southern China is acidic, and c) polluted air tends to stay in the basin. The fact that the acid rain problem has become serious in southern and inland regions means that China has to deal with acid rain promptly as an extensive environment problem. Though it requires scientific confirmation based on actual measurements and international consensus, it is almost certain that an occurrence of extensive acid rain in East Asia will become an international issue. In 1993, "Acid Deposition Monitoring Network in East Asia Scheme" was put forward, prompting exchanges of views among experts from East Asian countries and international organizations. Based on the discussions, the Acid Deposition Monitoring Network in East Asia (EANET) was established and began operations in January 2001.

Figure 12 Acid Rain Situations in China in 2000

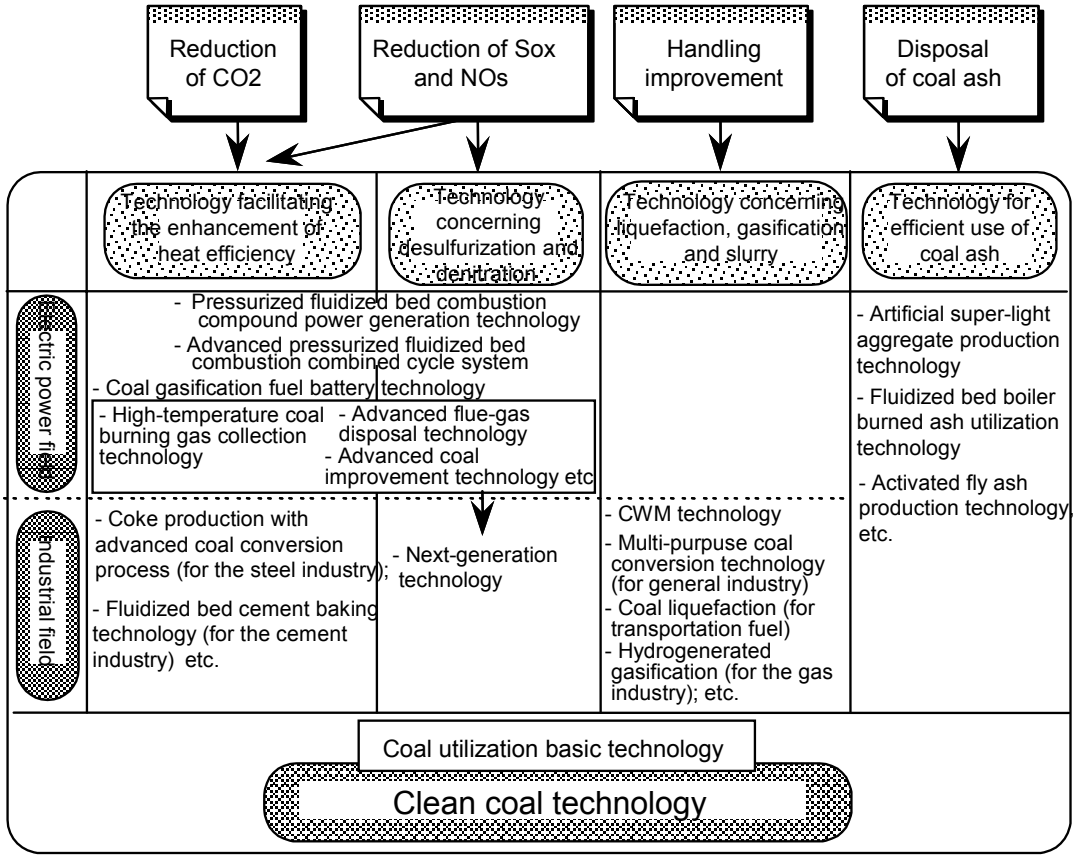


A total of 11 countries are participating in EANET – China, Indonesia, Japan, South Korea, Malaysia, Mongol, the Philippines, Russia, Thailand, Vietnam, and Cambodia. Laos is studying joining EANET in the future. An important characteristic of the acid rain problem in East Asia is that unlike in Europe and the United States, observation of acid rain is necessary not only on land but also at sea.

(4) Technology development centering on clean coal technology

If East Asia has to depend on coal over the long term, it is important to establish clean coal technology to effectively utilize coal (Figure 13). As far as coal is concerned, we have technology to cope with immediate environment problems. The question is its cost. East Asian countries should make strenuous efforts toward the approach to secure a long-term energy supply option by developing clean coal technology and reducing costs.

Figure 13 Development of Clean Coal Technology Needed in Asia



(Source) Agency of Natural Resources and Energy

At the coal fired power plants recently constructed in Japan, coal is carried by closed belt conveyors from ships at harbor to coal silos. Coal, which is crushed into powdered coal in the coal silos, is blown into boilers and exhaust gas is released into the atmosphere after it is collected and treated for desulfurization and denitration. The residual products, such as ash and gypsum, are used as materials for cement and gypsum boards. Since whole operations are carried out in a closed system, or in an invisible manner, such coalfired power plants can be constructed in locations close to national parks. Needless to say, such a system is expensive to build. But it is fully competitive with other methods of power generation.

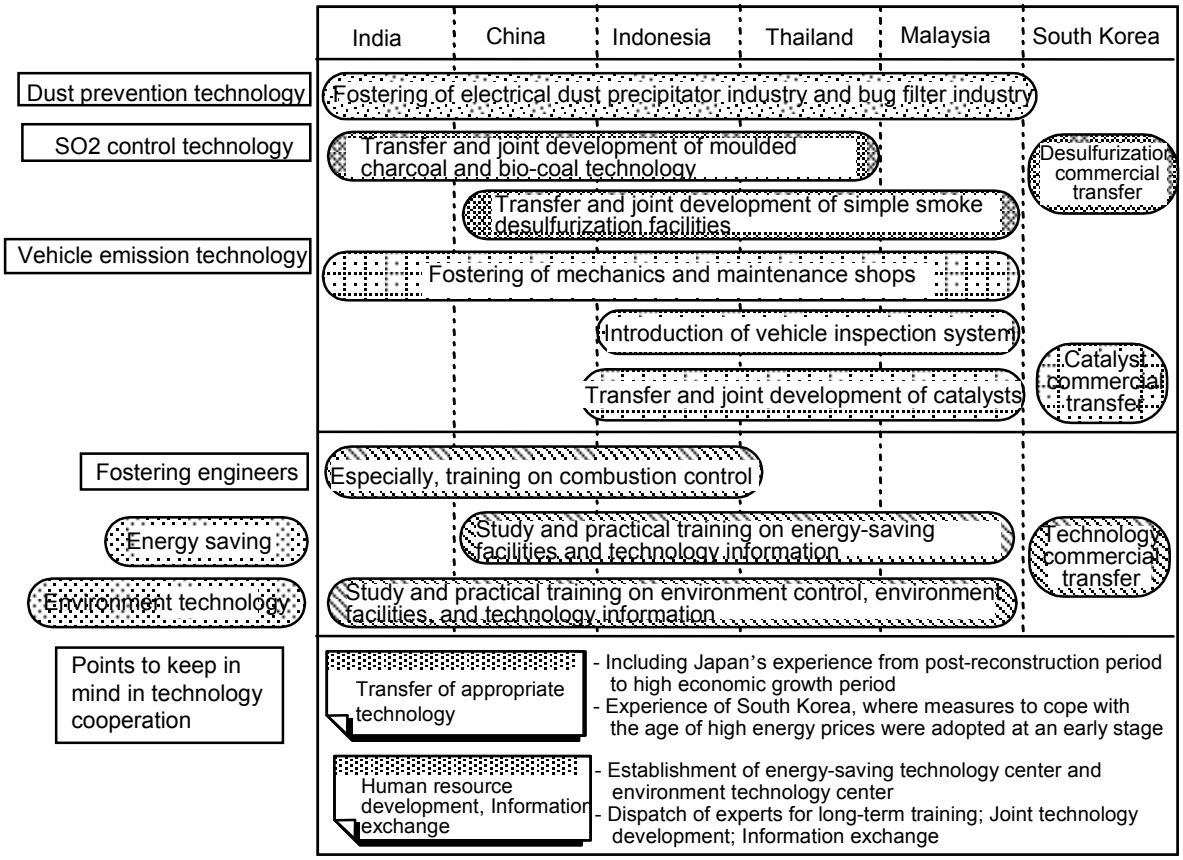
(5) Necessity of international cooperation in energy and environment fields

In Asia, there are many developing countries with different levels of economic standard and domestic resources. From around the mid-1980s, their economic activities increased one by one, as if they were following the path of the high economic growth of

Japan in the 1960s. Although economic activities slowed up temporarily due to the economic crisis, the economy picked up and the countries in the region have again begun to increase energy consumption in the medium and long terms. For this reason, the energy and environment problems have come to draw attention again.

Advanced countries have developed international frameworks, such as Clean Development Mechanism (CDM) and Activities Implemented Jointly (AIJ) scheme, to cope with problems of global warming and want to implement them in developing countries where better results are expected. However, their discussions tend to be focused on global warming problems. Developing countries, while they want financial assistance from advanced countries, are opposed to the idea for fear that the implementation of the frameworks may impede their economic development. Environment problems are difficult problems as they highlight the delicate conflict of interest between North and South. However, in order to resolve global environment problems, the participation of developing countries is indispensable.

Figure 14 Technological Cooperation to Cope with Air Pollution in Asia



(Source) Institute of Energy Economics

One of the big problems is that the contents of advanced countries' cooperation do not conform to the actual state of developing countries. Unless the environment measures conform to the actual state of developing countries, it is difficult to actually implement them. It would be efficient if the state-of-art technologies of advanced countries could be transferred to developing countries. In reality, however, they do not spread easily due to financial, technical, and systemic problems, including insufficient infrastructure. It is easy to absorb technologies conforming to the actual state of one's own country, but it is difficult to digest high technology in one stride. Therefore, it is necessary to promote joint development by transferring appropriate technologies and dispatching engineers (Figure 14).

The environment measure that drew attention in China in the early 1990s was spreading the use of coal briquettes by households. In China, where many small boilers are used at old small factories, people have extensive experience in studying boilers and therefore they feel an affinity with fluidized-bed boilers that desulfur burning coal with lime. As just described, the actual state of developing countries is far removed from the cooperation design envisioned by advanced countries. The question is what should be done in order for technological know-how to reach local people in developing countries. One idea is to establish, in cooperation with private firms, a publicity and training center on energy saving and environment technology in major cities, such as Shanghai, Jakarta, and Bangkok, that are directly connected to local people, and use the center as a local base. At the center, private firms display their products and technology and provide training on energy conservation and environment control.

If there is such a training center in developing countries, it is possible to provide necessary know-how to local mid-ranked engineers, who in turn transmit the know-how to local people. Private firms, for their part, can advertise their products. Moreover, if private firms visit local areas and understand the local environment and necessary conditions, they can modify their products to conform to local conditions. That there is a base to collect firsthand information is important for corporations considering entering a developing country's market.

The center should also be able to provide information on Japan's energy conservation efforts not only since the oil crisis but also since the high-growth period that started in the 1950s. Information on energy conservation efforts of Asian NIEs, such as South Korea, Taiwan, and Singapore, is also important. This is because the logic of raising profitability of industrial activity by seeking enhancement of productivity and stable operations is still accepted without any strong objection in Asian developing

countries. Global environment problems must be resolved steadily starting with immediate environment problems and regional environment problems.

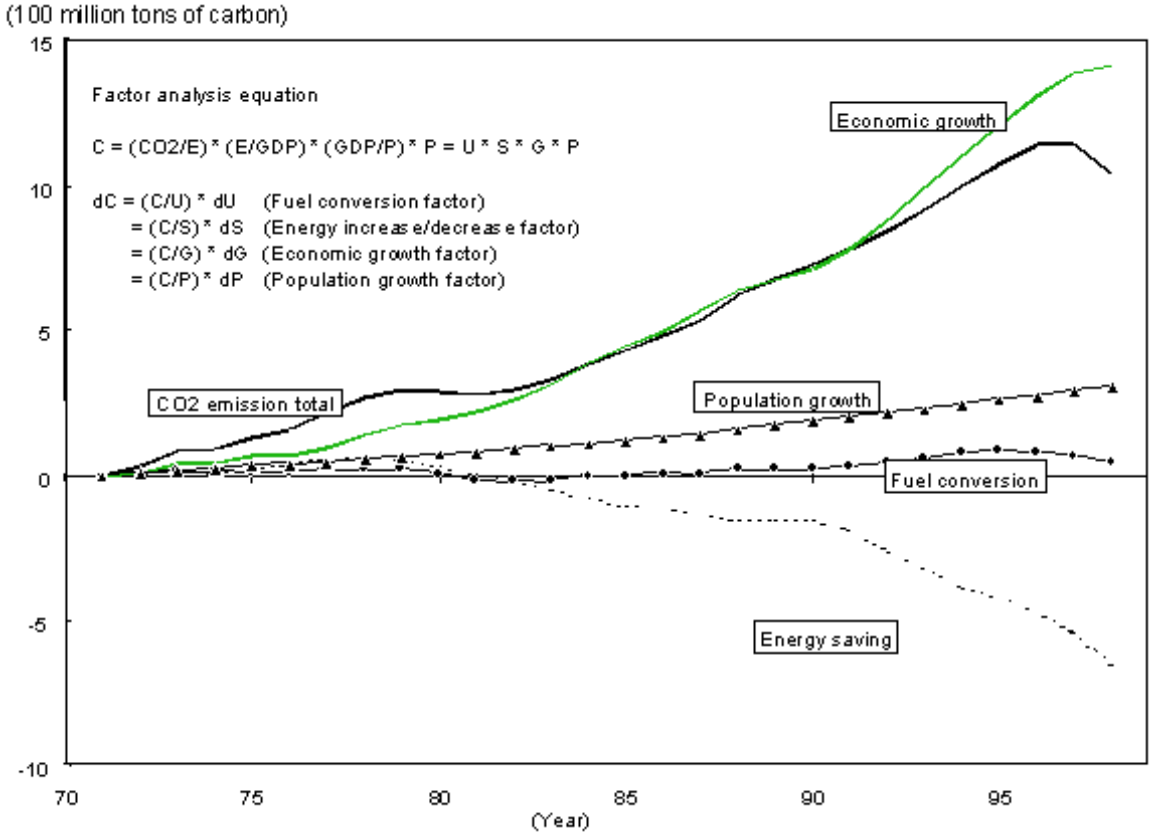
5. Response to the Problem of Global Warming in East Asia and Challenges

(1) Energy consumption in East Asian countries and its contribution to the problem of global warming

Responding to the problem of global warming is an extremely important challenge, as it constrains the future increase in energy consumption. The increase in greenhouse gas emissions, such as CO2 and methane, resulting from the use of fossil fuels has been pointed out as a big factor causing the problem of global warming. Under the Kyoto Protocol concluded in late 1997, advanced countries have agreed to strive to achieve the greenhouse gas reduction targets set for 2010. The problem is participation of developing countries whose energy consumption is expected to increase in the years to come.

A study of the changes in CO2 emissions accompanying energy consumption since the beginning of the 1970s shows that CO2 emissions in the world as a whole, which stood at 4.1 t-C (billion tons of carbon) in 1971 increased by 2.2 t-C by to 6.3 t-C in 1998. By contrast, CO2 emissions accompanying energy consumption in East Asia, which stood at 0.56 t-C in 1971, increased by 1.05 t-C to 1.61 t-C in 1998 (Figure15). Asian developing countries alone accounted for nearly half (48%) of the CO2 emission increase in the world as a whole.

Figure 15 Changes in Factors behind CO2 Emission Increase in Asian Developing Region



(Source) "IEA Energy Balance Table," "IMF Financial Statistics"

An analysis of the factors behind CO2 emission increases in East Asian countries clearly shows that the economic growth factor has had a major impact since the mid-1980s (Figure 15). In particular, the accelerated increase in CO2 emission caused by the economic growth factor in the 1990s is conspicuous. The increase in CO2 emissions caused by the population growth factor is also large. Since Asian developing countries heavily depend on domestic coal, the impact of the fuel conversion factor is almost negligible or contributes to increasing CO2 emissions. The energy saving factor began to have its impact after the second oil crisis, but from the mid-1980s, the impact of the swelling GDP brought about by economic expansion is greater than the impact of the improvement of energy efficiency.

A study of the changes in CO2 emissions in the past shows that the energy saving factor has an impact on reducing CO2 emissions and that the impact is strong enough to cancel the CO2 emissions increase caused by the population growth factor but not enough to totally cancel out the increase caused by the economic growth factor.

Therefore, the portion of the CO2 emission increase caused by the economic growth factor accounts for a considerable proportion of changes in the total amount of CO2 emissions. In the case of Asian developing countries, the economy grew at a breakneck speed in and after the 1980s. This is one of the reasons why they are not enthusiastic about restraining CO2 emissions.

Many of the Asian developing countries attach importance to cheap domestically produced coal as the pillar of their energy supply source for their ever-expanding economy. An increase in the consumption of coal, whose CO2 emission coefficient is relatively high among fossil fuels, would not lead to curbing emission of CO2. However, the actual condition is that they have to depend on coal as an energy source in order to sustain economic growth, even if they come under pressure to solve immediate environment problems, such as health hazards caused by CO2 emissions.

(2) Energy saving possibility of East Asian countries and technology transfer

A comparison of physical energy efficiency between Japan and East Asian developing countries (China, Indonesia) shows (Table 3) that the energy efficiency in Asian developing countries is far lower than that in Japan in various industry and power generation sectors. The low energy efficiency in the developing countries is not limited to the industry and power generation sectors, it is also true in all fields, including the civilian sector and transportation sector.

It seems that energy saving began to have its effect after the 2nd oil crisis, but the rise in energy efficiency is actually due more to the contribution made by the increase in the denominator, or an increase in GDP. There is still much room left for the improvement of energy efficiency, or the numerator, to contribute to the reduction of CO2 emissions. For instance, according to the IEA Energy Balance Table, Japan's power generation efficiency as measured by lower calorific value in 1998 was 43.6%, while that of China was around 30% (Table 6). Energy saving is an important pillar that holds the key to reducing CO2 emissions for the time being.

It is a matter of grave concern that Asian developing countries' energy demand continues to increase steadily along with their economic expansion without their energy efficiency being enhanced. How to improve the energy efficiency of Asian developing countries is the most important problem at hand in the sense that we have to stop the unbridled increase of their energy demand. With energy prices remaining at low levels since the second half of the 1980s, it is extremely difficult to promote energy saving in Asian developing countries. But we have to achieve it.

Table 6 Comparison of Energy Efficiency

	China	Indonesia	Japan
Electric power	Power generation efficiency 31.2% Auxiliary power ratio 8.2% Rate of power transmission and distribution loss 7.1%	Power generation efficiency 35.1% Auxiliary power ratio 4.2% Rate of power transmission and distribution loss 12.3%	Power generation efficiency 43.6% Auxiliary power ratio 7.5% Rate of power transmission and distribution loss 3.7%
Iron & steel	Crude steel basic unit 7,028 Mcal/t (blast furnace) (1.23 times)	Crude steel basic unit 2,740 Mcal/t (blast furnace) (1.83~1.99 times)	Crude steel basic unit 5,684 Mcal/t (blast furnace) (1.00 times) Crude steel basic unit 1,380~1,500Mcal/t (blast furnace) (1.00 times)
Paper & pulp	Papermaking basic unit 6,090 Mcal/t (1.22 times)	Papermaking basic unit 8,100 Mcal/t (1.63 times)	Papermaking basic unit 4,980 Mcal/t (1.00 times)
Cement	Fuel consumption rate 1,297 Mcal/t (1.68 times) Electric power consumption rate 110 kWh/t (1.16 times)	Fuel consumption rate 847 Mcal/t (1.10 times) Electric power consumption rate 126 kWh/t (1.33 times)	Fuel consumption rate 773 Mcal/t (1.00 times) Electric power consumption rate 95 kWh/t (1.00 times)

(Note) The power-generation coefficient for electric power was obtained from IEA Energy Balance on a low calorific value basis.

(Source) IEA Energy Balance Table, China Energy Yearbook, Indonesia Industrial Statistics

Asian developing countries are also having difficulty adjusting to the complicated trade-off relations between economic growth, energy supply, regional environment conservation, and global environment conservation. Since they are highly motivated to enhance their economic standard and are seeing rapid growth of their respective economies, the adjustment is all the more difficult. Under the circumstances, the policy option that would not conflict much with any of the problems is promoting energy conservation.

(3) Use of clean development mechanism in East Asia

The Kyoto Mechanisms are flexible mechanisms designed to reduce the cost of achieving Kyoto Protocol targets by as much as possible, or to achieve an emission reduction target in the most economically efficient way on a global scale. The Kyoto Mechanisms include emissions trading, joint implementation, and the Clean Development Mechanism.

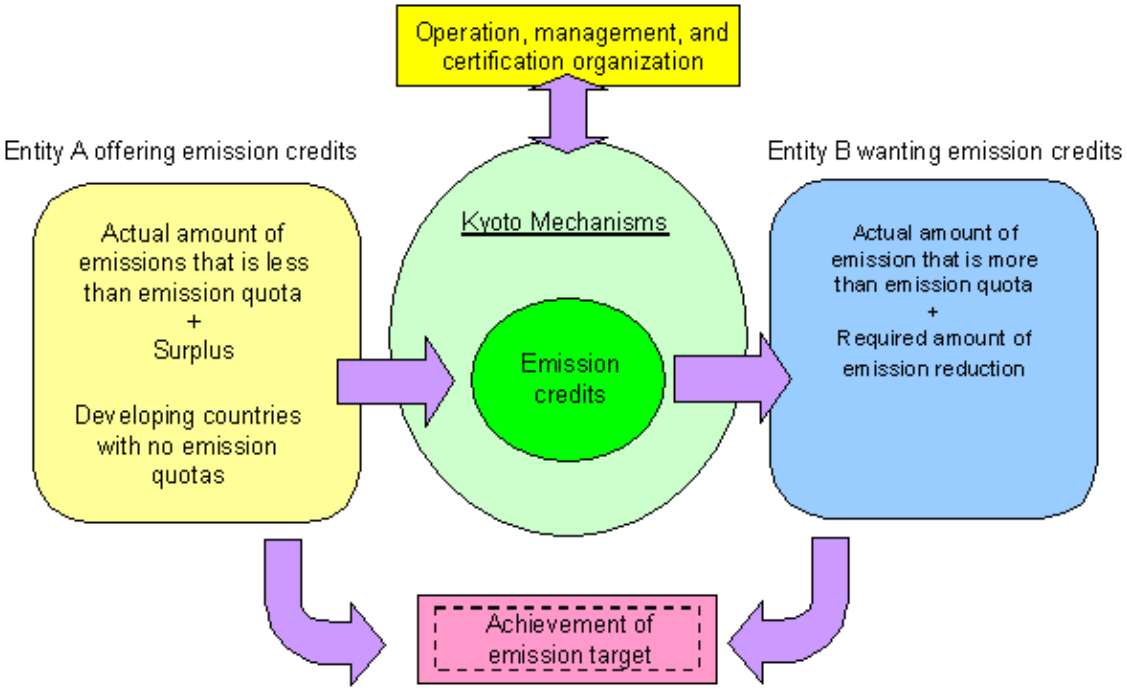
For Japan and other countries that have achieved energy conservation to a considerable extent, the marginal cost to reduce greenhouse gas emissions is exorbitantly high. However, in the countries, whose economic standards are relatively

low or whose energy consumption efficiency has much room for improvement, there are many means to reduce emissions at a lower cost.

The Kyoto Mechanisms make it possible for countries (or business operators) of different reduction costs to enjoy economic merits respectively by trading emission credits on the "market." [8].

Figure 16 shows a basic concept of the Kyoto Mechanisms. Suppose that entity A fails to meet its emission reduction target (surplus) in the target year and that entity B exceeds its reduction target (shortage). If the Kyoto Mechanism comes in to play, the two entities can achieve their respective target by trading the "surplus" and "shortage" emission credits between them. Entity A benefits from the trading. If transaction prices are higher than the costs to reduce emissions domestically, entity A would be prompted to reduce emissions aggressively in order to sell emission credits on the market. Meanwhile, if emission credits can be purchased at prices lower than the cost to reduce emissions domestically, entity B can keep the cost to meet its reduction target

Figure 16 Basic Concept of the Kyoto Mechanisms



(Source) Kudo Hiroki, Basic Lecture "Global Warming Problem and Energy," Institute of Energy Economics, September 2002

It is hoped that means to reduce emissions "at lower costs" will become available as

a result of the establishment of a structure where emission credits can be traded through a “market” and a system under which each entity can meet its reduction target by trading emission credits. An outline of each Kyoto mechanism is given below.

A) Emissions trading (ET)

Emissions trading refers to the ability of Annex B countries in the Kyoto Protocol to exchange part of their commitment to reduce emission of greenhouse gas. During the 2008-2012 commitment period, countries or business operators whose greenhouse gas emissions exceed their reduction targets can meet their commitment by purchasing emission credits from the countries whose greenhouse gas emissions are less than they are allowed. If the purchase price of emission credits is lower than the marginal reduction cost, one can meet reduction commitment at a lower cost.

B) Joint implementation (JI)

Joint implementation refers to the ability of an advanced country to count the reduction of emissions achieved in a greenhouse gas emission reduction project it carried out in another advanced country as its own emission reduction. Under the JI, an advanced county carries out greenhouse gas emission reduction projects, such as energy conservation and fuel conversion, in another advanced country, where the cost to reduce greenhouse gas emission is lower, and obtains part or whole of the reduction of emissions achieved by the project for meeting its own reduction commitment.

C) Clean Development Mechanism (CDM)

While JI is a system to trade emission credits among advanced countries, whose emission reduction targets are set by the Kyoto Protocol, CDM is a system under which an advanced country can obtain emission credits by carrying out an emission reduction project in a developing country. Although developing countries are not allotted reduction quotas, an advanced country can obtain emission credits if, for instance, their investment results in reducing emissions to less than a certain baseline. In order to implement this system, it is necessary to establish a framework to evaluate and certify actual reduction performance.

When it comes to the problem of global warming, specific emission reduction targets are imposed only on advanced countries, at least for the time being. However, in view of the nature of the problem, it is necessary that not only advanced countries but also developing countries address the problem. The Kyoto Mechanisms are being constructed with this point taken into account. The question is how the Kyoto Mechanisms can be utilized with regard to the use of coal, a major issue in dealing with the problem of global warming.

In developing countries, where consumption of coal is expected to keep increasing,

CO2 emissions will inevitably increase in line with an increase in coal consumption, resulting in increasing the total amount of emissions in the world as a whole. Given economic environments of various countries, it is difficult to shift to other fuels rapidly. Therefore, it is necessary to curb CO2 emission from increased coal consumption as much as possible by enhancing the efficient use of coal, while continuing efforts to promote the use of alternate fuels.

The clean development mechanism has the effect of allowing developing countries to bring in efficient coal utilization techniques from advanced countries. It will make it possible for developing countries to use their geographically- or energy supply structurally-important coal efficiently at lower costs and promote the introduction of advanced countries' technology. For advanced countries, the clean development mechanism will make it possible to meet their emission reduction targets at a cost lower than in the case of reducing emissions domestically and this in turn could contribute to their energy policies requiring domestic consumption of coal.

By implementing low-cost reduction projects not only with coal-related technology but also with other techniques, one can devise a system to maintain domestic use of coal. There are many low-cost reduction projects in advanced countries as well as in developing countries. Among them are projects to make low consumption-efficient factories and power plants more efficient or rebuild them, and to promote afforestation in better environments.

If the cost of acquiring CO2 emission rights by implementing JI projects or CDM projects abroad is lower than the cost of reducing CO2 domestically by enhancing the efficient use of coal and promoting the use of other fuels, it would be possible to achieve emission reduction targets more economically and efficiently, while maintaining the domestic use of coal. This idea of making it possible to increase domestic use of coal by implementing low-cost CO2 reduction projects abroad, or "carbon offset," has already been experimented with by U.S. firms. In order for a country (business operator) to implement a JI or CDM project abroad, it requires a great deal of labor and costs, such as seeking a project, evaluation of the project, and continuous management of the project. Therefore, it would be beneficial for the users of coal if they can acquire reduction credits at the time when they purchase coal.

For example, it would be useful to study a structure in which a coal-supplying country or coal supplier acquires credits through low-cost measures, JI or CDM projects, and sell them along with coal to users of coal. It would not only reduce coal buyers' investment costs but also increase their options. For suppliers, it would add value to coal and enhance their advantage on the market.

I have just described the prospects of the utilization of the Kyoto Mechanisms, taking into consideration of the current status and outlook of coal utilization. However, at this stage, detailed discussions on the Kyoto Protocol have yet to be finished and the outline of the Kyoto Mechanisms is not necessarily clear. Under these circumstances, in order to effectively utilize the mechanisms, it is necessary to specifically study the following problems.

A) Domestic policies that would give incentives to businesses

Businesses need incentives to make investment abroad in order to utilize the Kyoto Mechanisms. It would be necessary to strengthen domestic measures (direct control, tax system, domestic emission right transaction system, etc.) and establish a system to promote voluntary efforts. Measures that should be adopted may differ from one country to another. Depending on the design of institutional arrangements, adjustments between the government and businesses would become necessary. What is important is to establish a system that will help maintain international competitiveness, meet emission reduction targets and conform with the international emission-right market to be established in the future.

B) Feasibility studies at an early date

Since every country is expected to utilize the Kyoto Mechanisms in one way or another in the future, it is important for investors, who want to maintain their international competitiveness, to get low-risk projects at a low cost. To that end, it is necessary to accumulate know-how by conducting feasibility studies in various areas and screening projects even before an international system is established.

C) Strengthening relations with host countries

Of the Kyoto Mechanisms, JI and CDM projects are highly likely to be carried out mainly by corporations. However, since there are various risks involved, as in the case of general investment projects, host countries may hesitate to take action at an early stage. Moreover, there are many things that will be left to negotiations between parties concerned, such as calculation of reduction amount for a CDM project. It would be necessary to promote the establishment of environments with host countries in order to make it possible to study risks that would impede project implementation at an early stage and to carry out a series of operations, from study and implementation of projects and credit acquisition, as smoothly as possible.

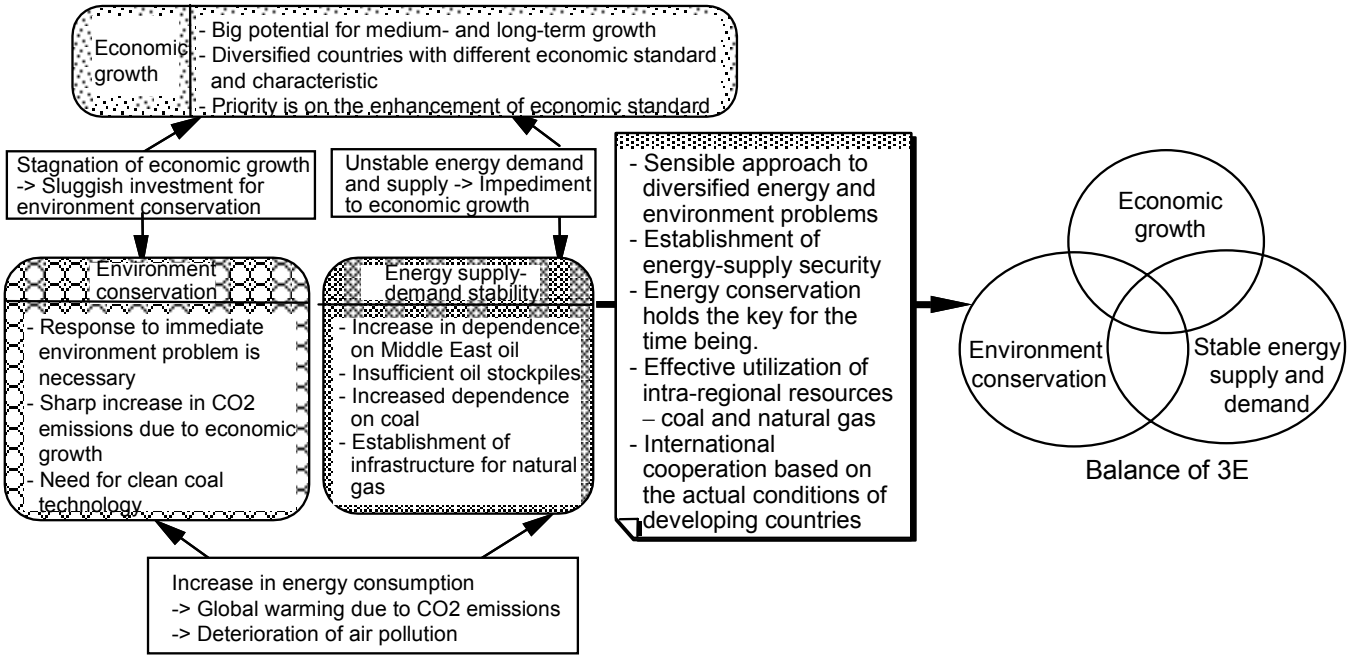
(4) Task for sustainable development of East Asia – from the viewpoints of energy and environment

In Japan, moves to reject fuels with a high CO2 emission coefficient, such as coal, have intensified, reflecting the problem of global warming. However, if we consider balancing the three Es (economy, energy, and environment) in Asia as a whole, how to get along well with coal is more important problem. We have to assume the cost for immediate environment problems as energy consumption increases in the future. It is important not to focus only on resolving the problem of global warming but to pay attention to various three E (economy, energy, environment) problems in East Asia from a long-term viewpoint (Figure 17).

Advanced countries have been engaged in discussions on seeking the participation of developing countries in measures to resolve the problem of global warming, such as CDM projects. But it seems to me that the arguments are mainly from the viewpoint of advanced countries that are striving to achieve greenhouse gas emission reduction by 2010. It is necessary to ponder what order of priority is most natural from the viewpoint of developing countries. Japan, knowing the sweet and sour of developing country's problems, should devise a different approach to the problem.

The current lull in energy demand in East Asia due to the economic stagnation caused by the economic crisis in Asia and the collapse of the dot-com may be a good opportunity to ponder ever deteriorating energy and environment problems. By taking this opportunity, the direction of East Asia's energy and environment problems should examined from a broad perspective. Response to environment will be a big constraining factor for such commodities as energy in the future, but it will also offer new business opportunities to corporations.

Figure 17 Importance of 3E (Economy, Energy, Environment) Balance in East Asia



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