To what extent can China solve its energy problems by cooperation with Japan ?

Nami Morimoto*

This paper aims to examine China's current and future energy problems which stand in the way of Chinese sustainable development and also sustainable development throughout the Asia Pacific region. Although a considerable number of studies have been made on the supply and demand prospects of energy, what has not been examined in detail is a consideration of the political aspects of energy issues. This article's analysis will focus on this area by considering China's domestic economic policies, energy policies and foreign policies and their bearing on the energy problems it faces. The most beneficial methods for China to solve its energy problems will also be explored together with an analysis of China-Japan cooperation and its effects.

Introduction

The energy problem is one of the fundamental problems to be solved to achieve sustainable development in China and the Asia Pacific region. Regional stability in East Asia is also affected by energy concerns as energy has a deep connection not only with economic problems but also with political and environmental issues. China, in particular, has been continuing its rapid economic growth, and its energy demand has dramatically increased since it introduced the "open-door" policy in 1978. China's oil demand is expected to increase in the future, and concern over the impact of this increase has been growing. Energy also has a strategic nature as it influences the security of nations greatly. Looking back at history, there have been countless disputes over resources. Though oil and natural gas came to be traded on a commercial basis by the transformation of international society after the end of the Cold War, the relations between business enterprises and political strategies of governments are still intimate.[1] Especially in a socialist country like China, the relevance of state strategy and the energy industry is much stronger and so are the political aspects of the energy problem. Furthermore, the energy problem is related to environmental problems.

At present, the main resources used as primary energy sources in the world are fossil fuels (coal, petroleum and natural gas), nuclear energy, and alternative energy

* 一般教育　兼任講師

sources (solar, wind, fuel cells, etc.). From this list, China largely depends on coal, which causes air pollution, acid rain and global warming.[2] Therefore, dealing with China's energy problem also has the potential key to solving China's environmental problems. Any environmental problems in China will eventually affect its neighbours, The Koreas and Japan. Trade between China and Japan is also expanding greatly at present as well and the economic interdependence of both countries has been deepened as a result. The relationship between Japan and China is a matter of concern as it also has an influence on the whole of international society.

1. Possible Responses to Environmental Issues

It has been a challenge for China to achieve harmony between energy to support continuous economic growth and protection of the environment. In relation to the environmental problems, attention must be paid to the ratios of primary energy consumption in China. Table 1 shows the breakdown of this.[3]

Table 1. Primary Energy Consumption of China (%)

Coal	67.1
Petroleum	23.4
Natural gas	2.8
Hydroelectric energy	6.7

Source : Chinese statistical yearbook. 1999

It can be seen from table 1 that the consumption of coal and petroleum exceeds 90%, and therefore China greatly depends on these two energy sources. Unfortunately such a large consumption of fossil fuels causes environmental problems. This has become so serious in China that its solution is called "environment regeneration", not "environmental protection" any more. This problem includes air pollution, acid rain and global warming. The air pollution and acid rain are caused by SOx (sulfur oxide), NOx (nitrogenous oxide) and dust emissions, and global warming is due to the emission of CO2 (carbon dioxide). SOx, NOx and CO2 are discharged from the combustion of fossil fuels. China is the 2nd largest carbon dioxide-emitting country in the world after the U. S, and the concern about its impact has been growing worldwide. In terms of the environmental problems of the world, China is a very important country due to its size, large population and its economic potential. In order to solve the environmental problems, an appropriate energy solution has to be achieved from among the following options : increased non-fossil fuel usage, improved energy efficiency and reduction of pollution from fossil fuels (coal, petroleum and natural gas). These options will all be examined in

turn.

1. 1. Non-fossil fuels

The energy sources which do not emit SOx, NOx and CO2 are nuclear energy and alternative energy sources such as wind, solar and geothermal energy. China is eager for the introduction of these energies as a means of reducing its pollution. However, both alternative energy sources and nuclear energy are not presently major energy sources due to the costs and technology necessary for their implementation. Usage of atomic energy is especially controversial because it needs careful management to avert potential disaster as can be seen from the critical accident of the nuclear power plant in Tokai-mura, Ibaraki, Japan in June 1999. Thus, alternative energy sources and nuclear energy cannot be the main sources of energy for China for the time being. That being the case these energies cannot help alleviate Chinese environmental pollution at present given china's current situation. However Japan has the money and technology to make this possible if energy cooperation is possible between them.

1. 2. Energy usage efficiency

The environmental problem is also related to the low efficiency of energy usage in China. Though the efficiency unit has shown a tendency to improve year by year, it is still about 10 times as inefficient as that of Japan[4]. Environmental pollution from the energy discharge is expected to become huge if the economy grows rapidly and current methods of generating energy with such a low energy efficiency are used in China.[5] In order to avoid this, energy efficiency has to be improved, but there has been very little transfer of advanced foreign technologies to date because it is not economically viable.[6] China is unlikely to achieve the necessary levels of efficiency to slow the environmental damage while coping with the increase in energy production that their growing economy demands. If the relationship between China and Japan permits it, then Japanese technology could help to improve China's energy efficiency and environment while helping keep Chinese pollution from Japan.

1. 3. Coal

China has considerable amount of coal reserves and a long history of coal production and its energy policy has long been coal-centered. Coal is suitable for developing countries as the price is low. However because it is a resource that contains abundant carbon and sulfur, CO2, SOx, NOx, and impurities such as dust are emitted in large quantities into the atmosphere when it is burned. This is causing serious air pollution in the cities of China since clean coal technologies and pollution control equipment are not fully developed or commonly used. Moreover,

SOx and NOx cause acid rain, and they have brought this same problem to China's neighbors such as Japan and South Korea. In order to get rid of these problems, coal consumption must be reduced, or clean coal technologies have to be equipped. However the costs of these technologies are high, and sales of these technologies from advanced countries to developing countries have been limited. Though coal is likely to remain China's principal resource, the coal-centered structure will have to be changed to solve the environmental problems. Once more this is an area where Japan possesses the necessary technologies to help China and in the process reduce environmental pollution in the area as pollution recognizes no international borders.

1.4. Petroleum and natural gas

The last choices are the other fossil fuels petroleum and natural gas. Petroleum is used not only for fuel but also for making various chemical substances including plastic products. Furthermore, oil is the only practical fuel at present for automobiles. Therefore, petroleum is essential for modernization and the increase in oil demand is likely to be the largest increase among all the various energies. However, though it causes less, the large consumption of Petroleum also causes the same environmental problems as coal. As a result China has paid much attention to natural gas as an energy that emits less pollution into the environment. Natural gas discharges no SOx, and less NOx and CO2 in comparison with other fossil fuels. If conditions for its development are organized, they will be promising and necessary new sources of energy for China in the future. The money and technology for the exploration and utilization of these resources, not to mention the political problems associated with their locations, will all require Japanese cooperation. Therefore, the roles of petroleum and natural gas having been recognized as vital to the sustainable development of China, the following chapters will focus on these two energies.

2. Response to economic growth

The Chinese government has established a goal of an annual rate of at least 7.2% economic growth. To achieve this goal, they need to secure stable sources of energy. China now has a major problem to secure the necessary energy for economic growth. The Chinese GDP (Gross Domestic Product) grew to 900 billion dollars from 111.5 billion dollars during the 25 year period from 1973 to 1998, and the amount of the primary energy consumption has also showed a large expansion as can be seen from table 2.

Concerning the primary energy consumption per capita, while the average of OECD countries is 4.63 tons, China has a very small amount of consumption with 0.664 tons (See table 2.) This is a greatly lower number as the world level has an average of 1.47 tons. With the economic growth and the improvement of the

Table 2. GDP and Primary Energy Consumption of China

	1973	1998
GDP (Billion $)	115	900
Primary Energy Consumption (Mtoe[7])	264	891

Source : The Energy Conservation Center,
"Handbook of energy & economic statistics in Japan", 2001

standard of living of Chinese people, ownership of private automobiles and electrical appliances will greatly increase and the amount of energy consumption is expected to rise further.[8] It is easy to imagine that the total energy consumption will shoot up in China even if the rise per capita is a little, as it has a population of 1.2 billion.

Table 3. Primary Energy Consumption per Capita, 1998 (toe/Person)

OECD Total	4.63
World Total	1.47
China	0.664

Source : The Energy Conservation Center,
"Handbook of energy & economic statistics in Japan", 2001

Though it is an overwhelmingly resource rich country compared with Japan and South Korea, China has about 26 times the landmass of Japan with 1/5 of the world's population and it is very serious in meeting its demand for energy for its rapid economic growth. A stable energy supply is indispensable for the continuous economic development that the Chinese government is aiming for. In order to secure a stable energy supply, what methods open to China should be examined. There are four options which will be examined in turn.

2. 1. Developing domestic oil field

The first option is increasing the production in existing oil fields in China. Petroleum has long been China's principal source of acquiring foreign currency. The petroleum trade has been important for relations between Japan and China ever since their diplomatic relations were normalized in 1972. However, in 1999, China suddenly suspended crude oil exports to Japan.[9] Though the exports were resumed soon after, it is clear that the energy balance between two countries had fundamentally changed. The Chinese petroleum industry faced the severest of circumstances due to the fall of the international crude oil price that began in late 1997 together with the management aggravation of state-owned companies. In order to overcome such conditions the Chinese government conducted the following large-scale reforms.

2.1.1. Reform of the petroleum industry

The petroleum industry of China used to use the function differentiated system which meant that the CNPC (China National Petroleum Corporation) covered the upstream operations (development, production) and SINOPEC (China Petro-Chemical Group Corporation) took charge of the downstream operations (refinement, petrochemical, product sales). Aiming at strengthening the competitiveness of its petroleum industry, the Chinese government carried out a reorganization of state-owned oil companies. CNPC and SINOPEC exchanged some property with each other in July 1998 and they were reborn as two integrated conglomerates from onshore upstream to downstream operations. This reform brought a competitive principle to the Chinese petroleum industry for the first time.

The pricing system was also changed in June 1998 to the new system whereby the price of crude oil and oil products were decided by an index-price system based on an international price.[10] The market price of the crude oil and oil products used to be controlled by the government in China, and the change to such a price system means a switchover from the conventional socialistic policy with strong controls to the price system based on the market principles that are conscious of the international market.

After the reforms, the business performance of the Chinese petroleum industry was dramatically improved as its restructuring progressed and the international crude oil price soared. According to the announcement by the Chinese government in March 2001, the total profit of 65 petroleum companies reached 92.2 billion yuan and this figure accounted for 40.9% of the profit of all state-owned enterprises.[11] The reform of the petroleum industry is now what we call the symbol of the state-owned enterprise reform in China. However, regardless of these results, Chinese energy development has for a long period been stuck in a rut. The three main oil producing zones — Daqing, Shengli and Liaohe, situated in the northern and northeastern parts of China-are considered to be nearing depletion. China can sustain their current level of production only with additional, sound investments. While CNPC and other state oil companies intend to continue exploration efforts in West China as well, the funds and technologies available for frontier development are limited unless Japan can be persuaded to help.[12]

2.1.2. Introducing foreign capital and technology

China has been a center of oil development in East Asia since the Daqing oil field was discovered in 1959. However, the problem of the energy industry as a result of concentrated national control is that it appears dull compared to the energy production in the 1970's. Therefore, in the latter half of the 1970's, China adjusted their traditional oil strategy of "self-reliance and exporting for foreign cash" policy.

Then it started to introduce foreign capital actively for almost all the Chinese sea stages except for the East China Sea, when the reform and open-door policy started in 1978. It was in a project by the Japan China Oil Development Corp. (JCODC) that Japan participated for the first time. JCODC was established as a Japanese consortium to carry out exploration and development of petroleum in Bohai in March 1980. About 64% of the stockholders are petroleum public corporations, and some other Japanese oil companies also formed a consortium. This project was the first practical state business between Japan and China, and this produced about 500 million barrels.

The state council of China approved the joint development business with foreign companies on shore in 1985 and introduced more foreign capital. At present, China is proceeding with the release of the inland part of the Tarim basin to the foreign companies to expand the quantity of their petroleum production. The Tarim oil field was said to be in the world's maximum class of oil reserves that hadn't been developed yet, and development was made from the end of the 1980's. Some Japanese enterprises also contracted to develop these areas with Western oil companies. However, crude oil reserves were much lower than expected with experts originally believing it to be the same level as Kuwait. Without new discoveries of large-scale oil and gas fields, the existing domestic oil resources and production cannot satisfy economic growth in the future. Therefore developing existing domestic oil fields cannot be the solution to China's energy problems.

For the development of energy in China, great sums of money in the form of fund cooperations were granted, money such as low interest loans from the international banking agency, of foreign governments, and of export-import banks. Among them, Japan's fund cooperation was the largest. The Japanese Government supported infrastructure maintenance related to energy in China by a large quantity of ODA grants. Compared to other advanced countries, the gravity of the energy sector is big in Japanese ODA. Energy development in China was regarded as contributing to the national interest of Japan, a resource-poor country. However, with the economic growth in China and financial difficulty in Japan, Japanese financial aid to China is being reduced. This puts the cooperation between both countries at a turning point.

2. 2. Developing oil and gas fields overseas

The second choice is overseas development. China is actively cultivating resource diplomacy as a result of production from the existing domestic oil fields making little progress while domestic demand for petroleum increases. It can be said that the strategy is of securing stable supplies of resources by making friendly relations with the various countries that have undeveloped proven and unproven

reserves.

2.2.1. Developments in the Middle East and South America

China is developing oil and gas connections especially in the Middle East and South America. Chinese President Jiang Zemin has visited oil-producing countries in the Middle East and worked for strengthening energy ties with them since the end of October 1999[13]. China especially makes much of relations with Saudi Arabia, and both countries agreed to build a strategic cooperation partnership in political and economic fields in the talks between King Fahd, Crown Prince Abdullah and Jiang. As a result of the precautions towards communist states, Saudi Arabia, an Islamic state, had not had close relations with China, and both countries only normalized their diplomatic relations in 1990, a mere 11 years ago. However, China regarded the Saudis as an oil supplier and the Saudis looked on China as a big market and a trading partner. China invests in upstream oil sectors in the Middle East, and Middle Eastern countries invest in downstream activities in China. Furthermore, China also has been actively exploring for oil in South America, in places such as Peru and Venezuela. In 1994, the Chinese government abandoned their "self-sufficient" policy and CNPC started to develop oil fields in Peru that were China's first development abroad.

While the Western countries have reduced their dependence on the Middle Eastern petroleum after the oil crises, East Asia including China, Japan and South Korea have increased their dependence. The unstable situation in the Middle East makes the energy supply/demand structure of East Asia extremely vulnerable. The two oil crises in 1973 and 1979, and the effect on the world economy showed the danger that is caused by excessive dependence on one area, and energy security came to be a worldwide problem. The amount of production overseas is limited and the development of overseas oil is unstable due to a variety of factors and it cannot therefore be the main solution to China's problems.

2.2.2. The East China Sea and The South China Sea

China also has some more controversial overseas activities, namely exploring in the East China Sea and the South China Sea. It is estimated that plenty of natural resources are buried in these areas. However, developing the East China Sea area is at present difficult as China is currently involved in an unresolved territorial issue over possession of this area and its mineral rights.

On the Senkaku Islands, Japan, China, and Taiwan claim sovereignty. The territorial dispute emerged after ECAFE (Economic Commission for Asia and the Far East) conducted a resources investigation of the East China Sea's continental shelf in May 1969 and announced the possibility that petroleum resources were

present in the seabed around the Senkaku Islands. Many Chinese fishing boats appeared around the Senkaku Islands and created a diplomatic incident in the late 1970's. On this, Deng Xiaoping suggested "It will be dealt with in a better way by the next generation." when he visited Japan in 1978 and the issue was shelved.[14] Though the Japanese Government had not intended to accept Deng's proposal of, "shelving the Senkaku issue", it became common sense inside and outside of China as Japan didn't clearly make an official announcement on its position. However, the Senkaku Islands were specified as a Chinese territory in "The Law of the People's Republic of China on its Territorial Waters and their Contiguous Area" which was passed by the Chinese parliament in February 1992. With this Chinese legal basis, China is developing an offshore oil field in the East China Sea.[15] On this issue there is an indication that "China has made successful trial digging of the oil field on the Japanese side of the Japan-China median- line in the Sea of Japan and there is a danger that China will proceed with this development and Japanese rights and interests could be lost.[16]"

Next, in the South China Sea, six actors including China, Taiwan, Vietnam, the Philippines, Malaysia and Brunei have claimed sovereignty of islands including Spratly Islands and Paracel Islands. They have anticipated the petroleum resources in the South China Sea and insisted on their possession. This territorial dispute is also connected with securing the safety of sea-lanes of communications (SLOCs). Therefore, this issue involves not only six surrounding states but also Japan and Korea because this area is a strategic sea-lane of communication which makes it important for defense. East Asia imports a large quantity of crude oil from the Persian Gulf and the dependence on the Middle Eastern petroleum is high. It is transported from the Persian Gulf by huge tankers, and they pass through the Indian Ocean, and go into the Malacca Straits, and then passes through the South China Sea, and on to Asian ports such as Yokohama, Shanghai, Pusan and so on. The crude oil carried by this means is expected to increase more and more, and the strategic importance of the Indian Ocean and the South China Sea as sea-lanes has been rising.

The East China Sea and the South China Sea adjoin the area of the southeastern part of China where the lack of energy is a major worry, and China's assertion over the petroleum drilling rights in these sea areas is becoming stronger.[17] It is true that no country has wanted to jeopardize their trade and investment links with one other so no more than an exchange of protests over the islands is expected to be made for the time being. However, it will be very difficult for each nation including China, to develop by themselves, the resources in these areas unless these territorial issues are solved.

2. 3. Imports

The third solution is importing oil and gas from abroad. China's oil dependence on the Middle East is rapidly growing. In the summit talks between China and Saudi Arabia, they agreed to expanding crude oil imports from 2.4 million tons to 3.6 million tons a year. As mentioned before, excessive dependence on the Middle East makes China's energy structure vulnerable. Therefore, the Chinese government has tried to secure other suppliers. One such effort is the proposed petroleum pipeline construction from Kazakhstan, and another one is the ongoing petroleum pipeline construction from Russia.

2. 3. 1. Petroleum pipeline from Kazakhstan

As the Central Asian region adjoining China is a rich area in petroleum and natural gas resources, China is determined to develop relations with the countries in this region. Chinese Premier Li Peng visited Kazakhstan and had a talk with President Nazarbaev in late September 1997. Kazakhstan and China used to have a border conflict that dated back several centuries. The unsolved issue of demarcation of the border was resolved, after more than five years of talks, in 1998. Li Peng emphasized the importance of Kazakhstan, and around the time of his visit in 1997, CNPC signed a deal for the comprehensive development project of oil fields in Kazakhstan. This is the project to jointly develop the Aqtobe and Uzen oil fields located in the western part of Kazakhstan, and to transport oil and gas with a proposed pipeline of 3,000 km through Xinjiang between the two nations. Though one million tons of crude oil is annually transported by rail now, the oil import will be expanded more in the future if pipeline construction proceeds. However this pipeline faces stiff opposition from the US for military strategic reasons and from Russia for economic reasons. The US doesn't want China to have an oil supply they cannot easily interdict and the Russians don't want to lose their monopoly on transporting the oil as they have the only pipeline out of the region at present.

2. 3. 2. Petroleum pipeline from Russia

When President Yeltsin visited China in November 1997 and had summit talks with President Jiang Zemin, they gave a joint statement, which covered natural gas development cooperation.[18] Though there was a long antagonistic history between China and Russia (the Soviet Union), both countries looked for a foundation for mutual cooperation and understanding to get over the various unstable factors in their relationship, including territorial problems.[19] China and Russia got over these difficulties by placing the relations of both countries on "the strategic partnership" in June 1997. Though it will still have a lack of transparency in the future, the fact that a big change was brought to the international situation in East Asia will be

beneficial. Given such a movement, Mr. Daniel Yergin stated, "Relations between China and Russia are not based on Marx and Lenin any more, but they will change according to the things which are dependent on the petroleum and the gas.[20]" In September 2001, Chinese Premier Zhu Rongji talked to Russian Prime Minister Mikhail Kasyanov and signed an agreement document for the economic field, which contains the petroleum pipeline construction of both countries.[21] This pipeline will connect Dalian with the suburbs of Irkutsk in Siberia, with the distance being about 2,400 km, and is scheduled for starting construction in 2003. It is planned that 20 million tons of Russian crude oil in a year will be supplied to China from 2005.

For China the expansion of dependence on petroleum is connected with security, and the risk of breaking the state's strategy. Therefore, with regard to petroleum imports, China can be presumed to individually expand the developments which Chinese influence can reach. Although they need a considerable amount of funds and modern technologies, and without foreign cooperation they will not be realized, these pipeline constructions are beneficial for diversifying sources of energy. Oil and gas imports would be a most realistic choice. Add to this, emergency response measure will be necessary and the following chapter discusses energy security.

3. Risk management

Energy is the base of the social and economic life, and the securing of energy sources is vitally important for any country. Therefore, any emergency energy shortages could cause unforeseen circumstances such as domestic confusion and international conflicts. There are a lot of unstable factors in the energy structure in China. As mentioned before, China's dependence on the Middle East is rising at a remarkable rate. With this in mind the kinds of emergency response measures available should be examined.

3. 1. Unilateral and bilateral

It is necessary that each nation maintains its own risk management measures. China is strengthening relations with the Southeast Asian countries that are concerned with the security of sea-lanes. Recently, China extended its influence, through the granting of ODA (Official Development Assistance) and the investment of private enterprises to Myanmar, Cambodia, and Thailand. The Chinese aid stands out especially in its support to Myanmar, as the United States has maintained economic sanctions on Myanmar. Myanmar is on the import route of the Middle Eastern crude oil, and it is located in a place that could become an important position in regard to the Indian Ocean. The safety of the sea-lanes through the Malacca Strait is absolutely vital for petroleum stability. While the import routes of Japan and South Korea concentrate on the route through the Malacca Strait from

the Middle East and Africa, the Chinese import route is very pluralistic as it includes the proposed pipelines.

Furthermore, China has given energy cooperation to the diplomatically isolated countries and at the same time strengthened political relations with them. Cooperation with North Korea, which is internationally isolated, is one example of this. The main energy supply to North Korea, a nation that is worried about its extreme lack of energy and foreign currency, is now only one million tons of Chinese crude oil that is imported annually.[22] In September 2001, President Jiang Zemin called on North Korea after an interval of 11 years. Chinese trade with North Korea became active again and a quarter of all Chinese exports to North Korea was mineral fuel including crude oil. Therefore, China takes a comprehensive approach that isn't confined to the energy fields over the petroleum issue.

However, unilateral and bilateral solutions could lead to excessive competition and conflict among nations. Some believe that the argument over the South China Sea, with its troubles in offshore oil field development and deployment of the military in this area is an example of this.[23] China in particular is seen as the sovereign power taking the strongest line as it tries to secure ocean rights and interests in the East China Sea and the South China Sea by military strength. If surrounding nations come to take action against this naval power reinforcement, it is possible that competition between the navies could increase international tension among the states concerned. The supply of resources is unevenly distributed throughout the area and advanced technology and enormous funds are needed for their development. These facts make the energy problem an international matter that cannot be solved by any one country. Therefore, there needs to be a multilateral framework of cooperation.

3.2. Multilateral framework

An energy issue can be said to involve the contradiction between politics and economics, i.e., while the economic space is globally spread beyond nations, the political space is still based on nation states. In East Asia the central governments are deeply involved in the energy sector in ways such as the existence of state-owned enterprises and government's commitment on strategy decisions. Government acts as a main player here by deciding the choice of the energy and the trading partner countries, and regulating imports and exports. However, as both diplomatic relations and regional organization are poor in this area, political confrontation could easily expose the regional energy relations to international tensions and conflicts. Regional energy cooperation schemes that the East Asian countries participate in have just begun. The establishment of energy working groups in APEC (Asia-Pacific Economic Cooperation Conference) and APERC

(Asia-Pacific Energy Research Center) are examples. Furthermore, the IEA (International Energy Agency) works to advance the cooperation within the energy sector, such as petroleum stockpiling and petroleum flexibility in a state of emergency, but China is not the member country because it does not satisfy the stockpile duty although now China is working to increase its strategic reserve. Japan has participated since its establishment and South Korea joined it in 2001 and it is possible for them to help China to build an oil storage system. Recently, ASEAN has started to set up a regional petroleum stockpile and a petroleum mutual flexibility scheme for times of emergency. Both China and Japan have begun to examine the possibility for cooperation with ASEAN on this and other issues. Such a movement should be encouraged.

Conclusion

Economic cooperation promotes the flow of people, articles and information between countries, and it can be said that Japanese economic cooperation with China played a certain role in the Chinese transition from the closed system to the open system. However, such energy cooperation is set to change as Chinese domestic conditions and the environment that both countries are in changes. At present, the future of the petroleum trade is opaque, and ODA to China is proceeding in a downward direction and development in China is also coming to a limit. Therefore Japanese cooperation with China is now standing at a crossroads. Two options are given as methods for cooperation with China. One is a search for common profit, and the other is the application of a multilateral framework.

First, it is necessary to clarify what both countries state as their goals, and produce common values by balancing their goals. Developing countries tend to put emphasis on economic growth, and put off such issues as energy security and environmental protection. As for development, it can be advanced by the initiative of the private sectors. At present, the reduction of the public part in development is a worldwide trend. However, in the field of crisis management and environmental preservation, governmental initiatives and the cooperation of NGOs will be needed. It is necessary to develop a common recognition about the future energy problems by offering the technology and know-how of the environmental countermeasures and granting funds. If Western oil majors lead these developments, coping with the environmental problems can be considerably delayed as the oil majors pursue an economic rationality. Environmental problems however, have a time gap. In other words, they are of the nature that they emerge over time to some extent and if a problem has emerged, recovery is very difficult. Therefore, the problems that can happen should be predicted at the early stages, and countermeasure should be conducted to prevent such a situation arising. At present, Japan should continue to

grant the environmental protection technology, including clean coal technology and training of specialists, that is offered by Japan now. The energy security strategy should be managed first by each country, building up strategic oil stocks. Though petroleum stockpile are examined, they are still not effective in China. On this point, it is possible for Japan to provide petroleum-stockpiling know-how.

Though bilateral cooperation between Japan and China continues to be important, it needs to be used effectively within a multiple framework, now that energy exceeds a national frame and a market has been formed beyond countries. Energy has been historically a factor in disputes in East Asia. Deep-rooted mutual distrust is left between Japan and its neighboring countries from the past war experiences, which were caused largely by desire for resources. Therefore, very few organizations have been established in this region to act as mediators in regional disputes. It is necessary to make efforts to solve the energy problems in this region multilaterally in order to improve the vulnerable energy structure. Although cooperation and interdependence themselves don't bring peace and stability to areas at once, interdependent relations of substance let the countries recognize that making each other's relations worse would be disadvantageous to the region and the countries themselves. Such understanding contributes to the peace and the stability of the region. Therefore, developing a well-balanced energy security scheme should be done by making the most of both the multilateral cooperative approach and bilateral cooperation.

[**Notes**]

1) Nanay, Julia. "Whither the Oil Industry ? The Fate of the Caspian Hangs in the Balance (The Dilemma of Transport Routes)". *SAIS Review*. 19. Jan. 1999 : pp. 272-281.
2) Primary energy is energy that is not transformed into secondary energies such as electricity and gasoline.
3) Nuclear energy and other alternative energy sources are not yet main sources of energy, and so they are not included in this table.
4) Ministry of International Trade and Industry. *Energy/warning from the future*. 1997 : p. 120.
5) For further details of the relationship between economic growth and environmental affairs, see Fujisaki, Nariaki. *Chikyu kankyo mondai to hattentojokoku (the global environmental problem and developing countries)*. Institute of Developing Economies. 1993 : pp. 147-160.
6) Johnson, Todd M. "Foreign Involvement in China's Energy Sector". *China joins the world*. Ed. Elizabeth Economy and Michael Oksenberg. New York : Council on foreign relations press, 1999 : pp. 276-277.
7) Mtoe=Million Tons of Oil Equivalent
8) For more on this point, see Kojima, Reiitsu. ed. *Kaihatsu to Kankyo (Development and Environment)*. The Institute of Developing Economies 1993 : pp. 34-43.
9) *Nihon keizai shinbun*. Feb. 6, 1999.
10) The index price system is the system whereby the State Development and Planning Commission presents "an index price" based on the crude oil in the Singaporean market and CNPC and SINOPEC decide the market price of the oil products in which an actual domestic petroleum market price is decided based on this. The Institute of Energy Economics. "Restructuring of China's Oil Industry and Oil Supply Options". 1999.

11) *The Nikkei Business Daily*. Mar. 1, 2001.
12) Paik, Keun-Wook. *Gas and Oil in Northeast Asia : Politics, Projects and Prospects*. London : The Royal Institute of International Relations. 1995 : pp. 114-117.
13) *Nihon keizai shinbun*. Nov. 2, 1999.
14) Zhao, Quansheng. "China's Diplomacy in the Post-Cold War Era". *The Dynamics of International Relations in East Asia*. ed. by Saito, Motohide. Tokyo : Toyo Keizai Shimposha, 1998, pp. 43-61, Watanabe, Akio ed. "International Policy of Current Japan"
15) *The Sankei Shinbun*. June 4, 2000.
16) Hiramatsu, Shigeo. "China's advances in the South China Sea". *Toa*. Apr. 1999 : pp. 6-23.
17) Calder, Kent E. *Pacific Defence : Arms, Energy, and America's Future in Asia*. New York : William Morrow and Company, Inc. 1996.
18) *Nihon keizai shinbun*. Nov. 11, 1997.
19) Hama, Katsuhiko. "China's strategy for the internationalization of energy supplies and Asia's international environment". Ed. Radtke, Kurt and Raymond Feddena. *Comprehensive Security in Asia*. 1999. pp. 200-201.
20) Yergin, Daniel., et al., "Fueling Asia's Recovery". *Foreign Affairs*. 1998. March/April. pp. 45-46.
21) *Nihon keizai shinbun*. Sep. 9, 2001.
22) Izumi, Hajime. "Serious food and energy issues in North Korea". *Kokusai Shigen*. Sep. 1996 : pp. 18-19.
23) Kayahara, Ikuo. *Energy Strategy of China*. Ashi shobo. 1996 : p. 19.