Japan's Response to Climate Change

By Kaya Yoichi

Overview of Climate Change Problems

Climate change, or global warming, has long been an issue in the scientific community, but it was not widely recognized by society as a real phenomenon until after the regular monitoring of the density of carbon dioxide (CO_2) started in various parts of the world in 1958.

In the 1980s, responses to various atmospheric problems such as acid rain and the depletion of the ozone layer began to attract global attention, bringing the global warming problem on the table of discussion at the world political stage.

In the past decade, the United Nations Framework Convention on Climate Change (UNFCCC) was concluded in 1992 and the Third Session of the Conference of the Parties to the UNFCCC (COP3) held in Kyoto in December 1997 adopted the Kyoto Protocol to specify a response to the treaty.

However, the response to global warming differs from person to person and from country to country. Most notably, U.S. President George W. Bush announced in late March that his administration would not ratify the Kyoto Protocol.

The United States emits more greenhouse gases, particularly CO_2, than any other country. According to 1998 data, the amount of greenhouse gases emitted by the United States accounts for 24% of the world total and 38% of the total among the industrialized countries.

The Kyoto Protocol can still come into effect if the industrialized countries ratifying the agreement produced more than 55% of the industrialized nations' 1990 CO_2 emissions. This means that theoretically the Kyoto Protocol can be implemented without the United States.

Even so, the countries of the world should continue efforts to persuade Washington to change its mind and join their ranks, because Washington's enormous influence could cause other countries to follow suit, crippling the effect of the Kyoto Protocol.

The U.S. decision to withdraw from the Kyoto Protocol is believed to have been prompted by two factors: 1) a causal relation between man-made emissions of greenhouse gases and the density of the gases in the atmosphere is not scientifically established, and 2) restraints on the consumption of fossil fuels to tackle global warming would be highly likely to substantially curb economic growth. In other words, Washington is taking the stand that 1) the world should delay its response to global warming until the issue is scientifically established, and 2) economic development is more important than restraints on global warming.

The U.S. case typifies views critical of making a response to global warming. But most scientists assert that the world must push for measures to address global warming regardless of such arguments. Their case is based on the following factors.

Firstly, although there are a variety of problems yet to be scientifically explained besides the points already mentioned about global warming, it must be noted that the impact of global warming on the future is irreversible. The elevation of the sea level is one example. The rising sea levels are being brought about by a rise in temperatures, causing the melting of the ice on the land and its influx into the ocean. It can be said that once sea levels rise, they will not come down. In order for the sea surface to return to the previous level, temperatures must fall at least to the previous level. If this can be attained, the inertia of nature is substantially large.

The impact of the elevation of the sea level will be enormous. For example, if the sea level rises by one meter, 60% of the population of Bangladesh would likely be affected.[1] The majority of Bangladeshi people are poor and rely on cultivated land in low-lying areas downstream of the Ganges River. As a result, a rise in the sea level will have an enormous impact on their lives.

Another example is the cooling of Europe. Many meteorological experts fear that global warming could disrupt the mechanism of thermohaline circulation in the Atlantic Ocean, which would lead to the cooling of Europe. In an article carried in the August 1997 issue of *Nature*, a group of meteorologists substantiated this theory using a simulation model.[2] Most scientists agree that thermohaline circulation in the Atlantic cannot be restored once it is cut. Given that European civilization developed against the background of a temperate climate brought about by thermohaline circulation, the impact of cooling will be immeasurably big.

Secondly, as to the economic impact, substantial restraints on the consumption of fossil fuels will be necessary to prevent global warming. As fossil fuels represent the bulk of energy resources, economic production and the consumption of fossil fuels are interrelated, and restraints on the consumption of fossil fuels would end up stifling economic growth. This is undisputable. Figure 1, showing the trends in Japan's gross national product (GNP) and CO_2 emitted by fossil fuels in the 1990s, clearly bears this out. (The dotted lines, which represent numbers projected by the Japanese government, will be explained later.)

Looking back on what was discussed in the past, the U.S. argument that implementation of the Kyoto Protocol will harm its economy is not groundless. Yet, it is wrong to become pas-

sive in addressing global warming from such a viewpoint. The scale of the global warming problem is not related to the economy. Rather, this point should be taken to testify to the difficulty of addressing the global warming problem and the need for implementing long-range and drastic measures for addressing global warming.

The global warming problem cannot be settled in a short period of time, for example by 2010. Emissions of greenhouse gases, mainly CO_2, must be eventually cut to a fraction of their current levels in order to stop the progress of global warming.[3] A long period of time and drastic efforts will be needed to attain this goal. The U.S. government asserts that it recognizes the seriousness of global warming. If so, we earnestly expect Washington to take such a long-range and drastic response as mentioned above, even if it cannot accept the Kyoto Protocol in its present form.

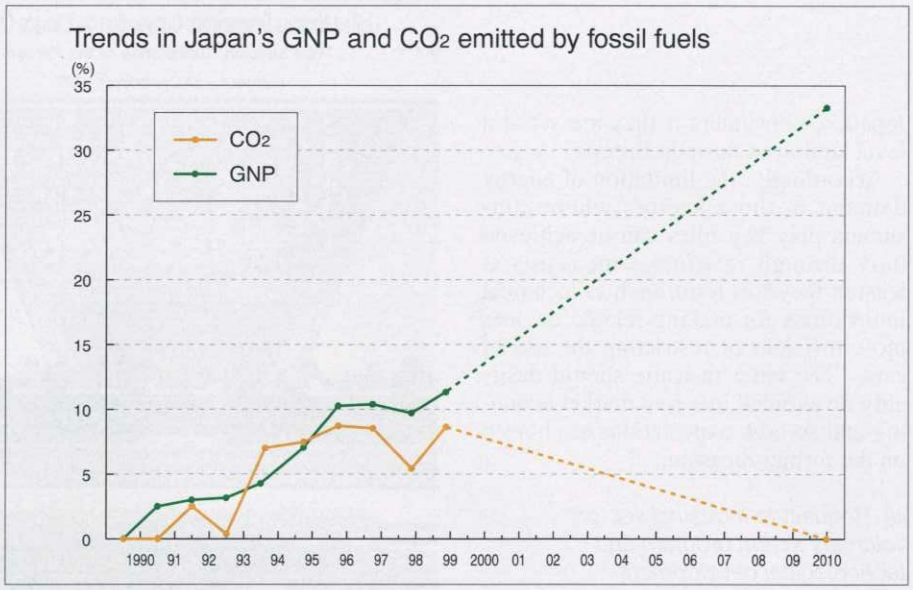
Japan's Response

As symbolized by its hosting of the Kyoto COP3 conference in 1997, the Japanese government has been seriously concerned about facing up to the global warming problem.

Japan's response to global warming involves: 1) the formulation and implementation of concrete short-term measures (up to about 2010) under the Kyoto Protocol, and 2) the formulation of a supra-long-range program for developing technologies for blocking the progress of global warming. This chapter deals with the short-term response, and the next chapter recounts the long-term response.

Soon after the COP3, the Japanese government unveiled, ahead of any other country, an initiative for responding to the COP3 accord. It proposed lowering emissions of greenhouse gases in 2010 to 1990 levels through various energy-related measures, on the assumption that, by around 2010, emissions of greenhouse gases would increase nearly 20% from the 1990 levels if energy consumption continues unchecked. The Japanese government

Figure 1



plans to achieve a 6% cut in gas emissions, which Japan is obliged to do according to the Kyoto Protocol, through various other measures.

Discussions on specific measures for achieving the 6% cut are not progressing, since details on implementing the Kyoto Protocol, such as what will absorb greenhouse gases and how to handle the Kyoto mechanism, have yet to be defined. Measures for stabilizing emissions of CO_2 by energy policies are now being earnestly examined by an expert panel of the Ministry of Economy, Trade and Industry. Below, I elaborate specifically on the point at issue of CO_2 stabilization and the direction of Japan's response.

i) Necessity of recognizing difficulties of attaining COP3 accord

Japan is obliged to curtail greenhouse gas emissions by 6% from 1990 levels under the COP3 accord. But this target will be extremely difficult to achieve, given that CO_2 accounts for 95% of the greenhouse gases Japan emits (by the ratio of global warming potential). The lower dotted line in Figure 1 shows the above-mentioned target of reducing CO_2 emissions to 1990 levels by around 2010 through measures related to energy supply and demand. The upper dotted line shows the current government target of GNP growth.

The two curves, which continued to rise in tandem in the 1990s, are projected to move apart. It is easy to see that this projection will not be realized without drastic efforts.

ii) Difficulties of dealing with general consumers and environment tax

It is apparent that energy conservation, along with a shift in the use of fuels, will be indispensable for a new energy policy, but the issue at stake is how to promote that measure. The growth of energy consumption since 1990 is noticeable in the household and transport sectors, particularly for automobiles. Energy consumption for automobiles is determined by consumers in general, and it is not easy to find policies for altering their consumption behavior.

Environment taxes or carbon taxes are often mentioned as a policy option for cutting energy consumption, but consumers in general are not so sensitive to changes in energy prices. The carbon taxes introduced or likely to be introduced in Europe are in the order of several thousand yen per ton of carbon (¥1,000 is about $8), or about three yen (about ¢2) per liter of petroleum. (This calculation cannot be applied to Scandinavian countries which combine carbon taxes with income tax reductions.) In Japan, gasoline prices are set at about hundred yen (about ¢80) per liter due to high petroleum-related taxes. It is highly likely that the carbon taxes will hardly affect the behavior of

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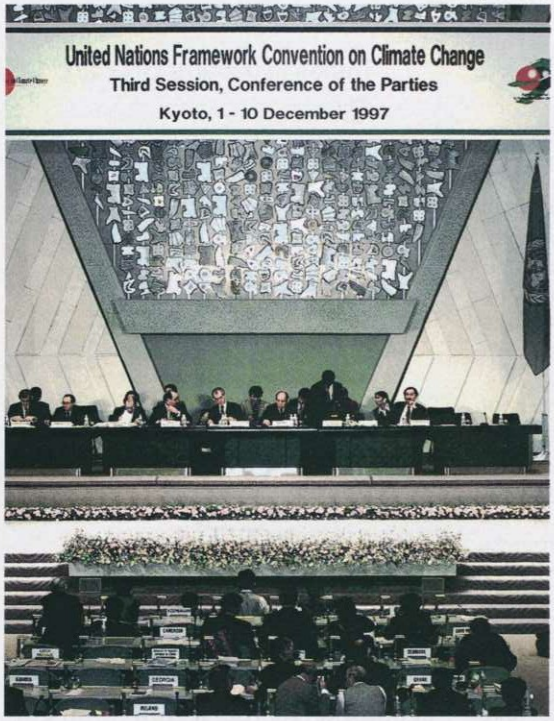

The Kyoto Protocol was adopted at the Third Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in December 1997

Japanese consumers if they are set at a level similar to those in Europe.

Accordingly, the limitation of energy demand in those sectors where consumers play key roles can be achieved only through restrictive measures at least in the short term, such as technical innovations for making related devices more efficient or restricting the use of cars. The latter measure should desirably be avoided in a free market economy and so high expectations are placed on the former measure.

iii) Request to industrial sector; voluntary action program and technological development

In Japan, energy consumption by industries accounts for about 50% of total energy consumption. Thus it is important for industries to make efforts to restrain energy demand. Yet, it must be noted that industrial energy demand has hardly risen since 1990 and is unlikely to increase substantially in the future due to industrial energy-saving efforts. The Japan Federation of Economic Organizations (Keidanren) has issued a declaration on the stabilization of energy consumption, calling for limiting CO_2 emissions to 1990 levels. Following the Keidanren lead, each industrial sector and each company has mapped out its own action programs.

The Keidanren declaration can be held in high regard in that it is consistent with the government plans to respond to the COP3 accord. But Keidanren has not clarified to what extent the declaration can be implemented. Besides, how the so-called "outsiders" which have yet to unveil their own action program will behave in this regard is the point to be watched.

For industries, it is important to make efforts to raise the energy efficiency of commodities used by general consumers, such as electric home appliances and automobiles. The government, under the "top runner method," has set targets for higher efficiency, requiring each industrial sector to achieve its own target. This government approach is directly related to the promotion of energy saving in the consumer and transport sectors, as mentioned in section ii, and high expectations are placed on its outcome.

iv) Difficulties of reducing share of coal as power generation fuel; stagnation of nuclear power generation and impact of accelerating the liberalization of nuclear power generation

A shift in fuel consumption is mostly attributed to the power generation fuel sector. Japan's reliance on coal as a primary energy source declined 0.7-0.9% annually from the 1980s to the 1990s, making a considerable contribution to Japan's success in curbing an increase in CO_2 emissions. An increase in the ratio of nuclear power and replacement of coal by natural gas were major factors. Yet, there are some signs that the two factors are losing their relevance.

The nuclear energy sector was hit by a series of accidents. There are 52 nuclear reactors in operation in Japan. But public acceptance of nuclear energy has deteriorated following the sodium leakage from the prototype fast-breeder reactor Monju in 1995, and other accidents at nuclear facilities. A delay in the siting of a plant for reprocessing highly radioactive spent nuclear fuel has added to the industry's woes. Accordingly, plans for expanding or building new nuclear power plants are being delayed or suspended.

Japan should hopefully expand its nuclear power generation capacity, given that nuclear power accounts for about 35% of Japan's total electric power demand (in terms of kilowatts per hour) and is still below economically optimum levels, while electric power demand still tends to increase. Even so, improvement of public acceptance of nuclear power should be the first consideration.

Another important factor in considering the composition of the electric power supply is the growing orientation toward use of coal amid the progress of deregulation of the electric power market.

Some electric power generators have for some time looked to coal thermopower generation from the viewpoint of reducing the reliance on petroleum. Lately, electric power companies as well as independent power generators newly entering the energy market are increasingly inclined toward using less costly coal amid liberalization of the electric power market. Such a trend will inevitably make electric power generation more dependent on coal and accelerate emissions of CO_2. How to restrain CO_2 emissions will be a serious problem policy-makers must address in the future.

With this in mind, a government panel is currently working on a scenario of achieving both 2% annual economic growth and implementing the COP3 accord. The scenario will be unveiled by the middle of the year.

Long-term response

As mentioned above, CO_2 emissions

must ultimately be cut to a fraction of the current level to prevent the progress of global warming. This amounts to requiring a departure from the current fossil fuel-centered energy system. The Japanese government quickly unveiled in 1990 a global rehabilitation concept, called "New Earth 21," and various energy-saving research and development projects are under way.

As Yamaguchi Tsutomu's article in this issue refers to details of this matter, I will cite in this chapter only the important points of the long-term response Japan should promote in this regard.

i) Issues on nuclear energy

Nuclear energy will play an important role as a non-fossil fuel in the long run. Yet, a site for facilities to process highly radioactive waste has not been chosen. This is the biggest problem now facing Japan's nuclear energy sector.

Reprocessing of spent nuclear fuel has been promoted for effective utilization of uranium resources for many years. It is common knowledge, however, that the reprocessing is preconditioned by the development of a fast-breeder reactor. But the development of such a reactor has been put on hold since the Monju accident. If the reprocessing of spent nuclear fuel is carried out as originally planned without the fast-breeder reactor, a large amount of plutonium will remain in stock. Such a situation without doubt is undesirable economically and from the viewpoint of preventing nuclear proliferation. The preferable scenario for preventing the stock of plutonium will be the expansion of intermediate storage of plutonium, while developing a highly secure fast-breeder reactor with public acceptance.

ii) Promotion of new types of renewable energy

Development of renewable energy sources, such as solar energy and wind energy, must be promoted. But the output of renewable energy, under the existing method, drastically varies according to the passage of time from its generation. This stands in the way of expanding the use of the new types of renewable energy. Development of a low-priced, small-size electricity storage system or the use of hydrogen or other user-friendly energy sources will be the answer to clearing the barrier. Looking to the distant future, development of technology for generating a huge amount of electric power less susceptible to time changes, such as space energy, should be encouraged.

At the same time, efforts should be made to improve biomass technology. Biomass is used in developing countries as a key energy source, but only through conventional simple burning, and its energy efficiency is extremely low. In the future, biomass should be utilized on a large scale and through more efficient burning or chemical transformation, so that it can be transformed into electricity or fluid energy, which can be utilized more efficiently.

iii) Promotion of higher efficiency in each sector

Apart from the above-mentioned supply-side approach, technology for raising the efficiency of demand is equally important. Higher efficiency for each industrial product, such as automobiles, electric home appliances and processing devices, has long been promoted, and its importance remains unchanged. In the case of the automobile sector, the introduction of a hybrid-engine car and cell-battery car is expected to greatly contribute to higher fuel efficiency.

Meanwhile, the cascade use of energy, such as cogeneration and the use of industrial waste heat for home use is equally important. The cascade use of energy is not easy in Japan because the thermoelectric ratio of energy demand is lower than in Western counties and a vast amount of cryogenic energy is required in summer. Nevertheless, such energy use should be further expanded along with the development of variant electricity sources, such as the cell battery and the micro-turbine, as well as the development of technology for storing heat and electricity.

iv) Rationalization of energy use in houses and buildings

Demand for heat in non-commercial sectors is mostly for air-conditioning. But this demand can be drastically reduced through structural improvements, such as insulation, and through the development of heat pumps which use atmospheric heat, geothermal heat and other easily available natural heat sources. Experimental houses using such energy sources have already been built in large numbers in Japan and Western countries. The introduction of such houses should be drastically expanded in the future.

Conclusion

Above, I have given an overview of Japan's response to global warming. Global warming is an unprecedented challenge facing mankind. I would like to emphasize that the key to success in dealing with the problem will be for individuals to practice self-restraint, instead of leaving themselves at the mercy of technology. JJTI

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