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Chapter 9

Global Warming Problems and Institutions

Preface

The 21st century has begun here in Japan with remarkably hot and rainy summers while the seasonal typhoons have grown more severe. For this the Japanese people have tended to blame global warming as if it were somehow a new and unanticipated phenomenon, yet recent studies have confirmed that ever since the 18th century the globe has been growing steadily warmer, and that one of the main causes of global warming has been the mass consumption of fossil fuels.

Even so, it was not until after the end of World War II that the mass consumption of fossil fuels by industrialized capitalist nations, led by the US, grew significantly: in Japan, for instance, the CO_2 emissions after the war rose approximately to five times the level that they had been before the war. In response to this surge, the United Nations founded the IPCC (the Intergovernmental Panel on Climate Change) in 1988 to carry out a scientific examination of the situation, and in 1992, after consideration of the Panel's report, the UN drew up a Framework Convention on Climate Change; this eventually led, at the end of 1997, to the adoption of the Kyoto Protocol, whose aim was, and remains, to reduce the emission of greenhouse gases. Even before this, however, in 1990, the IPCC had already pointed out that immediate reductions of over 60% in the net (sources minus sinks) emissions from human activities of long-lived gases would achieve stabilization of concentration at today's levels (First Assessment report). In 2007, the Forth Assessment Report prepared by the IPCC concluded that the increase of greenhouse gases of anthropogenic origin was the cause of Global Warming. The time has surely come when we cannot any longer ignore the reality of Global Warming — and, even more significantly, we cannot overlook the reasons for such a dangerous development.

Changes in the climate directly damage those developing countries that lack the ability to adapt to the harmful consequences wrought by the changes, and this is particularly true of places where natural disasters occur frequently, such as small island countries and low-lying coastal areas. We must therefore attempt to mitigate the damage by adapting to the realities of global warming. This means that humanity has to solve the issue of environmental constraints before it can consider the issue of resource depletion. No other phenomenon shows as clearly as climate change that the creation of economic wealth does not equal (or amount to the same thing as) humanity's progressive betterment.

I propose in this penultimate chapter to carry out an analysis of the system

that bears some responsibility for global warming, a topic that I first raised in chapter 4 and I shall examine a method that will establish an effective regime for enhancing the subjective ability of each participant to deal with the problem of global warming. The point that I should like to emphasize is that we need to evaluate the issue of global warming as an aspect of the more general question of "Environment and Development", and frame comprehensive perspectives for recognizing how global warming is connected to and related to the rapid destruction of biodiversity and other similar problems. If we focus only on the reduction of CO_2, one result will be to promote the highly questionable development of nuclear energy, and we must therefore carry out a general analysis and lay out a process for coping with the problem in terms of sustainability.

1 A system analysis of the Kyoto Protocol

1-1 Characteristics of the Kyoto Protocol

Because of the low price of its gasoline and its widespread reliance on cars, the US has for many years been the world's greatest producer of greenhouse gases, both for the absolute amount of CO_2 emissions and for per-capita emissions. In 2008, however, China overtook the US as the world's largest emitter of CO_2, and US per-capita emissions were 5 times greater than that of China, nearly 15 times greater than those of India (cf. Figure 9-1).

The Kyoto Protocol had accepted the need for flexible mechanisms and formulated a clean development mechanism (CDM), a joint implementation (JI) and a system of emissions trading, while industrialized countries and former socialist countries were obligated to reduce greenhouse gases based on "common but differentiated responsibility". These are called the Kyoto Mechanisms. CDM is a system by which those developed countries that have agreed to binding targets for greenhouse gases emissions (Annex I countries) implement emissions reduction projects in developing countries; thereafter, the developed countries can apply for credit for part of their reduced emissions through projects that are designed to meet their emissions targets. JI is a system similar to CDM, except that JI projects are implemented between countries with the binding greenhouse gases emissions targets (Annex I countries).

Two factors, however, have made it difficult to implement the Kyoto Mechanisms: the difference of per-capita CO_2 emissions, and the problem of value and money; in addition, there is the difference of the marginal abatement costs for reducing 1 ton of CO_2.

Yet, before we can attempt to tackle these obstacles, we need first to establish that the problem(s) of the global environment have to be discussed from the standpoint of 'fairness', which is a more highly advanced concept than equity: 'distributive fairness' includes the principle of equality and the principle of need, whereas the concept of equity is strongly related to the system of merit and effectiveness (Usui, 2004: 185–186). Seen from the standpoint of economic fairness, the principle of equality of emissions of per-capita greenhouse gases stresses the equality of the environmental load, which includes disposal and discharge, not equality of personal consumption and income; this raises the issue of the need to redefine the concept of personal equality, and what at once emerges here is the Indian claim that when we consider emissions credit the first thing that has to be faced is equality of the per-capita emissions. This principle was made clear in the Marrakesh agreements (2001), which set out to augment the Kyoto Protocol, affirming that "the Parties included in Annex I shall implement domestic action with a view to reducing emissions in a manner conducive to narrowing per capita differences between developed and developing countries". These flexible mechanisms were set up, however, in consideration of the equalization of the marginal abatement costs with economic effectiveness and the consequences of technology transfer to developing countries.

Yet some influential parties are still skeptical of the seriousness of global warming and this skepticism is addressed by the United Nations' "precautionary principle", a principle included in the United Nations Framework Convention on Climate Change. The precautionary principle states that necessary actions should be taken as soon as possible to obviate the effects of climate change, given the particular properties of the damage that is likely to be caused, such as its severity, or the difficulty, if not impossibility, of reversing the damage once it has occurred, although this does not mean that the cost should be left out of consideration when preventive measures have to be taken, or where preventive measures may not even appear to be necessary: the basic point of the precautionary principle is that measures should be taken even when the scientific evidence is still uncertain, or when doubts remain.

How then is the Kyoto Protocol likely to help us prevent global warming? In considering this question, we must examine two issues. One concerns the general effectiveness of the Kyoto Protocol (whose purpose is the prevention of global warming and of which the Kyoto Protocol is an agency); the other concerns the best answer to the question of what measures we need to take to achieve the goals of the Kyoto Protocol (where the purpose and the means for accomplishing it are through energy saving, forest absorption and similar

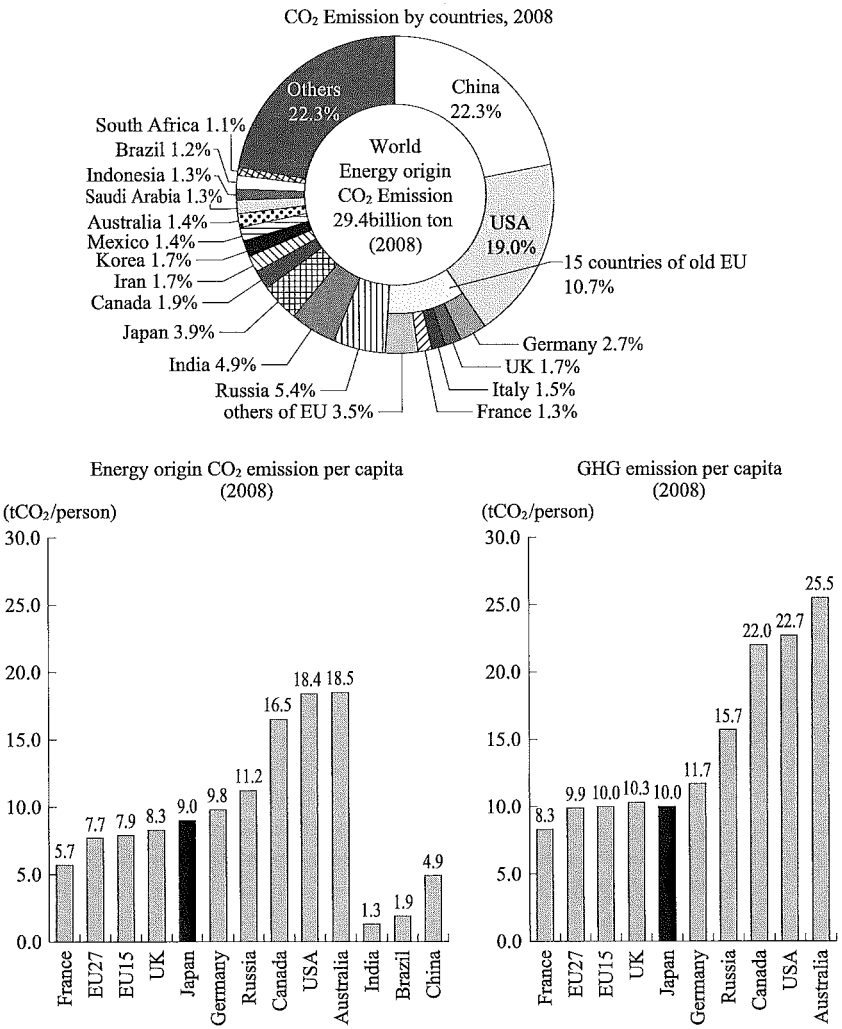

Figure 9-1 CO_2 emissions by countries, 2008 (IEA, 2010; Ministry of Environment Japan, 2010).

mechanisms).

If we look at the Kyoto Protocol from the viewpoint of a system and its participants, we find three characteristics; [1] the legal obligation to reduce emissions, [2] that the developed countries should take the lead in reducing emissions, [3] that the term specified for a response should be a period of five years. Thus, the Protocol sets out targets for the reduction of greenhouse gases emissions for a limited term, by allocating an emissions quota to each country and obligating countries to reduce emissions: from 2008 to 2012, the EU must reduce 8%, the US 7%, and Japan 6% from their 1990 levels. At the same time, the Protocol agreed that parties shall be able to apply credits towards their commitment goal that have been awarded for maintaining forest sinks. As we have already explained, the Protocol uses market mechanisms to implement the Kyoto Mechanisms of JI, CDM, and emissions trading.

This is to say that, for the participants, Annex I imposes a quantified reduction target only on a developed country or a member country of the former communist bloc and receives from them a fund and a technical offer, while the developing countries are placed by the developed countries under the CDM to carry out their own warming countermeasures on a voluntary basis. Yet even among the parties that are categorized as developed countries emissions reduction targets differ. Even though the target of the member counties of the EU was considered to be a joint achievement, the quantity of emission cuts of each member country was differentiated (the EU bubble), and since discharge rates did not become the norm until 1990, a surplus CO_2 emission allowance (hot air) was awarded to the former socialist countries that became independent after the Eastern Bloc disintegrated in 1991, while the US, as everybody knows, seceded from the Kyoto Protocol, although it remains subject to the United Nations Framework Convention on Climate Change.

The Kyoto Protocol is a cross-national agreement whereby the participants operate on a "level playing field", yet this is not quite what it may seem, for while the EU as a supranational body has decided on an 8% reduction for the whole of its extended family and takes actions to achieve this, it allows corporations to participate in the Kyoto Mechanism in a domestic context. What we need essentially are the combined efforts of each individual, each local government, each company, each nation, at every level, to reduce greenhouse gases, and it is important to establish systems and measures that enable participants to crystallize such measures into national reduction targets. It is thus necessary to analyze the effects of measures that have already been adopted, such as the environmental tax, emissions trading, CDM, JI, and whatever voluntary agreements governments have so far made with each other.

Table 9-1 The history of measures against global warming.

1985	At the Villach Conference (Austria), scientists agreed to respond to the menace of global warming.
1988	Participants at the Toronto Conference (Canada) agreed that by the year 2005 the "Developed countries should reduce CO_2 emissions by 20% from their 1988 levels".
1988	The United Nations set up the Intergovernmental Panel on Climate Change (IPCC).
1990	The IPCC produced its First Assessment Report.
1992	A United Nations Framework Convention on Climate Change was adopted. This stated that by 2000 the developed country should reduce their emissions to the 1990 levels. "The parties to the convention have met annually from 1995 in Conferences of the Parties (COP) to assess progress in dealing with climate change".
1997	The Kyoto Protocol was adopted: it obligated the developed countries to reduce greenhouse gases from the 1990 levels: Japan by 6%, the US by 7%, and the EU by 8%.
2001	The US seceded from the Kyoto Protocol.
2001	The necessary detailed rules for the execution of the Kyoto Protocol were confirmed by the Marrakesh agreements at the Seventh Conference of the Parties to the United Nations Framework Convention on Climate Change (COP7).
2005	The Kyoto Protocol went into effect.
2007	At the G8 summit held at Heiligendamm, Germany, the participants announced that, "We shall seriously consider the decisions which include at least a halving of global emissions by 2050".
2007	COP13 was held in Bali and "the Bali Roadmap" was published.
2008	The commitment period of the protocol began.
2008	The G8 Summit was held at Lake Toya, Hokkaido, Japan.
2009	The G8 Summit held at L'Aquila, Italy, required that by 2050 there should be "an 80% or more reduction goal for developed countries".
2009	COP15 was held at Copenhagen.

As for Japan, the government has announced its own countermeasure plans to achieve its 6% emissions reduction target by a 3.8% reduction through forest absorption, 0.6% through energy saving (which includes the generation of nuclear power), and through a 1.6% reduction by adapting and remaining faithful to the Kyoto Mechanism.

1-2 The effects and difficulties of the Kyoto Mechanism

The individual efforts of the participating countries of the Kyoto Protocol to reduce greenhouse gases emissions incur big differences in costs. It is said

of countries like Japan with advanced energy saving systems that the making of further efforts to save more energy is "like squeezing a dry dish cloth". In China and Russia, on the other hand, the price of energy has always been low and because of the economic systems of the former socialist countries the incentive to save energy has not been strong enough to achieve its goals. Russia, the Ukraine and the Eastern European countries implement most of the JI projects, many of which are projects in renewable energy and methane reduction, while Japan and China are carrying out projects within the framework of CDM to reduce such pollutants as hydrochlorofluorocarbon.

In the case of CDM, however, proof of "additionality" is imperative. "Additionality" signifies that the project is not "business as usual" (BAU). In other words, it must specify whatever it is that shows the project to be in addition to business as usual. Countries who implement the project must prove that greenhouse gases reduction measures can be put into practice only when they use a CDM system. Without the proof of additionality, the project is judged to be "business that would happen anyway" regardless of the Kyoto Protocol and it is not deemed to be a CDM project.

By 2008, the number of projects registered through CDM exceeded 1,650, 70% of the projects being undertaken by China, India and Brazil. In the first CDM market (the trading of CER issued by the CDM project) of 2008, however, China had increased its share from 73% of the previous year to 84%, and CDM projects in China now account for the dominant share in the recent CDM market.

In the first market figures for 2008, the volumes of trading by type of CDM project reveal that an overwhelming 82% of them were devoted to clean energy

Table 9-2 A system of the Kyoto Mechanism.

A mechanism name	The article of the protocol	Trading unit	A place of implementation	The first issued year
JI (Joint Implementation)	Article 6	ERU	Developed countries	2008
CDM (the Clean Development Mechanism)	Article 12	CER	Developing countries	2000
IET (International Emissions Trading)	Article 17	AAU	Developed countries	2008

ERU: Emission Reduction Units
CER: Certified Emission Reductions
AAU: Assigned Amount Units

projects (renewable energy projects: 45%; energy conversion and energy efficiency projects: 37%). Of the 45% share of renewable energy, waterpower accounts for 21%, wind power for 17%, biomass for 6%, others for 1%. On the other hand, the share of the hydrochlorofluorocarbon processing projects decreased year by year from 64% in 2005 to 3% in 2008 (Word Bank, 2009).

1-3 The global warming policy of President Obama

In March, 2001, on the establishment of the Bush administration, the US seceded from the Kyoto Protocol and has yet to return, but the current president, Barack Obama, promised in his campaign statement to work towards the reduction by 2050 of greenhouse gases emissions to less than 80% of the 1990 levels by adopting the following policies (Barack Obama and Joe Biden, "New Energy for America" 2008).

The President will attempt, at least for the time being, to revert by 2020 to the 1990 level of emissions. Since the market mechanism has been working in the US for many years, it stimulates American consumers and businesses to overcome climate change in the most effective manner, and the president will therefore carry out a cap and trade policy and sell all the credits at auction. He aims to establish the system of a 100% auction that will require industries to pay for all emissions, instead of allocating emission credits to each company based on evidence of its past pollution. The allowance (purchase price for CO_2 emission allowance, 15 billion dollars a year) generated by an auction will then be used to support the development of clean energy, to improve energy saving, and to develop a next-generation bio-fuel and clean cars. This method will contribute to the economy and to the attainment of the emissions reduction targets. This allowance is, at the same time, to be used as a fund that will be distributed to the officers who manage federal land and each individual state, and to those who oversee the wildlife. It will enable wildlife to adapt itself to a warmer climate. The remainder will be used to help families and areas that suffer adverse effects as a consequence of the shift to new energy and a Low-carbon society.

By re-engaging itself in the United Nations Framework Convention on Climate Change and by seeking agreement with the other major players in the world's economy to make a better effort to reduce the discharge of harmful substances, the US has thus once again become the leader amongst those countries who are responding to climate change.

President Obama will also attempt to reduce America's dependence on foreign oil and will promote Low-carbon technical development by using the income drawn from the cap and trade auction to secure sources of future

energy and new employment for 5 million people.

The government of the US will invest 150 billion dollars for ten years on projects to develop a plug-in hybrid car, to enhance commercial renewable energy projects, to save energy, to encourage the building of low-emissions coal-based power plants, and to promote next-generation bio-fuels and a fuel infrastructure, while shifting to a new digital power network. At the same time, the president plans to invest in highly skilled manufacturing workers and manufacturing engineering centers, and thus to make it possible for American workers to develop the environmental technology that the world so badly needs. All these investments will help the private sector and create good and new green jobs for 5 million people, while not stealing technical know-how and their livelihoods from workers in foreign countries.

If the administration of President Obama is able to carry out the energy policy as we have sketched it above, its effect will be epoch-making, and since it is proposed as the Green New Deal policy that aims to accomplish an integrated solution to the world's overlapping economic and environmental crises, I should like to leave it for the moment and return to it for further examination in the final chapter.

1-4 The participation of developing countries

On the other hand, the Kyoto Protocol does not obligate developing countries to reduce greenhouse gases. We assume that when the developed countries asked the developing countries to participate in the Kyoto Protocol, "the equal emission allowances per person under total volume control" was agreed on in the belief that each person on earth emits an equal amount of CO_2. (For example, if we try to figure out the equal emission allowances per person by dividing emissions allowances that stabilize the atmospheric CO_2 concentration at 450 ppm, which is regarded by the world population as the acceptable range for the prevention of global warming, the amount is approximately 2-3 tons per year.) China, as we have seen, now exceeds the US in the absolute amount of emissions, and has become the world's largest emitter of CO_2. In China, moreover, the per-capita emission is even now around 3.8 ton, and has already exceeded the acceptable standard (cf. Figure 9-1)

Even if the developed countries reduce emissions, the developing countries make up for it by discharging rather more. The UNFCCC is therefore considering whether to demand that China and India restrain their greenhouse gases emissions according to the Convention's rule of "common but differentiated responsibility". The solution to the pollution problems experienced by individual countries and the solution to the problems experienced by the

global environment have much in common, especially amongst the developing countries. The main cause of acid rain and global warming is the consumption of fossil fuels, and it would be important to save energy and the forests even if the problem of global warming did not exist. The fourth Assessment Report of the IPCC (Working Group 3) emphasizes that the short-term health benefit from the mitigation of air pollution by greenhouse gases reduction measures will, to a considerable degree, offset the expense of the mitigations (IPCC, 2007b: 12).

Various approaches have been proposed to distribute "a fair allocation of the burden" based on the concepts of responsibility, ability, and effectiveness, one of them being the multistage approach. This requires that developing countries should participate to expand gradually the range of those countries amongst their number that accept binding emission reduction targets and to impose more obligations upon them. Another is the approach by sector suggested by Brazil, which would set the obligation to reduce emissions in line with the rise in temperature consequent upon each country's past discharges.

1-5 The problem of forest sinks

It is now estimated that about half of all anthropogenic carbon emissions is absorbed by marine and terrestrial ecosystems. At first, the Japanese government anticipated that, compared with the 1990 levels, it would be possible to achieve an absorption quantity of 37% through effective forest management and from initiatives carried out as JI projects. Yet, as we have already mentioned, the Bonn agreement in July 2001 allowed 3.8% (13 million ton of carbon) more than the quantity expected. This has recently been included in the Marrakesh agreements.

This is a result of the EU's considerate decision to lower Japan's reduction burden, which is said to be disadvantageous in comparison with that of the EU (Yoshida and Ikeda 2009: 132). In Japan, the quantity of CO_2 absorbed by forests and reforestation as stipulated by the Kyoto Protocol (Article 3 Clause 3) is small (approximately 1 million ton of carbon), but that achieved through forest management under Article 3 Clause 4 covers a considerable number of forest sinks.

The quantity of CO_2 absorption that Japan can claim for on the accomplishment of its emissions' targets is mainly the quantity absorbed through the management of all the national forests, public forests, and private forests. As domestic measures, therefore, it is necessary to establish a system that will offer incentives and a CO_2 emission allowance to forest owners for their forest management. Actually, 70% (approximately 17,500,000 ha) of Japan's forests

must achieve a 3.8% absorption of CO_2 to reach their targets as sinks. If improvement in forest management remains at the current level, there is a possibility that the quantity of CO_2 that Japan can absorb will fall well short of 3.8%. Steady and general enforcement of improvements in the management of forests, an adequate timber supply and the utilization of woodland are considered to be indispensable if goals are to be achieved. In reality, we must overcome the low profitability of forests, the heavy burden of thinning and aging, and a dearth of forestry workers (Kobayashi, 2008).

Since the capability of forest sinks to absorb and discharge CO_2 is uncertain, the Bonn agreement defined limits to the intended CDM forestry project and set an upper limit to its application of 5 times 1% of emissions for the base year of the first five-year commitment period, and set limits country by country for forest management activities in conjunction with the quantity of domestic absorption. Yet, since forests themselves release fixed carbon as CO_2, the COP9 of 2003 (held in Milan, Italy) declared that, as for the CDM forestation project, any CO_2 reduction effect achieved by forestation could not be held to have "Permanence".

Consequently, the Bonn Agreement distinguished forestation projects from the other CDM projects, since it accepted that after a certain period of time targets for emissions might no longer apply. The forestation project has therefore two types of short-term time-limited CO_2 emission allowance and one long-term time-limited CO_2 emission allowance. Each type has a choice of length and renewal: one is valid for 20 years and is updatable twice (for a maximum of 60 years) while the other is valid for 30 years and is not updatable. When you purchase a CO_2 emission allowance through the CDM forest project and achieve your targets for emissions reduction, you are still required at its expiry date to purchase a further CO_2 emission allowance and make up the deficit. In other words, a sink CDM has built-in "impermanence" and a "compensation obligation", with the result that the number of its implementations is far fewer than that of the source CDM, and its price remains at low levels (Yamagata, 2006).

On the other hand, measures to prevent deforestation are vital since the fewer forests there are the less shall we be able to reduce CO_2 emissions, quite apart from our duty to protect the biodiversity of the tropical forests and preserve them in good condition.

Yet even as late as the signing of the Kyoto Protocol, deforestation was not recognized as a cause of global warming, and there is no mechanism that requires developing countries to consult on deforestation, which is a major contributor to global warming. For example, the carbon emission caused by

logging and the destruction of forests by fire is enormous; the total amount of CO_2 released by forest fires around the globe is estimated to be approximately 6 billion–15 billion tons per year (IPCC, 2007a: 527). This is an immense tonnage even in comparison with the emission of 27 billion tons of anthropogenic origin. If the prevention of peat and forest fire were to be built into the CDM mechanism, we might expect a marked effect, but, within the international framework of the post-Kyoto Protocol, it is only discussed as an action that is related to Reducing Emissions from Deforestation and Degradation (REDD).

2 Measures against global warming in Japan

2-1 The biggest problems hindering progress of the Kyoto Protocol and the reduction of emissions

Although Japan's reduction target set by the Kyoto Protocol is 6% from the 1990 levels, discharges thereafter in fact increased by 1.9%; but because of the recession, emissions after 2008 (on a quick estimation) declined. Within the original target of 6%, 3.8% was to be absorbed by forest sinks (as proposed by the Kyoto Mechanism), but what is clear, alas, is that, in spite of efforts to carry out the plans to reduce emissions, the emissions have actually decreased hardly at all.

We now need to ask how much do the marginal abatement costs amount to? A study to find out how much it costs to reduce a ton of CO_2 emissions in Japan has just started, and according to a questionnaire conducted by the Economic Research Institute of Kyoto University and sent out to 2,400 major companies, those companies which budget to reduce emissions spend, for reducing 1 ton of CO_2, 2,200 JPY. Yet, generally, the cost in fact amounts to less than this, and in many companies the cost is a minus cost, according to circumstances, for what a minus cost means in this instance is that by saving energy many companies earn a positive profit (Ikkatai, 2008).

In Japan, the biggest obstacle to any real progress in reducing emissions of CO_2 is that the principal sources of total emissions that need to be reduced and the precise reduction targets by companies have not been adequately clarified. This point is illustrated by the different procedures followed by the EU. There, the aim is the specific reduction of the emission rate according to rates of production rather than to an absolute amount. A further problem for Japan is that a concrete mechanism to reduce CO_2 such as an environmental tax or emissions trading has not been established on a countrywide basis. Without setting individual targets and concrete means to reach them, it is

natural that a target for the whole country cannot yet be properly worked out.

In 2006, The Institute of Economic Research of Kyoto University published the results of a questionnaire that it had sent out in 2005: it reported that only approximately 20% of the companies to whom it had been sent the questionnaire had responded, and only 4.5% of those companies who did respond knew what their marginal abatement costs were. A year later, in 2007, after a further questionnaire had been distributed, 58% of the companies targeted responded, yet only 25% of these companies apparently knew their marginal abatement costs. The object of the questionnaire had been to make a survey of the major Japanese companies, and, as these figures make clear, the reduction of greenhouse gases has hardly acted as a constraint for the companies. CO_2 emissions do, nevertheless, constitute a cost for a company, and actions taken to reduce CO_2 discharges undoubtedly make a vast difference to a company's overall cost structure.

2-2 The utilization of emissions trading

Since the Marrakesh Accord (COP 7, 2001) stated that "the amount of emission allowance which can be sold in emissions trading is lower than 10% of the CO_2 emission allowance allocated to the country", it becomes necessary to examine the relationship between a country's participation in international emissions trading and in its own domestic emissions trading system and environmental tax.

The UK, for instance, has initiated a Climate Change Policy that effectively combines the Climate Change Levy, the Climate Change Agreements and a Voluntary Emissions Trading Scheme. In the Voluntary Emissions Trading Scheme, the government allocates a budget of a certain scale as a discharge reduction grant and supports a company that can reduce emissions at little expense with a certain amount of money per reduction unit. A CO_2 emission allowance is issued for those companies that have deducted a quantity of reduction from baseline emissions before the reduction, and each company can accommodate its reductions over or short of the set amount of reduction through emissions trading. Emissions trading by cap and trade awards credits for all kinds of reduction of pollutant emissions and controls the total amount, while the price of the CO_2 emission allowance is estimated to be tens of thousands of JPY per 1 ton of carbon. Although this mechanism prices the emission allowance at low levels, it has achieved greater reductions than those set as targets, and has acquired greater understanding of how CO_2 emission allowance trading can work, while it recognized that there was still room for improvements in the mechanism and for setting a method to fix baseline

emissions targets (UK 2004). In 2008, the UK passed the Climate Change Act, which aims for an 80% reduction from 1990 levels by 2050, and introduced a new domestic emissions trading system (Asaoka, 2009: Part I Chapter 2).

Japan is now implementing on a trial basis an integrated domestic market system that unifies three sub-systems. One is a trial emissions trading scheme, by means of which a company sets a voluntary reduction target and promotes an emissions reduction program for the achievement of its target and for which a CO_2 emissions allowance and an accompanying credit is tradable. The second is a domestic credit system whereby major companies provide the technology and funds to certify actions of emission restraint that small-to-medium sized companies have achieved (domestic credit). The third is the Kyoto credit system, to reduce transmission of greenhouse gases to foreign countries. In 2009, over 700 companies participated in the trials.

2-3 The reduction of garbage and CO_2

The actions taken by local governments to reduce garbage and the citizens' enthusiastic response serve as a useful reference for the greater-scale reduction of CO_2. Sapporo, for example, a city with a population of around 2 million, was designated by ordinance to implement a charge for garbage collection, and since July 2009 it has achieved a garbage reduction of more than 40%. We can learn two lessons from this. The first is that local governments, Sapporo among them, were given the authority to devise and develop methods of garbage classification and charges, with neighborhood associations as the basic unit, while invoking the active participation of the citizens. The second is the motivation for reducing garbage. Faced by the financial crisis, local governments shared a common purpose in reducing garbage, since, by reducing the expense of garbage disposal, they could secure a social welfare-related budget, which in turn would inspire the local residents and promote their awareness of the need for garbage charges and proper classification. These two lessons show that it is important to transfer authority and methods from the central government to local governments, whereby the introduction of an environmental tax and the giving of financial assistance to public transportation will encourage energy saving, and thus, by making the reduction of CO_2 something that everybody can see, to motivate society at all levels. They also show the importance of constructing an infrastructure to establish a Low-carbon society with long-term prospects of success.

3 The EU's policy for the prevention of global warming

The EU has adopted various innovations in environmental policy, and has asked each member country to concentrate on energy saving, adiabatic architecture (buildings, that is, which do not gain or lose heat), and renewable energy. Moreover, it has implemented [1] eco-tax reform, [2] a subsidy for renewable energy, [3] emissions trading, and [4] a phase-down of nuclear power generation. In addition, the EU has played a particularly prominent role in establishing the conditions of the Kyoto Protocol and in setting up the United Nations Framework Convention on Climate Change. Amongst the European nations leading this campaign are the Netherlands, a country that is, in particular, likely to be affected by any rises in sea level brought about by global warming, and Germany, which was the first country to initiate actions to deal with the ever growing environmental problems.

3-1 German environmental policy

By 1991, Germany had already passed the Electricity Feed in Tariff Law, which gave electric power companies a 15-year right to purchase renewable energy at a certain ratio of the retail price. The present German Chancellor, Angela Merkel, was from 1994 to 1998 the Minister of the Environment in the Kohl Administration, and given the situation in 1995 of a voluntary CO_2 reduction target and the EU bubble, Germany had by 1998 achieved 21% of its CO_2 reduction target.

After 1998, Germany's coalition government of Social Democrats and "the Green Party" carried out a policy of eco-tax reform, raised the gasoline tax, reduced income tax, and instituted a social security tax. Since 1999, the CO_2 emissions from traffic have, as a result, been decreasing, but residents living near the border purchase from countries with a cheap gas price, and that has been a problem. The next government was a larger coalition composed of the conservative Christian Democratic Union Party (the CDU) and the Social Democratic Party, but the eco-tax reform policies have not been changed.

Thanks the Electricity Feed in Tariff Law of 1991 and the Renewable Energy Sources Act of 2000, the electrical power companies were able to take advantage of the Feed in Tariff to guarantee a price within a fixed period of time and so promote the purchase of wind power. As a result, 9.1% of Germany's total electricity consumption in 2004 was provided by sources of renewable energy. While Germany now fosters wind power as an industry, the annual number of installations of solar power panels has exceeded even the

number of wind farms, because of the low-interest rate financing system.

The use of bio-fuels has also spread by mixing their duty (5%) with that of gasoline. In 2008, Germany passed the "Act to Promote Renewable Energies in the Heat Sector (EEWarmeG)". The Act was based on the "Integrated Energy and Climate Programme (IEKP)" and it obligated architects to design buildings that would draw on thermal power to make use of renewable energy (Asaoka, 2009: Part II Chapter 1).

By 2007, Germany had accomplished a 22% reduction of its Kyoto Protocol targets; this worked out as a reduction of 21% from its 1990 levels. Half of this reduction is accounted for by the conversion of inefficient facilities run by the former East Germany and, after unification, by a subsequent drastic decline in their production rates; the other half depends on energy saving in what was formerly West Germany. The reunified Germany has no present plan, however, to purchase emissions from other countries, while the CDM is left to operate on a private basis. Already, 1.8 million people work in environmental-related industries, where environmental policy is combined with technological innovation, investment and employment. Germany has crafted an eco-industrial strategy based on the assumption that the market in the 21st century will be "green" (Umwelt Bundes Amt, 2009), and it plans that by 2020 it will have reduced CO_2 emissions by 40% from their 1990 levels, while creating jobs for 400,000 people in the field of renewable energy.

Germany has a clear strategy by which it hopes to lead the world in the fields of renewable energy and environment-related policies by setting itself ambitious targets and standards. The government guarantees this by application of a long-term and reliable environmental policy and stable conditions that will make effective use of the Feed-in Tariff. In this way, Germany intends to extend its export competitiveness and improve its conditions of employment.

3-2 The policy of the Netherlands

The Dutch worked as key players in the establishment of the Kyoto Protocol and have led the EU (Chapter 4 reference) in seeking to fulfill its targets. They have reduction targets for emissions of 6% from 1990 levels and plan a 3% reduction within the country and a 3% reduction in transfers to foreign countries. The Dutch government uses CDM, JI, and emissions trading as measures of external policy, and, to show its eagerness for the reduction of CO_2, it has sought competing bids for funding CERUPT (CDM-related Unit Procurement Tender), ERUPT (JI-related Unit Procurement Tender). As a result, the Dutch have acquired experience of CDM, yet

amongst nearly 20 CDM projects in which the Netherlands originally invested, only 5-6 programs have survived. Recently, they have concentrated on external assignments in cooperation with the World Bank and regional development banks, not in the Netherlands alone.

3-3 The emissions trading system

The Kyoto Protocol gave the EU an emissions target of an 8% reduction from 1990 levels. Consequently, after the establishment in 2000 of 12-13 working groups and with participants from approximately 300 concerned organizations, the EU decided, after consideration of measures that would ensure transparency and cost-effectiveness, to demarcate 12 priority areas and 5 priority sectors. The 12 priority areas include, amongst others, a combined (energy) cycle, suitable treatment of the biomass and strict maintenance of the infrastructure, while the 5 priority sectors consist of electricity generation, the ceramic industry, iron and paper manufacturing, the oil industry — the sectors, in fact, that account for about half of the total of CO_2 emissions.

In line with the Kyoto Protocol and starting in January 2005, the EU agreed to the equivalent conversion of the CO_2 emission allowance of CDM and JI to the EUA (1 ton of CO_2 = EU allowance) and the emissions trading system (EU-ETS) within the EU, a system that ties emissions trading with CDM and JI. The amount at auction (an emission allowance bidding system) of distributing the CO_2 emission allowance for a price is limited to a maximum of 10% by the terms of the first nation distribution plan (2005-2007), and a maximum of 5% by the second nation distribution plan (2008-2012). The remainder is distributed by "grandfathering" (i.e., gratuitous distribution) on the basis of the established emissions. A company that cannot achieve its target pays a penalty (in 2005-2007, 40 euro per ton, afterward 100 euros per ton), or must make up the balance in emissions trading.

Since this mechanism focuses on the 5 priority sectors and deals with approximately 15 thousands companies, it does not inhibit the independent actions of each individual country within the Union. It is estimated that this system will enable countries to reduce to half the accomplishment expense of the Kyoto Protocol (from 6.8 billion euro to 2.9-3.7 billion euro). Approximately 3.1 billion tons of CO_2 was traded in 2008 and the business total sum reached about 9 trillion JPY ($90 billion).

One problem of emissions trading is that because an initial allocation had been held by the grandfathering system and was based on conventional results, "a windfall benefit" was derived from capping the price of electricity in the electric power industries. Since, furthermore, the allocation of emission

allowance throughout the EU had been lax, the need for emissions reduction fell and in early 2007 the price of 1 EUA slumped to nearly 1 euro. Actually, the price of the EUA tends to be linked to the price of crude oil, which shows that in thermal power plants the EUA is largely influenced by fuel conversion from natural gas to coal. It is apparent that the EU-ETS is bringing in a fuel substitute, but its effect on promoting a Low-carbon technology is limited (Masuda, 2008: 158).

The second nation distribution plan (2008–2012) stated that countries should deal with and improve on the issues mentioned above by aiming for increased transparency and simplification of the system. So, from 2012, for instance, the greenhouse gases emitted by airplanes in European air space will become subject to the EU emissions regulations, while, in response to post-Kyoto Protocol, there is a further plan to shift the business to auction progressively from 2013 onwards.

The expansion of emissions trading is important for the EU, not only within the EU itself but also in terms of its foreign relations, particularly with the US, and it is hoping, for instance, to participate in emissions trading with Canada and Japan. Connections with countries outside the EU can be created by CDM and JI, and because a big market is thereby created it becomes an incentive for private enterprise. Since the practice of emissions trading is expected to act as a means to allow the US to return to the Kyoto Protocol, it is necessary that before this can happen emissions trading in Europe must be seen to function well. Actually, the EU-ETS (emissions trading) market tripled in size from 2006 through 2008 and grew by more than three times from 2005 through 2006.

Since the end of 2009, all 27 EU countries have been obliged to introduce the carbon tax (environmental tax), while an emissions trading system has been introduced to add to other measures already being taken to counteract global warming.

3-4 A new direction of energy policy for the EU

The energy policy target of the EU, as devised by the European Commission, is the strategy of "20 20 20 by 2020": that is, by 2020 the developed countries will have reduced their emissions of greenhouse gases emissions by 30%. The EU has already promised to reduce emissions by 20% and, through the working of a more satisfactory global agreement, it will, by 2020, increase reductions further by a 20% improvement in energy efficiency, by a 20% increase in their share of renewable energy, and by a 10% rise in the use of bio-fuel for transportation.

If Japan is obliged to depend upon the import of such sources of energy as oil and natural gas to meet increasing demands, we shall inevitably have to face the issue of price increases. Yet if, by contrast, we do as the EU has done and increase investment in the means to improve the efficiency of energy use by adopting policies of renewable energy and new technologies, this will contribute to growth and to better prospects of long-term employment. The EU is already the world's leader in wind power, of which it has sold 20 billion euros' worth (approximately 3 trillion JPY) and created employment for 300,000 people. In this way, the EU has the potential to take the lead in building a Low-carbon technical market that will assist in the battle against global warming, and by these means Europe will be able to switch to a Low-carbon society, able to economize on energy while still being highly efficient. This new European energy policy ushers in a new Industrial Revolution and while it will stimulate the use of local clean energy and improve the security of the European energy supply, its ultimate aim is to strengthen its economic competitiveness (EU, 2007). And although such kinds of regulation will directly hit the sales of large luxury cars, which are the most profitable models produced by German carmakers, the apparent aim is to promote the innovation of car technologies by imposing the constraint of CO_2 reduction.

4 Halving emissions by 2050: the problems

4-1 Plan to reduce emissions to half by 2050

The Heiligendamm Summit of 2007 agreed that because the anthropogenic emissions of greenhouse gases had become approximately twice as great as could naturally be absorbed, we "should consider seriously that by 2050 we should reduce CO_2 emissions by half". The L'Aquila Summit of 2009 went further and agreed that "by 2050 the developed countries must attempt to reduce their greenhouse gases emissions by more than 80%". The grounds for stipulating an 80% reduction are found in the Stern Review (the UK), which based its conclusions on a country's income and its historical responsibility, and calculated from per-capita emissions that countries with a rich economy have the responsibility of reducing their emissions by 60–80% from 1990 levels (Stern, 2006: 537–539).

If we hope to achieve such a target, however, we shall need — as indispensible prior conditions — a total reform of a country's social and economic systems, radical innovations and an environmental tax. We shall also have to ensure that China and India agree to cooperate in such programs of energy saving, for only by cooperation in the fields of the environment and the

economy — the basics of political cooperation — shall we be able to establish the conditions for building world peace. This is the chief lesson that the EU has taught us.

The EU started life as the European Coal and Steel Community and went on to achieve such significant results in measures to protect the environment that today it provides all the global standards; it was the EU, too, that took the initiative in formulating the Kyoto Protocol. The most important lesson that the EU has taught us is that political dialogue between countries must be founded on cooperation in matters that affect the environment and the economy, since these affect us all equally: what we do in our own little corner of the world has repercussions for those who live on the other side of the globe.

4-2 Cooperation with China and India

The CO_2 emissions from the coal-fired plants that are in the process of being built in China and India over the ten years from 2006 through 2015 will decide the emissions in 2050 and afterwards, depending on what kind of techniques are used for the facilities (cf. Figure 9-2). If things go on as they are, the world's energy-related CO_2 discharges will, by 2050, have risen by 57%, but we can equalize this if we choose a different policy scenario (Zhang, 2010), which means that the participation and cooperation of China and India in introducing energy saving technology will be absolutely essential.

When we consider that a quarter of all emissions are related to goods exported from China, which has become the world's greatest exporting country and the largest emitter of CO_2, then we understand how vital it is that the developed countries, Japan amongst them, should cooperate fully with China

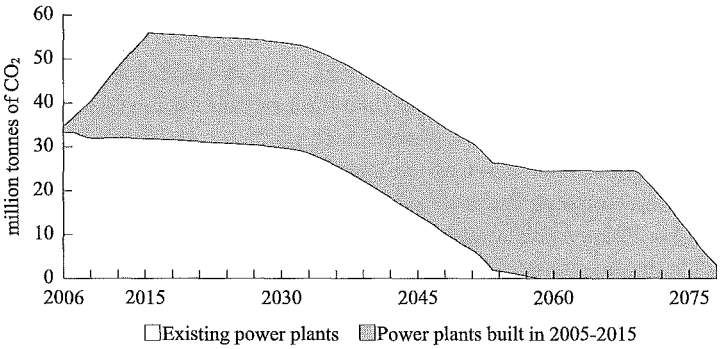

Figure 9-2 CO_2 emissions from coal-fired plants which built before 2015 in China and India (Zhang, 2010).

in seeking to overcome the dangers such emissions entail.

4-3 The necessity for principles, frames, strategies and the feasibility of "The Low-carbon society"

So, to summarize our argument so far, we strongly urge Japan to change its present attitude towards the global warming problem and introduce the following principles, frames and strategies to wrestle seriously with the challenges that global warming poses:

- A Basic Act for global warming control
- A Long-term reduction target (80% reduction) by 2050 and a mid-term target (25% reduction, 10% of renewable energy use) by 2020
- The Introduction of an Environmental Tax
- An emissions trading system
- The promotion of innovation and a prevalence system for Low-carbon society, a Feed in Tariff of the renewable energy
- A policy unification (climate security policy, technological innovation policy, competitiveness policy, employment policy)

We may therefore say that Japan, as a representative of the developed countries, needs, on the basis of these principles and strategies, to prepare a radical new policy system for immediate realization so that she may close the gap between the present policy and what must take its place. In 2009, the first administration of the Democratic Party of Japan took office and among their policy objectives, they set out the goal of a 25% reduction by 2020 of emissions from 1990 levels. Although they have tried to enact a Basic Law for the prevention of global warming, it will be necessary to work out as soon as possible a much more specifically detailed and concrete plan.

4-4 "Limitation creates Innovation"

Denmark hosted the COP15 gathering, held in Copenhagen in December 2009, to set the framework for measures to be taken against global warming after 2013. As we have already mentioned (Chapter 4), the posters in Copenhagen's Design Center featured the slogans "Limitation creates Innovation" and "Dialogue creates Inspiration".

In the 1970s, with its back to the wall, Denmark developed a strategy to deal with the oil crisis of that decade: it reduced dependence on fossil fuels, froze plans to construct nuclear power plants and pursued every possibility avenue for tapping into sources of renewable energy. As a consequence of these efforts, Denmark became the world's leading country in the utilization of wind power and biomass.

Looking in retrospect at Japan's innovations during the postwar period, we may take note that when, in 1970, Japanese companies responded to the regulations regarding gas emissions from American cars by reducing their own car emissions, they succeeded, within 30 years, in reducing them to less than 1% of their former rates. The American auto industry, however, postponed regulation enforcement, which resulted in a loss of international competitiveness and a decline in their fortunes.

After the war, as we have seen, Japan was constrained by her limited space, her high population density and her few natural resources to develop energy saving technologies. She also needed to respond to citizens' movements organized in protest against the pollution that attended the period of economic growth, and so began to foster the ideas of green technology and its corresponding systems. The limitations imposed by her lack of natural resources and by her particular social constraints forced Japan to create both her own energy sources and the environmental technology and systems needed to operate them.

Today, as time passes and the pains inflicted by global warming are felt throughout the world, Japan is once again being tested to see whether she can take the lead in establishing a world-wide Low-carbon society that is able to support "sustainable development" in environmental, economic and social matters, thus predicting the future direction of the 21st century. There is certainly no doubt that the target for developed countries to reduce by 2050 80% of their greenhouse gases emissions by energy saving and renewable energy is a difficult challenge. If she hopes to meet this challenge, Japan must blaze a new path, and, on the basis of her past achievements, she must strive to propel — as two wheels of one cart — technical development and reformation of the social system to work in greater harmony with the natural world.

The Japanese government has been writing a roadmap for reducing greenhouse gases (25% by 2020). The roadmap's proposed regulations specify the technology required: in the industrial sector a next-generation coke oven diffusion rate of 50%, in the home 10 million households with solar power, in transportation a power-hybrid car ratio of over 60%.

Yet, as we mentioned in Chapter 6, it is necessary to preserve a range of choice once the reduction targets have been announced by not designating the actual reduction measures to be taken; and to offer stronger incentives for the concerned parties to take such measures on their own initiative, we need a sound system design, the introduction and implementation of an environmental tax and the emissions trading system.

It is important to work out what we hope to have achieved by 2050,

overview it carefully, select concrete targets for 2020 and the means to reach them, and then carry them out with true seriousness of purpose.

5 The road to an abundant "Low-carbon society" after the Kyoto Protocol

While the United Nations Framework Convention on Climate Change and the Kyoto Protocol are important first steps on the road towards the prevention of global warming, the system design for what is to happen after 2013, the period of "the post-Kyoto Protocol", still retains many problems (Takamura and Kameyama 2005: 52–53).

The first problem is that even if the targets of the Kyoto Protocol were to be accomplished, the amount of reduction would remain at 5% from 1990 levels, and the total reduction quantity would decrease still more because of America's withdrawal from the Protocol.

We have to set feasible short-term and long-term goals and create a structure that will enable us to accomplish them.

The second problem is the doubtful participation of such countries as the US, China, and India, although even in the US individual states and companies with a global business have been making efforts to reduce emissions, and there is a possibility that the country itself will cooperate with the EU in emissions trading. Yet before we can create an international cooperation framework for long-term technical development, it will be necessary to encourage President Obama to bring America back into the UN process. China and India, too, would profit from the reduction of the greenhouse gases if they were to engage seriously in pollution-abatement measures and resources saving.

The third issue is a fair distribution of the burdens of reduction. Since the developed countries' reduction targets set by the Kyoto Protocol were not based on objective grounds but were the product of political compromise, two core problems of the system design will remain after 2013: fairness of burden distribution and cost efficiency.

The fourth problem, if we really mean to solve the problems of global warming, concerns the vital structural rearrangements that must be effected in the way human societies make use of energy and the resources of the environment, since all that the Kyoto Protocol does is determine the incentives that might bring this about.

It is therefore time to plan how — through the development and the spread of technology and a reform of the system — we are to convert our

wasteful consumers' society into an abundant "Low-carbon society", while hoping to correct the North-South imbalance, which, in this particular area of fundamental inequality, is responsible for the huge difference that exists between per-capita emissions.

BOX 9-1 Citizens' effort to boost community wind power

A noteworthy case of citizens' effort to disseminate the doctrine of renewable energy is the "Green Energy Tariff", an idea introduced by the Hokkaido Green Fund (HGF).

The Green Fund accumulates an extra 5% in money through a monthly electricity tariff for the foundation of an environmental-friendly "Community power plant", in which it invests the money.

Since HGF debits the electricity tariff and the Green Fund from members' bank accounts and pays it to Hokkaido Electric Power, members are not required to change their methods of payment.

Instead of tacking the cost on to electricity bills, HGF appeals to members to save electricity by generating 5% for the Green Fund.

The HGF has paid for the construction of a Community power plant with funds accumulated by donations like the Green Energy Tariff.

The HGF built Japan's first Community power plant "Hamakaze"-chan (in Hamatombetsu-cho, Hokkaido) in September 2001. After that, they constructed a second plant "Tempumaru" (in Akita prefecture), and cooperated in the construction of Aomori Prefecture's first plant "Wanzu".

In 2005, a Community power plant was built in Ishikari-shi, Hokkaido, and by 2009 11 Community power plants were in operation throughout Northern Japan. Around 4,000 people have invested in the HGF and the total contribution by the members has so far come to about 2.3 billion JPY.

The social significance of this activity stems from the search for a new form of civic activity that goes beyond the simple cooperative movement that was organized in Hokkaido against nuclear power plants and had simply called for a public referendum ordinance.

Directives for the future: [1] expand the practice of community wind power, [2] set up local businesses of environmentally-friendly energy production other than wind power, [3] construct a system that enables us to select which type of energy to buy, [4] create a single profitable through saving energy source, [5] expand the local liquidity of money.

Approaches such as these are important examples of the principles, framework, and strategies for building a sustainable Low-carbon society.

As we noted in Chapter 8, companies that generate wastes are guilty (as

is the economy which supports them) of wastefully squandering precious resources, and it does not follow that our efforts to save the environment will conflict with our efforts to save the economy. Indeed, the contrary proposition is true: if we are careful about saving fossil fuels to prevent a climate change, this will also lead to a reduction in business costs, while, at the same time, it will reduce air pollution and have a positive influence on human health. What I am arguing throughout this book is that efforts to prevent climate change and economic development are not opposed to each other, or each other's interests: if approached sensibly, they assist each other.

What does follow is that an increase in the price of resources and the constraints imposed on the environment are inextricably related limitations that will promote companies to innovate.

The Stern Review, written at the instigation of the British Government, states that we only need to invest 1% of the global GDP in order to avoid climate change, but that if we do not take action now the economic damage will amount later to 5–20% of the global GDP. The Review concluded that the benefits of strong, early action to avoid change would considerably outweigh any immediate costs (Stern, 2007: Summary of Conclusion).

The four pillars of the proposed countermeasure are emissions trading, a technical cooperation framework, countermeasures to reduce deforestation, and speedy adaptation to the warming that has already occurred and now threatens many exposed communities.

A further seven targets and measures are also necessary:

[1] targets for the reduction of CO_2 emissions to be set not only for the developed countries but also for the rest of the world, [2] Role and target, conditions, the CDM for developing countries, [3] international emissions trading, [4] forest preservation measures, [5] technical development and transfer, [6] adaptation, [7] a fund mechanism (Stern 2009: 149–180)

Since the effects of CO_2 emissions and the actions taken to reduce them have already become global in their reach, the Problems that will follow the Kyoto Protocol after 2013 can no longer be negotiated by the CO_2 manufacturing countries alone.

Since a "Cost-Benefit Asymmetry" occurs when an actor cannot benefit directly from his efforts to reduce CO_2, it becomes necessary to establish a system whereby everybody can reduce emissions in a peaceful manner. At the same time, the G8 summit in L'Aquila in 2009 agreed that while "the developed countries should aim at an 80% or more reduction of greenhouse gases by 2050", a commitment to discharge restraint and efforts to reduce emissions by the developing countries are equally indispensable. And since the flow of

funds and investments necessary for the large-scale reduction of CO_2 and the subsequent adaptations will be enormous, we shall require the establishment of a suitable fund and an appropriate investment mechanism (Takamura, 2009).

Summary

No one denies that the economic system that came to birth during the Industrial Revolution has depended for its subsequent growth on fossil fuels. Nor does anyone doubt that the destruction of nature through the thoughtless expropriation of resources on the one hand and the mass generation of waste and CO_2 on the other have together been busily creating "the unsustainable society" on a massive global scale. What does remain a matter of dispute, however, is an answer to the questions "What kind of society should we put in its place? What sort of model do we want to adopt for the 21st Century if humanity is to survive to see the end of it?"

Amartya Sen himself, as we reported in Chapter 3, has pointed out that income as the index of economic growth does not correspond to the standards of the good life of human beings, to, that is, their wellbeing. In Sen's view, the purpose of the economy is to improve the welfare of the people while reducing the environmental load.

Another obvious problem that needs to be resolved is that differences of per-capita CO_2 emission by country makes it difficult to realize the aim of "environmental fairness". If "fairness" is to be achieved, the developed countries must, by 2050, reduce their emissions 70–80%, as the EU has recommended, while the developing countries must, by the same date, reduce their greenhouse gases by half.

To that end, radical innovation and system reform are crucial, and the global environmental problem asks Japan to follow a particular course in the 21st century that may benefit the rest of the world. It depends on the choices that the Japanese themselves make whether Japan can take on world leadership in environmental technology and mechanism in the 21st century by adopting the lesson that Japan has learned from Denmark — "Limitation Creates Innovation" — and thus, by securing an independent position in Asia, play a role especially in the economic development of the Chinese people, too, in all their ethnic variety.