

Kyoto Protocol Group
How can Japan meet the Kyoto target?
~Consideration of cost-effectiveness and certainty~

The 7th Keio and Tsinghua Student's Environmental Symposium

How can Japan meet the Kyoto target?

~Consideration of cost-effectiveness and certainty~

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Abstract

The Kyoto protocol was adopted at COP¹³ in December, 1997. Japan ratified it in 2002, and has taken obligation to reduce GHGs emissions by 6% in first commitment period (2008-2012) compared to 1990 level. Therefore, Japan has had “the Government Actions plan for coping with global warming” since 1998, and revised it in 2002. However, it does not work very well. In order to meet the Kyoto target, Japan needs to take additional actions.

Because of twice “oil crises”, Japan has tried to improve their energy efficiency. As a result, Japan has become to be one of the highest energy efficient country. However, at the same time, Japanese marginal abatement cost becomes to be much higher than other countries. Concerning that, under the protocol, there are Kyoto mechanisms to help reduce the cost.

In this paper, taking compatibility of economy and environment into account, we propose that Japan should increase the proportion of Kyoto mechanisms as additional actions. Moreover, in terms of Japanese contribution to the world and certainty of actions, we propose that Japan should perform CDM actively.

We hope that our proposal will be the breakthrough to the Japanese plan for coping with global warming.

¹ Conference of Parties

Chapter 1: Kyoto Protocol and Japan

In this chapter, the summary of the Kyoto protocol which is the international regime for coping with global warming and the Kyoto mechanisms are going to be explained.

1-1 Summary of the Kyoto protocol and Japanese target

1-1-1 Summary of the Kyoto protocol

The first IPCC assessment report that was published in 1990 pointed out the seriousness of global warming. In 1992, United Nations Framework Convention on Climate Change was adapted, and it entered into force two years later. The purpose of this framework convention is that “The ultimate objective of this Convention...is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”². However, there were not any concrete measures to prevent global warming. In 1995, the second IPCC assessment report was published, and it said that “to stabilize of the CO₂ concentration at its present level could only be achieved through an immediate reduction in its emissions of 50-70%.” According to those reports, the world became to need to have concrete measures against global warming immediately. In 1997, the Kyoto Protocol was adapted at COP3 which was held in Kyoto, Japan. It has two important characteristics. One is that the Annex I countries (mainly developed countries) have the target to reduce or limit greenhouse gas emissions between 2008 and 2012, and try to reduce the average of their emissions by at least 5.0% compare to 1990 level. Each Annex I country also has each target. This target was decided by political negotiations. For example, Japan has to reduce 6%, for USA is 7% and for European Unions is 8%. The other characteristic is that using the Kyoto Mechanisms is accepted to reduce emissions cost-effectively. This will be explained later.

The Kyoto Protocol is not entered into force in November, 2004. According to the article 25 of the protocol, “this protocol shall enter into force on the 90th day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55% of the total CO₂ emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession”. The current situation is that the number of parties reached to 126 parties, and Russia ratified the protocol on November, 2004. Therefore,

² UNFCCC HP

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the rate of the total CO₂ emissions for 1990 of the Parties included in Annex I is more than 55%, as a result, Kyoto Protocol will enter into force in February, 2005. As mentioned above, Japan ratified it on 4th January, 2002, thus Japan has to reduce their emissions by 6%.

1-1-2 Japanese target

Figure 1-1 shows “GHGs emissions in 2002 and targets”. The total emissions of Japan in 2002 are over 8% compare to 1990 level. This means that Japan need to reduce by 14% to meet the target. In 2001, the United States declared their withdrawal from the Kyoto Protocol due not to be able to meet the own target. As figure 1-1 shows, it is also very difficult for Japan to meet the target compare with EU. According to this, Japan needs to use the Kyoto mechanisms actively.

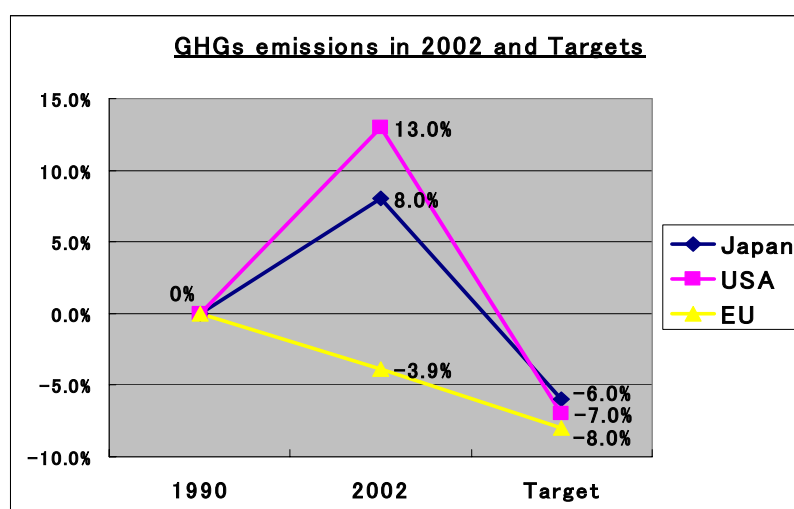


Figure 1-1³

1-2 What is the Kyoto mechanisms?

The Kyoto mechanisms are one of flexibilities under the protocol. It consists of three mechanisms which are JI (Joint Implementation), CDM (Clean Development Mechanism), and IET (International Emission Trading). Through these mechanisms, many Annex I countries would meet their target less cost compare to the case that actions are only by domestically. Because Japanese marginal abatement cost is high, we think that the Kyoto mechanisms are also useful measures for Japan.

³ Based on EEA HP and US EPA HP, made by own

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(a) Joint Implementation

JI is the system which Annex I countries would carry out the project to reduce GHG emissions with other Annex I countries in them. An investment country would get all or part of emission reduction as credits. In JI, there are two procedures. One is track 1 and the other is track 2. Which procedure is taken is depend on whether a host country can meet all eligibility requirements or not. If a host country can meet all eligibility requirements, track 1 would be applied. However, if a host country cannot meet all, track 2 must be applied. More details about will be explained in Chapter 3.

In track 1, at first, a projector would plan the emission reduction project, and it must be approved by investment and host country. After that they carry out the project, and get ERU (Emission Reduction Units). On the other hand, in track 2, the projects must be approved by the third party that is called “the Article 6 supervisory committee” as well. Getting ERUs will be available after 2008.

(b) Clean Development Mechanism

CDM is the system which Annex I countries can reduce GHGs emissions in non-Annex I countries instead of doing so domestically. This is almost same as JI except for host countries and procedure. As mentioned above, whereas host countries of JI are Annex I countries which are mainly developed countries, host countries of CDM are non-Annex I countries which are mainly developing countries.

CDM has only one procedure. It is almost same as track 2 in JI. There is also the third party that is called “CDM Executive Board” to examine and approve the projects and credits. The credits of CDM are called CER (Certificate Emission Reduction), and Annex I countries can utilize CER to meet their target. Getting CERs has already been available since 2000.

(c) International Emission Trading

IET is the system which GHGs emissions allowances can be traded among Annex I countries. There are four kinds of credit which are available in this system, which are AAU (Assigned Amount Unit), RMU (Removal Unit), ERU, and CER. According to the principle of emission trading, the marginal abatement cost of each country would be equal and Social abatement cost would be minimized. IET will start after 2008.

Chapter 2: Japanese Strategy until now

In this chapter, we will describe Japanese strategy for coping with global warming until now. Then we will describe current situation in Japan.

2-1 The Government Action Plan for coping with global warming

2-1-1 The Government Action Plan 1998

Just before the COP3, “the relation council joint session about the domestic actions against the global warming issue” was held in November, 1997. In the session, the agreement as Japan including the industrial world was accomplished. It was the plan to suppress the emission of energy origin CO₂ increase in zero with taking actions in the industry, transportation, household · business sectors⁴ under the estimates that Japan’s emission of energy origin CO₂ in 2010 increase by 20% to 1990 level when not taking special actions⁵. However, in the Kyoto Protocol, Japan has been under 6 % of reduction obligations. Therefore, the government incorporated addition actions by the utilization of “Sink” and “Kyoto mechanism” and so on into the plan in a hurry (Figure 2-1) . These contents were specified as “Government action plan 1998 ” in June, 1998 and as clear from it, Japan’s main part of the actions to meet the Kyoto target is the domestic actions. Specifically, as for the domestic actions, it consists of the direct regulation such as the reinforcement of the law about the rationalization of the use of the energy (the energy saving law) and “Industry’s voluntary initiative”. And it also depended on technical development, the change of a national life style, etc.

2-1-2 The Government Action Plan 2002

Japan proceeded with the revision and the establishment of “the Government action plan 1998” to meet the target. However, in June 2001, the Ministry of Environment announced that Japan’s total emission of the greenhouse gas in 2010 would increase by 5-8 %⁶ to 1990 level⁷. In July, 2002 the Ministry of Economy, Trade and Industry (METI) said that Japan’s energy origin CO₂ in 2010 would increase by 7%

⁴ In addition to this, Japan attended the Kyoto conference with the prospect that Japan reduces 0.5% in CH₄ sector and 2.0% by Technological Innovation.

⁵ Increase of 20 nuclear power plants, introduction of new energy and an average of 2% economic growth rate in 2001～2010 are the premises. (Prime Minister of Japan and his cabinet HP)

⁶ In the case that nuclear power plants are established additionally by 13 and 7 respectively. When drawing up “Government action plan 1998”, the estimated number of increase of nuclear power plants is 20.

⁷ Ministry of Environment (2001)

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to 1990 level⁸. On those estimates, in March 2003 Japanese Government decided “Government Action Plan 2002”. The breakdown of the 6 % reduction in the “Government Action Plan 2002” is as in table 2-1. While domestic actions is same as “Government action plan 1998”, the utilization of the Kyoto mechanisms decrease to 1.6 % because of the increase of sink’s upper limit in Marrakech Accord. Indeed, considering total emission of the greenhouse gas in 2002 is 7% to 1990 level, 1.6 % of necessary emission reduction 13.6 % is only 12%.

“Government Action Plan 2002” has four basic principles in implementing actions against global warming. Those four are “Compatibility of economy and environment”, “Step by Step”, “Shared responsibility” and “International cooperation”.

“Compatibility of economy and environment” means that Japan should design the actions against global warming to activate economy or create employment. “Step by Step” is the concept that Japan divides 2002～2010 to 3 steps and review in each step. Specifically, the 1st step is 2002～2004, the 2nd step is 2005～2007 and the 3rd step is 2008～2012. Now, Japan is in the end of the 1st step and reviewing the actions of the 1st step for the following steps. “Shared responsibility” means that all entities, such as Government, industry, household and so on, should tackle the global warming issue. “International cooperation” is the description that Japan is conscious that United States’ leaving from the Kyoto Protocol and developing countries don’t have reduction target. Because the cause and the influence of global warming are global, all countries should make an effort toward the reduction of the greenhouse gas. Furthermore, in addition to the effort of every country, further efforts under the international cooperation are indispensable.

In Japan, based on above concepts, actions against global warming have been implemented.

⁸ METI (2001)

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Table 2-1⁹ The breakdown of 6% of reduction

	Rate of Reduction	
	Action Plan 2002	Action Plan 1998
Energy origin CO2	±0.0%	±0.0%
Technological Innovation and Life Style	-0.5%	-0.5%
Non-energy origin CO2 · CH4 · N2O	-2.0%	-2.0%
HFC · PFC · SF6	+2.0%	+2.0%
Sink	-3.9%	-3.7%
(Kyoto Mechanism)	-1.6%	-1.8%
Total	-6.0%	-6.0%

2 – 2 The current situation in Japan

As mentioned above, now, Japan is reviewing “Government Action Plan 2002” for following steps. In this review, the Ministry of Environment¹⁰ and the METI¹¹ announced that Japan’s energy origin CO2 in 2010 would increase by 8.4 % , 2.6~4.7% respectively to 1990 level and Japan’s total emission of the greenhouse gas in 2010 would increase by 6.2~6.7 % , 3.7~5.5% respectively to 1990 level.

Japan’s total emission of the greenhouse gas in the base year¹² is 1,237Mt-CO2. So, to meet the Kyoto target, -6% to 1990 level, Japan needs to reduce to 1,163 Mt-CO2. However, actually, Japan’s total emission of the greenhouse gas in 2002 is increasing by 7.6 % to 1990 level that is 1,331 Mt-CO2¹³. So, after all, Japan needs to reduce by 13.6% to 1990 level. When viewing the breakdown of CO2 emission according to the departments, in 2002, CO2 emission of the industry department decreases by 1.7% to 1990 level, that of the transportation department increases by 20.4% and that of the household · business department increases by 28.8% · 36.7% respectively¹⁴. It can be said that at present the degree of contribution of the transportation · household · business sections are high.

Also, Japan had two oil crises in 1970’s and Japanese industry made an effort

⁹ Global Warming Prevent Headquarter (2002)

¹⁰ Ministry of Environment (2004)

¹¹ METI (2004a)

¹² About HFC · PFC · SF6 is year 1995 and about the others are year 1990.

¹³ Ministry of Environment HP

¹⁴ Ministry of Environment HP: The actual targets in “Government Action Plan 2002” are -7% of the industrial department, +17% of the transportation department and -2% of the household · business department.

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to develop energy saving technologies. As a result, Japan has been maintained one of highest energy saving countries in the world¹⁵ and is faced with high marginal abatement cost to meet the Kyoto target. From Figure 2-2, the cost of Japan to meet the Kyoto target is higher than that of EU and United States.

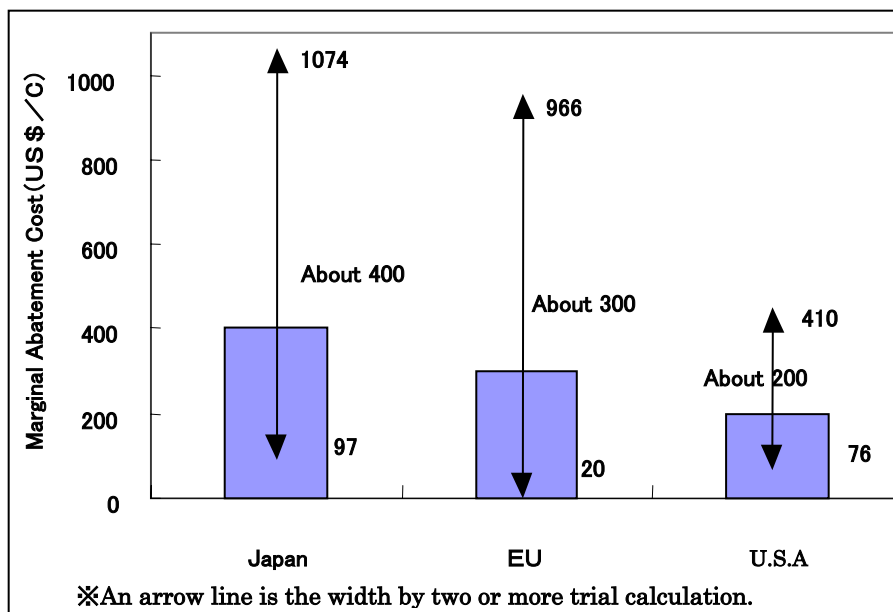


Figure 2-2¹⁶

¹⁵ Actually, according to the newest IEA/OECD (2004), primary energy/GDP of Japan (1995 price) are changing the minimum in the world after the 1970's. Although there is criticism that it is necessary to measure by purchasing power parity from NGO etc., Japan ranks among 30 percent of energy efficiency higher ranks even if it measures by purchasing power parity. It is probable that Japan's high energy efficiency has affected marginal abatement cost.

¹⁶ IPCC (2001)

Chapter 3: Increasing the proportion of the Kyoto mechanisms

In the previous chapter, it was clear that Japan tried to reduce GHG emissions mainly by domestic actions rather than by Kyoto mechanisms even though having high marginal abatement costs compared with other developed countries. Taking the compatibility of economy and environment into account, the total cost for additional measures to global warming should be minimized. Japan should utilize more Kyoto mechanisms whose marginal abatement costs are expected to be low. In this chapter, we will examine how much Japan should increase the proportion of Kyoto mechanisms.

3-1 Basic Principle

The purpose of increasing the proportion of Kyoto mechanisms is lowering the total cost of additional actions as we mentioned before. In order to lower the cost, we need to compare the cost of additional domestic actions with that of CDM, and to choose the lower one. In addition to the cost-effectiveness, we also take account of the feasibility to increase Kyoto mechanisms. It is expected that the proportion of Kyoto mechanisms should be increased as a result, so we will discuss it later in 3-2.

3-1-1 Performing CDM activities firstly

There are three Kyoto mechanisms; International Emission Trading, CDM, and JI as we described them in chapter 1. Among these three mechanisms, we think that CDM has priority over Emission Trading and JI. There are two reasons for it. First, CDM has certainty of getting credits rather than Emission Trading and JI. Second, CDM can transfer technology into developing countries.

① Certainty of getting credits

We will explain why Emission Trading and JI do not have priority compared with CDM when thinking about certainty of getting credits. First, we will refer to why Emission Trading is not appropriate for main additional actions in comparison with CDM/JI. Actually each mechanism has uncertainty of getting credits, but it is more possible that Japan cannot achieve the Kyoto target when we decide to depend on mainly Emission Trading as additional measures. When comparing getting credits through CDM/JI projects with through Emission Trading as main additional measures of Japan, it is clear that the latter has more risk in terms of compliance with Kyoto. For example, if in 2012 it turns out not to get credits as expected in both situations, for

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the former there is one more option, Emission Trading, to achieve the target though it has uncertainty. On the other hand, for the latter, it is impossible to develop CDM/JI projects and get credits during the year 2012. According to World Bank experience, 5 to 7 years lead time is needed until getting credits from the start of CDM/JI projects¹⁷. Moreover, WB, IEA and IETA (2004) shows that lead time is about 9 months to 60 months (5years), taking account of every project from small size to large one. In other words, CDM/JI activities cannot generate credits as soon as these projects start, which is a different characteristic from Emission Trading. Therefore, if depending mainly on Emission Trading as Japanese additional measures without taking other measures and turning out not to get enough credits in 2012, Japan cannot help failing to meet Kyoto target automatically. Although, of course, it is necessary to prepare for International Emission Trading, Japan firstly should give CDM/JI projects priority as additional measures and start to prepare for them as soon as possible.

Next, we will explain why we do not think JI is better as main measures compared with CDM. When host countries of JI activities for Japan are just Russia and Ukraine, there are two reasons for this; (a) JI-related system still undecided, and (b) little information on both countries' JI-related behavior and criteria¹⁸.

First, we will mention why host countries for Japan are just Russia and Ukraine. We can perform JI projects with central eastern European countries (economy in transition countries: EIT) besides Russia and Ukraine. However, we think that it is difficult to perform JI projects with these EIT countries, because they are member countries of EU and EU has their own emission trading system called EU Emission Trading System (EU-ETS) ¹⁹. EU-ETS will start in January, 2005 and there is a possibility that the access for JI projects to central eastern Europe by countries besides EU members like Japan will be limited systematically.

(a) JI-related system still undecided

We will explain that the system related to JI is not decided yet in comparison with CDM when only Russia and Ukraine can be host countries for Japan. Actually there are two types of procedures which host countries of JI can take; track 1 and track

¹⁷ METI (2004d)

¹⁸ From here, we will mention the risk when Japan performs JI activities as main additional actions, and consequently Japan should carry out mainly CDM projects. However, if we can avoid the risk and uncertainty of JI activities, JI should be taken into account as additional actions of Japan.

¹⁹ IEEJ (2004b) EU Emission Trading Directive on EU-ETS starting in January, 2005 was adopted. The Article 11 b (1) of the draft Linking Directive shows the baseline of JI projects is necessary to be based on *acquis communautaire*. Therefore, there remains a risk of restrictions being put on the operation of projects in the future.

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2. When participating in JI projects, they can choose one of them. Taking track 1, the procedure of JI activities until getting credits is easier than that of CDM because the verification and certification by a third party, which is necessary for CDM, is not needed. However, as figure 3-2 shows you, in order to take track 1, host countries have to meet many requirements. In fact, there is little chance that both countries, Russia and Ukraine can meet these requirements²⁰. Therefore these two countries are likely to take track 2, and if so, they need to get the designation and accreditation by third parties such as Article 6 supervisory committee (A6SC) and Accredited Independent Entity (AIE). Especially, A6SC, which corresponds to already working CDM Executive Board as to the procedure of CDM activities, plays a key role in whole procedures of JI activities, but will be established after Kyoto protocol comes into effect. Therefore, JI-related system is still unclear in comparison with CDM at this moment. (a) JI-related system still undecided

Table 3-1²¹ Requirements for host countries (necessary : ○, unnecessary : ×)

Requirements	Projects	CDM	JI	
			track 1	track 2
(a) Party to the Protocol		○	○	○
(b) Designate a national authority		○	○	○
(c) Assigned amount calculated and recorded		×	○	○
(d) National Registry				
(e) National system to estimate emission				
(f) Submitted most recent required inventory		×	○	×
(g) Submitted supplementary information on assigned amount				

(b) Little information on both countries' JI-related behavior and criteria

Next, we will refer to the unclear JI-related behavior and criteria of Russia and Ukraine. Both countries' JI-related behavior means how much they will perform JI activities and Emission Trading. It is said that the target after the first commitment period of Kyoto strongly influences on their behavior²². If each country including both

²⁰ Preparation for the inventory is one of the hardest requirements to meet for host countries which want to take track 1. According to NEDO (2002), Russia did not submit their inventory accurately and regularly so far, and they need to improve fundamentally.

²¹ METI (2004d)

²² Five years from 2008 to 2012 is the first commitment period decided by Kyoto protocol, and negotiation for after-Kyoto will begin from 2005.

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countries has a tougher reduction target after 2013, it is easy to project that a carbon price will rise after the first commitment period. Then, Russia and Ukraine will try to bank their AAUs called hot air as much as they can during the first commitment period, and instead of it, try to promote JI activities aggressively. On the other hand, if the target after 2013 is not so strict, they will try to sell their hot air during the first commitment period to maximize their benefit. In this way, nothing associated with after-Kyoto is decided yet right now, so it is dangerous to depend on JI projects with Russia and Ukraine as Japanese main additional actions to reduce global warming.

We will also discuss host countries' criteria when they approve and participate in project activities. It means what kind of CDM/JI projects they prefer or give priority to. Before these criteria are decided clearly, there is a risk that companies cannot get approval by host countries, so investment in JI projects do not increase. China and India, which have large potential of CDM activities, have already indicated their preferred project types or characteristics²³. However, even getting information on JI activities with Russia and Ukraine is difficult at the moment²⁴, and it is certainly hard for companies to participate in JI projects. (b) Little information on both countries' JI-related behavior and criteria

② Technology transfer into developing countries

As we mentioned above, CDM has certainty of getting credits rather than Emission Trading and JI. In addition to it, CDM has one more advantage; technology transfer to developing countries. As we described about it in chapter 1, performing CDM leads to transfer technology from Annex I Parties (developed countries) to non-Annex I Parties (developing countries). Though it is true that JI can transfer technology between developed countries, what we would like to focus on here is technology transfer into developing countries.

Global warming is not a short-term problem but a long-term problem, and it is projected that energy-origin-CO₂ emission in developing countries such as China and India will exceed that in developed countries in 2030 as Figure 3-3 shows. Japan is a country which has one of the greatest technology in the world, especially technology related to energy efficiency improvement, so Japan should perform CDM projects actively and make a contribution internationally. Moreover, among mechanisms decided

²³ Chinese government made a new regulation in June, 2004, which shows that “the priority areas for CDM projects in China are energy efficiency improvement, development and utilization of new and renewable energy, and methane recovery and utilization”. Chinese Government HP: “Interim Measures for Operation and Management of Clean Development Mechanism Projects in China”

²⁴ personal communication with Mr. Iemoto, a staff of Japanese think-tank, Kyoto mechanism information platform.

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by Kyoto protocol, CDM is the only action which involves developing countries.

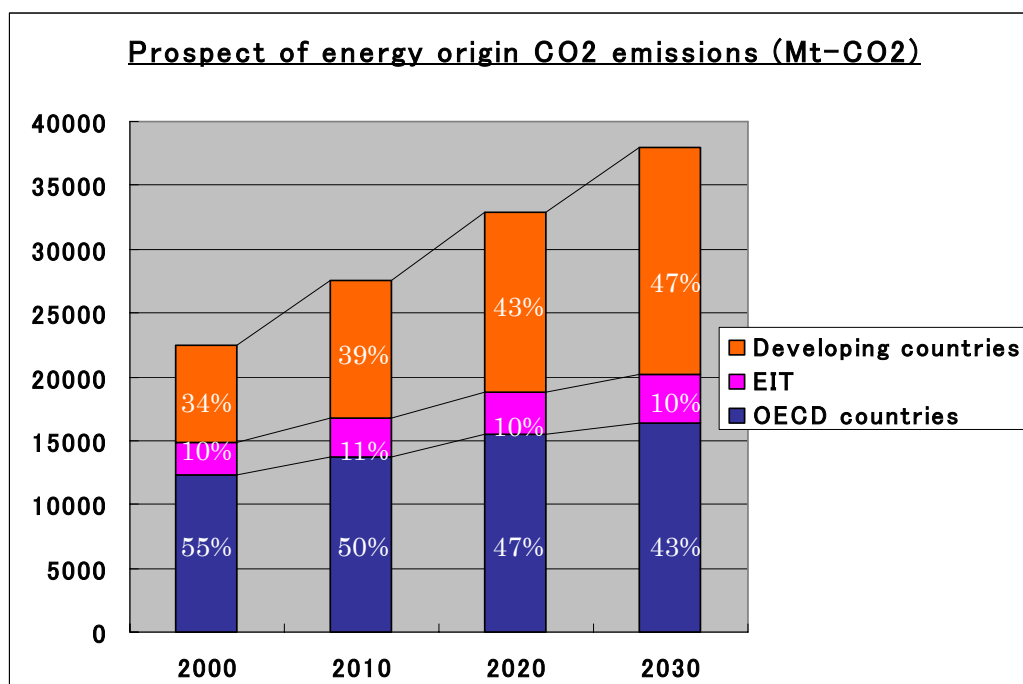


Figure 3-2²⁵

For these reasons; ① certainty of getting credits and ② technology transfer into developing countries, we think that Japan should perform CDM activities mainly as additional actions.

3-2 Comparison of “cost-benefit”

3-2-1 Japanese Marginal abatement cost

To compare cost-benefit, the Japanese marginal abatement cost curve of additional actions must be known. However, it is not shown in Japan. Although “the Government actions plan for coping with global warming” says how much emission we are going to reduce by many sectors, doesn’t say about the cost. In terms of this point, EU made ECCP²⁶ (European Climate Change Plan) in 2001, and it showed cost of attainable actions below €20/t-CO₂. When Japan tries to think about additional actions, Japan should estimate the cost of those actions.

²⁵ IEA (2002)

²⁶ ECCP (2001)

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In this paper, we try to estimate Japanese marginal abatement cost curve from figure 3-3 which is according to Ministry of Environment (2003b).

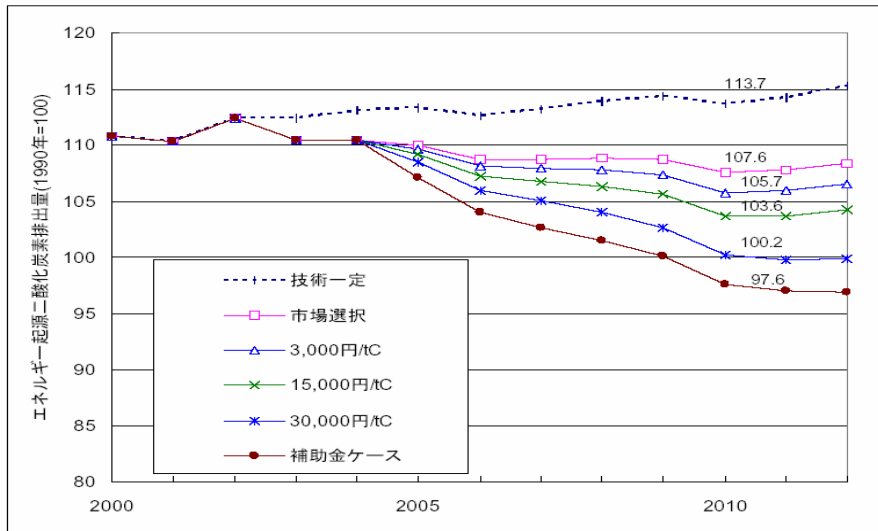


図 2-2. ケース別エネルギー起源二酸化炭素排出量の推移
 注：グラフ中の数値は 2010 年の排出量（1990 年の排出量を 100 とする）を示す。

Figure 3-3²⁷

This figure shows “Estimating energy origin CO2 emissions at each case”, and vertical axis shows energy origin CO2 emissions. This figure supposes that emissions in 1990 is 100%. Ministry of Environment (2003b) says that “optional market case²⁸” is same as BAU case, so it can be said that a gap between other cases and optional market is the effect of environmental tax. For example, if impose \$27/tC tax, Japanese energy origin CO2 emissions in 2010 would be 105.7%. In this case, the effect of environmental tax is 1.9% (=107.6% – 105.7%). Here, we don’t focus on the effect of its tax, and focus on that a meaning of imposing tax. Assuming that figure3-4 shows the Japanese marginal abatement cost curve.

²⁷ Ministry of Environment (2003b), 市場選択 and 補助金ケース means “optimal market” and “subsidy case”. 3000 円/tC, 15000 円/tC and 30000 円/tC are equal to \$27/tC, \$136/tC and \$273, respectively.

²⁸ About each case, please refer to Ministry of Environment (2003b)

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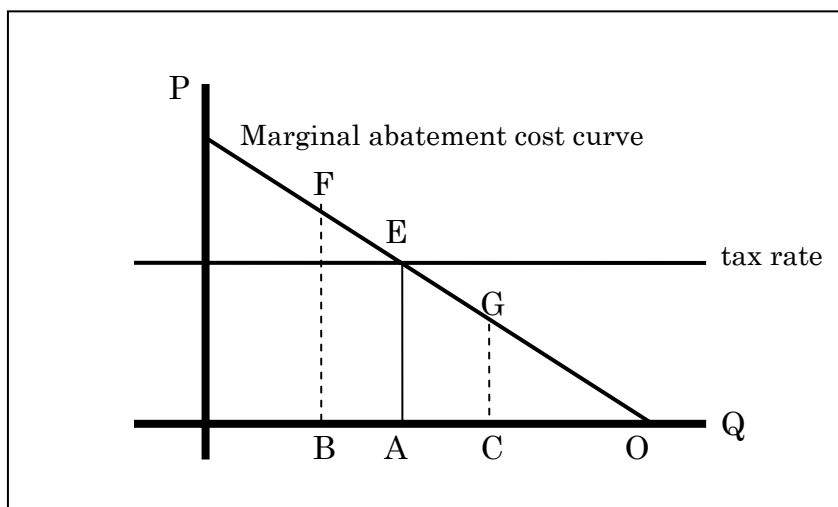


Figure 3-4

Vertical axis and horizontal axis show cost and emissions. If Japanese marginal abatement cost is CG , it is lower than tax rate, so they would reduce OC by themselves. On the other hand, if their marginal abatement cost is BF , it is higher than tax rate, so they would pay tax. This means, in figure 3-4 case, that Japan would reduce OA by themselves, and Japanese marginal abatement cost would be AE which is same as tax rate. Return to figure 3-3, therefore, if Japan tries to reduce 1.9% ($=107.6\% - 105.9\%$) by domestic actions, Japanese marginal abatement cost would be \$27. If they try to reduce 7.4% ($=107.6\% - 100.2\%$) by domestic actions, their abatement cost would be \$273. According to Ministry of Environment (2003b), Japan needs to impose \$410 tax when they try to meet “subsidy case” with only the environmental tax. As a result, Japanese abatement cost curve can be estimated such as figure 3-5.

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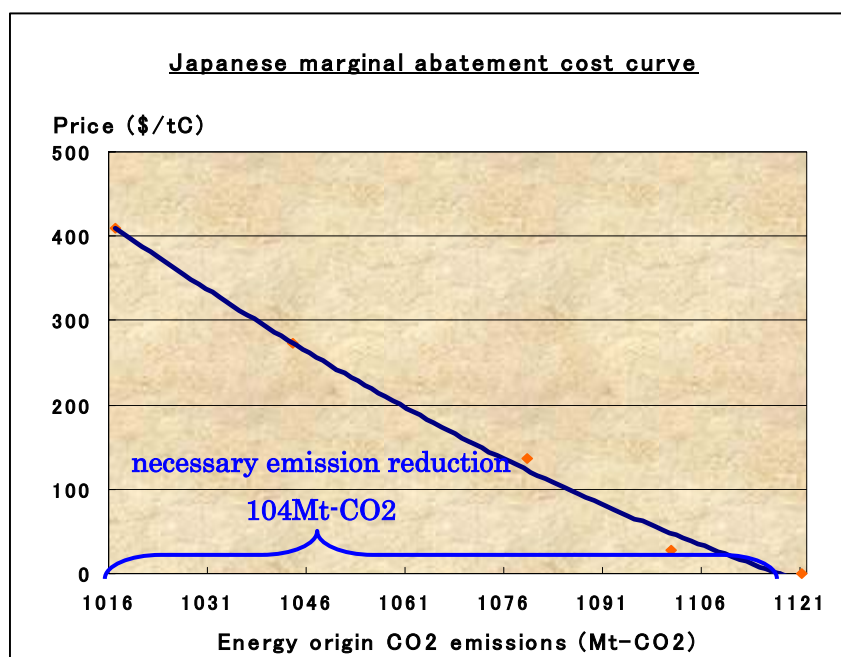


Figure 3-5²⁹

3-2-2 Compare the cost of domestic actions with CDM

After estimating Japanese marginal cost curve, the cost of CDM must be known as well. In fact, there are many researches about it. In this paper, we suppose that the price of CER is \$40/tC (= \$11.4/t-CO₂), which is according to WB, IEA and IETA (2004). We use this reference later chapter to show CDM potential. Based on both the cost of domestic actions and CDM, comparison of cost can be shown by figure 3-6. As this figure shows, Japan would reduce emissions by domestic actions until its marginal abatement cost is \$40, and they would get CERs for remaining. According to an absolute quantity, Japan would reduce about 16Mt-CO₂ by domestic actions and would get about 88Mt-CO₂ CERs out of 104Mt-CO₂ that is necessary emission reduction of Japan. There is a notice here. About 20Mt-CO₂ has already planned to be reduced with Kyoto mechanisms in “the Government action plan for coping with global warming”. Therefore, Japan need to get 108Mt-CO₂ (=88Mt-CO₂+20Mt-CO₂) CERs in terms of “cost-benefit” approach.

²⁹ Made by own

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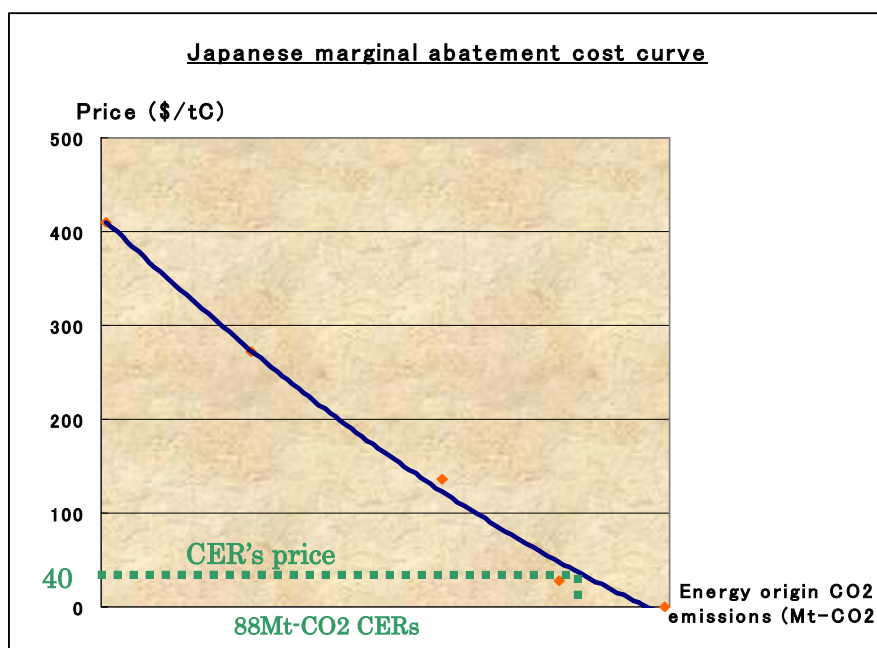


Figure 3-6

3-3 *Estimates of credits potential*

Now we emphasized CDM should be performed actively. However, in fact, how much reduction potential exists? In this section, we are going to examine how much credits potential exists in 2010 by two estimates. One is the study of WB, IEA and IETA³⁰, and the other is the estimate which Ministry of Economy, Trade and Industry of Japan (METI)³¹ takes into account when using Kyoto mechanisms³².

3-3-1 Estimate by WB, IEA and IETA (2004)

Firstly, we are going to show the estimate by the study of WB, IEA and IETA which is based on many studies. According to this study, demand for CERs in 2010 would be 250Mt-CO₂ at price of \$11.40/t-CO₂. It also says that this demand will be met by the supply³³ adequately. Even if the demand in 2010 becomes maximum

³⁰ WB, IEA and IETA (2004)

³¹ METI (2004b)

³² Many studies about reduction potential of CDM exist, for example OECD (2004), MIZUHO (2004). But in this paper, we use WB, IEA and IETA (2004) because it is based on many studies, and each organization is authoritative. And, we use METI (2004b) because it has the possibility that it may influence to Japanese measure to global warming.

³³ Downward, potential to WB, IEA and IETA (2004) means market potential including transaction cost.

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(500Mt-CO₂), this study says that the demand will be met by the supply because the supply can be maximum, too. However, maximum supply is not always attained. This study said that if we need 500Mt-CO₂ CERs³⁴ in 2010, 2700 projects³⁵ are required. Considering the number of new projects and lead-time, it is difficult to supply 500Mt-CO₂ CERs. On the other hand, in 250Mt-CO₂ case, 1300 projects are required. This means that 200 new projects per year are required, and the study says that it can be available. However, is it true that 250 Mt-CO₂ CERs will be available in 2010?

3-3-2 Estimate by METI

Secondly, we are going to show the estimate by METI. In fact, this estimate is according to “Point Carbon³⁶”. As figure 3-7 shows, about 160Mt-CO₂ CERs are prospected in 2010. That is to say, whereas it is possible to supply 250Mt-CO₂ CERs in 2010 according to the WB, IEA and IETA (2004), it is possible to supply 160Mt-CO₂ CERs in 2010 according to METI. In this study, we think that Japan should follow safer side because Japan need to get credits certainly. (It is necessary to assume the situation Japan cannot get the sufficient credit in 2010.) Therefore, we’d like to introduce about 160Mt-CO₂ CERs potential in 2010.

However, can we obtain all amount of credits potential as CERs? The content of projects should be considered. Table 3-8 shows the characteristics of each CDM project. As this table shows, HCFC has high global warming potential and reduction efficiency is very high. However, because of those reasons, there is the apprehension that HCFC is produced to be destroyed itself³⁷. In addition, Chinese priority to CDM projects should be considered. China, who occupies about 40 % of credits potential in the world³⁸ and seemed to be a major host country of Japan in CDM, has announced that project of improvement energy efficiency, methane recovery, and rechargeable energy are given high priority in their provisional law. For these reason, we think credits from HFC projects should be eliminated from all amount of CERs credits. According to figure 3-7, total CERs potential in 2010 would be about 160Mt-CO₂ as mentioned above and CERs potential from HFC projects would be about 70Mt-CO₂. Therefore, we think real CERs potential in 2010 is about 90Mt-CO₂

³⁴ Strictly speaking, it is necessary to consider the CER that was arisen before 2008. And, 400 Mt-CO₂ are required in 2010 if we want to match the demand of 500 Mt-CO₂ in 2010, on the other hand, 200 Mt-CO₂ are required in 2010 if we want to match the demand of 250 Mt-CO₂ in 2010.

³⁵ In WB, IEA and IETA (2004), there are 150000t-CO₂ per every project

³⁶ Point Carbon is the information company located in Norway, and offers carbon market information and so on.

³⁷ Japan Machinery Federation and Mitsubishi Securities (2004)

³⁸ WB, IEA and IETA (2004)

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Figure 3: CER supplies towards 2012 (million CERs p.a.)

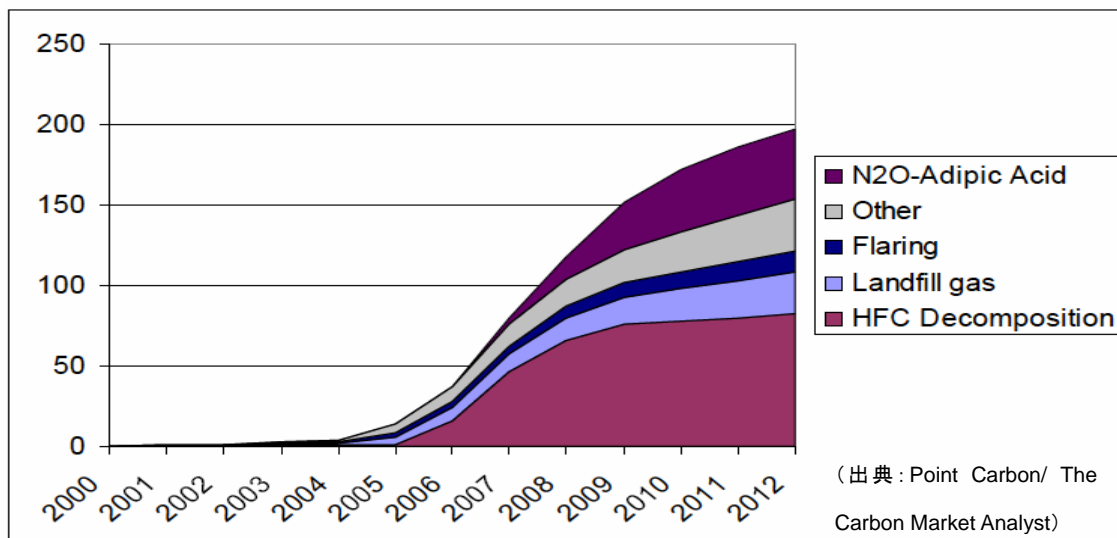


Figure 3-7³⁹

Table 3-8⁴⁰ The type of major CDM project and each characteristics

Sorts of projects	Renewable energy	Methane recovery	HFC decomposition	Cement production	Improvement energy efficiency	sink
Gas	Mainly CO ₂	CH ₄	HFC23	Mainly CO ₂	Mainly CO ₂	CO ₂
GWP	1	21	150—11,700	1	1	1
Per project emission reduction	various	various	very large	large	small	various
CER's price	low—high	low—middle	very low	low — high	low — high	low — middle

³⁹ METI (2004b)

⁴⁰ MIZUHO (2004)

3-4 How many CERs should Japan get?

From section 3-1 to 3-3, we compared domestic actions with CDM in point of cost-effectiveness and showed the estimates of credit potential in 2010. Moreover, we estimated that 90Mt-CO₂ potential would exist per year. From this figure, it is clear Japan cannot get 108Mt-CO₂, remarked in 3-2-2, even if Japan can get all amount of this credit potential. In this section, we'll show you which country would mainly demand for CERs, and how many CERs would be required by Japan.

3-4-1 Who is the buyer of credit potential?

Figure 3-9 shows each Annex I country's reduction target. The figure means to deduct GHGs emission in 2000 from AAU⁴¹. As this figure, it appears that Ukraine, Russia and EU(10) which affiliated with EU newly, have already attained the target and would be sellers of CERs. On the other hands, it appears that EU(15) which are conventional EU countries, Canada and Japan have not attained the target yet, so they have the high possibility to purchase CERs. Therefore, it is easy to estimate that major demand countries of CERs are EU(15), Canada and Japan. However, we have to take account of EU-ETS which will be performed by EU(15) and EU(10). In January, 2005, EU-ETS will start as we mentioned before. After EU-ETS works well, EU(15)'s shortage to meet their targets is offset by EU(10)'s surplus to achieve their targets, so we think EU(15) will not be a major demand country of CER. Considering this point, it seems major demand countries of CERs are Canada and Japan in 2010.

⁴¹ USA withdrew from Kyoto Protocol in 2002, so USA's figure is small information here. EU(15) means conventional EU countries, and EU(10) means countries who joined EU newly.

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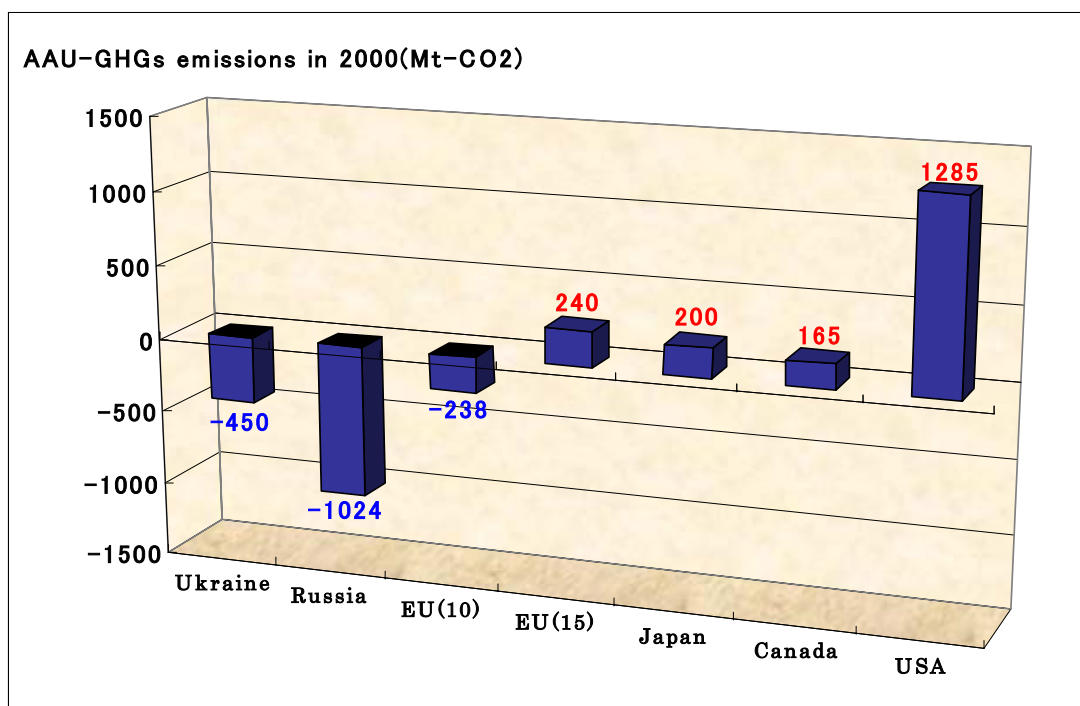


Figure 3-9⁴² how much each country has to reduce GHGs to meet the Kyoto target

3-4-2 How many CERs should Japan get?

Now, Japan expects to get 20Mt-CO₂ per year by Kyoto mechanisms in government action plan, and the government of Canada expects to get minimum 12Mt-CO₂. We cannot estimate accurately how many CERs Canada will get, so following the current proportion of Japan to Canada (20Mt : 12Mt), approximately 2 : 1, we propose Japan should aim to get 60Mt-CO₂ CERs. Of course, Japan should get more if Japan can get much more CERs than expected. However, in this paper we think that Japan should try to get 60Mt-CO₂ CERs in terms of certainty of getting credits.

⁴² IEEJ (2004)

Chapter 4: Japanese Strategy from now on

In previous chapters, we concerned that Japanese marginal abatement cost is high and examined increasing the proportion of the Kyoto mechanisms that are said that its marginal abatement cost is low. Consequently, Japan can get 60Mt-CO₂ CERs annually and we came to the conclusion that Japan should aim to get 60Mt-CO₂ CERs annually. In this chapter, we are going to show the whole image of Japanese strategy for coping with global warming including aiming at acquisition of 60Mt-CO₂ CERs.

As shown in Chapter 3, Japan needs to reduce 104Mt-CO₂ additionally to meet the Kyoto target, and Japan can get 60Mt-CO₂ CERs annually. However, as mentioned in Chapter 2, Japan has already assumed 20Mt-CO₂ annually by Kyoto mechanisms in “the Government Action Plan 2002”. Therefore, that is to say Japan needs to get 40Mt-CO₂ CERs additionally.

When getting 40Mt-CO₂ CERs additionally and cost-effectiveness is considered, what effect is there for Japan? According to the marginal abatement cost curve that we made, Japanese marginal abatement cost is \$410/tC when all 104Mt-CO₂ is reduced by domestic actions. As a result of deducting 40Mt-CO₂ from the necessary reduction amount of 104Mt-CO₂, 64Mt-CO₂ is the amount that Japan needs to reduce additionally by domestic actions⁴³.

Figure 4-1 shows the breakdown of Japan’s additional actions. In the case that Japan aim to obtain 60Mt-CO₂ CERs, Japanese marginal abatement cost reduces to \$210 which is about half of \$410. This has a big meaning for Japan where the marginal abatement cost is higher than any other countries. Therefore, Japan should aim to get 40Mt-CO₂ CERs additionally, or 60Mt-CO₂ CERs as a whole. The whole image of Japanese strategy including our proposal mentioned above is shown in the table 4-2. As a result of increasing the proportion of the Kyoto mechanisms which is our proposal, the target of the domestic actions becomes +2.7% from -0.5% and that of Kyoto mechanisms becomes -4.8%⁴⁴ from -1.6%.

⁴³ Although Japan reducing 64Mt-CO₂ by international emission trading or JI is also considered, we decide to reduce by domestic actions for the reason explained in Chapter 3. That is, JI isn’t considered as the main additional actions because of the problem of the risk of JI with Russia · Ukraine and international emission trading isn’t because of the problem of timing.

⁴⁴ According to the Marrakech Accord, the use of the Kyoto mechanisms shall be supplemental to domestic actions. However, there is quantity limit. In Netherlands case, they are planning to use the mechanisms a half of their necessary emission reduction. Therefore, our proposal that the proportion of the mechanisms is about 35% (=4.8%/13.6%) is no problem.

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Figure 4-1 The breakdown of Japan's additional actions
 In the case Japan aim to gain 60Mt-CO2 CERs and reduce the remaining of 64Mt-CO2 by the domestic actions

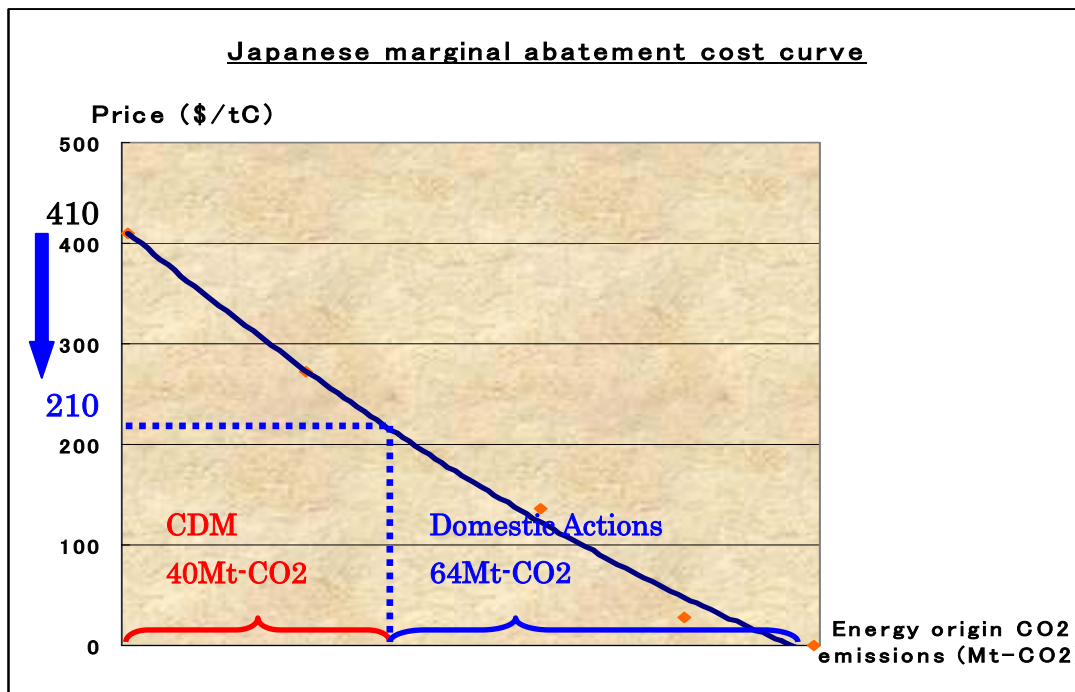


Table 4-2

	<i>Current situation</i>		<i>Proposal</i>	
	target	necessary emission reduction	target	necessary emission reduction
Domestic Actions	▲0.5%	104Mt-CO2	+2.7%	64Mt-CO2
Kyoto Mechanisms (CDM)	▲1.6%	20Mt-CO2	▲4.8%	60Mt-CO2
Sink	▲3.9%	48Mt-CO2	▲3.9%	48Mt-CO2
total	▲6.0%	172Mt-CO2	▲6.0%	172Mt-CO2

※₁ Technological Innovation and Life Style is included in Energy origin CO2

※₂ Supposing that Sink can meet the target

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Epilogue

To increase the proportion of the Kyoto mechanisms might be criticized that Japan neglect to make an effort in domestic by other countries. However, that Japan performs CDM actively leads to large emission reduction in terms of long-term and global. Global warming is not a short-term and regional problem. It is a in the long-term and globally problem. In this paper, we strongly propose that Japan should perform CDM actively not only to lower cost but also to contribute to the world.

We think that Japan has to develop the circumstance of performing CDM immediately, and tries to insist on the meaning and necessity to perform CDM to other countries. We hope that Japan would cooperate with other countries through the Kyoto mechanisms to cope with global warming, and have a leadership among those countries.

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