

**Domestic and Overseas Trends in Measures to Combat Global  
Warming and Future Prospects<sup>1</sup>**  
**- The Necessity of Utilizing the Kyoto Mechanisms and Related Issues -**

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**1. Introduction**

In 2002, Japan, the EU, Canada, and other major developed countries ratified the Kyoto Protocol and, despite continuing insistence by the US and Australia on not ratifying the Protocol, there is a growing possibility that the Protocol will come into effect during 2003 with ratification by Russia. Given this, those countries in the EU and elsewhere that have ratified the Protocol are promptly pursuing approaches to reduce the costs of achieving their targets by considering the introduction and implementation of measures utilizing the Kyoto Mechanisms and emissions trading systems.

At the same time, Japan is presently reinforcing its existing measures as the first stage of a “step-by-step approach” and, with a view to the review scheduled for 2004, it is quite likely that Japan will examine additional measures, depending on developments in the economy and its nuclear power generation capacity. Although a close examination of precisely what additional measures should be adopted is a matter for future consideration, utilization of the Kyoto Mechanisms is essential for Japan to reduce the costs of achieving its targets, and preparations for the start of the compliance period should be made from an early stage.

The purpose of this report is to consider those matters that should be studied at present, in the light of these domestic/overseas trends and future developments, regarding how to utilize the Kyoto Mechanisms as domestic measures.

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<sup>1</sup>This report was made based on a presentation made at the 377<sup>th</sup> Regular Research Report Meeting of the Institute of Energy Economics, Japan.

**2. Countries ratifying the Kyoto Protocol and trends/forecasts of greenhouse gas emissions in these countries**

**(1) Countries ratifying the Kyoto Protocol (see Diagram 1)**

Detailed rules on implementing the Kyoto Protocol (the Marrakesh Accords) were agreed upon at COP7 (2001), thereby establishing the conditions needed for participating countries to ratify the Kyoto Protocol. The EU then ratified the Protocol at the end of May 2002, Japan did the same in June, and Canada, which had been thought unlikely to ratify, signed on in December of that year, bringing the number of countries ratifying the Kyoto Protocol to 100. The possibility remains strong that the Kyoto Protocol will come into effect during 2003 with the ratification of Russia.

**(2) Trends/forecasts of greenhouse gas emissions in these countries**

**a) Trends in these countries**

The trends in greenhouse gas emissions among developed countries through 2000 vary by country. There has been a consistent uptrend in the US and Australia, as well as in Canada, a Protocol signatory. Despite having seen their rising levels of emissions generally level off in recent years, Japan, the Netherlands, and Norway are still above their target levels. On the other hand, the UK and Germany, two EU members with large-scale greenhouse gas emissions, are realizing steady declines towards their target levels through domestic fuel conversion and more efficient energy consumption, and Sweden, experiencing a similar reduction, has even adjusted its national reduction targets downwards. The countries of Eastern Europe and Russia, seen as future suppliers of emission credits, have substantially reduced their emissions, but their emission levels have stabilized over recent years due in part to economic recovery (see Diagram 2).

**b) EU**

Despite a large number of EU member countries such as Spain and Portugal seeing since 1990 an increasing trend in carbon dioxide emissions attributable in great part to increased use of fuel for transport, the substantial reductions made by the UK and Germany, which have some of the highest emissions levels in the EU, have meant that emissions volumes for the EU as a whole have dropped more than 4% since 1990. Although recently announced emissions forecasts show the EU will be about 140 million tons (CO<sub>2</sub> equivalent), or approximately 3%, above its target if existing measures are simply pursued as they are, the introduction of additional measures, such as an emissions trading system within the EU, could well bring about a reduction exceeding the EU's Kyoto Protocol target by 180 million tons, or around 4.3% (see

Diagram 3).

**c) Canada**

Canada's greenhouse gas emissions in 2000 were about 20% above their 1990 level, representing an annual increase of 1.8% and a nearly 26% divergence from the country's emissions target (94%) in the Kyoto Protocol. This prompted the Canadian government, in advance of the deliberations on the bill for ratification before Parliament in the latter half of last year, to compile a draft plan for achieving the Kyoto Protocol targets. To achieve these targets, this plan stipulates reducing greenhouse gas emissions by 80 million tons (CO<sub>2</sub> equivalent) using the measures presently under consideration and by 100 million more tons using new policy measures, including utilization of the Kyoto Mechanisms by both the public and private sectors; it then presents measures that have the potential for a further reduction of 60 million tons. At the same time, Canada has demonstrated that it will continually urge that the reduction of greenhouse gas emissions due to the use of such energy as electric power generated from hydraulic power or natural gas that is primarily exported from Canada to the US (cleaner energy exports) be recognized within international rules.

**d) Russia/former East Europe**

Greenhouse gas emissions for Russia in 1999 (excluding greenhouse gas sinks) were a substantial 38.4% below their 1990 level. By volume, 80% of these greenhouse gas emissions were carbon dioxide and about 15% methane. Despite a substantial drop in Russia's greenhouse gas emissions between 1990 and 1994, a slowdown in the rate of reduction of primarily CO<sub>2</sub> emissions since then has produced a leveling off of the overall trend (see Diagram 4).

Forecasts released by the Russian government indicate that future economic expansion will lead to an upsurge in greenhouse gas emissions as well. Russia's economy is expected to grow at an annual rate of 5.2% over the next 10 years, according to the forecasts for mid-range scenarios. In conjunction with this, CO<sub>2</sub> emissions are projected to be rising at an annual rate of 1.5% in 2010, but the level of those emissions will still be 25% less than that of 1990. Even the forecasts given in the IEA's World Energy Outlook 2002 suggest the decrease will be on the order of 17%, and the level of "hot air" that has long been estimated for Russia is approximately 20% of the 1990 level (approx. 480 million tons; CO<sub>2</sub> equivalent).

The emissions trends in the countries of former Eastern Europe are, notwithstanding some disparity among their levels of reductions, similar to that in Russia in that the rates of reduction have begun to slow recently. The economies of

these countries are likely to expand in future, especially with accession to the EU, and CO<sub>2</sub> emissions from energy consumption are forecast to increase at an annual rate of about 1% from 2000. With the lowered emissions achieved thus far, however, the total emissions for the countries of Eastern Europe are still about 15% below 1990 levels, and overall it appears highly likely that many of the countries in this region will become suppliers of emissions credits (US DOE, International Energy Outlook 2002, Reference case).

**(3) Vision for a future international market**

As has long been pointed out, Eastern Europe and Russia will have surplus emission credits while countries such as Japan, Canada, and Norway are expected to find themselves in the position of purchasing emissions credits from overseas. The crafting of an intra-regional emissions trading system and progress made through other measures could turn the EU, too, into a net supplier of emissions permits. In any case, Japan must construct a strategy for reducing its compliance costs using the Kyoto Mechanisms while taking into account the international supply and demand for credits.

**3. Recent trends in, and characteristics of, measures to combat global warming taken by the countries of Europe**

**(1) History of measures to combat global warming** (see Diagram 5)

In addition to energy conservation and other conventional measures to combat global warming, market-oriented approaches such as tax systems and emissions trading systems have been steadily introduced since the 1990s. Similarly, steps in the industrial sector towards establishing voluntary reduction efforts among the companies concerned have also been incorporated among these measures since about the time of the Kyoto Conference.

Characteristic of recent years have been (1) the introduction of environmental tax systems in Germany and the UK, both countries with high levels of emissions, and (2) the emergence of countries considering policy combinations of tax systems, voluntary reduction efforts, and emissions trading systems. Denmark early on introduced an emissions trading system in its electric power sector, and the UK, too, created an emissions trading system as part of its combination of tax systems and voluntary agreements. One distinctive feature of the industrial sectors in some countries has been the planning and implementation of experimental trading systems that help companies more accurately estimate the costs of reducing emissions and let them gain experience with the emissions trading system. At the same time, earning

reduction credits through financial participation in such programs as ERUPT and CERUPT, administered by the Dutch government, and the World Bank's IFC is another approach gaining attention as a means by which governments actively establish emissions credits.

**(2) European approaches: characteristics and strategies**

Many of the specifics of the EU intra-regional emissions trading system to be introduced in the future, Norway's own trading system, and other approaches envisioned by EU countries remain unclear. However, the actual trials being conducted involve (1) studying and designing specific systems for utilizing the Kyoto Mechanisms, (2) searching for means of acquiring credits as cheaply as possible at the present, and (3) governments and companies actively implementing trial approaches aimed at gaining experience with trading systems likely to be introduced in future and to determine any issues that need to be addressed. In these moves one can get a glimpse of the future strategies of EU countries in trying to achieve their targets through the market system with as much economic efficiency as possible (see Diagram 6).

**4. Present approaches in Japan and future prospects**

**(1) Trends thus far in measures to combat global warming**

Japan's greenhouse gas emissions for 2000 (data reported to UNFCCC) were 1.386 billion tons (CO<sub>2</sub> equivalent), representing a 7.9% increase over 1990. To meet its Protocol commitments, therefore, Japan must make an approximately 14% reduction.

The present scenario for Japan achieving its Kyoto Protocol targets is described in the Outline for Promotion of Efforts to Prevent Global Warming, revised in 2002. Japan is trying to comply with the Kyoto Protocol by stabilizing CO<sub>2</sub> emissions from energy consumption at 1990 levels, by using the policy options of holding emissions at certain levels through other greenhouse gas countermeasures and forest management as a primary carbon sink, and by acquiring emissions credits overseas through use of the Kyoto Mechanisms. A step-by-step approach, moving ahead in stages, will be adopted in realizing this scenario. In the first stage of this policy, the principal focus will be on reinforcing and improving the effectiveness of existing measures and establishing the proper conditions for utilizing the Kyoto Mechanisms; already the Energy Conservation Law has been revised and the decision made to implement a policy of encouraging electrical power suppliers to introduce new types of energy (RPS

System).

**(2) Forecasts for energy supply/demand and CO<sub>2</sub> emissions; issues involving measures to combat global warming**

In this step-by-step approach, an assessment will be made in 2004 of the policy measures taken to that point, and new additional measures will be considered if it is determined that insufficient progress has been made. With both supply-side problems such as delays in constructing nuclear power generators and a continuing rise in energy consumption in the private sector (households, businesses) and the transport sector (principally privately-owned vehicles) expected, however, stabilization at 1990 levels by around 2010, especially for CO<sub>2</sub> generated by energy consumption, will not likely be easy. In devising measures for achieving reductions in both these sectors, there is less price flexibility than in the industrial sector, making compliance costs extraordinarily high, and it is thus no easy matter to secure qualitative reductions in emissions. Consequently, bearing in mind the disposition of the excess emissions in these sectors and the risks in trying to achieve the Protocol targets through other measures such as greenhouse gas sinks, consideration must be given to options for achieving these targets through the future utilization of the Kyoto Mechanisms.

**5. Issues in utilizing the Kyoto Mechanisms**

**(1) Ideas on utilization of the Kyoto Mechanisms**

The Kyoto Mechanisms consist of three tools: international Emissions Trading, Joint Implementation (JI), and the Clean Development Mechanism (CDM). These tools differ by starting point and utilization methods within both the Kyoto Protocol and the Marrakesh Accord.

Feasible for immediate consideration is the CDM, whereby certified emission reduction (CER) credits earned by emissions reduction efforts in projects started in or after 2000 can be applied towards a country's target, including those actual reductions achieved prior to the commitment period. Japan should therefore begin studying CDM projects early on should it become necessary for Japan in future to ensure as wide a variety as possible of options for earning emissions credits overseas. In the case of JI projects, credits for actual reductions for projects begun in or after 2000 will be recognized from 2008 onwards, and thus the credits to be earned there can be maximized by completing the development of projects and preparations for implementing them before 2008. Emissions trading will begin in earnest from 2008, basically once credits initially allotted to individual countries onwards become

available for trading. Because the parties that will engage in such trading (governments and companies) have almost no experience with such a system, however, the assumptions for this future market, relevant domestic systems, and an adequate preparatory stage prior to actual trading must be established in advance (see Diagram 7).

**(2) Issues in implementing CDM projects**

CDM projects are the first feasible approach, and many issues need to be examined in carrying out these projects. There are currently no policy incentives for companies that must implement the CDM projects, which lends great uncertainty to decision-making. Within the process of considering participation in a CDM project, there are a number of factors difficult to assess by parties seeking to start up projects right away: (1) selection of the target countries and projects, (2) risks in the target countries (legal/economic risks, local views on CDM projects), (3) forecasts of future credit prices, and (4) procedural uncertainties (the extent of follow-up procedures, etc.). For that reason, policymakers should devise provisional support measures to cover risks that companies themselves cannot assume. As more and more experience is gained, an environment in which these risks gradually lessen (and a scheme developed by which they will be reduced) so that CDM projects can be steadily implemented would be desirable (see Diagram 8).

A great deal of public assistance has already been planned and implemented from this perspective. Together with steadfastly promoting such measures as information provision to enhance understanding among domestic companies involved in JI/CDM projects (for example, the Ministry of Economy, Trade and Industry's Help Desk and the Kyoto Mechanism Guidebook), decisions on domestic application procedures, feasibility studies conducted by the national government on JI/CDM projects (for example, projects by NEDO), capacity building to promote CDM projects in developing countries, and the organization of funds and application of trade insurance to support projects planned from next year onwards, efforts should also be made to broadly promote awareness and understanding among domestic parties engaged or seeking to engage in these projects. Consolidating and publicly releasing information from relevant organizations and companies that can be shared between companies – information on the CDM acceptance systems and the functions of the various organizations in host countries, conditions within host countries, policy objectives, the legal infrastructure for carrying out projects – is necessary, as is developing a program that would facilitate matters for parties wishing to implement

projects by centralizing the various CDM application procedures (see Diagram 9).

## **6. Toward the establishment of a future system**

As was mentioned earlier, European countries are conducting in-depth studies of policy measures with a particular focus on the Kyoto Mechanisms and are preparing to implement trial measures before the start of the first commitment period in 2008, all to help achieve their respective Kyoto targets. This is surmised to be a manifestation of their aims to verify as early as possible measures that are compatible with these Mechanisms and to play a useful role in putting together the final policy measures in order to reduce as much as possible the costs for each country in achieving its Kyoto Protocol targets and maximize the effectiveness attainable by utilizing the Kyoto Mechanisms.

In Japan, on the other hand, the situation at present is that little progress has been made in examining domestic systems for ultimately utilizing the Kyoto Mechanisms. Given Japan's clear need to utilize the Kyoto Mechanisms to achieve its Kyoto targets and the trends/forecasts for its domestic greenhouse gas emissions, it should begin preparations for the commitment period as it pursues these examinations. Bearing this in mind, the following list of matters meriting further consideration has been compiled.

### **(1) The 2004 review**

As things stand now, neither (1) the items to be assessed nor (2) the standards for assessment in the review of policies scheduled for 2004 have been clearly stipulated. Nevertheless, it is highly probable that the relevant data to be assessed will be the figures recorded in 2002. As mentioned earlier, the delay in building nuclear power plants at home is becoming more tangibly felt, while there remains a high degree of uncertainty with regard to economic policies and economic forecasts for the future. Under such circumstances, the 2004 review should carefully study the full spectrum of factors impacting on energy supply/demand and should elucidate the direction of the policy measures that will ultimately be taken.

### **(2) Presumed scenarios for achieving targets and the need for early consideration**

Let us now consider measures to be pursued should the domestic measures set forth in the existing Outline for Promotion of Efforts to Prevent Global Warming not be fully implemented, in other words, a scenario for the ultimate policy measures for achieving the Kyoto targets (see Diagram 10). In light of the various policies studied



thus far by the countries of Europe, the following scenarios appear plausible: two government-driven scenarios -- (1) the national government using the national treasury to purchase emissions credits from overseas, and (2) similarly, private companies purchasing these credits through voluntary participation (the view behind the Dutch system) – and two additional scenarios involving a domestic emissions trading system, namely (3) allotting credits only to the industrial sector (the UK or EU systems, which differ on the policy point of whether or not to include conversion sectors) and having the national government (or the private sector, through voluntary participation) purchase the excess credits needed for the private and transport sectors, and (4) allotting all credits (in practical terms, this means allotting these credits to the top-tier industries: the type planned by Norway).

Careful consideration and coordination requiring much discussion will be needed to determine which of these scenarios is the most appropriate for Japan. One lesson that can be applied from the experience of other countries in designing similar systems is that preparations for the commitment period starting from 2008 must incorporate several stages for consideration and trials, as Japan has had no experience thus far in designing systems like the emissions trading system (see Diagram 11). At the very least, the utilization of the Kyoto Mechanisms has already been advocated in the existing Outline and, as it increasingly appears that achieving its targets through domestic policies alone will be quite difficult, discussions on future systems (with the principal focus on the utilization of the Kyoto Mechanisms) should be arranged early on between the private and public sectors and a trial period arranged for the selected policy measures.

The experimental systems used should incorporate the following elements: (1) a pricing structure by which trading parties can determine their own reduction costs, (2) realistic frameworks that increasingly correspond to the future system, (3) the ability to forecast credit prices via links with overseas systems and the utilization of CERs generated early on.

### **(3) Issues for consideration when studying system construction**

In studying the construction of such a system, several points must be borne in mind. First is that the role of the Kyoto Mechanisms is to enable each country as certainly as possible to achieve its target while keeping the costs of doing so as low as possible. In this context, attention must also be paid to maintaining international competitiveness of domestic industries will be harmed, how to link the domestic market to the international market, how to enable the market to flexibly respond to

circumstantial changes (domestic emissions trends, international trading prices, etc.) both inside and outside the country, and how to ensure conformity with the revisions to energy policies and economic policies now underway.

## **7. Conclusion**

(1) Regardless of the introduction of additional measures, the utilization of Kyoto Mechanisms is essential for Japan to achieve its targets. From that premise, it follows that Japan must assess the possibility of options that allow it to acquire emissions credits less expensively than through domestic measures, keeping in mind all the while a vision of the international market of the future. CDM projects, for example, are one option for acquiring emissions credits that can be pursued early on, and Japan must therefore promptly examine the feasibility of such projects and the degree to which they can be utilized in the future.

(2) A policy direction for promoting the utilization of the Kyoto Mechanisms must be made clear as soon as practicable. Looking ahead to the review of domestic systems in 2004, early discussions should be arranged through the cooperation of the private and public sectors on a system that can effectively utilize the Kyoto Mechanisms. Doing so will help encourage all parties to assess the potential of CDM projects at an early stage.

(3) In assessing the future utility of CDM/JI projects, information on host countries' systems, project needs, preparation periods for individual projects, and the problems and restrictions faced in implementing projects must be gathered from an early stage. It is also important, to smooth decision-making and implementation by companies, to find means of consolidating the information available for sharing, centralizing procedures, and developing support schemes for CDM/JI projects.

(4) Given the great likelihood of countries and companies utilizing the Kyoto Mechanisms in future and their total lack of experience in doing so, the trading participants must gain the experience needed for rational action if this system is to be utilized effectively. A trial period should be arranged early on for such study, taking into account market conditions and scenarios expected in 2008 and onwards. Staged methods that gradually approach the final system should be considered, and attention paid to links with overseas markets in terms of trading prices and the utilization of

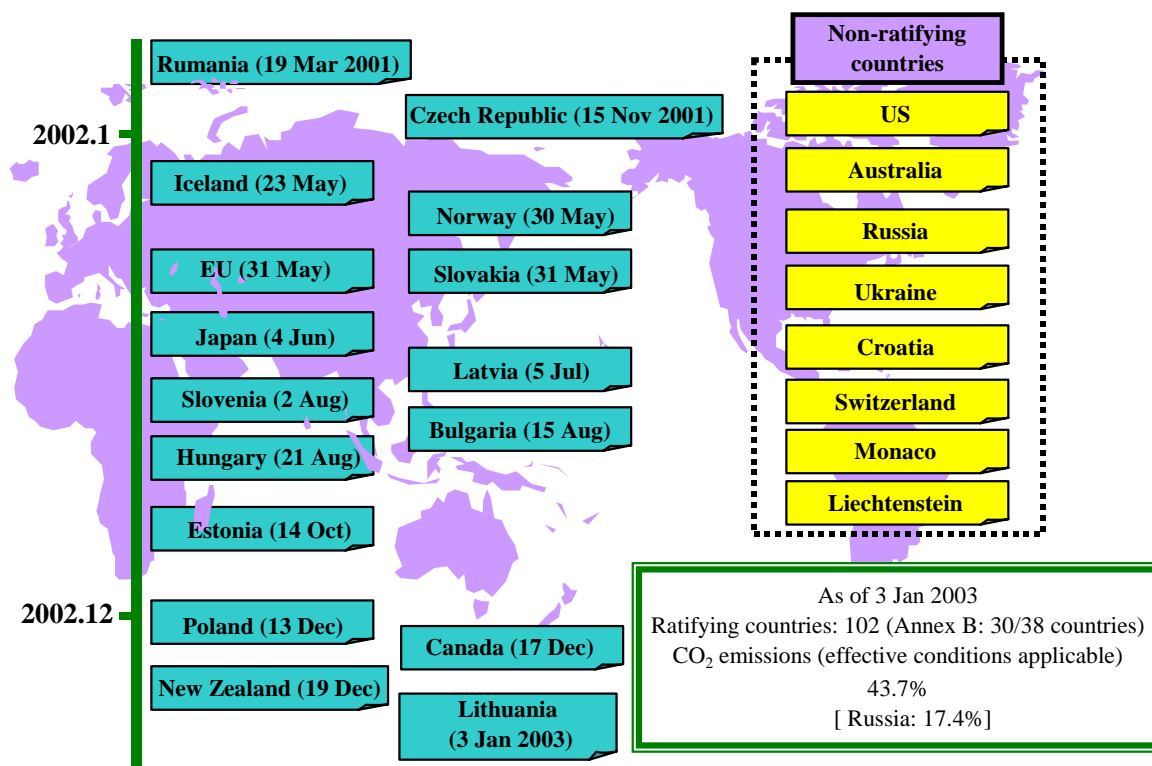
CERs generated early on.

(5) When examining domestic systems, it is important to clarify the conditions that systems must meet. In addition to those aspects that must be scrutinized involving measures designed to combat global warming – lowering the costs of achieving targets, reducing policy costs, giving due consideration to the international competitiveness of industries, establishing links to an international emissions trading market, etc. – attention must also be paid to energy security and ties to the energy market system when ascertaining trends.

### Reference

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Diagram 1 Ratification by Annex B Countries



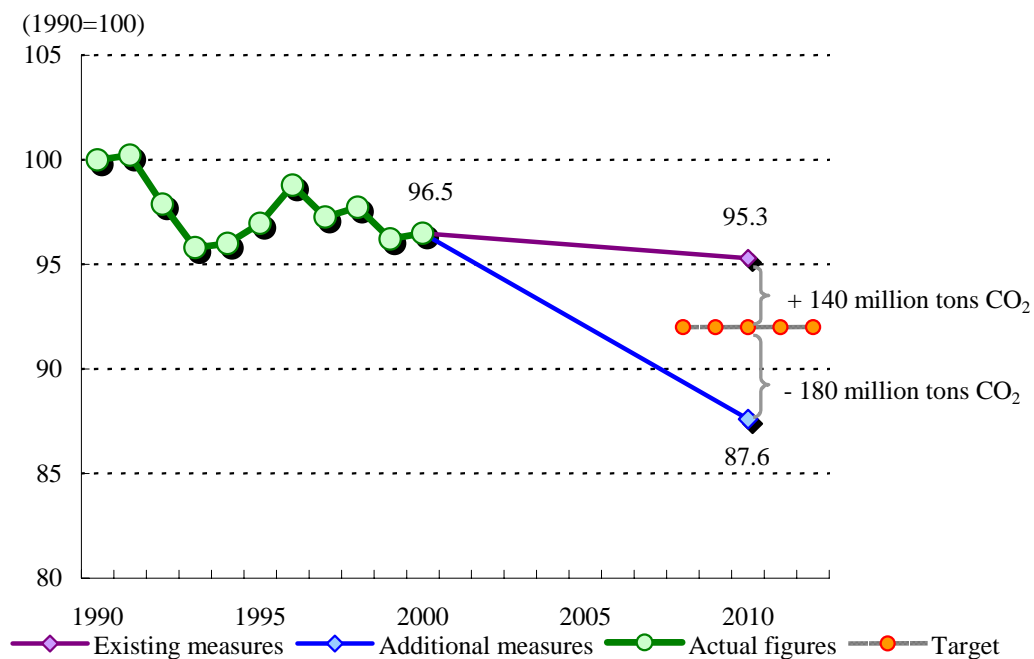
(Source) UNFCCC website

Diagram 2 GHG Emissions in Major Countries

	Kyoto target	Change in emissions from base year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CFC alternatives
Germany	-21%	-19.1%	-12.8%	-4.1%	-2.3%	0.1%
UK	-12.5%	-12.9%	-5.5%	-3.4%	-3.2%	-0.8%
Finland	0%	-4.1%	-0.2%	-2.9%	-1.6%	0.6%
Sweden	4%	-1.9%	-0.3%	-1.3%	-0.4%	0.1%
France	0%	-1.7%	1.4%	-1.1%	-2.5%	0.6%
Denmark	-21%	-1.7%	0.3%	-0.1%	-2.5%	0.7%
Netherlands	-6%	2.5%	7.1%	-3.3%	0.0%	-1.2%
Italy	-6.5%	5.0%	4.6%	-0.3%	0.5%	0.2%
(EU total)	-8%	-3.7%	-0.4%	-2.0%	-1.5%	0.2%
Norway	1%	6.3%	11.8%	0.7%	0.0%	-6.2%
US	-7%	14.2%	13.7%	-0.6%	0.6%	0.5%
Canada	-6%	19.7%	16.5%	3.0%	0.1%	0.2%
Australia	8%	18.1%	16.3%	0.5%	2.1%	-0.7%
Japan	-6%	7.9%	9.2%	-0.4%	-0.2%	-0.8%

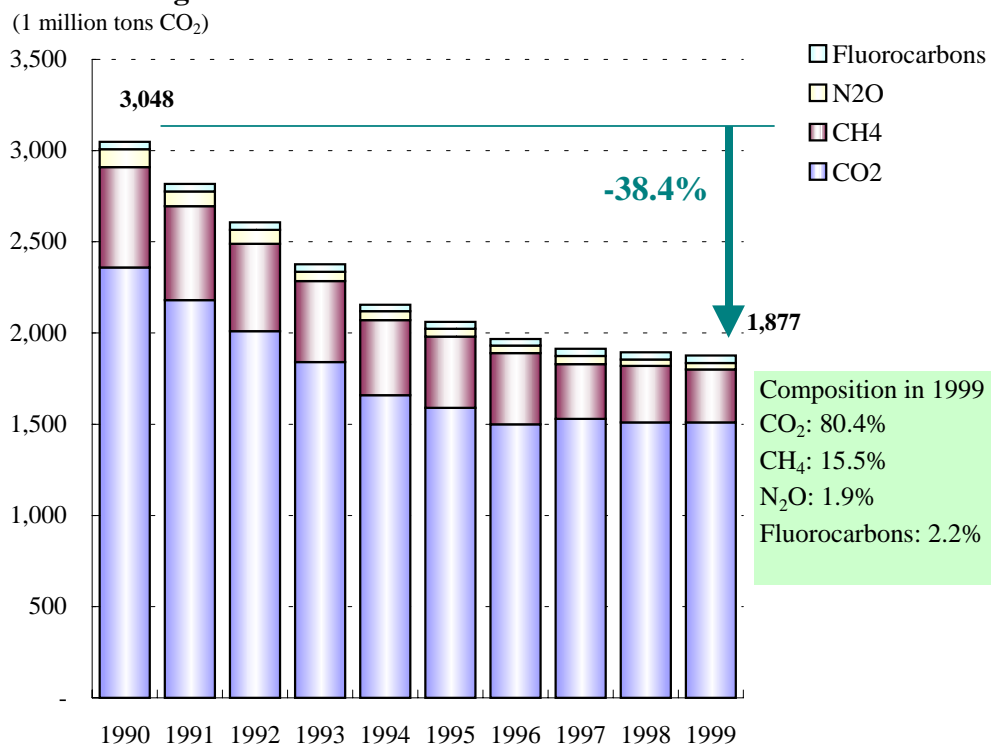
(Source) UNFCCC website

**Diagram 3 Forecasts of GHG Emissions by the EU**



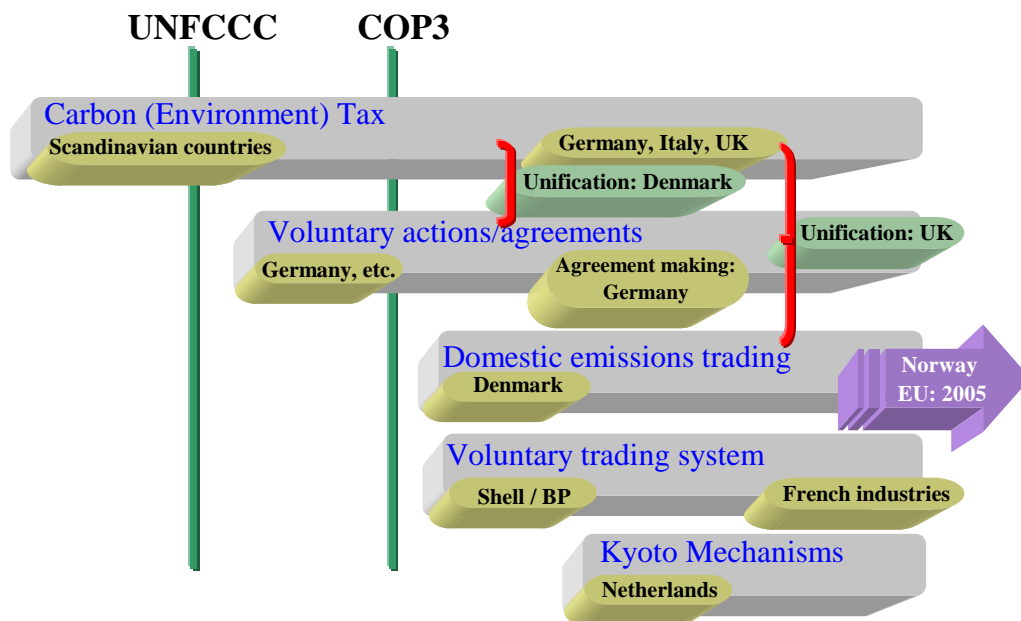
(Source) EEA, Greenhouse gas emission trends and projections in Europe, 2002

**Diagram 4 Trends in Emissions of GHGs in Russia**



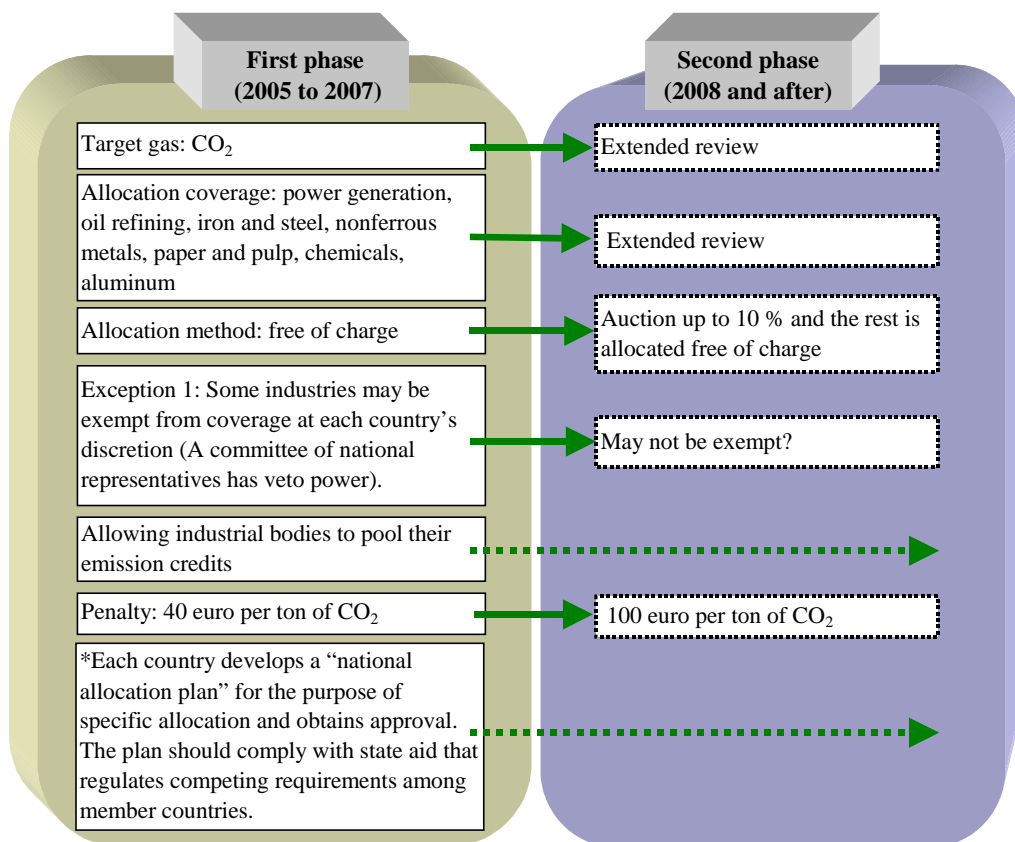
(Source) Government of Russia, 3rd National Communication (20 November 2002)

**Diagram 5: Derivation of global warming policies in Europe**



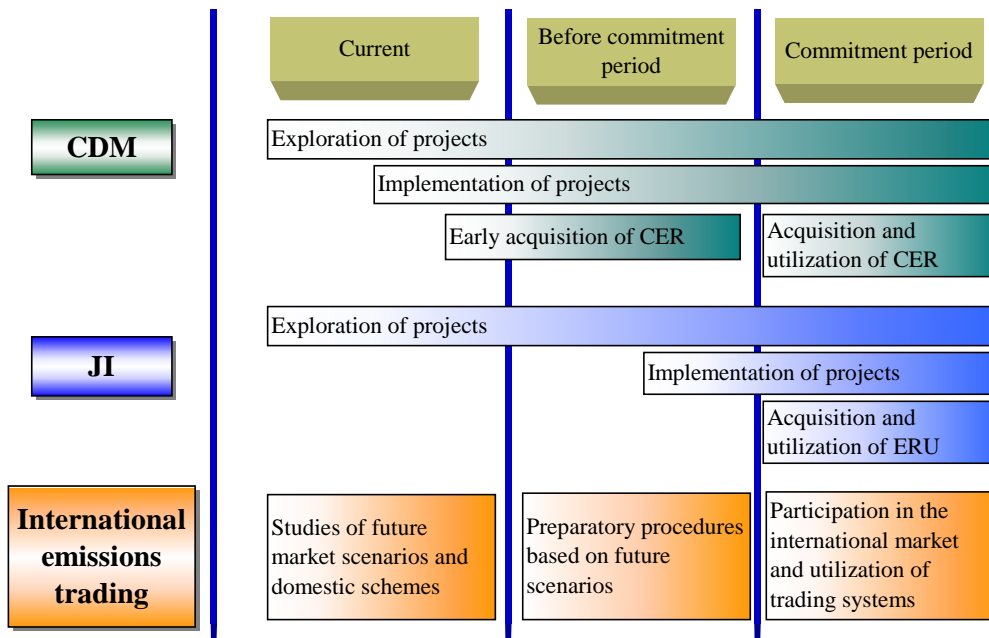
(Based on various sources)

**Diagram 6: EU-wide emissions trading**



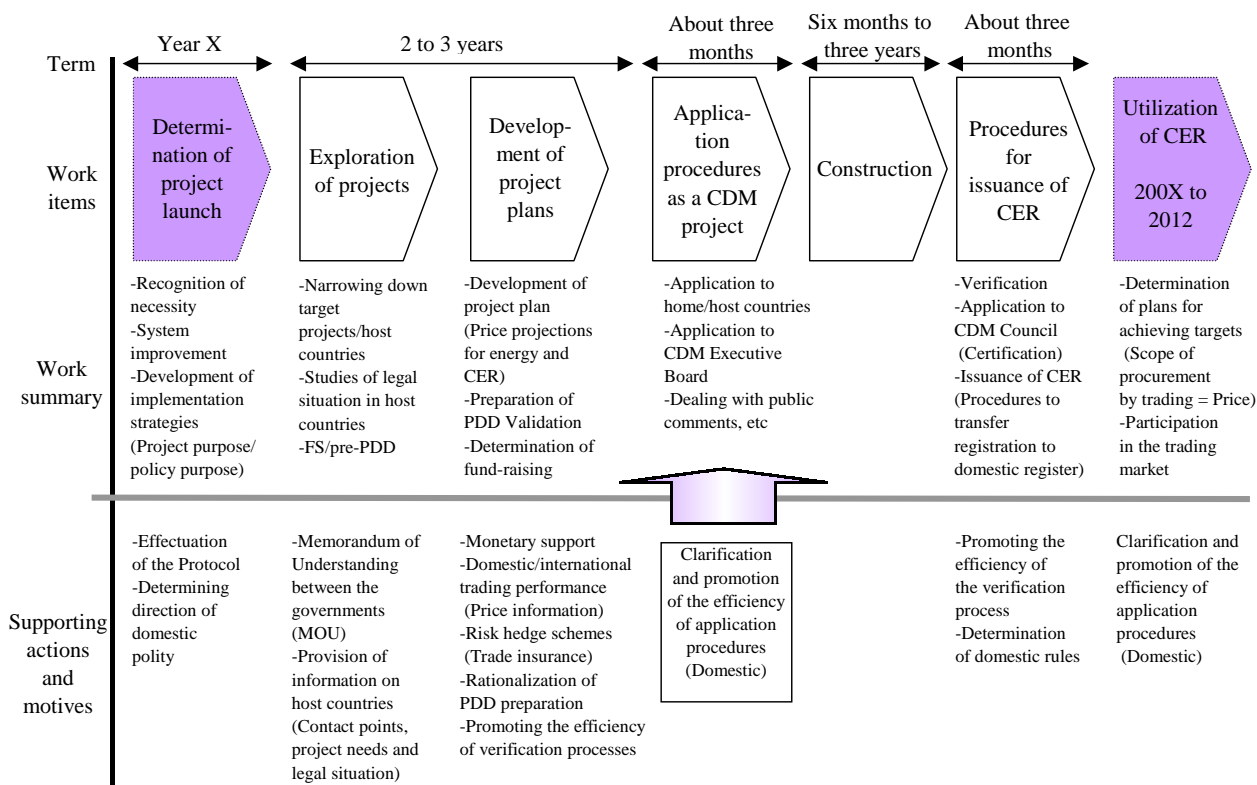
(Based on materials from the European Commission)

**Diagram 7: Utilization schedule for Kyoto Mechanisms**



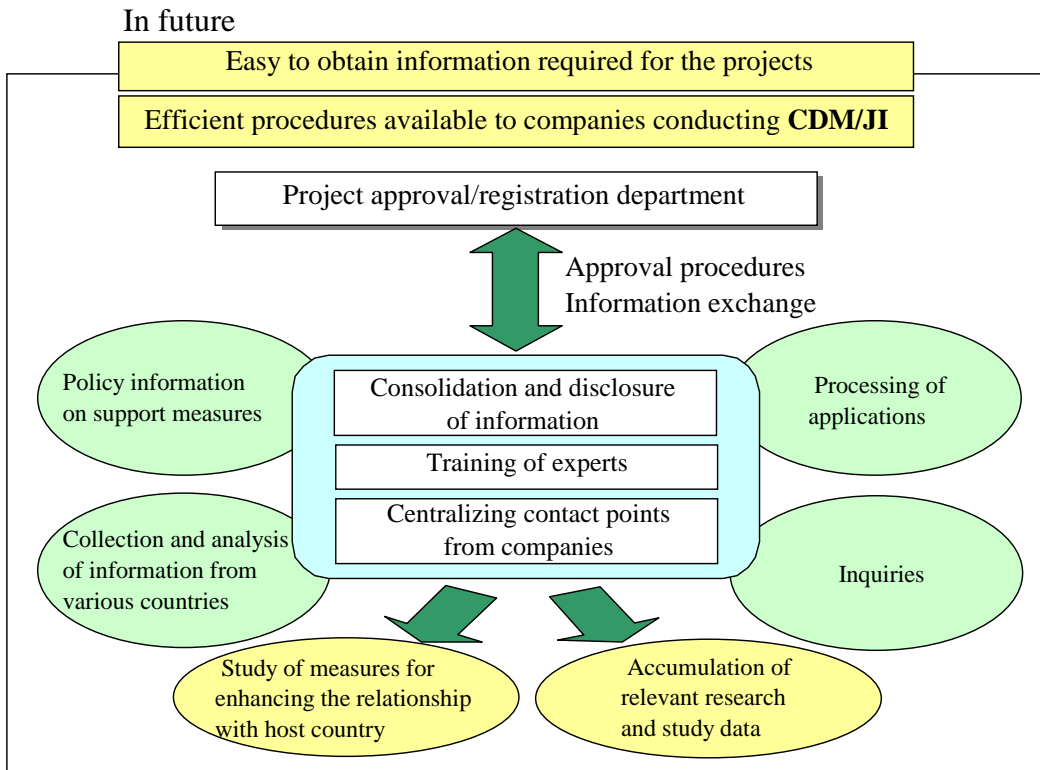
(Based on various sources)

**Diagram 8: Implementation process for CDM projects and related issues**

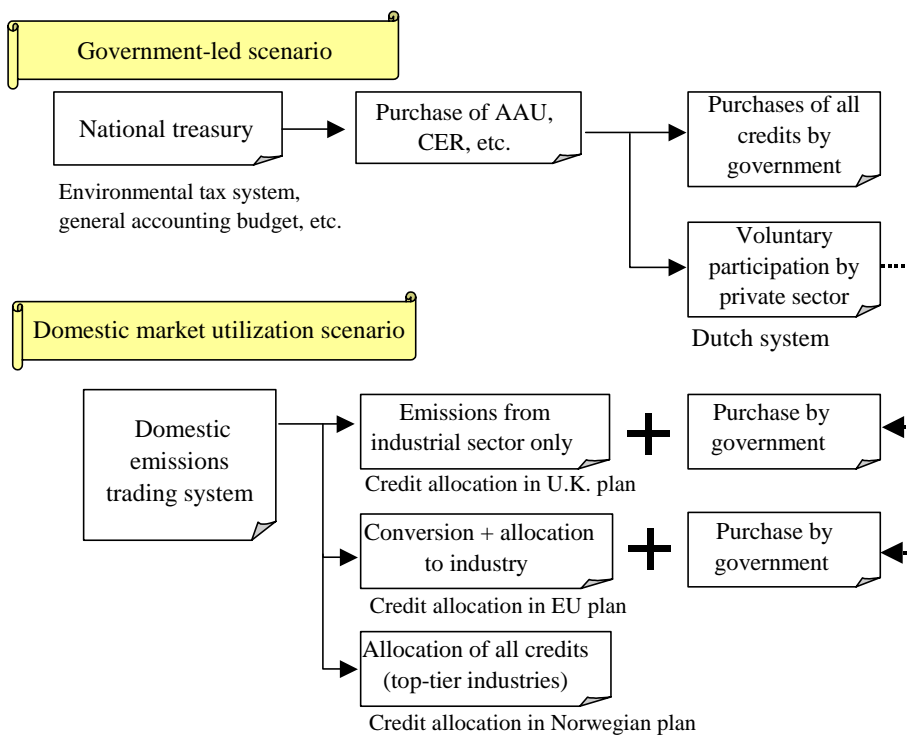


(Based on interviews and various sources)

**Diagram 9: Integration of CDM/JI Projects Support**

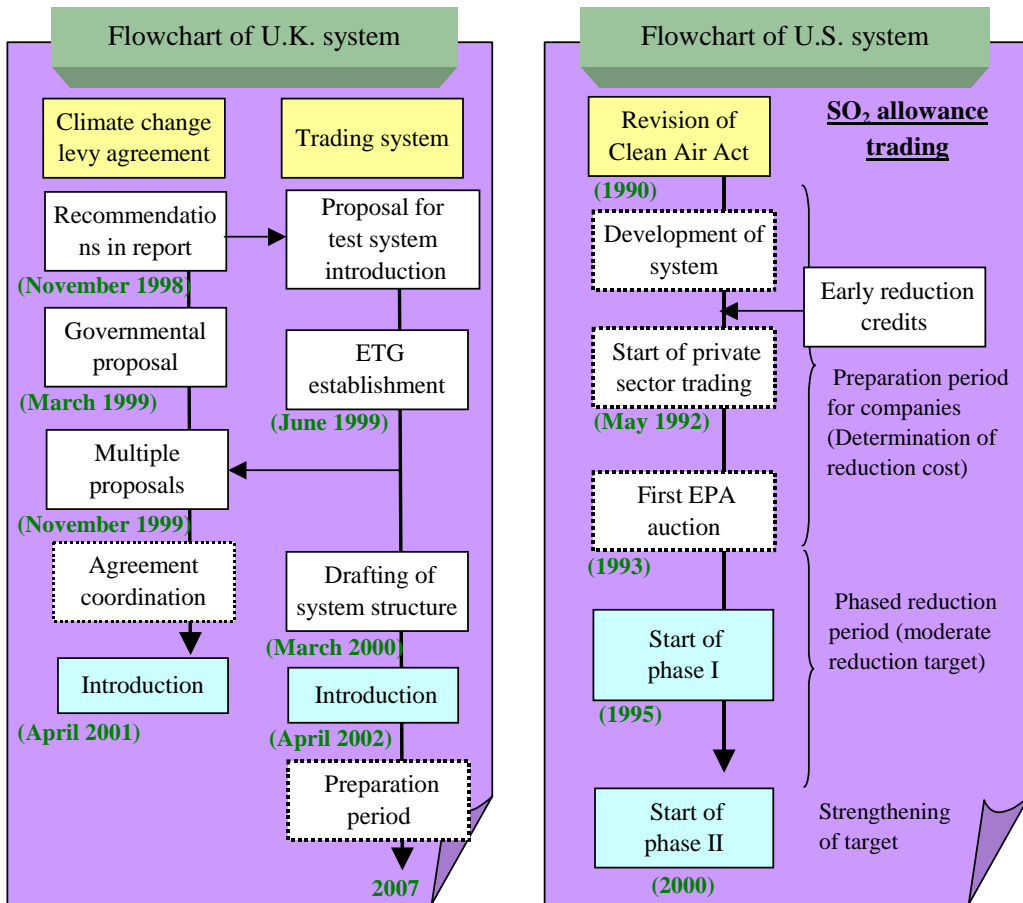


**Diagram 10: Possible target achievement scenarios**





**Diagram 11: System construction time schedule and preparation measures**



(Based on various sources)

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