

Sectoral Approaches♦

— Concept and Application —

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Summary

While considering proposals from relevant organizations, we have analyzed the definitions and applications of sectoral approaches that have grown controversial in the consideration of the future framework against global warming over the recent years. We reiterate that proposals and research reports regarding sectoral approaches have given no common definition of such approaches. Definitions, scopes and significances of these approaches are adapted to proposal sponsors' ideas. When considering and evaluating sectoral approaches, therefore, we must specify their objectives, understand their details. At future international negotiations, these approaches may be used for setting targets, considering national targets equitably and forming components of credit creation and trading systems. They should not be positioned as alternatives to the Kyoto Protocol approach but viewed as ideas for forming any type of agreement and used according to their respective objectives.

Introduction

In discussions on a future international framework of global warming prevention measures over recent years, the term "sectoral approaches" and assessments under the approaches have emerged frequently. For example, Chapter 3 of the fourth assessment report by the Intergovernmental Panel on Climate Change detailed the potential of sectoral mitigation policies and described analyses and assessments on their effectiveness. The Bali Action Plan, as agreed on at the 13th Conference of Parties (COP13) to the U.N. Framework Convention on Climate Change (UNFCCC) in Indonesia's Bali in December 2007, called for the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA)¹ to consider "cooperative sectoral approaches and sector-specific actions" for technology transfers². Japan, which has long considered the effectiveness of sectoral approaches in the prevention of global warming, has implemented the sectoral approaches under the Asia-Pacific Partnership for Clean Development and Climate (APP) and proposed a future framework under sectoral approaches at the AWG-LCA and AWG-KP (the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol).

Sectoral approaches have thus been growingly identified. But interpretations of the approaches have not necessarily

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¹ The AWG-LCA is a new working group that was created at the COP13 conference in Bali to pave the way for participation of the United States and developing countries as well as others in discussions on the future framework. Another ad hoc working group was established in 2005 to discuss the next numerical emission reduction targets for industrial countries under the Kyoto Protocol. This is called the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol, or AWG-KP.

² UNFCCC, Decision -/CP.13 "Bali Action Plan", para. 1(b)(iv)

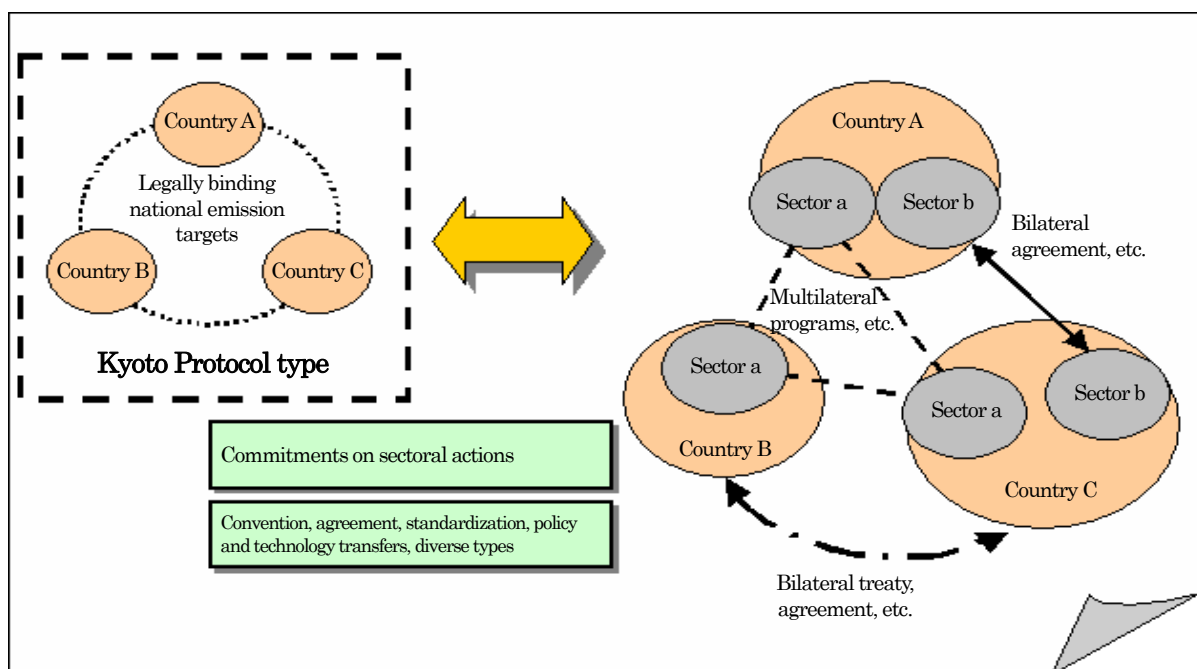
been unified. Relevant researchers, organizations and countries have used "sectors" for making future framework design proposals, based on their respective definitions or concepts. Occasionally, proposals classified as "sectoral approaches" are effectively different.

In this report, we sort out and analyze studies on recently proposed sectoral approaches and outline the APP operations for the specific implementation of such approaches, believing that relevant people should have common understanding about "sectoral approaches" in considering a future framework of global warming prevention measures.

1. Background for Consideration of Sectoral Approaches

Under the recognition that the present Kyoto Protocol has problems regarding its effectiveness, sectoral approaches have been proposed as supplementing, revising or replacing the present framework. A problem with the Kyoto Protocol is the absence of incentives for developing countries to reduce greenhouse gas emissions. Another problem is that the United States, accounting for one-fifth of the world's GHG emissions, has withdrawn from the protocol. In order to achieve the ultimate goals of the UNFCCC, developing countries that are about to expand GHG emissions rapidly should promote their emission reduction efforts, and the United States and other major GHG emitters should take part in a significant framework. Sectoral approaches have been proposed to pave the way for these countries to take part in the new framework.

Figure 1-1 Kyoto Protocol Framework and Sectoral Approach Concept



Sources: Hiroki Kudo, "Roles and Consequences of Sectoral Approaches in Building A Future Framework," for the 4th global environment symposium (cosponsored by CRIEPI and IEEJ) on January 28, 2008.

Figure 1-1 compares the Kyoto Protocol framework with the concept of a new framework under sectoral approaches. The Kyoto Protocol imposes binding GHG emission quotas on a country-by-country basis. Under the sectoral approaches, however, countries or sectors that can implement emission reduction measures would set their respective emission reduction targets and define the binding power of the new framework in accordance with their respective realities. Generally, the Kyoto Protocol approach is frequently viewed as conflicting with sectoral approaches. But some of such approaches can supplement and coexist with the Kyoto Protocol approach depending on specific forms of the new framework. Sectoral approaches could be flexibly applied to specific industrial or developing countries

in accordance with their respective realities.

We here would like to sort out and analyze details of sectoral approaches as proposed by various research institutes.

2. Classification of Sectoral Approaches

Examining many proposals and studies on sectoral approaches, we find

that proposal sponsors adapt definitions, scopes and significances of sectoral approaches to their own ideas in the absence of any common definition. Sectoral approach proposals have a variety of objectives, specifics or systems. Therefore, we must first specify objectives of sectoral approach proposals and understand their details in discussing these proposals.

We here would like to classify sectoral approach proposals into three categories in accordance with their objectives and systems (see Figure 2-1). The first category seeks to encourage developing countries and others outside the Kyoto Protocol to join a new framework against global warming. Unlike the Kyoto Protocol requiring specific countries to achieve absolute GHG emission reduction targets, this category allows national commitments and emission reduction targets to be more flexible. Sectoral approaches that prompt non-Kyoto Protocol nations to join the new climate change prevention framework and improve the effectiveness of the new framework are here defined as "effectiveness-oriented sectoral approaches." This category includes the no-lose target³ approach and cooperation in technology transfers⁴.

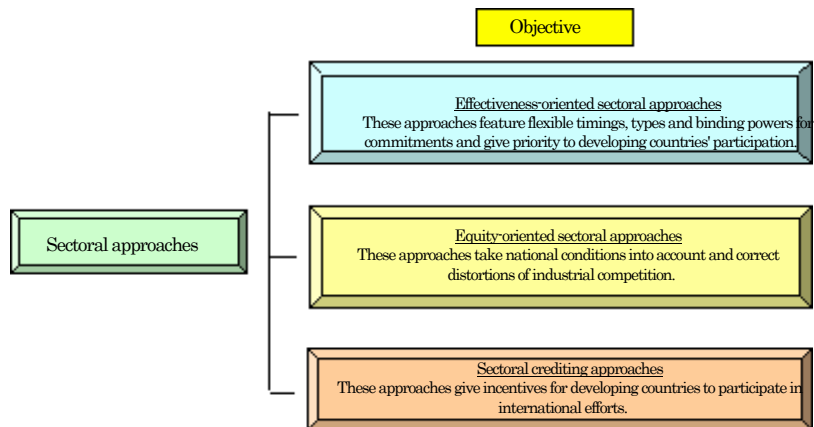
The second category covers approaches that take sector-by-sector conditions into account in setting country-by-country GHG emission reduction targets. This category of approaches harmonizes bottom-up approaches with top-down approaches. Sectoral approaches in this category are designed to secure fair burdens on countries when country-by-country GHG emission reduction targets are set. Such approaches include the Triptych Approach⁵ and the multi-sector convergence approach. We call these approaches "equity-oriented sectoral approaches."

The third category covers "sectoral crediting" approaches proposed as an incentive for developing countries to participate in international emission-cutting efforts, promote their domestic emission-reducing measures and introduce and diffuse technologies provided by industrial countries. The category includes sectoral CDM (Clean Development Mechanism)⁶ and sectoral crediting⁷ proposals. These sectoral crediting proposals are not alternatives to other approaches but complementary ones that encourage developing countries to participate in international efforts and give flexibility to industrial countries' achievement of emission-reduction targets.

2-1 Effectiveness-oriented Sectoral Approaches

The effectiveness-oriented sectoral approaches aim at a flexible arrangement to pave the way for developing countries that have no emission-reducing obligations under the Kyoto Protocol and the United States that has broken

Figure 2-1 Classification by Objective



³ Schmidt et al. (2006)

⁴ Schmidt et al. (2006)

⁵ Groenenberg et al. (2001)

⁶ Baron and Ellis (2006)

⁷ Samaniego and Figueres (2002)

away from the protocol to participate in a new international framework after 2012. Various approaches regarding commitment makers, binding power and types of targets have been considered for flexibility. The effectiveness-oriented sectoral approaches give priority to balancing effects of commitment implementations with the feasibility of commitments. Legally binding absolute emission targets can secure environmental effects but are difficult for developing countries to accept. Any framework based on such targets would be less effective. The basic idea for the effectiveness-oriented sectoral approaches is that we should develop a framework that is feasible to be joined by a wide range of countries including developing nations while being less certain than the Kyoto Protocol to bring about environmental effects. Relevant proposals over recent years have given considerations to specific system designs and problems with system implementations or operations.

Figure 2-2 Classification of Effectiveness-oriented Sectoral Approaches

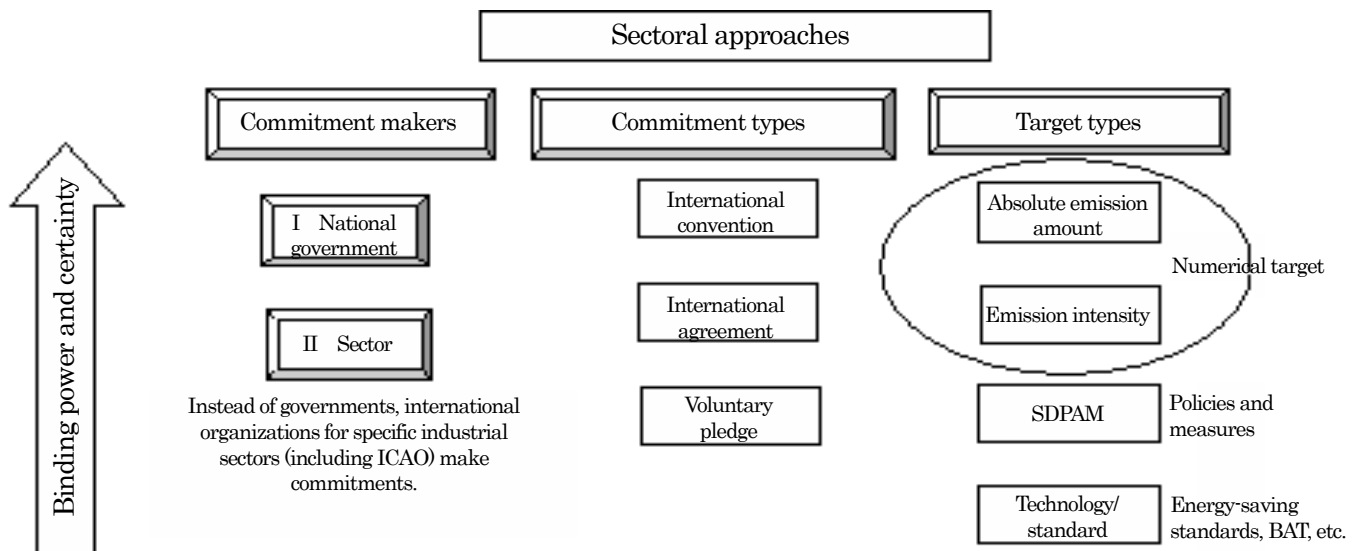


Figure 2-2 shows the classification of effectiveness-oriented sectoral approaches by commitment maker, commitment form and target. Commitment makers are those that make commitments and secure their implementation. Governments may make such commitments for specific sectors within their respective countries, and international industry organizations may become commitment makers. The former commitments may result in national sectoral targets and the latter may lead to transnational sectoral targets.

Commitments may take the form of voluntary pledges, international agreements or international conventions depending on their binding power. Legal binding power increases in that order. Voluntary pledges are unilateral statements of nonbinding targets. Specifically, such pledges are registered as domestic climate change countermeasures at the United Nations or reported as such measures to the international body. In voluntary pledges, national governments can freely fix policy implementation forms, policy details and target dates. As far as commitments are voluntary, national governments may not necessarily have to quantify effects of their policies or measures. National climate change countermeasures are reported to the U.N. Secretariat through the national communication process. Given that reports from developing countries are limited, voluntary pledges are expected to be useful for grasping real measures taken in developing countries (Lewis and Diringer, 2007).

Under any international agreement, voluntary efforts may have to be accepted as sufficient by other agreement partners (such as parties to the U.N. Framework Convention on Climate Change). Governments may have to make significant binding commitments rather than simple pledges. Depending on some conditions, they may be required to

quantify expected effects of emission-reducing measures⁸. If any international convention were to be concluded, procedural rules and criteria would have to be established for governments' commitments. For example, Lewis and Diringer (2007) proposed that developing countries gradually shift from voluntary pledges to an international convention under a new framework after 2012.

Targets proposed for effectiveness-oriented sectoral approaches include absolute emission amounts, emission intensities, sustainable development policies and measures (SDPAMs), technologies and standards. From these targets, one or more may be selected freely. Depending on a target-reviewing process, targets may be fixed or dynamic. A fixed target for a framework may not be altered until a new framework is developed. A dynamic target may be automatically raised in accordance with economic development indicators such as GDP data.

In a study on various existing sectoral approach proposals, Siikavirta (2006) classified these proposals by target or mechanism into four groups -- (1) approaches for setting numerical targets, (2) sectoral crediting mechanisms, (3) technology-oriented approaches and (4) sustainable development approaches. The first group is further divided into three subgroups -- national targets, national sectoral targets and transnational sectoral targets. Out of the targets in Figure 2-2, absolute emissions and emission intensities fall within the category of numerical targets, according to the classification by Siikavirta (2006). The SDPAM or target policies and measures are subject to the sustainable development approaches. Targets for the introduction of technologies and standards fit the technology-oriented approaches.

2-2 Equity-oriented Sectoral Approaches

The equity-oriented sectoral approaches focus on how to fix country-by-country shares of GHG emission reductions. The Triptych Approach is one of the sectoral approaches based on differences between countries in population, economic growth, living standards, economic structure and power mix. It was used for negotiations to fix country-by-country shares of emission reductions within the European Union in 1997. The Triptych Approach divides GHG emission sources into three sectors -- the energy-intensive industry, the power producing sector and the domestic sector. Giving considerations to differences between national conditions, the approach uses different standards for the three sectors to calculate sectoral emission quotas. The Triptych Approach has been adopted for country-by-country emission quotas, rather than sector-by-sector targets or commitments (Groenenberg et al., 2002)⁹.

Since the Triptych Approach has been developed originally for fixing country-by-country shares of GHG emissions for the EU countries that are economically similar, it must be adjusted for global applications to meet greater differences between countries. In this respect, the multi-sector convergence approach has been proposed. This approach calls for (1) setting the year and level for the convergence of GHG emissions, (2) defending rights for countries with less per capita emissions and low economic development levels to achieve economic growth, (3) adjusting emission quotas and emission-reducing speeds in consideration of economic structure differences between countries, (4) taking into account geographical conditions such as cold regions, warm regions and wide territories, and (5) adopting flexible measures giving considerations to emissions that accompany the economic transition (Jansen et al., 2001).

The multi-sector convergence approach features emission standards based on differences between sectors in a domestic economy. The approach seeks to converge per-capita emissions in all countries ultimately. Under this approach, countries that have special reasons to require greater emission quotas than well-endowed nations may be allowed to get additional quotas. The multi-sector convergence approach also subjects all GHG emissions to emission quotas (while the Triptych Approach subjects only CO₂ emissions to quotas) and allows developing countries to achieve economic growth without restricting GHG emissions unless emissions remain below a threshold (Jansen et al., 2001).

⁸Lewis and Diringer (2007) proposed that an expert panel or an independent organization be created for assessment of quantified policy effects and that such organization be designed to verify projected emissions while refraining from deciding whether to accept any specific policy.

⁹ Sector-by-sector targets or commitments may prevent each nation from promoting the most cost-efficient emission-reducing measures.

2-3 Sectoral Crediting Approaches¹⁰

Massive private sector investment in global warming countermeasures has been implemented through the Clean Development Mechanism (CDM). The U.N. Secretariat has issued 127.68 million tons (in CO₂ terms) in certified emission reductions (CER), or CDM credits. By 2012, CDM credit issues are expected to reach 1.17 billion tons¹¹.

The sectoral crediting approaches aim at promoting and expanding the flexibility mechanism of the Kyoto Protocol and have been discussed as solutions to problems regarding the CDM as a project-based approach¹².

Sectoral crediting approach proposals are divided by objective into two groups. One group consists of sectoral CDM proposals that call for admitting policy-based program CDMs, sector-wide CDMs and regional CDMs in addition to project-based CDMs. Another group proposes that credits be issued for developing countries' climate change countermeasures (including the implementation of relevant policies and the introduction of standards) and be allowed to be traded. This is designed to provide incentives for developing countries to accept some obligations under a new international framework after 2012. This approach calls for creating a new crediting mechanism separated from the CDM and is different from the sectoral CDM proposals.

In both groups of sectoral crediting approach proposals, policy effects or sector-wide efforts must be quantified. Each proposal thus focuses on how to quantify them. Technical problems with the quantification include double counting and coverage. The double counting problem means that credits could be issued for a single project under both the project-based CDM and sectoral CDM systems. The coverage problem means that measures or efforts in one sector bring about emission reductions as credits for the sector while other measures are taken to increase emissions. In order to avoid these problems, sector-wide measures or efforts may have to be subjected to quantification and each sector's coverage may have to be specified.

Lewis and Diringer (2007) called for restricting credits available for trading, warning that credits for policies and measures in one country could become excessive subsidies for commitments by other countries and that limitless credit issues could become an incentive to impede a transition to appropriate emission targets.

The Samaniego and Figueres (2002) proposal considers an arrangement for encouraging developing countries to join a new framework by developing the existing CDM, instead of creating a framework imposing new numerical targets on them. This proposal seeks to develop the present CDM into a sector-based CDM. Specifically, the project-based CDM may be transformed into a policy-based CDM or a CDM based on a group of projects¹³. No targets may have to be set for sectoral CDMs. Reductions from the baseline level may become credits¹⁴.

The first advantage of expanding the existing CDMs into sectoral CDMs is that an incentive will be created to introduce climate change countermeasures for the whole of each sector. The second advantage is that if industrial countries' further emission reductions are decided on at negotiations on a new framework to fight climate change, demand for CDM credits will increase to allow developing countries to contribute to tackling climate change through CDM-based emission reductions. The third advantage is that sectoral CDMs would help developing countries build capacity for making commitments by promoting collection of sectoral data. Furthermore, transaction cost of CDM

¹⁰ This section considers such sectoral credit studies as Samaniego and Figueres (2002) of the World Research Institute (WRI), the OECD's Bosi and Ellis (2005), Philibert (2005), Baron and Ellis (2006), and the CCAP's and the Pew Center's Lewis and Diringer (2007).

¹¹ One credit amounts to one ton in CO₂. The projection includes estimated emission reductions for CDM projects subject to registration procedures at a U.N. CDM office (as of March 13, 2008) (<http://cdm.unfccc.int/index.html>).

¹² A problem with the present CDM is a disincentive for developing countries to introduce climate change policies. This means that developing country governments may refrain from introducing due climate change policies, fearing that such policy introduction would lead CDM projects to be treated as business as usual. In this regard, the CDM Executive Board has decided not to regard CDM projects as BAU for countries that introduced climate change policies such as energy conservation and renewable energy introduction subsidies in or after November 2001.

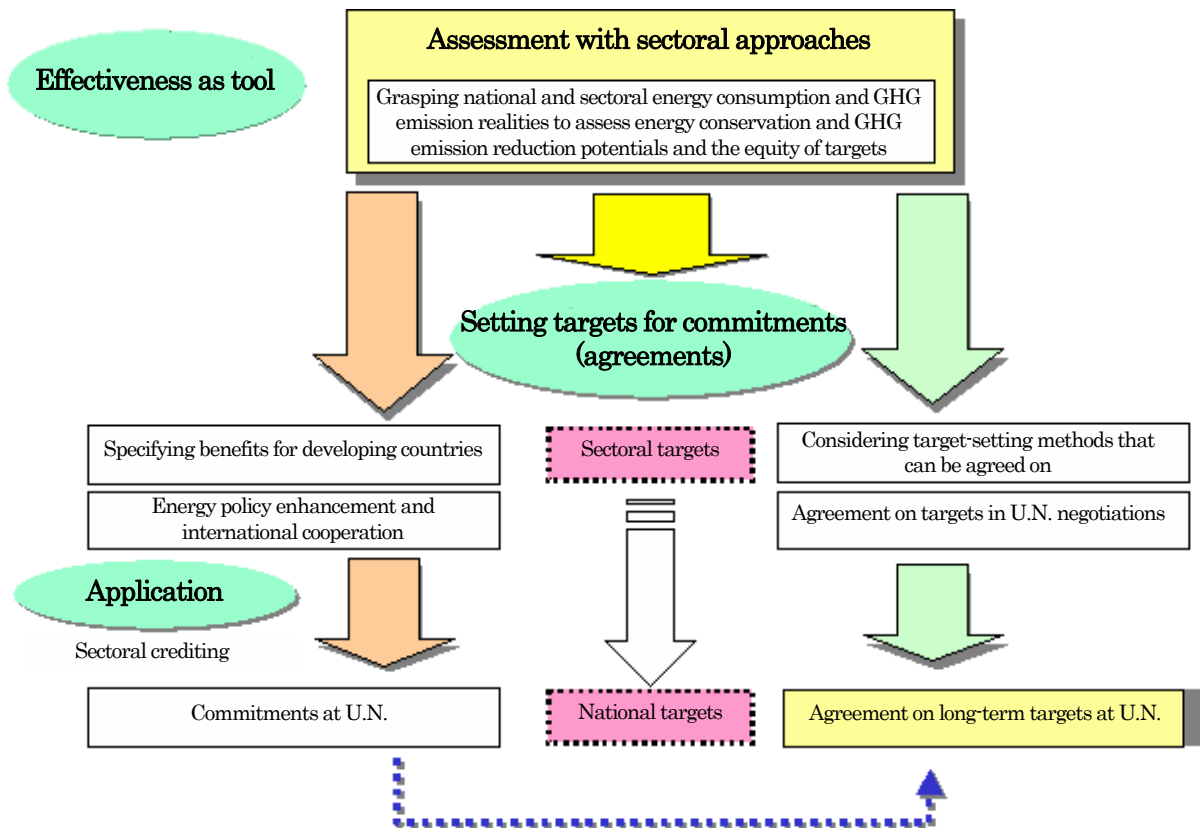
¹³ Sectoral CDMs include CDMs for specific sectors (including power producing, transportation and forest sectors), CDMs bundling regional projects, and their combinations (including a CDM for regional transportation and lighting sectors).

¹⁴ The reason why the CDM was limited to individual projects was that developing countries were concerned that sectoral baselines could become de facto emission-reduction targets.

trading may be saved. A system for 2% of CDM gains to be contributed to an adaptation fund may contribute to measures for adaptations to climate change. Sectoral CDMs may be compatible with the Kyoto Protocol. But technical problems are left to be solved before sectoral CDMs are realized. For example, sectoral baselines may have to be fixed and capacity may have to be built to project emissions and emissions inventories to monitor each project (Samaniego and Figueres (2002).

3. Sectoral Approaches' Roles and Consequences in Future Framework

Figure 3-1 Sectoral Approaches' Expected Roles in International Negotiations



As explained above, various sectoral approaches have been proposed for various objectives. We have classified them into three categories. Here, we would like to consider sectoral approaches' roles and consequences while taking note of future international negotiations.

Given future international negotiations, sectoral approaches can be expected to play three roles. First, sectoral approaches can serve as an effective tool for the assessment of GHG emission potentials. When future national measures against global warming are considered, national realities and GHG emission potentials may have to be assessed. Such assessment has been done through the AWG-KP process. Results of such analyses and their accumulation will play a great role in forming a consensus on effectiveness-oriented commitments. Comparative assessment benchmarks developed through sectoral assessment may allow countries to consider and agree on equitable national and sectoral targets. In this sense, sectoral approaches may play an important role as an assessment tool.

The second role of sectoral approaches is to serve as a method for setting targets. In order to solve problems with the Kyoto Protocol for national targets, we may have to work out more flexible and feasible commitments by considering various sectoral targets and target-setting procedures in which a wide range of countries including developing nations could participate.

The third role of sectoral approaches is to serve as applications. Like the Kyoto Mechanism under the Kyoto Protocol, sectoral CDMs and other credit-creating mechanisms are considered as options for countries to achieve targets and participate in the framework. Such consideration can be positioned as an option to develop agreement on the new framework. Sectoral approaches are thus expected to pave the way for developing agreement.

Possible consequences of efforts to understand and share roles of sectoral approaches in the course of international negotiations may include legal binding power gaps, sectoral targets and national targets, indicating that sectoral approaches are not necessarily alternatives to the Kyoto Protocol approach. We have to take note of this point. As well as the Kyoto Protocol approach, sectoral approaches seek to build a highly feasible, equitable framework in which a wide range of countries could participate. Sectoral approaches are not necessarily opposite to the Kyoto Protocol approach.

4. Sectoral Approach Proposals by Organizations

As explained above, sectoral approaches are expected to take diverse forms and bring about diverse consequences. Specific sectoral approach proposals by various organizations including research institutes have given considerations to such diversity. Here, we would like to closely examine real sectoral approach proposals made by various organizations and review the realities of these approaches.

4-1 OECD/IEA

The OECD has released many research reports on sectoral approaches. Here, we would like to outline seven OECD research reports published in three years from 2005 (three in 2005, two in 2006 and two in 2007)¹⁵. Of the seven reports covered here, three concern sectoral crediting approaches¹⁶, two concern sectoral approaches in the future framework including the effectiveness-oriented sectoral approaches¹⁷, one concerns transnational sectoral agreements¹⁸ and the remaining one concerns the SDPAM¹⁹.

4-1-1 Sectoral Crediting Approaches

OECD sectoral crediting approaches include those considered under the Annex I Expert Group²⁰ project²¹.

Bosi and Ellis (2005) considered three crediting mechanisms -- policy-based crediting, fixed sectoral emission limits and intensity-based crediting. Under the policy-based crediting mechanism, credits are created on the introduction and implementation of climate change measures in a specific sector. Under the fixed sectoral emission limit system, credits are given for emission reductions by sectors or business enterprises from pre-determined limits. Under the intensity-based crediting mechanism, credits are created when emissions slip below a certain intensity target.

Regarding the three mechanisms, the Bosi and Ellis (2005) report assessed what would be required for defining the baseline, how credits would be created and what would be required for mechanism operation and management organizations. As frameworks for building these sectoral crediting mechanisms, this report proposed two approaches -- the transnational sectoral mechanism (for the world's enterprises in each sector) and the national sectoral mechanism (for each sector within a country). Regarding these mechanisms, it also compared these mechanisms from various viewpoints including environmental effects, necessary data and their availability, system designs, implementation costs and competitiveness.

¹⁵ One OECD report and six IEA/OECD reports

¹⁶ Bosi and Ellis (2005), Philibert (2005), Baron and Ellis (2006)

¹⁷ Baron (2006), Baron et al (2007)

¹⁸ Watson et al. (2005)

¹⁹ Ellis et al. (2007)

²⁰ The Annex I Expert Group has been created by the OECD/IEA, consisting of environment, energy and foreign affairs ministry officials from the Annex I countries. OECD and IEA officials undertake analyses to support the UNFCCC negotiations and development of domestic climate change countermeasures.

²¹ This section considers three research reports -- Bosi and Ellis (2005), Philibert (2005), Baron and Ellis (2006)

Baron and Ellis (2006) analyzed problems with operation of the three sectoral crediting mechanisms based on policies, intensity and emission limits and defined sectoral crediting as extending the CDM coverage to an entire sector. Under their proposal, baseline emission levels would be estimated and a system would be created to issue credits for gaps between baseline and actual emissions through international procedures. National governments or competent authorities would distribute these credits to relevant emission sources.

Philibert (2005) considered the potential compatibility between various emission targets and the domestic or international emission trading system. Targets subject to consideration included dynamic targets, legally binding price-capped targets, nonbinding targets, sectoral targets and action targets. Philibert concluded that dynamic targets, legally binding price-capped targets, nonbinding targets, sectoral targets (sectoral credits) and action targets would be compatible with the domestic or international emissions trading system, depending on models and first preconditions. Philibert also suggested that these targets contribute to a flexible climate change framework giving considerations to national conditions.

4-1-2 Sectoral Approaches Based on Future Framework

Baron (2006) put in order arguments about the scope for integrating sectoral approaches with a climate change framework and classified sectoral approaches into four categories -- (1) global actions through industrial sectors' voluntary pledges, (2) global agreements between industrial sectors and UNFCCC member countries, (3) national sectoral policies and (4) sectoral crediting mechanisms. Global actions mean an industry-led pledge-and-review mechanism where sectors (business enterprises) may adopt targets (absolute emission amounts, intensity levels or actions for achieving targets) and declare them unilaterally. According to Baron (2006), a relevant sector's clear production boundary would increase the trustworthiness of achievements. When achievements are reported regionally or globally, monitoring and emission certification would be required. Global agreements represent international approval of industry sector efforts to achieve certain targets. Sectoral policies mean agreements between sectors and governments giving considerations to the aspect of competition. Such agreements include an voluntary agreement by the European Commission and carmakers.

The sectoral crediting mechanisms set baselines for each sector and are close to the above-mentioned Baron and Ellis (2006) mechanism. The Baron proposal also considered how these targets' integration with the present climate change framework would affect national commitments, the Kyoto Protocol mechanisms and national policies. The proposal put forward various options, while falling short of considering the feasibility of various systems and comparison of environmental impacts.

Like Baron (2006), Baron et al. (2007) considered various sectoral approach options and analyzed industrial benchmarks, sectoral crediting and baseline development as sectoral approach means. As potential sectoral approaches under the UNFCCC arrangement, the report cited pledge-and-review mechanisms, technical agreements and national commitments to which sectoral commitments would be added up (Baron et al., 2007, pp.46-47). The report also included case studies on iron, cement and aluminum sectors and assessed these sectors' potential emission reductions.

4-1-3 Transnational Sectoral Agreement

Transnational sectoral agreements mean that sectoral emission reduction targets would be internationally negotiated and applied on a global basis. This scheme, introduced by Watson et al (2005)²², is suitable particularly for international sectors and considered as a solution to industrial competitiveness problems. The report was prepared for the Round Table on Sustainable Development at the World Bank in June 2005. It stated that there would be various targets, mechanisms and legally binding powers for sectoral agreements. Noting that stereotyped designs are impossible propose because of

²² The report was prepared for the Round Table on Sustainable Development at the World Bank in June 2005.

differences between sectoral conditions, the report cited intensity target agreements and R&D agreements as means for promoting technology transfers and diffusion. It also considered problems regarding the introduction of such sectoral agreements in aluminum, cement, steel, coal thermal power generation and automobile sectors.

For example, the report stated that an R&D agreement would be more appropriate than an intensity target agreement for the aluminum sector. As to the reasons, it noted that (1) the aluminum sector's electricity power consumption accounts for 50% of its GHG emissions and is difficult to reduce without costly changes in the national electricity mix, (2) the sector already has made new investment to acquire the most efficient technology, and (3) energy efficiency gaps between aluminum plants have been limited. Since the development and commercialization of more innovative technologies are necessary, the report proposed the R&D agreement as a more suitable option for the sector (Watson et al., 2005, pp.13-14).

The report also considered possible applications of sectoral agreements based on analyses of sectoral conditions regarding (1) production and trade volumes, (2) GHG emissions, (3) intensity (power consumption, process emissions) and (4) emission reduction potentials (diffusion of existing technologies, technologies available over a medium term, and those available over a long term).

4-1-4 SDPAMs

Ellis et al. (2007) studied how Sustainable Development Policies and Measures, or SDPAMs, would be incorporated into a climate change arrangement after 2012. The research report proposed the SDPAMs as the replacement of national numerical targets only for non-Annex I countries, or developing countries. As for the reasons for paying attention to the SDPAMs, the report stated that (1) nations would be able to promote climate change policies on a unilateral, bilateral or multilateral basis, (2) developing countries would be officially included into a climate change arrangement after 2012, (3) domestic policies of countries having no GHG emission reduction targets would be approved officially, and (4) SDPAMs would make it easier for governments to raise funds for policy implementations. The report viewed the SDPAMs as a bridge between countries having numerical targets and those having no such targets.

SDPAMs are divided into three groups -- SDPAMs with credits available for trading and offsetting emissions in industrial countries, those with non-credit incentives and those for registration of information. The report also noted that credits, while being key incentives for the implementation of SDPAMs, are based on demand from countries other than those implementing SDPAMs. As tough emission reduction targets of developed countries would ultimately be a precondition for these credits, it stated, some countries had rejected the SDPAM scheme. In order to incorporate SDPAMs into the future framework, systems will have to be built to define actions for international identification of SDPAMs and conduct crediting and other SDPAM assessments (submission, approval, registration, monitoring and verification). The report claimed that effective cases had existed for building these systems, citing the World Bank's lending decision process.

4-2 CCAP

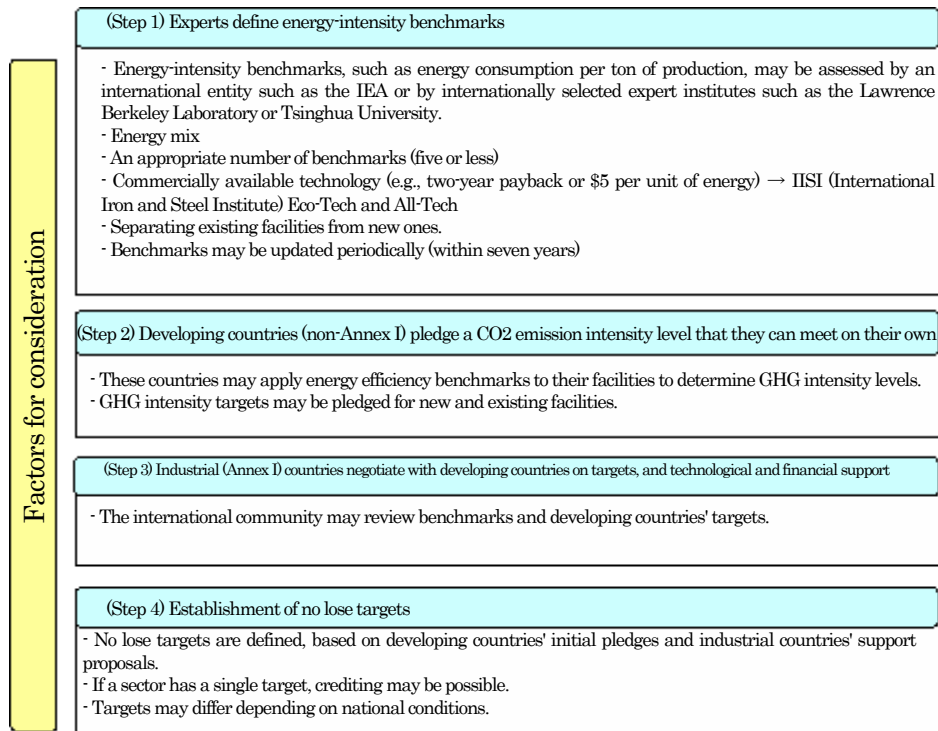
Schmidt (2006) proposed sectoral approaches for a new international climate change framework after 2012, based on discussions at the Dialogue on Future International Actions to Address Climate Change, sponsored by the Center for Clean Air Policy (CCAP)²³. While many other sectoral approaches were proposed as means to reduce emissions in specific sectors in developing countries, Schmidt proposed that developing countries voluntarily pledge "no lose" targets for sectoral emission intensity levels and that industrial nations adopt sectoral approaches that would impose national

²³ The CCAP invited senior climate change negotiators from industrial and developing countries to attend the biannual Dialogue on Future International Actions to Address Global Climate Change (FAD) under the future climate change framework project. Schmidt (2006) reflected discussions there.

absolute volume targets using sector-by-sector benchmarks.

Under the Schmidt proposal, major developing countries would first pledge "no lose" targets for intensity levels (e.g.: GHG emissions per ton of steel output). Specific sectors may include power generation, cement, steel, oil refining, paper-pulp and metallic products. The 10 largest GHG emitters (including developing countries) in each sector may cover 80-90% of global sectoral emissions. Excess reductions above targets under voluntary pledges would be used for issuing credits for sales to industrial countries. But no penalty will be imposed on failures to achieve emission targets. This is the reason these targets are called "no lose" targets. As an incentive for developing countries to set tougher targets, industrial countries and international financial institutions may provide some technology finance and assistance packages.

Figure 4-1 Steps to Establish No Lose Targets



Source: Schmidt (2006)

Developing countries' "no lose" targets would be determined through their negotiations with industrial nations. To this end, experts²⁴ would first assess energy efficiency benchmarks for major industrial processes. Then, developing countries would consider the applicability of these benchmarks to their own emission reduction targets. Although industrial nations would conduct benchmarking to determine the industry sector's emission reduction targets when setting national targets, the national targets are absolute amount economy-wide targets based on sectoral assessments and different from sectoral targets. Developing countries' other sectors such as transport, consumers and commerce would be allowed to take part in sectoral CDMs.

Schmidt (2006) included a very specific proposal that would create an international framework in which developing countries would contribute to GHG emission reductions through their voluntary pledges of emission intensity targets and receive technical assistance from independent international organizations and financial aid from industrial nations (see Figure 4-1).

²⁴ The IEA, the Lawrence Berkeley Laboratory and Tsinghua University are cited as example experts.

4-3 Pew Center

The Pew Center held unofficial meetings named Climate Dialogue at Pocantico²⁵ to deal with international climate change frameworks in 2004 and 2005 and released two research reports on sectoral approaches, based on discussions at these meetings. Of the reports, Bodansky (2007) put in order definitions and categories of sectoral approaches and studied "transnational sectoral agreements" in which national governments would pledge sectoral emission-reducing actions. Another report, Lewis and Diring (2007), analyzed policy-based commitments as part of a new international climate change framework after 2012, considering the feasibility of and key problems with such commitments.

4-3-1 Transnational Sectoral Agreements

Bodansky (2007) proposed transnational sectoral agreements for national governments' commitments of sectoral emission-reducing actions as part of the next framework. Such agreements may take three forms -- (1) sectors' respective agreements, (2) simultaneous or serial negotiations for a series of sectors, and (3) sectoral agreements as part of a comprehensive framework including other type of commitments as well. Bodansky (2007) noted that an economy-wide approach²⁶ can flexibly allow the least costly sectors to reduce emissions most and can prevent emission leakage to non-regulated sectors. Since an integral approach where all major GHG emitters participate with all emission resources and sinks covered would be more desirable from environmental and economic perspectives, however, transnational sectoral agreements that are easier for countries to take part in and negotiate²⁷ would be more effective.

Bodansky (2007) also studied assessment criteria for the selection of sectors suitable for the above-mentioned transnational sectoral agreements. Environmental criteria include sectors' shares of GHG emissions, sectoral GHG emission growth rates, sectoral GHG emission-reduction potentials and secondary benefits. Among economic criteria are adjustment costs, capital lock-in (long-term effects) and international competitiveness. Effectiveness-related criteria include industrial intensity, network effects, industry's acceptance, product identity, easy monitoring and supervision, feasibility of negotiations and feasibility of participation.

While Watson et al. (2005), as mentioned in 4-1-3, cited not only national governments but also international trade organizations as commitment makers, Bodansky (2007) basically limited commitment makers to national governments.

4-3-2 Policy-based Sectoral Approach

Lewis and Diring (2007) considered the possibility of policy-based commitments being incorporated into the new climate change framework and important problems with the incorporation. Policies And Measures, or PAMs, as proposed by Lewis and Diring (2007) for the new framework, are basically designed for developing countries and represent one of the commitment types rather than the only or most important commitment form. These policies and measures are those linked to the whole of the new framework.

Under the PAM proposal, national governments may make voluntary action commitments, new commitments as part of the new framework package, and regular commitments. Commitments are thus designed to develop gradually. In the voluntary action commitment phase, national governments may be allowed to discretionally set forms, details and timings of PAMs. These PAMs may be declared or registered on a list of commitment actions in a framework convention. Voluntary action commitments would be unilateral declarations. Their effects would not have to be

²⁵ Four unofficial meetings were held between July 2004 and September 2005, with government officials, business leaders and citizens participating from 15 countries including Australia, Brazil, Britain, Canada, China, Germany, India, Japan, Mexico and the United States. Participating companies included Alcoa, BP, DuPont, Exelon, Eskom (the largest electric utility in Africa), Rio Tinto and Toyota Motor.

²⁶ While a sectoral approach targets a specific sector, the term economy-wide approach has been used to target an entire country.

²⁷ As a relatively smaller number of players take part in sectoral agreements, their negotiations are considered to be easier.

quantified. Voluntary action commitments would be useful for grasping actions of developing countries. In the phase for commitments as part of a package for the future framework, one country's policies for voluntary actions may have to be accepted as sufficient by others. Policy commitments in this phase may have to represent significant obligations rather than simple pledges. Their expected GHG emission reduction effects would have to be quantified. The assessment of policy effects would be required for such quantification. Therefore, Lewis and Diring (2007) proposed an expert panel or an independent organization for the assessment of policy effects. Such panel would only certify projected emissions and stop short of deciding whether specific policies are right or not.

Such system would be fully incorporated into a framework convention and procedures and criteria would have to be developed for regular updating of commitments, according to Lewis and Diring (2007).

The research report also considered crediting PAMs, noting that the means to promote and support participation of developing countries in the new framework would include (1) capacity building for development, assessment and implementation of policies, (2) promotion of technology access, and (3) provision of market opportunities for raising funds. But it warned that PAM-based credits for one country could excessively subsidize other countries' commitments and that limitless credits could become an incentive to impede a transition to the establishment of appropriate GHG emission targets. The report then proposed restrictions on credits available for trading. For example, credit issues may be limited to some percentage of applied credits. Or, credits may be issued only for GHG emission reductions above originally projected levels. This could become an incentive for overachievement of commitments. Another proposed measure calls for only countries meeting certain conditions to be given access to the crediting mechanism.

4-4 Other Proposals

We here would like to consider Kulovesi and Keinanen (2006) on legal problems with sectoral approaches for international negotiations, Coninck et al. (2007) on international technology-oriented agreements as potential global warming countermeasures, and the WRI's Bradley et al. (2007) on a comprehensive review of sectoral approaches.

4-4-1 Legal Problems with Sectoral Approaches

Kulovesi and Keinänen (2006) on legal problems classified sectoral approaches into two categories – procedural sector models in which sectors in place of national governments make commitments and substantive sectoral models in which global benchmarks are established for specific sectors²⁸. Procedural sectoral models are further divided into two subcategories – the first models in which agreements are made between national governments and the second models in which agreements are made between representatives from non-government industrial sectors or between national governments and industrial sectors. In the procedural sectoral models, implementers of climate change countermeasures shift from national governments to non-government entities. Important in this respect are potential implications on international law. As far as agreements are made between national governments, the present UNFCCC framework may stand (but the Kyoto Protocol may have to be modified). For a case in which agreements are made between representatives from non-government industrial sectors and or between national governments and industrial sectors, no precedent agreement exists on a global basis. Therefore, some new international law framework may have to be developed for this case. On a regional basis, European Union member countries and the European Commission have made voluntary agreements with the industry sector (European auto agreements²⁹).

²⁸ Kati Kulovesi, Katja Keinanen (2006) Long-Term Climate Policy: International Legal Aspects of a Sector-Based Approach

²⁹ The European Commission made voluntary agreements with the European Automobile Manufacturers Association (ACEA), the Japan Automobile Manufacturers Association (JAMA) and the Korea Automobile Manufacturers Association (KAMA) in 1998 to reduce average CO2 emissions from new vehicles to 140 grams CO2 equivalent per kilometer by 2008 (by 2009 for KAMA). Since the goal was found difficult to achieve in 2004, the introduction of some regulations has been discussed.

Table 4-1 Types of Technology-oriented Agreements

Type	Outline	Cases
(1) Knowledge sharing and coordination	Meeting, planning, exchange of information	Carbon Sequestration Leadership Forum, coordination and harmonization of research agenda and measurement standards
(2) RD&D	Jointly agreed RD&D activities, funding commitments	ITER fusion project, mutual agreements to expand or enhance domestic RD&D programs, etc.
(3) Technology transfer	Commitments for technology and project financing	Global Environment Facility, flowing from developed to developing countries, facilitating international licensing and patent protection, etc.
(4) Technology mandates and incentives	Agreements encouraging technology deployment by establishing deployment mandates for a specific technology or group of technologies	Deployment mandate for renewable portfolio standards, international technology performance standards for automobile fuel economy or appliance efficiency, renewable energy subsidies

Source: Coninck et al (2007)

4-4-2 International Technology-Oriented Agreements

Table 4-2 Qualitative Examination of Technology-oriented Agreements

	Knowledge sharing and coordination	RD&D	Technology transfer	Technology mandates and incentives
Environmental effectiveness	This type of TOAs features uncertain effectiveness and complementary roles	This type of TOAs features uncertain effectiveness and complementary roles	This type of TOAs features uncertain effectiveness and complementary roles	Possible GHG reductions.
Technological effectiveness	Real technological development is difficult to evaluate. How far a specific goal has been achieved should be evaluated.			
Economic efficiency and cost-effectiveness	Very high	High	High	High (depending on institutional design)
Incentives for participation and compliance	Low costs. Higher costs accompanying constraints (including intellectual property right problems)		Low (incentives should be provided)	Low (1. Compliance costs are lower than under other policies. 2. Fairness for international competition. 3. Co-benefits may be expected in some cases)
Administrative feasibility	Existing state organizations can be used.			

Source: Coninck et al (2007)

Coninck et al (2007) defined technology-oriented agreements (TOAs) as international agreements aimed at promotion of research, development and technology demonstrations. They cover development of technologies and mandatory introduction of specific technologies instead of emission targets or emission intensity targets. Table 4-1 specifies types of TOAs.

Coninck et al (2007) stated that TOAs that aim at knowledge sharing, RD&D (research, development and

demonstration) and technology transfers as well as emission control policies would play a key role, while RD&D agreements alone would lack incentives for emission reductions. The research report also stated that automobile, building, appliance and other sectors where emissions trading and other policies are difficult to implement would be appropriate for mandatory introduction of specific technologies³⁰.

The research report qualitatively examined TOAs' environmental effectiveness, technological effectiveness, economic efficiency and cost effectiveness, incentives for participation and compliance, and administrative feasibility. The results of the examination are tabulated in Table 4-2.

4-4-3 International Sectoral Cooperation

The WRI's Bradley et al. (2007) comprehensively studied the potentials and limits of sectoral approaches and evaluated specific sectors. Remarkably, Bradley et al. (2007) covered not only specific industrial sectors but also 10 broader-defined sectors, including electricity, transport (motor vehicle manufacture and aviation), industry (chemicals, cement, steel and aluminum), buildings, agriculture and forestry. Table 4-3 specifies the sector-by-sector evaluation results. GHG emission figures represent percentage shares of global emissions. The share of global international exposure is based on trade volumes, international investment and operations of multinational corporations. Concentration of actors is related to the number of emission sources. Sectoral approaches are considered more suitable for sectors with a higher concentration of actors (fewer emission sources). The evaluation of the uniformity of products/processes is based on numbers of products, steps and final products. The government role is measured by regulations and subsidies (industry protection policies may be barriers to sectoral approaches).

Table 4-3 Applicability of Sectoral Approach (by sector)

Sector	GHG emissions issues	Share of global international exposure	Concentration of actors	Uniformity of products/ processes	Government role	GHG measurement/ calculation issues	GHG attribution
Electricity & heat	24.60%		—	+	—		
Transport	13.50%						
Motor vehicle manufacture	9.90%	+	+	+	+		
Aviation	1.60%	+	+	+		+	+
Industry	21.10%						
Chemicals	4.80%	+	—	—			
Cement	3.80%		+	+			
Steel	3.20%	+	+	+			+
Aluminum	0.80%	+	+	+			+
Buildings	15.40%		—	—	+		
Agriculture	14.90%		—	—	—	+	
Waste	3.60%		—	+	—	+	
Land-use change & forestry	18.20%			—	—	+	

Notes: Sectors shown do not comprise 100 percent of global emissions. A "+" grade suggests high appropriateness or conduciveness for international sectoral cooperation. A "-" grade suggests a barrier to international sectoral cooperation.

Source: Bradley (2007), p.3

³⁰ The electricity sector is cited (for agreements on the introduction of the renewable portfolio standard system and the coal cartridge system), based on the political and administrative feasibility of technology introduction.

5. Application example of Sectoral Approaches (APP³¹)

5-1 Overview of APP

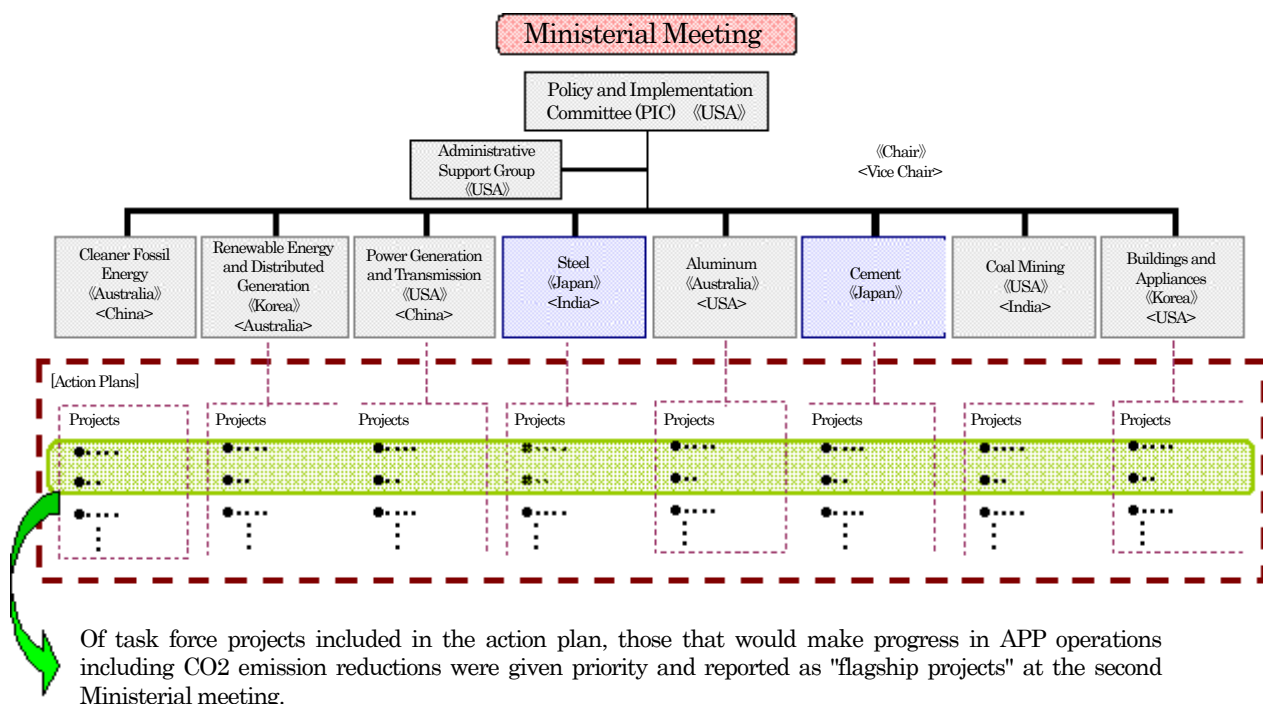
The Asia-Pacific Partnership on Clean Development and Climate is a regional cooperation partnership launched at the initiative of the United States in July 2005. There were six original APP members -- Japan, the United States, Australia, the Republic of Korea, China and India. At the second APP ministerial meeting in October 2007, Canada's participation in the APP was officially decided on.

The APP was created to address growing energy demand, energy security and climate change in the Asia-Pacific region. Specifically, it promotes regional cooperation in the development, diffusion and transfer of clean and efficient technologies. It focuses on energy technologies and facilitates cooperation in promoting the introduction of specific technologies. Regarding climate change, the APP is positioned to supplement the Kyoto Protocol.

5-2 APP Management

The APP has put the Policy and Implementation Committee under the Ministerial meeting that makes overall management decisions, specified eight sectors for operations and set up a task force of government and private sector representatives for each sector to work out and implement concrete action plans (see Figure 5-1). Since the seven APP participants account for a majority of global output, energy consumption and GHG emissions, the APP is expected to produce great effects. Since government and private sector representatives and researchers are united to implement projects, the effectiveness of these projects is expected to increase. As the APP participants are fewer than the UNFCCC members, the APP is expected to make faster and more practical progress.

Figure 5-1 APP Management Organization and Operations



5-3 Sector-by-Sector Action Goals and Present Situation (Flagship Projects)

The APP is working out action goals for the eight sectors and measures to achieve these goals. Flagship projects to achieve action goals in these sectors were reported at the second APP Ministerial meeting in 2007 and have been

³¹ Asia-Pacific Partnership on Clean Development and Climate

underway. Action goals for these sectors and the flagship projects are outlined below.

(1) Cleaner Fossil Energy Task Force

The Cleaner Fossil Energy Task Force recognizes that coal, oil and gas will remain critical fuels for all six Partner economies. Given predictions of increasing energy demand in the Asia-Pacific region, the Task Force seeks to improve the efficiency and environmental performance of fossil fuel use. The Task Force identified a range of key advanced coal and gas technologies that can significantly reduce greenhouse gas emissions, air-borne pollutants and other environmental impacts, including Integrated Gasification Combined Cycle (IGCC), producing hydrogen from coal, and Ultra-Supercritical Pulverized Coal. The use of carbon dioxide capture and storage also could help reduce greenhouse gas emissions from fossil fuel use. The Task Force is actively working to share best practices, eliminate market barriers to the deployment of these technologies, and increase the utilization and efficiency of cleaner fossil energy.

【Flagship projects】

- ① Callide-A oxy-fuel demonstration project (CFE-06-05)
- ② Assessing post combustion capture (PCC) technology for emissions from coal fired power stations (CFE-06-06)

(2) Renewable Energy and Distributed Generation Task Force

Renewable energy and distributed generation technologies will be critical for all six Partner countries to realize the goals of energy access, energy security, poverty alleviation, reducing greenhouse gas emissions, and mitigating the economic and social effects of increasing fossil fuel prices. The Renewable Energy and Distributed Generation Task Force is working to promote renewable energy technologies, such as hydro, solar, geothermal and wind, which generate virtually zero emissions. The Task Force is promoting distributed generation as a model that can significantly reduce emissions and promote greater cost efficiencies, as well as respond to the demographics of energy poverty, thereby increasing access to modern energy services. To promote these objectives, the Task Force will strive to identify barriers to technology transfer and financing associated with deployment of renewable and distributed generation technologies, focusing on cost competitive technologies with both on and off-grid applications.

【Flagship projects】

- ① Building critical mass for ultra high efficiency solar power strategy (RDG 06-01)
- ② Feasibility study and development of microgrid smart energy solution

(3) Power Generation and Transmission Task Force

The six Partner countries produce 49% of the world's electricity. Improvement in power generation and transmission efficiency in Partners thus has the potential to reduce the emissions of millions of tons of CO₂ and pollutants. This share of power will likely continue to grow given both China and India's goals to increase access to modern energy services throughout their rural regions and the need for increased generation capacity in all Partners. Despite growing demand for power, the potential for mitigation of greenhouse gas and pollutant emissions in Partners is substantial. For example, a low-cost simple upgrade at an Indian power station has recently allowed its power generation efficiency to be improved by 1.5%. The Task Force tackles such efficiency improvement in all Partner countries through systematic actions.

【Flagship Projects】

- ① The entire chain of power generation best practices, peer review, workshops and follow-on projects which implement best practices either through operational changes or installations of new hardware and reduce emissions.

(4) Steel Task Force

Partners presently account for more than 57% of the world's total production of crude steel. Production is expected to increase, with India and China leading the way. Partners on the Steel Task Force have worked together to identify technologies to reduce the emissions and energy consumption of the global steel sector.

【Flagship Projects】

- ① State of the art clean technology (SOACT) handbook (STF-06-05)
- ② Establishment of common methodology to identify reduction potential and performance benchmarking (STF-06-02 and 03)
- ③ Development of mechanism for eligible technology adaptation based on expert diagnoses (STF-06-04 and 06)

(5) Aluminum Task Force

Partners account for approximately 37% of the world's aluminum production. The aluminum industry is one of the fastest growing sectors, with rapid growth in developing countries. Through the Partnership, countries can advance industry toward global perfluorocarbon (PFC) reduction objectives and address the management of waste byproducts and emissions resulting from the aluminum production processes. Partners will promote best practice performance, increase technical support, and identify impediments to deployment of best available and affordable technology. The six Partners' aluminum associations agreed to a memorandum of understanding (MOU) in May 2006 which included a commitment to enhance the greenhouse gas performance of aluminum production processes and to enhance existing cooperative arrangements across the sector. The agreement strongly indicates relevant organizations of Partners will cooperate in raising funds for the Task Force to further pursue goals.

【Flagship Projects】

- ① Management of PFC emissions (ATF-06-02)
- ② Management of bauxite residue (red mud) (ATF-06-03)

(6) Cement Task Force

Cement is an essential material for social infrastructure and has played a vital role in providing the foundation for economic development around the world. The production process for cement is energy intensive and requires a large amount of natural resources for fuel and raw materials. Consequently, the aggregate amount of CO₂ emitted from the global cement industry has reached about 2.2 billion tons, accounting for approximately 5% of global man-made CO₂ emissions. Energy accounts for up to 40% of the cost of cement production. Energy efficiency improvements therefore have great potential to reduce costs, while dramatically reducing the majority of pollutants generated by fuel combustion.

Partner countries account for about 61% of global cement production. The Cement Task Force therefore has significant potential to achieve its long-term goals to reduce CO₂ emissions and conserve energy through sharing information on clean energy technologies and cooperating further to diffuse such technologies.

【Flagship Projects】

- ① Establishing center of excellence (CMT-06-05)
- ② High energy biomass fuels for cement production (CMT-07-08)
- ③ Energy conservation performance diagnosis (CMT-07-10)

(7) Coal Mining Task Force

Coal is the world's most abundant and widely distributed fossil fuel. Although coal deposits are widely dispersed, over 58% of the world's recoverable reserves are located in four Partnership countries: the United States (27%), China

(13%), India (10%) and Australia (8.7%). According to the International Energy Agency, by 2030, coal-based power generation is projected to more than triple, with coal likely providing 33% of global electricity generation. The Coal Mining Task Force is working to improve coal mining and beneficiation efficiency, reduce coal's environmental impacts and improve coal mining's safety record. This includes promoting best available technologies and practices in coal preparation, coalmine methane capture and improved mine health and safety.

【Flagship Projects】

- ① Information sharing on coal processing technologies (CLM-06-01)
- ② Coal mine health and safety strategy (CLM-06-09)
- ③ Increasing recovery and use of coal mine methane (CLM-06-11)

(8) Buildings and Appliances Task Force

Together, buildings and appliances use between 20% to 40% of total primary energy in Partners. By addressing power demand in appliances, office and consumer electronics, and lighting, as well as building design and operations, the Task Force strives to significantly improve energy efficiency, especially in the residential and commercial sectors.

【Flagship Projects】

- ① Harmonization of test procedures (BATF-06-01)
- ② Harmonization of test procedures for compact fluorescent lamps (CFLs)
- ③ Improving building and development efficiencies (BATF-06-07)
- ④ Green building flagship in China (Mayors' training center, Olympic Village zero energy building, and center of excellence (COE) in sustainable design and technology at the Agenda 21 demonstration energy-

5-4 APP's Expected Future Effects

The APP might have been the largest-scale attempt to take advantage of sectoral approaches for countering global warming. According to the classification of sectoral approaches in Section 2, the APP may be an effectiveness-oriented approach.

For more than two years since the APP was launched, the participants have shared objectives and considered specific projects. Effects of the partnership will become a future focus of attention. We here would like to consider achievements that the partnership is expected to make.

(1) Expansion of Specific Projects (Participation) and Emergence of Effects

While the number of participating countries in the APP is limited to only seven, they account for a great share of global economic output, energy consumption or GHG emissions. Therefore, great hopes are placed on some great effects of the APP. The APP participants have promoted fact-finding efforts in each sector and growingly recognized potentials in China and India in particular. How to realize these potentials and demonstrate quantitative results will be the key to the survival of the partnership.

The accumulation of achievements is expected to prompt other industrial and developing countries to participate in the APP. A greater coverage of countries may allow the partnership to enhance its potentials to supplement U.N. efforts.

(2) Development of Independent Projects on Improvement in Investment Climate for Private Sector

The partnership features the participation of wide-ranging parties including partner governments, private enterprises and researchers. Particularly, private enterprises' participation will allow the partner countries to share problems, will help eliminate barriers in China and India and will lead to the private sector's independent investment. Instead of any legal binding power, business environment improvement and development will provide incentives for sustaining effective technology transfers. The partner governments will realize the improvement of intellectual property right protection,

taxation and other relevant systems, which will be required to lead to enterprises' decisions on investment expansion.

(3) Developing Countries' Growing Recognition of Need for Cooperation

The accumulation of APP achievements (including success stories) will have good impacts on developing countries within and outside the partnership. Through cooperation under the APP, developing and industrial countries will share a path to resolving energy and environment problems. This may contribute to the formation of a consensus on developing countries' commitments at the United Nations. In this sense, the APP may have to demonstrate benefits for developing countries based on its achievements and pave the way for creating greater international cooperative relations.

(4) Positive Promotion of International Negotiations

The APP pursues the implementation and effects of projects and represents an effectiveness-oriented sectoral approach. It is the only sectoral approach embodied for a future framework for global warming prevention. While the economic size and GHG emissions of the APP participants are expected to lead to great achievements, the partnership may have to try "effectiveness-oriented," "equity-oriented" and "sectoral crediting" approaches and demonstrate its relevant achievements toward international negotiations on the new framework in order to enhance its own effectiveness.

From the effectiveness-oriented viewpoint, for example, the seven APP participants may consider sectoral energy efficiency and policy introduction targets, pledge these targets in accordance with their respective conditions, and consider programs combined with sectoral credits for developing countries. From the equity-oriented viewpoint, they may examine sectoral energy consumption efficiencies and CO₂ emission intensities, set common targets such as top runner approaches and MEPS (minimum energy performance standard), and conduct continuous reviews to consider and adopt effectiveness-enhancing mechanisms. They may also develop into a specific program to consider setting voluntary national targets. If the seven APP members make progress in embodying sectoral approaches, their approaches may grow more persuasive at international negotiations under the United Nations and give implications for a worldwide framework agreement that would be more equitable and effective.

Conclusion

While considering proposals from relevant organizations, we have so far analyzed the definitions and applications of sectoral approaches that have grown controversial in the consideration of the future framework against global warming over the recent years.

We reiterate that proposals and research reports regarding sectoral approaches have given no common definition of such approaches. Definitions, scopes and significances of these approaches are adapted to proposal sponsors' ideas. When considering and evaluating sectoral approaches, therefore, we must specify their objectives, understand their details and share information with them. At future international negotiations, these approaches may be used for setting targets, considering national targets equitably and forming components of credit creation and trading systems. They should not be positioned as alternatives to the Kyoto Protocol approach but viewed as ideas for forming any type of agreement and used according to their respective objectives.

From the viewpoint of their persuasiveness in international negotiations, it is important for national governments to take advantage of channels such as the APP to consider, implement, review and propose specific measures. In order to consider the future framework on climate change from a long-term viewpoint, it may be significant for governments to utilize practical approaches based on specific experiences for forming a path to achieving the ultimate goals of the UNFCCC.

Contact : report@tky.ieej.or.jp

	Organization	Research Report	Approach	Proposal Outline
[1]	OECD	Watson, C., Newman, J., Rt Hon Upton, S. and Hackmann, P. (2005). Can Transnational Sectoral Agreements Help Reduce Greenhouse Gas Emissions? Background paper for the 12 June 2005 Meeting of the Round Table on Sustainable Development.SG/SD/RT(2005)1.	Effectiveness-oriented approach/international sectoral agreement	Proposing a mechanism to negotiate emission reduction targets (intensity targets) for specific sectors and apply these fixed targets on a global basis.
[2]		Bosi, M. and Ellis, J. (2005) Exploring Options for “ Sectoral Crediting Mechanism” , IEA/OECD, COM/ENV/EPOC/IEA/SLT(2005)1	Sectoral crediting approach	Considering three crediting mechanisms -- policy-based crediting, fixed sectoral emission limits and intensity-based crediting
		http://www.oecd.org/dataoecd/55/61/34902644.pdf		
[3]		Philibert, C., (2005), New Commitment Options: Compatibility with Emissions Trading , IEA, COM/ENV/EPOC/IEA/SLT(2005)9	Effectiveness-oriented approach/Market mechanism	Considering compatibility of dynamic targets, price caps, sectoral targets and other numerical targets with emission credit trading systems
		http://www.oecd.org/dataoecd/62/40/35798709.pdf		
[4]		Baron, R. and Ellis, J. (2006) Sectoral Crediting Mechanisms for Greenhouse Gas Mitigation: Institutional and Operational Issues , OECD/IEA,COM/ENV/EPOC/IEA/SLT(2006)4	Sectoral crediting approach	Analyzing problems with management of three sectoral crediting mechanisms based on policies, intensity targets and total emission targets
		http://www.oecd.org/dataoecd/36/6/36737940.pdf		
[5]		Baron, R. (2006) Sectoral Approaches to GHG Mitigation: Scenarios for Integration ,	Effectiveness-oriented approach	Considering various sectoral approach choices (global actions, global agreements, sectoral policies and sectoral credits)
		OECD/IEA. COM/ENV/EPOC/IEA/SLT(2006)8		
		http://www.iea.org/textbase/work/2006/cop12/ghg.pdf		
[6]		Ellis, J., Baron, R. and Buchner, B. (2007),	Effectiveness-oriented approach/SDPAM	Considering the potential of SDPAMs to replace national numerical targets
		SD-PAMS: WHAT, WHERE, WHEN AND HOW ?		
		, COM/ENV/EPOC/IEA/SLT(2007)5		
	http://www.oecd.org/dataoecd/15/12/39725449.pdf			
[7]	Baron, R., Reinaud, J., Genasci, M. and Philibert, C., (2007), Sectoral Approaches to Greenhouse Gas Mitigation-Exploring Issues for Heavy Industry, OECD/IEA	Effectiveness-oriented approach	Considering various sectoral approach choices, and proposing pledge-and-review processes, technology agreements and national commitments based on sectoral commitments as future potentials of sectoral approaches	
	http://www.iea.org/textbase/papers/2007/Sectoral_Approach_Info_WEB.pdf			
[8]	CCAP	Schmidt, J., Helme, N., Lee, J., and Houdashelt, M. (2006) Sector-based Approach to the Post-2012 Climate Change Policy Architecture	Effectiveness/equity-oriented approach	Developing countries may voluntarily pledge "no lose" emission intensity targets for sectors (industrial sectors), while industrial countries may accept national absolute-amount numerical targets using sectoral benchmarks.

	Organization	Research Report	Approach	Proposal Outline
		http://www.ccap.org/international/Sector%20Straw%20Proposal%20-%20FINAL%20for%20FAD%20Working%20Paper%20%7E%208%2025%2006.pdf		
[9]	Pew Center	Bodansky, D. (2007) International Sectoral Agreements in a Post-2012 Climate Framework	Effectiveness-oriented approach	International sectoral agreements in which national governments pledge emission-cutting actions for specific sectors
		http://www.pewclimate.org/docUploads/International%20Sectoral%20Agreements%20in%20a%20Post-2012%20Climate%20Framework.pdf		
[10]		Lewis, J. and Diringer, E. (2007) Policy-Based Commitments in a Post-2012 Climate Framework	Effectiveness-oriented approach/SDPAM	A policy-based commitment mechanism to shift gradually from initial voluntary pledges to new commitments as part of a future framework package and regular commitments.
		http://www.pewclimate.org/docUploads/Policy-Based%20Commitments%20in%20a%20Post-2012%20Climate%20Framework.pdf		
[11]		International Climate Efforts Beyond 2012: Report of the Climate Dialogue at Pocantico (2005)	-	Examining various proposals for the future climate change framework
		http://www.pewclimate.org/docUploads/PEW_Pocantico_Report05.pdf		
[12]	Resources for the Future (RFF)	Coninck, H.D., Fischer, C., Newell, R.G. and Ueno, T. (2007) International Technology-Oriented Agreements to Address Climate Change, RFF DP 06-50	Technology standard approach	Considering emission control policies and roles of international technology-oriented agreements for sharing of information, promotion of RD&D and technology transfers
		http://www.rff.org/rff/Documents/RFF-DP-06-50.pdf		
[13]	Center for International Climate and Environmental Research-Oslo (CICERO)	Jansen, J.C., Battjes, J.J., Sijm, J.P.M., Volkers, C.H. and Ybema, J.R. (2001) The Multi-Sector Convergence Approach-A flexible framework for negotiating global rules for national greenhouse gas emissions mitigation targets , ECN-C-01-007, CICERO WP 2001: 4	Equity-oriented approach/multi-sector convergence approach	Aiming at converging per capita emissions in all countries
		http://www.cicero.uio.no/media/1313.pdf		
[14]	World Resources Institute (WRI)	Samaniego, J. and Figueres, C. (2002) Evolving to a Sector-Based Clean Development Mechanism in "Building on the Kyoto Protocol: Options for Protecting the Climate " Edited by Baumert, K. A., Blanchard, O., Llosa, S. and Perkaus, J.	Sectoral CDM	Considering problems with implementation of policy-based CDMs and project-bundling CDMs
		http://pdf.wri.org/opc_chapter4.pdf		
[15]	World Resources Institute (WRI)	Bradley, R., Childs, B., Herzog, T., Pershing, J. and Baumert, K.A. (2007)	Effectiveness-oriented approach	Considering sectoral approach choices (establishment of numerical targets, crediting, standardization, policy harmonization, international forums for negotiations) and their applicability for electricity, transport (motor vehicle manufacture and aviation), industry (chemicals, cement, steel and aluminum), buildings, agriculture and forestry sectors

	Organization	Research Report	Approach	Proposal Outline
		Slicing the Pie: Sector-based Approaches to International Climate Agreements:Issues and Options , http://pdf.wri.org/slicing-the-pie.pdf		
[16]		Siikavirta, H. (2006) Long term Climate Policy:Sectoral Approaches and Proposals, Ministry of Environment, Finland http://www.ymparisto.fi/download.asp?contentid=59527&lan=fi	-	Research on sectoral approach reports
[17]	Ministry of Environment , Finland	Kati Kulovesi, K. and Keinanen, K (2006) Long-Term Climate Policy: International Legal Aspects of a Sector-Based Approach , Ministry of Environment, Finland http://www.ymparisto.fi/download.asp?contentid=29397&lan=fi	-	Considering international law problems with the case in which sectors instead of national governments make commitments, and with the case in which global benchmarks are set for specific industrial sectors
[18]		Groenenberg H., Philipsen D. and Blok, K. (2001) Differentiating commitments world wide: global differentiation of GHG emissions reductions based on the Triptych approach-a preliminary assessment , Energy Policy, Volume 29, Number 12, October 2001, pp. 1007- 1030(24)	Equity-oriented approach/ Triptych approach	Classifying emission sources into three sectors -- energy-intensive, power generation and domestic sectors -- and estimating emission quotas for these sectors