

Sectoral Approaches as a Post-Kyoto Framework

A Proposal of Japan's Sectoral Approach

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Executive Summary

Sectoral Approaches as a post-Kyoto Framework

(1)Significance recognized in Bali Action Plan(December 2007)

• A major issue at a side event in COP13 (Bali) sectoral approaches are referred to in the Bali Action Plan

(2)EC's EU-ETS Reform Proposal (January 2008)

• EC has pointed out issues, including carbon leakage and distortions to conditions of international competition within and outside the Community; hence, more recognition of the significance of sectoral approaches

(3)Prime Minister' Fukuda's Davos proposal (January 2008)

• Prime Minister Fukuda advocated the necessity to establish quantified national targets based on sectoral approaches.

Chapter 1 Japan's Sectoral Approach

Some typical criticism against sectoral approaches include the following:

Can they improve current policy measures in terms of environmental effectiveness and cost effectiveness? Is there not strong resistance against the adoption of a new approach?

Will sectoral approaches not complicate negotiations?

Is the government capable of getting hold of accurate information on industrial activities?

Would sectoral approaches not create sector havens?

What are the potential frameworks to ensure compliance?

• Japan's Sectoral Approach is proposed with consideration for the abovementioned criticism and other issues, including technical issues (baseline setting rules and definition of sectors).

Proposal for Japan's Sectoral Approach

1.1. Purpose of Sectoral Approaches

• To achieve real greenhouse gas reductions at a global level, based on scientific analysis of sector-specific GHG reduction potential and with minimum impact on international competition.

1.2. Participating Sectors

• Actual participation is expected of the following sectors: 1)Electricity sector 2)Energy-intensive sectors

3)Sectors in which the products and services they produce are used in sectors apart from the industrial sector (transportation and residential/commercial sectors) and as a result consume a significant amount of energy in total.

4)Other sectors wishing to participate

1.3. Participating countries

• Envisaged participating countries are those countries where the abovementioned sectors account for (or, are projected to account for) a significant portion of GDP in the country's current or future economic structure, and that account for 70% of accumulated global greenhouse gas emissions:

US, China, EU. India, Russia. Brazil, Japan, Indonesia, Canada, Mexico, Australia and Korea.

-Other countries are welcome to participate as well.

1.4. Negotiated Agreement Targets

- Benchmarking is basically proposed, from the perspective of ensuring the environmental effectiveness of sectoral approaches.
- However, the details of negotiated agreement targets may vary among participating sectors.
- Sectors should be allowed to decide whether to commit to absolute GHG reductions or to intensity-based reductions.
- Targets should not be limited to GHG reductions and improved intensity; it is appropriate to include as targets other contributing measures, such as the installation rate of equipment.
- Negotiated agreement targets are diversified, but the projected GHG reductions to be achieved when each target is achieved should be indicated.
- The negotiations above will be compiled into a "sector template "in negotiations.

1.5 . Parties to Agreements and Method of Negotiation

- Two-stage agreements= envisaging intergovernmental agreements and government-industry agreements
- Parties to agreements should be industry organizations or individual companies.
- Negotiation method (Similar example in WTO General Agreement on Trade in Services) .

1)A contact group comprising technological experts from both government

and industry to identify appropriate benchmarks and energy efficiency levels to be achieved.

2)IEA to serve as secretariat and compile the draft agreement from technological and objective perspectives.

3)Negotiated agreements to be concluded in 2009.

4)Governments to commit to taking measures to guarantee the domestic implementation of sector-specific negotiated agreements. (Interim Report Category I. Refer to appendix)

1.6. Domestic Mandates to Implement Agreements

• There are various potential measures to ensure the implementation of agreements (due to diversified government-industry relationships according to countries)

• Proposals for Japan:

-Revisions in the Law on Temporary Measures to Promote Business Activities for the Rational Use of Energy and Utilization of Recycled Resources and/or the Law Concerning the Rational Use of Energy

-Approval of benchmark achievement plans by industrial organizations or individual companies, followed by supportive measures and measures against non-compliance.

1.7.Relation with Emissions Trading Schemes

• Questions raised in today's emissions trading scheme debate include the following:

-Questions about economic effectiveness→ imperfect market, in reality

-Questions about allocation issues \rightarrow allowance setting, regressive character

-Historical government-industry relations in Japan \rightarrow allowance allocation by government appears to be regressive in light of the trend towards regulatory reform.

For the above reasons, Japan is not ready for a domestic emissions trading scheme. •On the other hand, Japanese industry is already engaged in international emissions trading. Thus, an intensity-based international emissions trading market could be newly established, parallel to the international emissions market, to be used to fulfill sectoral agreements.

• However, a gateway will be set between the two markets, restricting the net flow of allowances from the intensity-based emissions market into the emissions market based on absolute reductions.

1.8.Incentives for the Involvement of Developing Countries

- Measures projected as positive incentives
 - 1)Cooperation in the provision of information on technology and know-how and capacity-building

2)Public funding (or assignment of allowances) for capital investment required to achieve benchmarks

3)Implementation of Open DSM-type CDM in transportation and household/commercial sectors

4)Financial support (or assignment of allowances) for SD-PAM in participating countries

5)Trade expansion measures for countries, companies and products in compliance

• Measures projected as negative incentives

1)Trade restriction measures against non-compliance

2)Development of codes of conduct for private companies regarding transactions and investments among countries and sectors

Chapter 2 Environmental Effectiveness of Sectoral Approaches

• Based on quantitative analyses employing various sectoral approaches, the global GHG reduction potential is estimated to be several billion tonnes, implying remarkable level of environmental effectiveness.

• A sector template compiled based on the RITE (Research Institute of Innovative Technology for the Earth) model is provided. The scenario displayed halves emissions by 2050 based on the assumption that marginal reduction costs are equalized.

Chapter 3 Relation with the new Protocol

- Sectoral approaches can cover a major portion of the industrial sector and a remarkable part of the household/commercial and transportation sectors. It also promises the involvement of developing countries
- If countries, including developing countries, were to make Category I commitments to take some measures against gases apart from carbon dioxide that are emitted from non-participating sectors, total GHG reductions can be expected to amount to more than what can be achieved under Kyoto-type efforts, which do not impose reduction obligations on developing countries.
- For the realization of such efforts, the integration of agreements into the Commit & Act methodology, proposed in the 21st Century Public Policy Institute Interim

Report (Proposal for a Post-Kyoto Framework, October 2007) is proposed.

- On the other hand, if a Kyoto-type framework is continued:
 - -National cap negotiations should be based on sector-specific agreements in the industrial sector.

-The government's role is mainly to address the household/commercial and transportation sectors.

-Household/commercial and transportation sectors shall set per capita CO2 emission as benchmarks

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Introduction

This report is the sequel to "Proposal for a Post-Kyoto Framework –Interim Report (hereinafter "Interim Report")," published in October last year. The October Interim Report proposed a framework for a new protocol to replace the Kyoto Protocol. The proposal was structured on the concept that the new protocol should be based on concrete commitments of actions by governments and private sector entities to reduce GHGs, for which we coined the term, "Commit and Act". Commitments are categorized into Categories I to III, according to how commitments are made, whether or not they are legally binding and who is committing. Under Category I, major emitters, including some developing countries, are expected make international commitments to implement greenhouse gas reduction measures in various policy fields through domestic law and government budget (refer to attachment). Among these policy fields, reductions in greenhouse gases (energy-derived CO2, in particular) in the industrial sector are to be addressed by incorporating conclusions reached through sectoral approaches², regarding which this report will make a proposal.

Sectoral approaches were a major issue at a side event at COP13, held in Bali and were also referred to in the Bali Action Plan. Then, the EC proposal submitted to the EU on January 23, 2008, to reform the EU-ETS³ also pointed out that one of the shortcomings of the EU-ETS is that it has caused distortions to conditions of international competition within and outside the Community. This has occurred because each EU Member State allocated emission allowances according to its own

¹ The contents of this report are the outcome of research conducted by the 21st Century Public Policy Institute and thus do not represent the official views of Nippon Keidanren.

² Akihiro Sawa, "Proposal for a Post-Kyoto Framework," The 21st Century Public Policy Institute, October 2007,p20 http://www.21ppi.org/english/pdf/071112.pdf

³ "Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community," Commission of the European Communities, 23.1.2008, p.8.

rules, to the advantage of domestic industries; thus, given the need to ensure fairness in international competition, the EC, which originally had had no interest in sectoral approaches, has begun to recognize their significance. Furthermore, at the Davos Forum, Japanese Prime Minister Fukuda advocated the necessity to establish quantified national targets based on sectoral approaches.

Given these trends, it can be said that regardless of whether the framework for the next commitment period will end up being another Kyoto-type framework, or whether a different framework will be established, understanding sector-specific GHG reduction potentials and developing a concrete framework for sectoral approaches have become essential tasks to be addressed in future international negotiations.

Hereinafter, Chapter 1 will discuss concrete proposals for Japan's Sectoral Approach approaches in Japan; Chapter 2, the environmental effectiveness of sectoral approaches; and Chapter 3, how to incorporate such approaches into the new protocol.

Chapter 1. Japan's Sectoral Approach

There have been various proposals for sectoral approaches⁴. As this report does not aim to assess each approach, no analysis will be conducted on individual proposals. However, it is true that there has been some generalized criticism against sectoral approaches and thus, the new proposal should encompass certain consideration for such criticism.

Typical criticism against sectoral approaches include the following⁵:

- 1) Can they improve current policy measures in terms of environmental effectiveness and cost effectiveness? Is there not strong resistance against the adoption of a new approach?
- 2) Will sectoral approaches not complicate negotiations?
- 3) Is the government capable of getting hold of accurate information on industrial activities, particularly technological information and production forecasts?
- 4) Would sectoral approaches not create sector havens? In other words, if GHG reduction costs varied among sectors, would it not result in the relative protection of a particular sector? Also, if marginal reduction

⁴ Refer to Richard Baron, "Sectoral Approaches to Greenhouse Gas Mitigation: Exploring Issues for Heavy Industry," IEA2007 for categories of sectoral approaches

⁵ Ibid, p.20-21.

costs varied among sectors, would it not undermine economic efficiency?

5) What are the possible frameworks to ensure compliance? In other words, methods of incorporation into the new framework are unclear

Furthermore, other technical issues, including methods for determining baselines and the definition of sectors (boundary issues) have been pointed out.

With these issues in mind, a proposal for Japan's Sectoral Approach is elaborated below.

A Proposal for Japan's Sectoral Approach

<u>1.1. Purpose of Sectoral Approaches</u>

To achieve real greenhouse gas reductions at a global level based on scientific analysis of sector-specific GHG reduction potential and with minimum impact on international competition.⁶

1.2. Participating Sectors

The total emissions of participating sectors should cover 70% of the total emissions of the industrial sector. Sectors should basically be defined by "divisions" of the International Standard Industrial Classification (or, the equivalent of "divisions" defined by the International Standard Industrial Classification, in the presence of a national industrial classification system) However, considering the facilitated implementation of sectoral approaches, qualified actors may include industry groups when such organizations exist and "groups", as defined in the International Standard Industrial Classification, which account for a significant portion (70% or more) of the total emissions of a division. Furthermore, companies whose annual CO2 emissions do not exceed 10,000 tons are given the option of not participating.

Actual participation is expected of the following sectors:

- 1)Electricity sector
- 2)Energy-intensive sectors
 - —Manufacture of iron and steel, manufacture of chemical and allied products, manufacture of paper, pulp and paper products, manufacture of ceramic, stone and clay products, manufacture of petroleum products, manufacture of coal products, manufacture of non-ferrous metals and products, etc.
- 3)Sectors in which the products and services they produce are used in sectors apart from the industrial sector, in the transportation and residential/commercial sectors, and as a result causes a significant amount of energy consumption in total.

-Construction work, general including public and private construction work (buildings), manufacture of electrical machinery, equipment and supplies (household

⁶ This is based on the concern that under Kyoto Protocol-type national reduction standards set in a top-down approach, reduction targets will be allocated to each country as a consequence of international diplomatic negotiations and without due consideration for reduction potential and industries exposed to international competition may risk suffering an unexpected relative decline in competitiveness against rival industries in other countries depending on the domestic policy measures taken.

appliances, etc.), manufacture of information and communication electronics equipment, manufacture of transportation equipment (automobiles, etc.)4)Other sectors wishing to participate

1.3.. Participating countries

Envisaged participating countries are those countries where the abovementioned sectors account for (or, are projected to account for) a significant portion of GDP in the country's current or future economic structure, and that account for 70% of accumulated global greenhouse gas emissions; namely, the US, China, EU, India, Russia, Brazil, Japan, Indonesia, Canada, Mexico, Australia and Korea. However, other countries are welcome to participate as well.

1.4. .Negotiated Agreement Targets

From the perspective of ensuring the environmental effectiveness of sectoral approaches, we basically propose benchmarking. In other words, the fundamental goal is to minimize the total greenhouse gas emissions from relevant sectors on a global level through the gradual introduction of technologies and equipment of the highest energy (or CO2 emission) efficiency (currently available or projected to be commercialized by the target year)⁷⁸by all economic entities

Identifying and negotiating reduction potentials for each gas type instead of solely for energy-derived CO2 promises to be more effective than the latter.

However, it should be noted that negotiated agreement targets require different considerations depending on according to the abovementioned 1) to 4) in section 1.2.For example, in the electricity sector, different countries have different approaches to direct and indirect emissions⁹, and therefore, when applying sectoral

⁷ In the Dutch experience with Long Term Agreements in the 1990's, as well, benchmarking was adopted in the end, from the viewpoint of environmental effectiveness. Pieter Glasbergen "The Architecture and Functioning of Dutch Negotiated Agreements," in ed. by Andrea Baranzini and Philippe Thalman *Voluntary Approaches in Climate Policy*, Edward Elgar Publishing Limited, 2004, p.178.

⁸ For example, the electricity sector will newly build or renew existing plants for highest efficiency coal-fired power plants. In the iron and steel sector, the installation of coke dry quenching processes (CDQ) and top-pressure recovery turbines (TRT), etc. can be items of negotiated agreements. Also, refer to research results presented in Chapter 2 for estimations of the reduction potential of these measures.

To calculate emissions, Japan adopts an indirect emissions-based approach, in which the CO2emitted from power plants in the electricity sector are distributed downstream to the users of the power in the industrial and household/commercial sectors, where emissions are calculated. EU, however, uses a direct emissions-based approach, where emissions are calculated at the point of fossil fuel combustion. The direct emissions-based method has the advantage that emissions can be simply calculated identified, but does not encourage energy

approaches to the electricity sector, double counting of reduction potential and actual reduction must be avoided; hence the requirement of separate allowance allocation rules for the electricity sector and other sectors. Although it would be preferred that an international consensus be reached on such rules, in the event that it is not possible, indicators apart from those representing GHG reductions and intensity improvement, such as equipment installation rates, will be required.

Also, for automobiles and household appliances, product-specific fuel consumption standards and energy efficiency targets should be determined, instead of setting emission targets for plants and establishments as in the energy-intensive industries described in paragraph 2) of section 1.2.. Eco-labeling and technological standards and product standards could be considered as possible targets.

It should also be noted that targets need to be diversified from the perspective that the level of economic development, projected future production, energy situation, raw material situation, labor situation, etc. are varied among the countries in which the production bases of the companies belonging to the participating sectors are located. Therefore, targets should not be limited to the introduction of BAT; best practices (in production and energy management) can also be recognized as options for targets.

It should be left to the sector to decide whether to make GHG reduction commitments based on absolute reductions or on energy intensity. Furthermore, in prospect of the upgrading of industrial structures, intensity-based targets may include not only physical (per tonne) indicators but also value-based indicators based on the value of production or value-added.

Intensity-based commitments are often criticized as being insufficient in terms of environmental effectiveness, and thus the easier choice for companies, but this is

Refer to "Tracking Industrial Energy Efficiency and CO2 Emissions," IEA, 2007, p.106.

savings among consumers. For example, if people are not aware that they are emitting just as much CO2 as the power that they are consuming in the home or office, energy saving efforts will not be promoted. Also, if a business that switches from on-site generation to purchasing power, it will obtain a significant amount of allowances. Furthermore, the installation of equipment recovering and reusing by-product gases and exhaust heat is not recognized as a climate change countermeasure. In fact, there has not been one installation of waste heat recovery equipment since the launch of EU-ETS. The aforementioned EU-ETS revision proposal provides that full auctioning should be the rule from 2013 for allowances in the electricity sector, which can be interpreted as an attempt to resolve abovementioned issues by raising electricity prices.

Also, in the case of the iron and steel industry, where the energy conversion and energy final use processes are closely linked and yet independent, the APP Steel Task Force and International Iron and Steel Institute (IISI) have established the common idea that instead of evaluating only direct emission sources, energy conversion and energy consumption should be integrally considered in their debates on international benchmarking methods.

not always the case. As will be demonstrated in Chapter 2, they promise significant improvements in environmental effectiveness.

Also, it is not the easier choice for companies. The economy is liable to change, and thus the environment encompassing individual companies or the industry as a whole does not tolerate constant growth in production. Emerging industries and companies that are capable of pursuing an upwards trend in production will surely find intensity-based commitments more advantageous; although greenhouse emissions will be reduced from BAU levels, the absolute volume of emissions will increase. However, for a standard or declining company or industry, intensity-based commitments may prove to be disadvantageous. For example, in the event that production falls from 100 to 80, in order to comply with an intensity-based commitment of 1, energy consumption (or CO2 emissions) must be decreased by 20 points; however, the capacity utilization rate has usually been lowered in such cases, and thus the energy efficiency of the equipment is aggravated. Furthermore, because the costs required for the minimal maintenance of equipment and depreciation costs are fixed costs that cannot be reduced, companies will have to devise ways to accommodate the extra costs required for a company to maintain the given intensity level.

In fact, aggravated energy intensity has been observed in numerous recessions of the past¹⁰. Some industries have committed to absolute reductions under CCLA (Climate Change Levy Agreements), which had been implemented in the UK previous to the introduction of EU-ETS, and Japan's iron and steel industry also makes absolute reductions-based commitments under the Japanese Keidanren Voluntary Action Plan. With these circumstances in mind, commitments should be determined for a certain period of time (for example, 5 years), accommodating economic fluctuations, instead of for a single target year in the case of not only absolute reductions-based commitments, but intensity-based commitments as well.

Also, in those sectors that are marked by low potential for absolute GHG emission reductions and intensity improvements domestically, other methods of commitment may be considered as means of contributing to GHG reductions. It is conceived appropriate to include such contributing measures as targets in order to secure the participation of as many sectors as possible. These measures may include GHG reduction measures taken in overseas offices and/or subsidiaries (especially, those located in developing countries) of individual companies, technological

¹⁰ <u>http://www.enecho.meti.go.jp/topics/hakusho/2005/html/17021210.html</u>

consulting or provision of technological information to overseas companies and investments in GHG reduction technology development. Also, some industries and companies generate energy by reutilizing waste generated in the economic society, in addition to directly improving the energy efficiency of their establishments and plants; such measures could also be recognized as targets. Furthermore, for the electricity sector in countries that have adopted an indirect emissions-based approach, promoting energy conservation among end-users and commiting to achieve actual reductions through such efforts may also serve as targets.

Given that negotiated agreement targets can be as diversified as described above, the projected GHG reductions to be realized when each target is achieved should be indicated. The principle of "common but differentiated responsibilities and respective capabilities" shall also be applied upon setting these targets.

The discussions above have been compiled into the following chart, which will hereinafter be referred to as the "sector template." The new protocol should stipulate that if agreement can be reached upon even a segment of this template, that segment should be implemented without waiting for consensus to be established regarding the remaining parts of the template. Chapter 2 will provide calculations using this sector template for future GHG reductions projected for a case in which each sector in each country makes intensity-based commitments.

Sector Template	(Negotiated Agreements)	Absolute GHG reductions			Physical intensity Value-ba		Value-base	Value-based intensity Energy		GHG reduction BAT diffusion measures in	Technological support	Investment in GHG	Energy generated	Projected total				
		Energy- derived CO2	energy- derived	N20	HFC	SF6	PFC	Energy	C02	Energy	C02	product	product rate	overseas establishment S	overseas companies	reduction technology development	from waste utilization	 reductions
	(Sectors) Electricity																	
	Iron & steel Chemical Pulp & paper Ceramic Petroleum products Non-ferrous metals 																	
	General construction Electric machinery Information and communication electronics Transportation equipment																	
Total projected GHG reductions																		

Figure 1 – Sector Template

1.5. Parties to Agreement and Method of Negotiation

In the many sectoral approaches proposed throughout the world, there have been many different proposals concerning who should be parties to agreements. International industry groups, domestic industry organizations and governments¹¹ have been named candidates.

Our proposal for Japan's Sectoral Approach envisages two-stage agreements, namely intergovernmental agreements and domestic agreements between the government and sectors. The signatories to the sectoral agreements will be either domestic industry organizations (business forums are also eligible, in the event that no domestic industrial organizations exist) or individual companies.

Both the government and sectors will participate in the negotiation process, the procedure of which is elaborated below: The WTO General Agreement on Trade in Services shares components similar to the undermentioned process and the sector template mentioned in the previous section.

The IEA will assume a significant role in the following process. Marked by profound experience in energy efficiency technology and practices, Japan should also

¹¹ Richard Baron, op.cit., p.39-45.

consider making proposals to establish and host an international institution or a research group to support the IEA. This process should be authorized by the COP/AWG-LCA (Adhoc Working Group on Longterm Cooperative Action).

- A contact group will be composed within each participating sector. Each contact group comprises technological experts from industry and officials from government, who will negotiate issues specific of the sector. Contact groups will identify the appropriate benchmarks for each item negotiated, including BAT and energy (CO2) intensity.
- 2) Information regarding baseline-setting rules, technological review of reduction potential and BAT will be provided by the respective governments, based on experiences in the APP and other forums.
- 3) IEA will serve as the secretariat of each contact group and compile the outcomes from each group into a draft agreement on the sector template.
- 4) Negotiations shall be completed by mid-2009.
- 5) Agreements reached regarding negotiation items and their details will constitute the elements of Category I of the proposal in the Interim Report. That is, governments will commit to measures ensuring the domestic implementation of the sector-specific agreements reached. Measures with legal or quasi-legal mandates or that are allocated an appropriate portion of government budget are envisaged.
- 6) In the event that the final agreement lies beyond the framework of our proposal for a new protocol, for example if a Kyoto-type consensus is reached and national reduction targets are established, sectoral agreements will be respected in succeeding negotiations on national achievement targets. This point will be further elaborated in Chapter 3.

1.6. Domestic Mandates to Implement Agreements

As abovementioned, each country will be responsible for ensuring the achievement of the targets agreed upon through domestic measures; there are many potential measures to ensure implementation. Given that legal traditions, the history and current status of government-industry relations, status quo of the legal enforcement structure and administrative costs vary among governments, each country will select the measures that best fit their circumstances. For example, a covenant may be signed between the government and private sectors instead of implementing a legal measure.

In preparation of a case in which government-industry consensus cannot be built on what kind of measures should be taken, the Interim Report proposed an alternative concept, Category III, allowing the actors of participating sectors to directly register their commitments with the new protocol. (refer to page 58 of appendix).

The following are examples of measures that could be implemented in Japan. They are legal tools often employed by the Japanese government to induce certain activities in the industrial sector. The current Law on Temporary Measures to Promote Business Activities for the Rational Use of Energy and the Utilization of Recycled Resources and/or the Law Concerning the Rational Use of Energy could be revised to accommodate the following:

- Industry organizations or individual companies of participating sectors develop a program to achieve the indicators to which they have committed; programs will be approved by government.
- 2) When such programs involve making capital investments or introducing technologies required to achieve internationally agreed indicators determined by using the sector template, supportive measures, including accelerated tax depreciation and low-interest loans will be extended.
- 3) If an indicator committed to in the approved program aims to achieve the world's highest energy efficiency levels (e.g. manufacturing method of a specified product at a plant, energy efficiency of the product itself), the benchmark will be incorporated into the Energy Saving Law's Top Runner Program and thus be subject to fines and other punitive measures stipulated in the current Energy Saving Law in the event that commitments are not fulfilled by the target year.
- 4) Also, it will be stipulated that if commitments are made to indicators based on absolute reductions or intensity, and achievements made by the target fiscal year (or a multiple-year average) exceed the committed amount, the government can purchase excessive amounts through auction, within their budgetary limits and with reference to emissions trading market prices. However, if commitments are not met, the actors responsible for the formulation of the approved program are required to procure emissions from the international market or to pay a penalty determined in line with the emissions market price.
- 5) In the event that the indicators committed to in the approved program can be explained by neither paragraphs 3) nor 4) above, and are not achieved, the actors who have failed to comply with them are required to disclose the reasons for

failing to achieve the indicators and to include improvement measures in the next approved program.

These domestic measures will be deliberated in the national legislature at the timing of the ratification of the new protocol as domestic legal measures and government budget allocations entailing the ratification of the new protocol.

Countries that participate in the agreement will take domestic measures to ensure compliance within their respective national decision-making system. The essence of Category I, proposed in the Interim Report, is to make an international commitment to such domestic measures.

1.7. Relation with Emissions Trading Schemes

The essence of an emissions trading scheme is that once emission allowances are determined according to a given rule, it allows each emitting actor to comply with them with the least possible costs. It has enjoyed the support of economists and market players from the perspective of efficient resource allocation. However, the actual economic market has not only deviated from a state of perfect information and perfect competition, the assumptions upon which this proposition is established, it already encompasses diverse environmental and energy-related regulations. The economic efficiency of an emissions trading system will be undermined if all current regulatory measures that are distorting economic efficiency and that will not complement an emissions trading scheme, are not abolished; but how realistic is this? Also, according to some studies, the product pricing principle adopted by companies is based, not on the marginal cost principle, upon which economic efficiency is premised, but on the full-cost principle¹².

Furthermore, in the preceding EU-ETS, it is projected to take at least 10 more years before allowances are fully allocated by auction, and until then auctions will be employed in conjunction with free allowance allocations. The EU-ETS reform proposal by the EC indicates the possibility of 100% free allowance allocation for industries exposed to international competition and risking leakage (shifting of

¹²Toshihiro Oka and Mitsutsune Yamaguchi, "EU Haishutsuken Torihiki (EU ETS) no Kenkyu" Government Commissioned Research on Climate Change Issues 2006, Study Report, Ministry of Economics, Trade and Industry, March 2007

^{(&}lt;u>http://www.s.fpu.ac.jp/oka/euets070314.pdf</u>)_o

Yamaguchi, Akihiro Sawa and Yoko Nobuoka, "Naze Nihon de Ondanka Taisaku to shite Cap & Trade ga Saiyo sarenainoka" presentation at Society for Environmental Economics and Policy Studies 2007 Annual Meeting (<u>http://m-yamaguchi.jp/papers/Cap&Trade.pdf</u>) has also been referred to.

production centers overseas). However, if this is approved, allowances will never be 100% auctioned, meaning that the scheme will abandon the principle of efficient resource allocation. In other words, such allocation entails the danger of distorting the relative price among industrial sectors; thus the same criticism as that sectoral approaches are exposed to applies to the EU-ETS as well. If the current EU-ETS were inappropriately designed to grandfather (performance-based) allowances every year, it would be detrimentally affected; low-efficiency equipment would be kept to secure extra allowances in the following period¹³. Furthermore, the administrative costs entailing the verification process to determine whether emission reductions were really achieved (indispensable for securing of the transparency and reliance of an emissions trading market) and transaction costs required to settle CDM-derived allowances also cannot be ignored..

Nevertheless, the world emissions trading market has just been launched and has not yet accumulated empirical research; therefore we must be cautious when we make comparisons regarding the cost efficiency and environmental effectiveness of emissions trading schemes and other tools.

More serious than such questions of economic efficiency is the distribution issue. The allocation of allowances, if not 100% auctioned, is tantamount to determining the distribution of income among actors. Whereas resource allocation is done based upon price signals in the market the act of allowance allocation which means income distribution shall be based on politics and government.

If initial allocations are willfully made to be advantageous or disadvantageous for a certain business or industrial sector – in other words, if they were not based on scientific grounds but were a result of lobbying or negotiations with the government or legislature – would social equity be preserved? The possibility of industries and businesses with so called "political power" receiving unjustly favorable allowance allocations cannot be dismissed. If disparities between the advantaged and disadvantaged are significant, some actors may be destined to become future buyers, while others may be guaranteed the position of sellers¹⁴.

The concept of social equity may vary among countries with different historical relationships between government and industry. In Japan, government intervention in industry had long continued since the Meiji Restoration. The promotion of government-owned enterprises during the industrial promotion policy of the Meiji Era,

¹³ Toshihiro Oka "Haishutsuken Torihiki no Genso", Sekai, November 2007, Iwanami Shoten

¹⁴ Viewed at the national level, this depicts the structure of the Kyoto Protocol itself. It is represented in the US withdrawal and Canada's abandonment of meeting its targets.

the allocation of goods during the Second World War, the allocation of foreign currency after the War and the investment adjustments in basic industries to follow are only a few examples among a long list of others. From the 1980's, when President Reagan and Prime Minister Thatcher declared that such government intervention undermined economic growth, deregulation came to be demanded of the government in Japan as well, and hence the gradual abolishment or relaxation of laws controlling specific industries (e.g. Petroleum Industry Law). With this historical background, the allocation of all allowances by the government that would accompany an emissions trading scheme would only naturally appear to be a retrogressive step in regulatory reforms from the perspective of Japanese industry. The Keidanren Voluntary Action Plan is recognized as an attempt that has successfully hindered the government mechanism to reintroduce regulations.

In the US, which does not share such experiences, the emissions trading bill currently submitted to Congress has many people in industry believing that it is rather the method that will minimize government intervention, as allowances would be determined in Congress¹⁵. Against the backdrop that many states have been considering the introduction of emissions trading schemes and other GHG reduction controls, the industry would prefer to have one unified policy rather than an array of state policies; this is another reason for their support for the emissions trading bill.

In Japan, some advocators of the introduction of a domestic emissions trading scheme support it in fear that Japan will be left behind or excluded because the US is also following the EU's footsteps in adopting a domestic emissions trading scheme. However, it is hardly likely that the allowances from EU-ETS, with its legal basis in the Kyoto Protocol, would be directly linked with credits based on an emissions trading scheme bill currently debated in the US, which has not ratified the Protocol, unless the EU-ETS side makes large institutional concessions. Even in the event that concessions are made and credits are consequently linked, from the perspective that more market participants means higher price stability and more trade opportunities, new entrants will be welcome to the market.

Also, although often overlooked, industrial sectors in Japan have already engaged themselves in emissions trading as they implement the Keidanren Voluntary Action Plan. The Japanese word "Jishu" of the "Voluntary Action Plan (Jishu Kodo Keikaku)" is used with a nuance distinct from the corresponding English word, "voluntary." This Japanese word "Jishu" means "self-binding". The target set in the

¹⁵ Interview by author with US industry leaders, Congress members and thinktank researchers in November 2007

Plan to achieve 0% or less compared to 1990 levels during the Kyoto commitment period are "self-binding" targets determined by the industrial sector itself and not by the government. Although the word "voluntary" is used for "Jishu" in the English translation, it is not at the liberty of the actors to comply or not to comply as the translation implies.

Therefore, while the Japan Business Federation (Nippon Keidanren) and its member industries are strongly opposed to a domestic emissions trading scheme that would give government the authority to determine allowances, but proactively employ international emissions trading (e.g. CDM) in their efforts to achieve their targets under the Voluntary Action Plan. Furthermore, the Keidanren Voluntary Action Plan has formally been designated a "Kyoto Protocol Target Achievement Plan" by Cabinet decision, under which the voluntarily determined reduction targets are formally given a quasi-legal effect. Compliance status is checked in third party assessments conducted in government Councils, and thus transparency is ensured.¹⁶

One last aspect of the distribution issue that must be discussed is the regressive feature of an emissions trading scheme. The corporate cost required to achieve emission reductions are ultimately passed on to consumers. The auctioning of allowances to the power sector as provided in the EU-ETS reform plan is an example that brings this point to light; electricity rates are raised. Allowances are allocated according to fossil fuel combustion, and thus consumer burden for energy consumption is incremented. Energy demand is inelastic to price, and therefore the costs incurred by low-income earners are relatively larger than those for high-income earners. The widening of the income gap and the disparity of living standards have been raised as political issues in today's Japan; it must be noted that the introduction of an emissions trading scheme will pose such distribution issues. This argument holds true for environmental taxes as well. There is no guarantee that government revenue generated by auctions and environmental taxes will not be spent on unnecessary public works in the name of global warming measures. Consideration of these distribution issues must not be neglected when debating the introduction of a domestic emissions trade scheme. Such concerns are shared in both the EU and the

¹⁶ These facts are not adequately explained domestically or internationally and require further efforts of the Nippon Keidanren. Papers by researchers include the following: Masayo Wakabayashi and Taishi Sugiyama "Japan's Keidanren Voluntary Action Plan on th e Environment" Reality Check: The Nature And Performance of Voluntary Environmental Programs in the United States, Europe, And Japan, Resources for the Future, 2007

US, where countermeasures are also being discussed.¹⁷ Furthermore, from a social perspective, the potential employment cuts caused by leakage also have distribution-related aspect, and thus is another issue under serious debate in Europe and the US.

Environmental taxes are an obvious burden in the eyes of consumers and are thus a serious political issue involving serious difficulties upon implementation. However, in an emissions trading scheme, the costs are obscured by emission allowances and the burden is not directly felt by consumers in an emissions trading scheme; thus, it can easily be mistaken for an inexpensive global warming measure, the expenses of which are assumed by companies. Therefore, it can be a politically convenient tool and thus needs careful consideration from the perspective of consumers.¹⁸

For these reasons, we believe that there is no need to rush the introduction of a domestic emissions trading scheme, in which the government makes allowance allocations, unless adequate studies have been conducted for an institutional design properly guaranteeing the equitable determination of allowances among industries and companies and for measures to resolve its regressive nature.

However, in order to promote the Sectoral Approach that we propose, an international emissions trading scheme may be utilized as a cost reduction measure. This idea is based on the judgment that since, as aforementioned, emissions trading is already in practice in the current implementation of the Keidanren Voluntary Action Plan, the Japanese industry would be able to draw on its experience and that because allowances based on Kyoto mechanisms, such as CDM, are on the international market, participating industrial sectors of each country participating in the Sectoral Approach would prefer to use the mechanism.

In the proposal for Japan's Sectoral Approach, its relationship with an international emissions trading market is structured as follows: the framework would encompass both an intensity-based emissions trading market and an absolute reductions-based emissions trading market with a gateway in between. If a comparison of market prices in the intensity-based emissions trading market and

¹⁷ For example, refer to Jason Furman, Jason E. Bordoff, Manasi Deshpande, and Pascal J. Noel,"An Economic Strategy to Address Climate Change and Promote Energy Security," The Brookings Institution, Oct. 2007 for debate in US. Also, for EU, the EU,Commission of the European Communities, op.cit, p.15.

¹⁸ Jason Furman, Jason E. Bordoff, Manasi Deshpande, and Pascal J. Noel, op.cit., p.18.

those of the absolute reductions-based emissions trading market proves that prices in the former are higher than those in the latter, then the flow of allowances from the latter into the former will be encouraged. On the other hand, if allowance prices in the absolute reductions-based emissions trading market exceed those of the intensity-based emissions trading market, allowing the net flow of allowances from the latter to the former market will provoke intensity-based emissions trading market participants to engage in overproduction for the purpose of acquiring allowances, and thus, the net flow of allowances from the intensity-based emissions trading market to the absolute reductions-based emissions trading market shall not be approved. ¹⁹

1) Each actor belonging to a sector that has agreed to an absolute reductions-based indicator using the sector template will be admitted to the national emission trading markets premised on absolute reductions and will be allowed to use the allowances generated in Kyoto mechanism activities, such as CDM (should they continue to be adopted in the new Protocol), to meet their targets. Actors may also sell their emission allowances to other actors belonging to sectors which have made intensity-based commitments, as in paragraph 2) below.

2) Actors that belong to sectors that have agreed to the adoption of intensity-based indicators in the sector template may use emission allowances purchased in nationally-operated markets premised on absolute reductions, allowances generated from Kyoto mechanism activities, such as CDM (should they continue to be adopted in the new Protocol), and emissions bought from actors described in paragraph 1) above to meet their targets. However, unless there is a net flow of emissions from emission markets based on absolute reductions to intensity-based emissions trading markets, intensity-based emissions shall not be sold to the emissions trading market based on absolute reductions.

3) Sectors which have agreed to intensity-based indicators may develop and operate an international emissions trading market at first within the sector, and in the future, across the sectors. In terms of operating this scheme, a cross-national linkage connecting respective markets or an appropriate international institution will be established. The role of gatekeeper to prevent contamination in emissions trading between markets 1) and 2) will be assumed by the international institution. Otherwise,

¹⁹The following are to be referred to for discussions on the economic rationality of such tools: "The UK Climate Change Levy Agreements: Combining Negotiated Agreements with Tax and Emission Trading," Gildas de Muizon and Matthieu Glachant in *Voluntary Apporoaches in Climate Policy*, ed. Andrea Baranzini and Philippe Thalman, Edward Elgar Publishing Limited, 2004, p.240-247.

if the scheme is operated by means of a market link, this issue will be dealt with by governments in their in national registry operations.

1.8.. Incentives for the Involvement of Developing Countries

Japan's Sectoral Approach proposal envisages the participation of developing countries. Although the Kyoto Protocol does not impose GHG reduction obligations upon developing countries, given forecasts of increased GHG emissions from developing countries (particularly countries marking rapid economic growth), it is essential that industrial sectors from developing countries also participate.

China and India, in particular, are characterized by high ratios of coal-fired power plants and are thus projected to account for a significant share of global GHG emissions; therefore, the involvement of the power sector in these countries is indispensable. They are expected to commit to, for example, raising the ratio of coal-fired power plants of the highest energy efficiency against all coal-fired plants to Y% in the next X years are expected.

Furthermore, with the rapid growth of energy-intensive industries, including the iron and steel and cement industries, in both countries, the participation of these sectors should also be strongly encouraged. Having acquired knowledge of benchmarking in APP task force activities and having received technological consulting at the actual emitting sources, these countries are familiar with sectoral approaches.

Proposals for incentive measures for developing countries and participating sectors from these countries are provided below. As we said in the Interim Report, our basic position is that funds and technology from developed countries should preferentially be forwarded to adaptation projects in least developed countries (LLDC). As for strong developing countries promising substantial economic growth, in particular, their expanding fund raising capacity should be taken into account so that aid and obligation are well-balanced. Thus, such balance has been taken into account in the following incentive measures:

- The following supportive measures shall be extended to those developing countries which have committed to the implementation of domestic measures mandating participating sectors to achieve agreed benchmarks (e.g. energy saving laws) (under our proposal, participation in Category I):
 - · Provision of technological information and operational know-how from the

industrial sector of countries that have achieved the benchmark;

- Provision of public funding for capital investment for the achieving the benchmark;
- · Cooperation in capacity-building regarding law enforcement
- 2) Developing countries participating in sectoral approaches and that have made Category I commitments shall receive financial support for SD-PAM in sectors other than industry (e.g. transport policy) (or may be considered for the assignment of allowances corresponding to their achievements However, in order to prevent the fabrication of emission allowances, they must be based on stringent standards of approval that are measurable, verifiable and reportable.)
- **3)** For automobile or household appliances manufacturing sectors, Open DSM-type CDMs shall be approved for the promotion of GHG emission reductions through the purchase of benchmark products in developing countries. An Open DSM-type CDM is a methodology that pursues additional product dissemination compared to BAU dissemination, thus demonstrating the additionality of the CDM project and issuing CERS corresponding to the GHG emission reductions identified by the demand side²⁰.
- 4) One of the aims of sectoral approaches is the mitigation of international competition issues. Therefore, it is only natural that the introduction of trade measures as incentives to comply with the agreements reached in sectoral negotiations or as penalties against incompliance should become an issue. The US's domestic cap-and-trade bill and the EU-ETS reform plan both include implications of such measures.

The relationship between WTO and Multilateral Environment Agreements (MEA) is a great source of contention that has yet to be resolved.²¹ While further

²⁰ This methodology was applied in 2005 in China's Shijiazhuang City, Hebei Province, in a project to promote the replacement of incandescent lamps for compact fluorescent lamps (CFL) with Japan's cooperation. Based on the results, it was submitted to the CDM Executive Board as a new methodology (NMO157; Open DSM-type CDM for Green Lighting in Shijiazhuang City, China and NMO157-rev), but at the CDM Executive Board meeting in February 2007, it was rated as a "B" case, which required reconsideration before it could be approved.

²¹ Papers analyzing global warming measures and WTO rules include: Aaron Cosbey and Richard Tarasofsky,"Climate Change, Competitiveness and Trade," A Chatham House Report, June 2007

debate is required between WTO and global warming negotiators, the following incentive systems can be proposed from the perspective of advocators of sectoral approaches:

take trade restriction measures against imports from countries not participating in sectoral approaches

give better treatment to imports from countries participating in sectoral $approaches^{22}$

raise tariffs or collect emission allowances from importers of goods and services from relevant sectors in non-compliant countries.

lower tariffs or grant importers emission allowances for imported goods and services from complying countries

impose a process tax (a tax imposed upon manufacturing methods that fail to achieve agreed benchmarks) as a border tax adjustment

for automobile and household appliances, impose import restrictions or expose products that fail to meet labeling and technological standards agreed upon in sectoral negotiations to unfavorable treatment in government procurement

5) It is also possible for industries and institutional investors to develop a common code of conduct for transactions with companies belonging to sectors in countries that have failed to meet benchmarks and those that have failed to comply with agreements based on sectoral approaches (not necessarily limited to developing countries). This code can be included in negotiated agreement targets based on sectoral approaches or be developed outside these negotiations.

As we pointed out in the Interim Report, the majority of current CDM funds have flowed into a limited number of developing countries with rapid economic growth; the destination of funds need to be diversified. In that context, developing countries making Category I commitments can be assumed to already have the capacity to procure funds without assistance, and thus, based on the principle of "common but differentiated responsibilities and respective capabilities," considerations should be made towards limiting the acquisition of emissions to those described in 1) and 3) above and altering the framework of conventional CDMs to accommodate only non-Category I countries.

The abovementioned is the Japanese proposal for sectoral approaches.

²² Ibid, p.24-25.

Finally, we will state our responses to the criticism against sectoral approaches mentioned at the beginning of this Chapter:

Can they improve current policy measures in terms of environmental effectiveness and cost effectiveness? Is there not strong resistance against the adoption of a new approach?

The environmental effectiveness of sectoral approaches will be elaborated in the following Chapter 2. The Keidanren Voluntary Action Plan, currently considered the domestic version of sectoral approaches, has progressed far beyond its targets. Furthermore, the APP Steel Taskforce estimates that by adopting a benchmark-based sectoral approach (and disseminating among APP member countries the high energy efficiency equipment already standardized in Japan), reductions of 127 million t-CO2 can be expected of the iron and steel industry alone.

The resistance against the adoption of a new approach can be explained as follows: The EU-ETS reform plan displays a strong interest in leakage issues, for which resolutions are to be discussed through 2010 and 2011. Regarding the free allocation rule for allowances, energy efficiency techniques and alternative production processes are also to be taken into account²³, thus demonstrating an approach comparable to that of sectoral approaches. Furthermore, experiences with sectoral approaches have been accumulated in the APP, including the US and East Asian countries. Given these global circumstances, we can say that the "resistance against the adoption of a new approach" has weakened.

Do sectoral approaches not complicate negotiations?

Our proposal of negotiations based on the sector template requires each sector and relevant governments to compose contact groups to conduct parallel negotiations. In that aspect, it is true that, compared to Kyoto-type diplomatic negotiations focused only on national emission targets, innovative approaches are required in the procedures and coordination techniques required to bring negotiations to a conclusion. However, each forum of negotiation engages experts with profound knowledge of on-site technologies and production data, therefore enabling more rational debate and the development of targets, which, once agreed

²³ Commission of the European Communities, op.cit., p16

upon, have been designed to be acceptable in the respective sectors; thus, consensus can be easily reached domestically and the certainty of compliances is enhanced. These advantages can offset if not overcome the disadvantage of complicated negotiations.

Is the government capable of getting hold of accurate information on industrial activities, particularly technological information and production forecast?

The negotiations involved in our proposal for Japan's Sectoral Approach are not intergovernmental negotiations based on information obtained by government from domestic industries, but take place at a forum of experts representing government, industry and IEA. Companies cannot be expected to disclose information on technology and production methodologies. However, since these negotiations do not aim to equalize marginal reduction costs, but rather to formulate a common acknowledgment of technological reduction potential and the production baseline, the accessible information should be adequate to satisfy their purposes, if not complete. As later explained in Chapter 2, conventional studies estimating reduction potential based on sectoral approaches revealed data deficiency, but sectors such the iron and steel and cement sectors have made advancements in the sharing of technological information of disclosed information has progressed, especially for energy conservation technologies and equipment; the APP and IEA have actually obtained adequate information through similar work.

Regarding the equalization of marginal reduction costs, we have proposed linkage with an emissions trading market.

Would sectoral approaches not create sector havens? In other words, if GHG reduction costs varied among sectors, would it not result in the relative protection of a particular sector? Also, if marginal reduction costs varied among sectors, would it not undermine economic efficiency?

To begin with, in the current operations of emissions trading schemes, the complete equalization of marginal costs at the global level has yet not been achieved, due to the lack of perfect competition, the presence of transaction costs and leakage issues (derived from the asymmetric structure of Kyoto Protocol's reduction obligations). It is true that the Japanese proposal for sectoral approaches will not

serve to resolve these issues; however, our proposal aims to prevent the aggravation of such downfalls by establishing an international intensity-based emissions market linked with an absolute reductions-based emissions market via a gateway.

What are possible frameworks to ensure compliance? In other words, methods of incorporation into the new framework are unclear.

Our proposal advocates two-stage agreements, namely intergovernmental agreements and government-sector agreements. These include the international agreements and domestic legal and quasi-legal agreements under Category I, elaborated in the Interim Report. Regarding non-compliance with Category I, we proposed a compliance framework, encompassing the establishment of a panel addressing non-compliant countries. Furthermore, domestic legal measures should be sufficient to ensure compliance domestically.

Chapter 2. The Environmental Effectiveness of Sectoral Approaches

Sectoral approaches are often exposed to the criticism that they are inferior in terms of environmental effectiveness compared to the Kyoto Protocol, with its national total reduction targets. This chapter will provide examples of GHG emission reduction estimations done by various research institutions using sectoral approaches. 10 examples will address multiple sectors and 7 examples will be sector-specific. Examples have been limited to those in which quantitative analyses have been conducted and no reference has been made to conceptual studies of sectoral approaches.

Although simple comparisons are not applicable because each estimation is based on different methods of calculation, including rules for regional and sectoral division, timing of reductions and baseline-setting, these research results collectively indicate a global CO2 reduction potential of several billion tonnes of CO2. This implicates remarkable environmental effectiveness, even in comparison with the target of increasing world energy efficiency by 30% (or, the GHG equivalent of reductions by approximately 7 billion tCO2 from BaU²⁴) in 2020, proposed by Prime Minister Fukuda at the Davos Forum. This is due to the fact that sectoral approaches assume the participation of sectors from developing countries marking significant growth.²⁵

²⁴ Values estimated employing a model developed by the Research Institute of Innovative Technology for the Earth (RITE), as given in p24- herein.

The following must be noted regarding these research outcomes: 1)Data-related issues

Discrepancies in data volume and quality depending on region and sector 2)Baseline setting issues

³⁾Discrepancies in assessment methodology among sectors

⁴⁾Tangibility of scenario

2.1. Studies of Emission Reductions Estimations for Multiple Se	ectors
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Studies	A) IEA (2007), Tracking Industrial Energy Efficiency and CO2 Emissions	B) OECD (2005), "Can Transnational Sectoral Agreements Help Reduce Greenhouse Gas Emissions?", meeting document for the OECD round table on sustainable development (Jan.2005)	C) IEA(2006) World Energy Outlook 2006	D) IPCC(2007) Climate Change 2007 Mitigation of Climate Change(4 th assessment report of IPCC)
Target Countries or Regions	OECD Member countries (target countries differ by sector)	Canada, USA, Latin America, Africa, West Europe, East Europe, Former Soviet Union, Middle East, India, China, Korea, Japan, South & East Asia, Australia and New Zealand	Worldwide coverage, including OECD Member countries (target countries differ by sectors)	Worldwide coverage
Target Sectors	-Sectoral Improvements (Chemicals/Petrochemicals, Cement, Pulp and paper, Aluminum, Other non-metallic and non-ferrous) -System Improvements -Life cycle Improvements	Aluminum, Cement, Steel, Coal-fired electricity generation, Automotive transport (Light- duty vehicles)	Power Generation /Transport /Industry /Residential and Services Sectors	Energy supply /Transport and its infrastructure /Residential and commercial buildings /Industry /Agriculture /Forestry /Waste management (ref. This report will especially focus on the 3 sectors: energy supply, transport and industry)
Baseline Assumptions and Main Results	Baselines vary among sectors. Total reduction potential, including all sectors, with Best Available Technologies applied: <u>1,972 ~ 3,235MtCO2</u> 。	Refer to next item; "Outline of estimation"	<i>Reference Scenario</i> , presenting a <i>sobering</i> <i>vision</i> of projections following current energy trends and without any particular new government measures, is adopted as baseline scenario (see p162-, IEA(2006)). <u>Total reduction potential in 2030</u> , for target sectors, 2,276MtCO2.	Baselines are assumed based on the sectoral assessments of status quo (refer to p11, IPCC(2007)). Total reduction potential (in 2030) in the 3 sectors treated in this table is 2,763 ~ 6,424MtCO2.
Outline of Estimation	'Universal indicators' are set in each sector, based on the assumption that "basic industrial processes and products are more or less the same across the world." Estimated savings are based on a comparison of best country averages with world averages, or best practice and world averages.(for further details, see p21- in IEA(2007)	Original estimations are not conducted in report, providing only samples of estimated potential of emissions and assessment results from other reports. Theory behind each estimation is, therefore, defined by the method of the original reports referred to in this round table paper.	An analysis of the effects that policies and measures under <i>Alternative Policy</i> <i>Scenario</i> have on energy demand and CO2 emissions is conducted in Chapter 9 of report Details of the scenario can be found in p168- of IEA(2006).	Estimated sectoral economic potential for global mitigation in different regions as a function of carbon prices in 2030, based on bottom up studies and in comparison with respective baselines (refer to the explanation in p11 IPCC (2007)). A full explanation on economic potential is found in Section 11.3 in this report.

Studies	E) IEEJ(2007), "Sectoral Evaluation of the Utilization Potential of Energy Efficient Technology"	F) IEEJ(2006), CO2 Reduction Potential by Energy Technology in Energy Intensive Industry	G) NEDO(2007), Wakugumi to Mokuhyo Sttei Houhou no Bunseki to Bumonbetsu Apurochi no Sangyo Tekigosei no Kento	H) CRIEPI(2007), Bumonbetsu Saika ni yoru Daihaishutsukoku no Post-Kyoto Suchi Mukuhyo Shisan	I) IEEJ(2007) Asia/World Energy Outlook	J: NIES, et al. (2007), Japan Scenarios toward Low-Carbon -Society Feasibility for 70% CO2 emission reduction by 2050below 1990 level-
Target Countries or Regions	-Varies among sectors due to data constraints. -General global reduction potential provided for developed countries and for developing countries	OECD Asia-Pacific, OECD North America, OECD Western Europe; OECD Central/Eastern Europe, Former Soviet Union, Central Asia, South America, North Africa, South Africa	OECD Asia-Pacific, OECD North America, OECD Western Europe; OECD Central/Eastern Europe, Former Soviet Union, Central Asia, South America, North Africa, South Africa	Seven major emitters: EU15, Japan, United States, India, China, Brazil, Russia	China, India and some other Asian countries	Japan
Target Sectors	Industry(Iron and steel, Cement, Pulp and paper)/Electricity generation/Transport (Light vehicle)/Residential and Buildings	Energy intensive industries(Iron and steel, Cement, pulp and paper)	Iron and steel, cement	Industry/Electricity generation/Residential and Commercial/Transportation/No n-CO ₂ GHGs(N2O, CH4)/ Forest sinks	Industry(Iron and steel, Cement, Chemical)/Residential and Commercial/Transportation(aut omobiles)/Electricity generation	Industry/Transport/Residen tial /Commercial
Baseline Assumptions and Main Results	-Assumes BaU case for each sector, based upon current supply-demand situation, etc, -Total reduction potential as of 2020: 3,637 MtCO2 for all target sectors and regions	-Adopts IPCC-SRES A1 or B2 as baseline scenario. -Total reduction potential as of 2030: 980 ~ 1,190 <u>MtCO2</u> for the three target sectors	-Adopts IPCC-SRES A1 or B2 as baseline scenario -Total reduction potential as of 2030: 970 ~ 1,140 <u>MtCO2</u> for the two target sectors	-Estimates a reduction target as of 2020. No baseline is defined. - <u>Total reduction target as</u> of 2050: 17,107 MtCO2 for all target countries and regions.	-Adopts a feasible case under current policies and measures as reference case. Estimates future supply- demand situation based upon current economic and socio situations. -Total reduction potential as of 2030: 2,131 MtCO2 for the target countries.	-Estimates reduction <i>target</i> against actual 1990 -Total reduction <i>target</i> as of 2050: 212 ~ 255 MtCO2 for all target sectors in Japan.
Outline of Estimation	-Assumes potential reductions to be difference between (i) current BAT introduction case in 2020 and (ii)BaU case. -Bottom-up approach on a technology-by-technology basis. Macro indicators used when data is not available. -Focusing on potential of each technology, socio-economic factors and market barriers are ignored.	-Estimates reduction potential in the case of replacing existing technologies and facilities with those of high-efficiency as of 2030. -Assumes that high-efficiency technologies and facilities feasible in Japan can be applied in other countries. -Estimates future production volumes from future energy consumption ratio based upon IPCC-SRES-Aland B2.	Estimates reduction potential in the case of replacing existing technologies and facilities with those of high-efficiency as of 2030. -Assumes that high-efficiency technologies and facilities feasible in Japan can be applied in other countries. -Focusing on potential of each technology, socio-economic factors and market barriers are ignored.	Estimates the quantitative reduction target for 2050, applying the triptych sectoral approach with some revisions.	-Assumes advanced technology case, where policies and measures for the improvement of energy efficiency and introduction rate of high-efficiency technology and facilities are enhanced. -Estimates reduction potential as the difference between the "reference case" and the "technology development case."	-Assumes "70% reduction in 2050" and evaluates its feasibility and technology requirements based on a backcast approach. -Estimates reduction rate for two different scenarios. -Sets socio factors based upon existing statistics and brainstorming of experts.

*IEEJ: The Institute of Energy Economics, Japan; NEDO: New Energy and Industrial Technology Development Organization, Japan, NIES: National Institute Environmental Science, Japan

2.2	Studies	of F	missio	n Re	duction	Estimat	tion '	Targeting	y Single	Sectors
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Studies	A) IEA(2005) Reducing Greenhouse Gas Emissions The Potential of Coal	B)(2008)FEPC "Senshinkoku ni okeru CO2 Sakugen Kouka no Hyouka Bunseki Gyomu"	C)APP(2006, 2007) Surveys by APP Steel Task Force	D)Matsuhashi et al.(2007) Study on Negotiating Strategy for Post-Kyoto Protocol about Easing Climate Change	
Target Countries or Regions	EU(25), Japan, Australia, USA, South Africa	OECD North America, OECD Pacific, OECD Europe, Economies in Transition, China, India, Developing Asia	(2006)6 APP Member Countries (excluding Canada) (2007)6 APP Member Countries(excluding Australia), OECD Europe, Russia, South Africa, Ukraine, Brazil	Middle East and North Africa, Sub Saharan Africa, Latin America, Other Asia, Centrally Planned Asia, Former Soviet Union, Central and Eastern Europe, Western Europe, North America, OECD Pacific	
Target Sector	Coal-fired Power Generation	Electricity Generation	Iron and Steel	Iron and Steel	
Baseline Assumptions and Main Results	-This purpose of this study being the introduction of existing estimations from other studies, assessment methods, including baseline setting, are varied. -Few examples show clear estimation results; therefore totals are omitted in this study.	-Reference Scenario defined in IEA World Energy Outlook 2006 is assumed as baseline. - <u>Reduction potential as of 2030:</u> <u>1.867MtCO2(=1.87GtCO2)</u> for the target countries.	(2006) <u>Reduction potential:</u> <u>127.2MtCO2</u> for the 6 target countries. (2007) <u>Reduction potential:</u> <u>358.5MtCO2</u> for the 11 target countries	<u>Reduction potential: 686MtCO2</u> for the target countries.	
Outline of Estimation	No explanation is given in report (refer to references presented in the report).	 -Assumes 3 scenarios: BaU, Real (Realistic scenario for transfer technologies, BAT (Advanced scenario for strategic technological transfer) -Estimates emission reductions for each scenario, by a bottom-up approach, focusing on potential of technologies. -Furthermore, considers increased reductions (1-5%) by measures for improving operations. 	-Estimates reduction potential for each target country based on improved efficiency rates and diffusion rates (target diffusion rate) of energy-saving equipment, and production quantities.	-Estimates reduction emissions for target countries, based on bottom-up approach on high-efficiency technologies, demonstrating its usefulness by employing <i>Cross Impact Matrix</i> <i>Method.</i> -Estimates reductions based on progress of energy-savings by means of changes in intensity through application of 4 Best Available Technologies.	

*FEPC: The Federation of Electric Power Companies, Japan, APP: Asia-Pacific Partnership on Clean Development and Climate

Studies	E)Battelle(2002a) Toward a Sustainable Cement Industry /Battelle(2002b) Toward a Sustainable Cement Industry, Substudy 8: Climate Change	F)WBCSD(2004) Mobility 2030	G)IEA(2005) Cool Appliances Policy Strategies for Energy Efficiency Homes
Target Countries and Regions	USA, Canada, Western Europe, Japan, Australia and New Zealand, China, East and South Asia, India, Korea, Former Soviet Union, Eastern Europe, Latin America, Africa, Middle East	Worldwide (no description of country-specific assessment results)	IEA Member Countries
Target Sector	Cement	Transport(Automobile)	Appliances
Baseline Assumptions and Main Results	-Technical emissions reduction potential for CO2 per tonne of cement <u>as of 2020; about 30%(of the</u> <u>worldwide</u>) -Total reduction potential is approximately equivalent to the amount of reductions that would be required if the world adopted a strategy to stabilize greenhouse gas concentrations at twice pre-industrial levels.(see p16 Battelle(2002b)) -CO2 emissions reduction potential using a combination of conventional reduction approaches <u>as of 2020 : 29%</u> ,	 -Sets benchmark as reference case projection showing total transport-related CO2 emissions doubling between 2000-2050 -Estimates reduction potentials in 2020, 2030 and 2050 -Estimates reduction potential based on studies of single technologies (see below) as of 2030: 7,687MtCO2, as of 2050: 22,047MtCO2 	-Assumes 3 scenarios: No-Policies, Current Policies, and Least Life-Cycle Cost efficiency(LLCC) -To obtain global results, estimates reduction potential based on Current Policies scenario. -Reduction potential <u>as of 2030: 572MtCO2</u> for targeting countries of IEA member countries
Outline of Estimation	-Estimates reduction potential based on 2 different approaches; technical potential for CO2 savings per tonne of production form conventional CO2 management approaches; and maximum technical potential by combination of actions for "conventional approaches". (For more details, see p16-23, Battelle(2002b))	 -Does not examine the technical or economic feasibility of any of the actions being simulated. -Examines the impact of single technologies on global road transport CO2 emissions, and also the combined impact of several actions (for details see p113-114, WBCSD(2004)). -In this table, only study results of impact of single technologies are given. 	-Calculates the difference of emissions between LLCC and No-Policies, and between LLCC and Current Policies, and considers them as reduction potential. -Gives values for every five years from 1990 to 2030 (only value for 2030 shown in this table)

2.3. Emission Reductions Assessment using the Sectoral Template based on the RITE Model

The following pages will present some illustrative examples of sectoral templates compiled by employing the research results of the Systems Analysis Group of the Research Institute of Innovative Technology for the Earth (RITE).²⁶

This study has been based on the assumptions that marginal reduction costs will be homogenized among countries and sectors (minimization of costs) to generate estimations of reduction potential represented by levels of physical intensity achieved by the introduction of best available technology, equipment and products. The timing of capital investment is being contemplated with considerations for vintage.

In this research method, it is possible to present detailed physical intensity values for each country and sector at any given year, such as 2020 or 2030. However, since the purpose of introducing these research results is to clarify that Japan's Sectoral Approach proposed in this report can be taken by countries and sectors to actually negotiate agreed targets for physical intensities in a given period. Therefore, with regard to the impact they may have upon actual negotiations, we have avoided providing specific values for specific years.

The following diagram demonstrates only the total potential of reductions from BaU (represented by accumulated sector-specific intensity improvements) in Japan, the US, EU27, China and India (of the 53 countries and regions that this research divides the world into and has compiled data for) in the year 2050.

²⁶The model employed for the analysis has been based on outcomes of "Assessment of Mitigation Frameworks after 2013 (Beyond 2010)," commissioned by the New Energy and Industrial Technology Development Organization (NEDO)



Furthermore, a concrete example of the sector template (figures 4-1 \sim 5, p27-31) is the format derived from the model employed in this study. Each cell can quantitatively represent what each country can do in which sectors to what extent in order to meet the requirement of equalizing marginal reduction costs. However, for the same reason as that given above, only items such as technologies and products covered are presented and specific values omitted. Generally, larger improvement rate values would be given for countries and sectors that are currently marked by low energy efficiency and require only limited costs for improvements.

Also, the data given here are for energy-derived CO2, although in the actual application of sectoral approaches, other gases and the forestry sector (logging and afforestation issues) should be considered as well.

The major assumptions for the baseline setting of the RITE model are as follows: the population data has been derived from the United Nations median projection for 2006, the GDP growth rate per capita has been taken from the World Bank's 2007 forecasts for the period up to 2030, and from the IPCC SRES scenario B2, for 2030-50. Furthermore, scenarios, including production, have been estimated based on past trends and the GDP per capita assumed above²⁷. The appendix table below should be referred to for other data sources.

²⁷ We thank the RITE Systems Analysis Group for providing us with the detailed data required for this task. Detailed data are available from the Group upon request.

Projected Scenario for Halving Emissions

In 2050, emissions are to be reduced to 13.1 GtCO2, or half of global emissions in 2005, which marked 26.2 GtCO2 (exclusive of bunker oil and other sources that are not included in national allocations), according to 2007 IEA statistics (refer to Graph 1).

- Setting emission levels to bring peak-out of emissions in 2030 (32.9 GtCO2); 13.1 GtCO2 in 2050.
- Equalization of marginal reduction costs assumed. 2020:5\$/tCO2; 2030:7\$/tCO2; 2050:334\$/tCO2
- Baseline (global) emissions for 2020, 2030, 2050 are as follows:
 - ➤ 2020: 37.6Gt
 - ▶ 2030 : 42.9Gt
 - ➤ 2050:48.3Gt





Assumptions	2000	FOB pri	ces adjusted to	equal following valu	es:		
for fossil fuel prices	Foss	il fuel pr	ices for 2000 a	and beyond estimated	so that production costs		
	will	incremen	t depending on	accumulated product	tion.		
			Coal-fired power generation	High efficiency gene assumed Equipment costs : 1 Generation efficience	eration with IGCC/IGFC ,050\$/kW ey : 42-55%		
		Innovative technological development Power Generation		Equipment costs and required power volumes assumed for post-combustion CO2 capture from coal-fired, natural gas-fired and biomass power generation.			
Technological assumptions	lopment		CCS	Equipment costs and required power volumes assumed for IGCC/IGFC with pre-combustion CO2 capture and oxygen combustion generation employing natural gas.			
	Innovative technological deve		Nuclear power generation	Advanced nuclear power generation technologies available beyond 2030 assumed. Equipment costs: 1,200\$/kW Equipment lifetime: 40 years Utilized capacity: 85% 30% increase of total power demand projected to be possible in 30 years. Also, no more than 50% of grid power can be supplied from this source (not applicable to regions where share already exceeds 50%).			
				PV power generation	209-720\$/MWh(2000) 37-128\$/MWh(2050)		
			Innovative	Storage system	375\$/MWh(2000 年)		
			technologies	Storage system	7.6\$/MWh(2050 年)		
				No more than 15% of grid power can be supplied. With a storage system an additional			

Appendix Table: Assumptions for RITE model (Technological specifications and economic factors)

			-	
		sportation	Fuel cell cars, plug in hybrid	Vehicle prices and energy efficiency assumed by car type.
		Tran	electric cars	Equipment costs for hydrogen supply infrastructure assumed.
		dustry & Steel)	Blast furnace / converter process	Equipment costs and energy efficiency for next-generation coke oven and hydrogen reduction in steel, etc.
		Ino (Iron	Direct reduction process	Equipment costs and energy efficiency assumed for direct reduction process with hydrogen gas.
	y improvements	er Generation	Coal-fired power generation	Supercritical technologies currently mainly used in developed countries (also projecting future shift to combined generation) assumed to be available as medium efficiency technology. Generating efficiency:36-43.5 [%LHV]
		Pow	Natural gas-fired power generation	State-of-the-art high-temperature NGCC (future use of FC also projected) assumed to be available as high efficiency technology. Generating efficiency: 52-62 [%LHV]
	lergy efficienc	lustry	Iron & steel	Improvements in energy efficiency through upgrading and dissemination of CDQ, TRT and byproduct gases in blast furnace / converter method.
	En	Inc	Other	High energy efficiency technology options are assumed to be available also for cement, pulp & paper, chemical, aluminum
		Transport ation	Vehicle efficiency	Improved efficiency in conventional internal combustion engine cars hybrid cars

	uel conversion	Power generation	Nuclear (conventional), hydro and geothermal, wind, biomass and hydrogen power generation are assumed.					
		Industry	Replacement of crude steel production using the blast furnace/converter process with electric furnace or direct reduction processes (natural gas)					
	Η	Transpor- tation	Utilization of alternative fuels (bio-ethanol, biodiesel)					
su	Policies related to major CO2 emission reduction measures curre implemented							
Other umptio	2008 and 1	2008 - 2012 Kyoto Protocol (Emissions trading, inclusive of former USSR and Eastern Europe, is possible)						
ass	~ 20 redu	010 US: ction rate	per unit GDP CO2 emissions reduction target (annual e 2%)					

Japan, 2020

	Negotiated age technologic respo	reement item / al and policy onses	Improved physical intensity (energy)	Improved physical intensity (CO2))	Reduced carbon contribution due to fuel diversification	Energy efficiency improvements	Innovative technology development	Projected CO2 reductions [MtCO2/yr]
		Energy savings				Increased high efficiency gas-fired power generation (high-temperature NGCC)		
		Biomass			Increased biomass power generation			
	Power generation	Photovoltaic					Increased photovoltaic power generation	
		Wind			Increased photovoltaic power generation			
		Hydro & geothermal			Increased Hydro and geothermal power generation			
		Nuclear			Increased nuclear power generation			
		Hydrogen						
		Conversion among fossil fuels		1	Increased gas-fired power generation			
		ccs					Implementation of CCS in coal-fired power generation	
	Other energy of errors	conversion and						
	Aluminum							
	Chemical	Ethylene- propylene						
Sector		Ammonia						
Cector	Pulp & paper	Chemical pulp						
	r up & paper	Paper/ paperboard						
	Cement					Increased deploymentof large scale SP/NSP (current BAT) technology (BaU:41 193kton/day)		
	Iron 8 atool	Blast furnace/ converter				Increased deploymentof current BAT I(CDQ, TRT, high-efficienct byproduct gas recovery equipment) (BaU:250 252kton/day)		
	non a steer	Scrap-based electric furnace						
	Other industrie	es						
		Light passenger cars				More hybrid cars		
		Heavy passenger cars				More hybrid cars		
	Transportation	Buses			Increased share of bioethanol	More hybrid cars		
		Light-duty trucks				More hybrid cars		
		Heavy-duty trucks						
	Transportation automobiles	, other than						
	Household & c	ommercial						
CO2 emi	ssions under Bal	U [MtCO2/yr]				Projected CO2 emissic [MtCO2/yr]	ons under BaU	

US, 2020

	Negotiated agreement item / technological and policy responses		Improved physical intensity (energy)	Improved physical intensity (CO2))	Reduced carbon contribution due to fuel diversification	Energy efficiency improvements	Innovative technology development	Projected CO2 reductions [MtCO2/yr]
		Energy savings				Increased high efficiency gas-fired power generation (high-temperature NGCC)	Increased high-efficiency coal-fired power generation	
		Biomass						
		Photovoltaic						
		Wind						
	Power generation	Hydro & geothermal			Increased hydro & geothermal power generation			
		Nuclear			Increased nuclear power generation			
		Hydrogen						
		Conversion among fossil fuels			Increase gas-fired power generation			
		ccs						
	Other energy of errors	conversion and						
	Aluminum					Increased deploymentof Prebake method (BaU:8 9kton/day)		
	Chemical	Ethylene- propylene				Increased deploymentof current BAT(BaU:0 48kton/day)		
Sector		Ammonia						
Sector	Dula 9 popor	Chemical pulp			Reduced purchased power			
		Paper/ paperboard			due to CHP			
	Cement					Increased large-scale SP/NSP (current BAT)technlogy		
		Blast furnace/ converter			Increased DRI production			
	Iron & steel	Scrap-based electric furnace						
	Other industries							
		Light passenger cars				More hybrid cars		
		Heavy passenger cars				More hybrid cars		
	Transportation	Buses			Increased share of bioethanol (Share among automobile fuel: 27%)			
		Light-duty trucks						
		Heavy-duty trucks						
	Transportation automobiles	, other than						
	Household & c	ommercial						
CO2 emissions under BaU [MtCO2/yr]				-	Projected CO2 emissio [MtCO2/yr]	ns under BaU		

EU27,2020

	Negotiated agreement item / technological and policy responses		Improved physical intensity (energy)	Improved physical intensity (CO2))	Reduced carbon contribution due to fuel diversification	Energy efficiency improvements	Innovative technology development	Projected CO2 reductions [MtCO2/yr]
		Energy savings				Increased deploymentof high-efficiency gas-fired power generation (high- temperature NGCC)	Increased high efficiency coal-fired power generation (current BAT)	
		Biomass			Increased biomass power generation			
		Photovoltaic					Increased photovoltaic power generation	
		Wind			Increased wind power generation			
	Power generation	Hydro & geothermal						
		Nuclear			Increased nuclear power generation			
		Hydrogen						
		Conversion among fossil fuels			Increased gas-fired power generation			
		CCS					Introduction of CCS technology in coal-fired power plants	
	Other energy o errors	onversion and						
	Aluminum					Increased deploymentof prebake method (BaU : 12 13kton/day)		
	Chemical	Ethylene- propylene				Increased deploymentof current BAT (Naphtha Cracking) (BaU:28 29kton/day)		
Sector		Ammonia				Increased deploymentof current BAT(BaU:0 5kton/day)		
	Pulp & paper	Chemical pulp						
		Paper/ paperboard						
	Cement					Increased deployment of large scale SP/NSP (current BAT) technology		
	Iron & steel	Blast furnace/ converter				current BAT I(CDQ, TRT, high-efficienct byproduct gas recovery equipment)		
		Scrap-based electric furnace						
	Other industries							
		Light passenger cars				Increased hybrid cars		
		Heavy passenger cars				Increased hybrid cars		
	Transportation	Buses			Increased bio-ethanol share	Increased hybrid cars		
		Light-duty trucks				Increased hybrid cars		
		Heavy-duty trucks						
	Transportation, other than automobiles							
Household & commercial								
CO2 emissions under BaU [MtCO2/yr]						Projected CO2 emissic [MtCO2/yr]	ons under BaU	

China 2020

	Negotiated agreement item / technological and policy responses		Improved physical intensity (energy)	Improved physical intensity (CO2))	Reduced carbon contribution due to fuel diversification	Energy efficiency improvements	Innovative technology development	Projected CO2 reductions [MtCO2/yr]
		Energy savings				Increased deploymentof high-efficiency gas-fired power generation (high- temperature NGCC)		
		Biomass						
		Photovoltaic						
		Wind			Increased wind power generation			
	Power generation	Hydro & geothermal			Increased hydro and geothermal power generation			
		Nuclear			Increased nuclear power generation			
		Hydrogen						
		Conversion among fossil fuels			Incrased gas-fired power generation			
		CCS					Introduction of CCS technology in coal-fired power plants	
	Other energy o errors	onversion and						
	Aluminum							
	Chemical	Ethylene- propylene				Increased deployment of current BAT (Naphtha Cracking)		
Sector		Ammonia			Shift from coal-oriented production to gas-oriented production (Gas-oriented production share	Increased deployment of current BAT		
	Pulp & paper	Chemical pulp						
		Paper/ paperboard						
	Cement							
	Iron & steel	Blast furnace/ converter			Increased DRI production			
		Scrap-based electric furnace						
	Other industries							
		Light passenger cars						
		Heavy passenger cars						
	Transportation	Buses						
		Light-duty trucks						
		Heavy-duty trucks						
	Transportation, other than automobiles							
Household & commercial								
CO2 emissions under BaU [MtCO2/yr]						Projected CO2 emissio [MtCO2/yr]	ons under BaU	

India, 2020

	Negotiated agreement item / technological and policy responses		Improved physical intensity (energy)	Improved physical intensity (CO2))	Reduced carbon contribution due to fuel diversification	Energy efficiency improvements	Innovative technology development	Projected CO2 reductions [MtCO2/yr]
		Energy savings				Increased deploymentof high-efficiency gas-fired power generation (high- temperature NGCC)(1042TWh/yr)	Increased high efficiency coal-fired power generation (current BAT)	
		Biomass						
		Photovoltaic						
		Wind			Increased wind power generation			
	Power generation	Hydro & geothermal						
		Nuclear			Increased nuclear power generation			
		Hydrogen						
		Conversion among fossil fuels			Increased gas-fired power generation			
		ccs					Introduction of CCS technology in coal-fired power plants	
	Other energy of errors	conversion and						
	Aluminum							
	Chemical	Ethylene- propylene				Increased deploymentof current BAT (Naphtha cracking) (BaU:7 16kton/day)		
Sector	Onemicar	Ammonia			Shift from coal-oriented production to gas-oriented production	Increased deployment of current BAT		
	Pulo & paper	Chemical pulp						
		Paper/ paperboard						
	Cement							
	Iron & steel	Blast furnace/ converter			Increased DRI production		Implementation of CCS	
		Scrap-based electric furnace						
	Other industrie	es						
		Light passenger cars				More hybrid cars		
		Heavy passenger cars				More hybrid cars		
	Transportation	Buses						
		Light-duty trucks						
		Heavy-duty trucks						
	Transportation automobiles	, other than						
	Household & c	ommercial						

Chapter 3. . Relation with the New Protocol

Sectoral approaches cannot achieve the complete coverage possible under the Kyoto Protocol, the advantage of which is that it sets an economy-wide cap on developed countries. However, sectoral approaches can cover a major portion of the industrial sector and a remarkable part of the household/commercial and transportation sectors. It also improves the likelihood of involving developing countries. Furthermore, if each country, including developing countries, were to commit to implementing measures to reduce emissions gases other than CO2 from sources beyond participating sectors, total GHG reductions can be expected to be larger than those possible under the Kyoto Protocol. The overall structure of our proposal for a new post-Kyoto framework is to build in Japanese sectoral approaches by integrating the policy matrix template for which agreement has been reached into the Category I policy template that we proposed in the Interim Report.

In the event that the new Protocol is based on an agreement to set a cap on national emissions, Japan's Sectoral Approach should be given the following status in the new framework.

Japan's Sectoral Approach is more specific about GHG reduction methods and is thus more likely to achieve real reductions compared to the Kyoto-type national caps determined without scientific basis. Therefore, international sectoral agreements established in the respective Contact Groups should be respected in international negotiations and should not be subject to alterations by succeeding intergovernmental agreements.

In that case, the major responsibilities to be assumed by governments comes down to developing measures covering segments of the household/commercial and transportation sectors that have not been covered by sectoral approach-based agreements (household appliances and automobiles) and the emissions reduction of gases other than energy-derived CO2.

Compared to the industrial sector, household/commercial and transportation (especially automobiles for personal use) sectors represent national living standards. The concept supported by developing countries that "common but differentiated responsibilities" should be based on per capita emissions holds more true in these sectors than in the industrial sector.

An international comparison of CO2 emissions per capita from these two sectors in 2004 with those from the industrial sector is shown in the figure below. The figure also compares per capita CO2 emissions with per capita emissions of gases other than energy-derived CO2.



(Source Central Research Institute of Electric Power Industry)

The following observations can be made based on the data provided in this figure.

• CO2 emissions per capita in the household/commercial sector are smaller in Japan and Korea compared to the US, Canada, Germany and UK.

• In the transportation sector, as well, CO2 emissions per capita are large in the US and Canada, and small in Japan and major EU countries.

• Europe and the US emit large volumes of methane and N2O.

• CO2 emissions per capita are small in the household/commercial and transportation sectors of China and India. However, China's CO2 emissions per capita in the in the industrial sector are almost equal to those of the EU.

From the perspective that global warming measures are not just an issue pertaining to the industrial sector but one questioning the lifestyle of each individual, there is a need to compare the level and trends of emissions in the household/commercial and transportation sectors among developed countries as well. Based on the outcome of these comparisons, governments must contemplate on how to encourage their citizens to reform their energy-intensive lifestyles.

In order to achieve national targets, which include the household/commercial and transportation sectors, governments must have instruments to mandate actors belonging to these sectors (building managers, households) to reduce emissions. However, it is difficult to devise an instrument other than Japan's Energy Saving Law, which mandates energy efficiency improvements in goods used in both

the two sectors.

If a Kyoto-type Protocol should continue to be pursued, the only realistic means would be employing flexible mechanisms like the Kyoto mechanisms so that the government can acquire emission allowances on behalf of these sectors. These funds will be assumed by the energy end-users of these sectors.

In Japan's case, the government will procure the necessary emission allowances from the international market using financial resources from Special Accounts for Energy, which is sourced by the petroleum and coal tax (Japan's environmental tax). In the future, the Japanese government will be required to consider a tax raise to avoid a shortage of funds in a way that will ensure the shifting of burden to final consumers.

If the new Protocol abandons the Kyoto framework and is based on COMMIT & ACT, as we proposed in the Interim Report, measures with legal mandates or that are allocated an appropriate portion of government budget will be required for governments to oblige or encourage final consumers to reduce energy consumption or to use renewable energy.

Once the industry's international competitiveness issue is separated from global warming negotiations by applying Japan's Sectoral Approach, the government must focus on what kind of measures it will take to achieve such changes in the lifestyles of its citizens.

Another very important point is that countries with large methane and N2O emissions should identify the causes and commit to studying reduction potential and implementing reduction measures.

Conclusion

Our proposal of Japan's Sectoral Approach has been compiled in more detail than any other existing paper in order to prove its feasibility, including the framework for integrating it into the new Protocol.

The proposal has allowed for diversified and flexible target setting so that it can involve as many sectors and countries as possible. Also, it has presented detailed ideas regarding a linkage with an emissions market for the minimization of marginal reduction costs, measures to mitigate compliance issues in developing countries and actors and methods of agreement. Furthermore, in Chapter 2, it has provided an answer to questions of its environmental effectiveness often posed regarding sectoral approaches.

However, many issues, including the technical issues embraced by sectoral approaches, remain unsolved. We hope that the world's negotiators will use this proposal as a basis in their bold challenge of addressing these issues.

Appendix

Proposal for a Post-Kyoto Framework

excerpt from Interim Report October 2007

Proposal for a Post-Kyoto Framework—Commit and Act

We are proposing a new framework here to replace the Kyoto Protocol because, as Chapter 3 will describe, the Kyoto Protocol has significant structural problems as an international commitment to address the global warming problem, and has failed to result in substantive greenhouse gas reductions on a global scale.

1. Necessary elements for a post-Kyoto framework

A new framework must be devised to replace the Kyoto Protocol, which leaves much to be desired as a means of addressing the global warming problem. The necessary elements when considering a "flexible and diverse framework" that is also politically feasible and incorporates the current positions of the various countries involved, which were discussed in Chapter 1, are outlined below.

A framework that:

(1) Is premised on a long-term perspective and sustainable, in the sense that it ensures the continued efforts of both governments and the domestic entities responsible for emissions

Such a framework would enable long-term efforts that take into account the lead-time required for technology development, from basic research to diffusion, while at the same time providing the predictability needed to drive decision-making on investments in the private sector.

(2) Identifies the potential reductions in the various countries (particularly major emitters of greenhouse gases) through scientific methods and an objective process, and shares information on these potential reductions among countries

Unless individual countries disclose information on their potential for reducing emissions, negotiations could lead to mutual distrust and simply become a propaganda battle aimed at ingratiating the public. This lesson has taught us the need to disclose and share objective data.

(3) Includes internationally legally-binding commitments made to policies and actions that governments can definitely implement

The framework of the Kyoto Protocol, which allows emitters to purchase emission credits to achieve their targets, even if those emission rights are derived from so-called "hot air,"

created concerns that such a framework would not actually result in greenhouse gas reductions, since purchasing emission credits could weaken efforts to meet numerical targets for greenhouse gas reductions.

Rather, it is very important that countries commit to policies that lead to an actual reduction in greenhouse gases. The framework should incorporate mechanisms by which each government's implementation of its domestic measures can be monitored and verified, without fail. This is tantamount to a mechanism that enables the infallible reduction of greenhouse gases. (For a counterexample, a certain European country decided in 1990 to cut CO_2 by 25-30% of 1987 levels by 2005, but there has been no verification that this has actually been achieved.)

Actual reductions in greenhouse gases can be achieved through international debates on energy policy that focus on the development, use and diffusion of technology; national reductions in energy-derived CO_2 via policies aimed at reducing the use of fossil fuels; and sharing information on best practices for the requisite policies and measures in agriculture and industry to reduce methane, N₂O and chlorofluorocarbon alternatives.

2. Overview of new framework

(1) Rationale for making a new proposal

Major emitters such as the United States and Australia are not expected to ratify the Kyoto Protocol, and developing countries are not expected to make substantial efforts to reduce greenhouse gases. This means that the Kyoto Protocol is not an effective framework for addressing global warming.

As the country holding the chairmanship of COP3, Japan will strive to develop the best possible proposal for combating global warming, based on the following six principles.

A: Environmental effectiveness—Ensure that greenhouse gases are actually reduced

B: **Science-based analysis**—Data on potential for reductions and costs should be based on scientific analysis

C: **Equity**—In accordance with "common but differentiated responsibilities and respective capabilities of countries and their social and economic conditions" (UNFCCC)

D: **Inclusiveness**—Broaden participation to include non-governmental entities as actors in the new agreement

E: Political feasibility—Required to enable all countries to participate in the framework

F: **Sustainable, long-term perspective**—A reasonable amount of lead time should be provided for innovative technology development and diffusion

(2) Proposal content

A new protocol, as described below, should be agreed on in discussions based on Article 4, paragraph 2 (d) of the UNFCCC. It should be examined based on Article 9 of the Kyoto Protocol, and should replace the Kyoto Protocol after the first commitment period expires at the end of 2012 (or when a COP decision is made to shift to a new protocol). This is because a new protocol would not only change the regulations and methods for reducing greenhouse gas emissions under the Kyoto Protocol, but, regarding the obligation of developing countries to limit and/or reduce greenhouse gas emissions, should also be premised on the need for major emitters among developing countries to accept some kind of legally-binding commitment as well as the need for the countries that withdrew from the current Kyoto Protocol to participate. As a result, the potential to satisfy these premises significantly depends on a new legal framework that is distinct from the Kyoto Protocol. Further, it would be practically difficult for a new legal framework and the Kyoto Protocol to exist simultaneously.

In 2013, the new protocol, comprised of the following three categories as major elements in its structure, should go into effect based on Article 17 of the UNFCCC. To take effect it must be ratified by two-thirds of the major emitters (refer to the explanation of Category I for the definition) and must cover two-thirds of the total emissions by major emitters so that it satisfies both requirements: that the new framework be effective and that it encourage universal participation.

Technology development and transfer, addressed below in section 3 of this chapter, and international cooperation in these efforts should be agreed on as a COP decision based on Article 4, paragraph 1 (g) and Article 5 of the UNFCCC, or this article could be amended and related provisions added.

Also, the financial mechanisms discussed in section 4 of this chapter could be based on a revision to Article 11, paragraph 4 of the UNFCCC or a COP decision, but it could also be a commitment under Category I, as described below.

Structure of the New Protocol

COMMIT AND ACT

Category I

Shared Commitments to Binding Actions by Major Emitters' Governments

- (1) Internationally legally-binding provisions are stipulated for major emitters including developing countries (the contents are determined by negotiating a series of policy templates through the "request and offer" negotiation process in order to build an agreed-upon policy matrix) (refer to pages 18 to 20 for the definition of policy template and policy matrix)
- (2) Provisions to ensure compliance and deal with countries in violation

Category II

Individual Commitments to Non-binding Actions by All Governments

- Individual governments make political commitments to policies and measures (the new protocol stipulates the kind of items that should be included in the commitments)
- (2) Measures to ensure implementation

Category III

Participatory Commitments to Individual Actions by Private Sector Entities

- (1) Commitments to actions to combat global warming by private sector entities that are in accord with the object of the new protocol
- (2) Procedures to register, validate and verify those actions and their achievements

Organizations Carrying Out Scientific Analysis—Expert Group

- (1) Regulations establishing and governing organizations that conduct a scientific analysis of each country's potential for reducing emissions and the cost of its measures, as well as validate and verify Category III commitments, while coordinating lines of authority with a Subsidiary Body for Scientific and Technological Advice (SBSTA)
- (2) Rules for accumulating and disclosing information obtained through the above activities

Effective Life of New Protocol and Regulations on Revisions

The commitment period should last 50 years beginning in 2013, and every five years negotiations should be held on revising Category I commitments and updating Categories II and III based on the most recent scientific, technical, economic and social information.

Features of New Framework

A: **Environmental effectiveness**—Internationally binding mandates requiring that individual governments adopt measures to reduce greenhouse gases more infallibly allow for greenhouse gases to be reduced than a scheme such as the Kyoto Protocol that can be circumvented by buying emissions credits in the event of non-compliance. This is consistent with Article 3, paragraph 1 of the UNFCCC principles.

B: **Science-based analysis**—Negotiations based on scientific analyses of the potential for reductions can be expected to help countries to avoid a political and diplomatic game marked by competition over quantitative targets without specifying the measures by which to achieve them. This is consistent with Article 3, paragraph 1 of the UNFCCC principles.

C: **Equity**—The principle of "common but differentiated responsibilities and respective capabilities of countries and their social and economic conditions" ensures common responsibility to fight global warming while differentiating between the extent of obligation in Categories I and II. This is consistent with Article 3, paragraphs 1 and 4 of the UNFCCC principles.

D: **Inclusiveness** —Opening the new framework to the voluntary efforts of private entities in work to address global warming, which is difficult for governments alone to address sufficiently, is a method that improves the awareness and elicits the active engagement of emitting entities, including non-governmental bodies.

As a result, this ensures that private entities could voluntarily commit to measures against global warming, even measures that would not have been possible by aligning domestic political interests regarding measures against global warming. This is based on the understanding that consumers' increasing environmental awareness will ensure that highlighting environmental awareness becomes an important aspect of companies' competitiveness.

Even NGOs that are very concerned about climate change should not limit themselves to advocacy work demanding that governments take measures to combat global warming, but

should also be encouraged to take action on their own that will actually reduce greenhouse gases.

This is consistent with Article 3, paragraphs 1, 2 and 3 of the UNFCCC principles.

E: **Political feasibility**—It is politically feasible that even developing countries that are major emitters but remain vehemently opposed to setting quantitative targets are persuaded to commit to set energy and economic policies that help combat global warming, because there should be some such measures that do not necessarily hinder their economic growth. This is consistent with Article 3, paragraphs 2 and 4 of the UNFCCC principles.

F: **Sustainable, long-term perspective**—With a 50-year commitment period for the new protocol and reviews every five years, adequate time is ensured for innovative technologies to emerge, and measures can be accelerated or modified with flexibility. This is consistent with the UNFCCC objective spelled out in Article 2.

Description of Categories I, II and III in the Proposed New Protocol

Category I

Shared Commitments to Binding Actions by Major Emitters' Governments

(1) Major emitters should be defined as the countries that account for 70% of the total emissions of the six greenhouse gases. These major emitters are the United States, China, the EU, India, Russia, Brazil, Japan, Indonesia, Canada, Mexico, Australia and South Korea (larger emitters listed first, according to IEA data).

How to treat the EU requires further discussion, but the basic idea is that the EU can be taken as a whole when the EU 25 is able to adopt common measures for the entire region. On the other hand, in fields such as energy policy where national authority supersedes that of the EU, each EU member should be expected to make a commitment to measures in that policy field.

(2) Policies and measures requiring agreement should be such that they have a domestic legal or quasi-legal mandate or are allocated an appropriate portion of government budgets. Provisions in the new protocol should stipulate that "appropriate and necessary steps be taken, including legislative proceedings." Nevertheless, countries that emphasize the need to set quantitative targets as in the Kyoto Protocol would certainly be able to commit internationally to the steps that they would have taken to ensure that their targets were met, and it is possible that policies and measures requiring agreement could be limited to those with legal or quasi-legal mandates or that are allocated an appropriate portion of government budgets.

(3) The respective policy fields and items for negotiation should be called "policy templates" (refer to Table 1 policy matrix on page 54) and major emitter countries should negotiate each policy template separately in a process that will complete the policy matrix with agreed-upon policy templates. The greenhouse gas reduction amounts shown in this matrix should be interpreted as reference values only, rather than quantitative targets.

Three principles must be followed when negotiating each policy template, as follows.

(a) Raising the level of energy efficiency

There is a shared view that improved energy efficiency is related to energy security and economic growth, and is thus a measure to combat global warming that can be taken with "no regret."

(b) Stimulating technology development

There is a shared view that the conflict between the environment and the economy can only be resolved through technological developments.

(c) Ensuring "policy coherence"

There are policies with other objectives that conflict with measures against global warming, and there must be a shared recognition that these policies must be changed so that they do not conflict with measures against global warming.

When it appears that the policy template negotiations will not all be resolved simultaneously, the measures in the policy template should be sequentially added to the Category I list in the new protocol.

Policies and measures in a policy template should be limited to those which can calculate greenhouse gas reduction volume from BAU. This ensures that the policy matrix shows the total greenhouse gas reduction volume for all major emitters and for each major emitter.

(4) The act of implementing those measures in policy templates or taking the domestic procedures necessary for implementing them should be internationally legally-binding.

(5) Policies and measures can be either worldwide or region-wide.

(6) Negotiations should be held by forming a contact group for each policy template. Contact groups for each gas, other than energy-derived CO_2 , should be formed, and negotiations on reduction measures held based on the situation of each gas. That is, negotiations should adopt a gas-by-gas approach, unlike the Kyoto Protocol's method of regulating total emissions of all greenhouse gases, in order to clarify the potential for reductions of each kind of greenhouse gas and identify appropriate measures that should be taken.

In the residential and transportation sector, contact groups should be formed for each type of product, such as home appliances and automobiles

(7) Regarding provisions to ensure compliance and to deal with countries in violation, a panel should be established under the UNFCCC where proceedings could be taken against governments that do not take the measures agreed to in the policy matrix. Alternatively, the dispute resolution scheme laid out in Article 14 of the UNFCCC could be incorporated in the new protocol.

In this case, it would be difficult to establish an optimum dispute resolution scheme from a bilateral frame of reference, since climate change is a global problem. Accordingly, there are two options: (1) a complaint procedure could be set up so that "a country that believes another country has violated the new protocol could submit a complaint to the panel established in the new protocol"; or (2) dispute resolution procedures engineered to reflect the global nature of this problem could be newly devised.

(8) The issues outlined in the "Growth and Responsibility in the World Economy" economic communiqué of the G8 summit at Heiligendamm and the Sydney APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development should be the primary candidates for negotiation.

(9) Negotiations should be conducted by having a third party (a suitable research organization or international organization that can be agreed on by the negotiating countries) scientifically calculate the emissions reduction potential of each country and identify the best available technology (BAT). Based on this data, the "request and offer" negotiation process should be used for the policy measures that countries mutually agree on. This process should fully incorporate the achievements of the research to date on sectoral approaches.

(10) After an agreement is reached on long-term goals such as desirable density of greenhouse gases, and a schedule of action to reach these goals is drawn up, major emitter governments should compare those long-term goals with the total greenhouse gas reduction showing in the lower-right-hand cell of the policy matrix. If gaps are discovered, and if major emitter governments agree to take the additional actions needed to fill the gaps between them, negotiations should be restarted on an expanded range of policy fields (each one representing a new policy template). This feedback loop of negotiation is essential to the successful functioning of the concept of Category I.

Table 1.	Policy	Matrix	(Exampl	le))
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Field	Measures for thermal power plants	Alternative	Energy	Energy	Nuc-	Methane	N ₂ O	Measures to	 Greenhouse gas
		fuels for auto-	efficiency	efficiency	lear			restore forest	reduction volume
		mobiles	(iron and	(cement	power			cover	
Country			steel)	etc.)					
U.S.	Mandates adoption of minimum thermal	Mandates use							
	efficiency standards	of bio-ethanol							
Japan	Mandates adoption of minimum thermal								
	efficiency standards								
U.K.	Mandates adoption of minimum thermal								
	efficiency standards								
Germany	Froze construction of new coal-fired power plants								
Russia									
China	Mandates adoption of minimum thermal								
	efficiency standards after 5 years								
Brazil		Mandates use							
		of bio-ethanol							
Greenhouse gas reduction									 Total greenhouse gas
amount									reduction amount

Note: The columns above represent examples of the various types of policy templates. A newly agreed column would be added upon the conclusion of each negotiation to achieve a complete policy matrix. (The new protocol should stipulate whether the addition of a new column would necessitate an amendment to the protocol itself, which in turn would necessitate ratification procedures every time an agreed-upon policy template is added, or not).

Further, the technology development and diffusion and the financial assistance for this, which we maintain in this report should be dealt with under separate agreements distinct from the new protocol, could become another policy template, depending on the way in which negotiations develop.

Example of possible policy template

- Make minimum thermal efficiency rate standards mandatory for new or replacement thermal power plants and provide incentives to adopt BAT (if this can be achieved, greenhouse gas reduction amounts can be calculated)
- Take measures for early replacement of obsolete thermal power plants
- Abolish subsidies and special tax allowances to industries that are CO2 unfriendly, such as the coal industry (environmentally harmful subsidies)
- Take measures to help fund equipment for coal-fired power plants in accordance with CCS potential
- Take legal measures for adoption of alternative automobile fuels
- Assess greenhouse gas reductions based on the establishment of energy conservation laws, the setting of sector-specific energy efficiency targets (results of sector-specific approach used efficiently here) and compliance with targets
- Bring schedule forward with a view to abolishing alternative chlorofluorocarbons
- Take measures to reduce non-energy-derived CO2
- Take measures to reduce dinitrogen monoxide
- Take measures to restore forest cover rate
- Establish international cooperation and financial mechanisms for nuclear power development; coordinate with IAEA
- Take legal measures to support the adoption of renewable energy
- Take measures based on the carbon-footprint concept²⁸

²⁸ Carbon footprint is a concept that identifies emission amounts at the consumption stage to encourage policymakers and consumers to choose low-carbon raw materials for the manufacturing process and transportation. Specifically, organizations that review and operate international criteria and standards, such as the ISO, standardize methods for evaluating and publicizing individual products' carbon footprint (information disclosure on life cycle assessment by product). Governments, businesses and organizations commit to using these criteria and standards and implementing programs and policies that display greenhouse gas emissions at the product manufacturing and transportation stage, regardless of whether the product is imported or domestic at the consumption stage.

<u>Category II</u> Individual Commitments to Non-binding Actions by All Governments

(1) This category should cover all States party to the UNFCCC (including the major emitters defined as members of Category I above).

(2) The actions to which the countries commit would not have to be legal or quasi-legal measures, nor would governments have to allocate a budget for them. The quantitative value of the effect of the greenhouse gas reduction expected to be achieved through implementation of these measures should be provided as a reference value.

(3) Implementation of measures in this category would not have to be internationally legally-binding, but would be political commitments instead.

(4) Policies and measures can be either worldwide or region-wide.

(5) The measures that are committed to should all be established by the deadline for negotiations on the new protocol, and included in the text of the protocol.

(6) Every five years an expert group, whose role would be spelled out in the new protocol, should verify implementation of commitments and give advice on policy to encourage implementation.

Governments that are extremely remiss in implementing measures should be "named and shamed" by COP.

(7) Measures for commitment should be listed in the new protocol. For example, see the items listed below, which are adapted from Japan's Kyoto Target Achievement Plan. In addition, such important premises as the population growth rate and economic growth rate should be clearly specified.

(8) Category II is equivalent to the off-mentioned "pledge and review" process.

Examples of measures for Category II

(1) Policies and measures for reducing and absorbing emissions, by type of greenhouse gas and sector

- Energy-derived CO₂
 - a. Strategy for building CO₂-conserving regions and cities and developing a low-carbon socio-economic system
 - b. Policies and measures for individual facilities and entities
 - c. Policies and measures for individual equipment
- Non-energy-derived CO₂
- Methane and dinitrogen monoxide
- Three CFC substitute gases
- Carbon sink measures

(2) Cross-sectional measures

- · Systems to calculate greenhouse gas emission amounts
- National education campaigns
- Efforts by public institutions
- · Promotion of technology development to address global warming
- Promotion of research on climate change and strengthening of monitoring and observation system
- Adaptation strategies

<u>Category III</u> Participatory Commitments to Individual Actions by Private Sector Entities

(1) Given that human beings are the source of greenhouse gas emissions, governments should not be the only ones expected to reduce greenhouse gases. Rather, we must recognize that all entities must participate in programs aimed at combating global warming. International treaties premised on the nation-state system to date have been unable to resolve the global warming problem, and international agreements of a new kind that recognize the participation of NGOs/NPOs, international industry groups, national industry groups, individual companies, and multinational corporations should be crafted.

In particular, such agreements would also be very effective in combating the "leakage" problem, if those international industry groups make a commitment to using BAT when investing in any country.

(2) With global consumers becoming more aware of the need to protect the global environment, and corporate social responsibility (CSR) affecting companies' ability to raise funds in the market, etc., a growing number of companies recognize that developing environmentally friendly products and services and adopting environmentally friendly production methods are important elements of their own competitiveness. Although, these companies are starting to take the lead voluntarily, regardless of the measures embraced by government policies, they are not adequately appreciated by environmentalists.

In this respect, insistence on incorporating Category III in the new protocol itself carries the message that industry seriously intends to tackle global warming.

(3) Many NGOs/NPOs are not only involved in advocating policies, but actually carry out various actions aimed at reducing greenhouse gases. These NGO/NPO activities contribute a great deal to enhancing awareness of environmental preservation among people who find it difficult to modify their lifestyle.

(4) It could be effective to give a specific role in the new protocol to private sector entities engaged in activities aimed at combating global warming in order to help popularize these activities and raise motivation. For this purpose, entities wishing to commit to tackle global warming should be allowed to register their own measures against global warming in the new protocol (5) Accordingly, Article 6 of the UNFCCC should be amended, or a new article added based on Article 4, paragraph 1, (i) to provide a tangible basis for participation by private groups. Any private sector entity that has set greenhouse gas reduction and curbing targets (individuals excluded) should be able to participate, and the list of registered activities and their descriptions should be entered into a database and made public on the UNFCCC website.

(6) Each entity should be able to enter the achievements of their registered activities, based on their own assessment, on the website for disclosure. They should also be allowed to state whether their activities have been verified by a third party, including the expert group stipulated in the new protocol.

(7) Entities with extremely impressive achievements should be rewarded by COP after verification by the expert group. Conversely, in the event of suspicion of false reports, such activities should be reviewed by the expert group or an organization commissioned by the expert group and the results disclosed.

Specific examples of register-able activities

- Commitment by international industry groups to use BAT when making international investments
- Policies of industry groups such as the United States Climate Action Partnership (USCAP)
- World Business Council for Sustainable Development (WBSCD) activities, etc.
- Targets set for greenhouse gas reductions and measures for their achievement by national industry groups
- Targets set for greenhouse gas reductions and achievement by individual companies
- · Individual companies' targets to improve energy efficiency of products
- Individual companies' targets for technology development for combating global warming
- Activities such as Japan's "CO₂ diet" and "Team Minus 6%" ... etc.

3. International cooperation for innovative technology development

Striking a balance between resolving the global warming problem and the demands of economic growth and energy security will require technology that can drastically raise energy efficiency. It will also require applied technology that uses energy which emits no greenhouse gases and serves as a substitute for fossil fuels. Development of these technologies cannot be achieved without major discoveries by scientists that bring entirely new technologies to the world stage, in addition to improvements to existing technology.

The Kyoto Protocol focused resources on the development of applied technologies capable of making short-term improvements, rather than medium- to long-term basic research, due to the short commitment period. When devising a post-Kyoto framework, this point should be kept in mind and an emphasis put on ensuring a balance between basic R&D and practical technology development through international cooperation.

It is also important that the major developed nations with advanced research skills agree to a system of cooperation for technology development that is distinct from the new protocol, and that these countries share the burden in providing the necessary resources.

The system of cooperation should have the following characteristics.

(1) An international cooperation program should be established and an appropriate system developed for handling intellectual property rights and assigning public-private roles. This program should distinguish between short-term practical research on energy conservation and the development and use of new energy and long-term basic research that will lead to innovative technology development.

(2) The IEA, which has experience in coordinating international cooperation relating to energy issues, should be given the role of coordinator for the energy-related international joint research project.

(3) After short-term practical research on energy conservation and the development and use of new energy bears fruit, it is vital that the relevant technology be quickly passed on. For this purpose, policy measures for technology transfer and diffusion should be coordinated among major emitters by putting the results of short-term practical research into context with the aforementioned policies in Categories I and II.

(4) An arrangement regarding research that is directly linked to a country's industrial competitiveness, such as fuel cells and solar batteries, should be sought between a limited number of countries to ensure an appropriate exchange of information and research between major countries.

(5) When setting the amount of financial burden borne by each country, negotiations over this apportionment should be conducted by taking into account the cumulative amount of the related R&D investment that each government has made to date.

(6) As mentioned in the notes to the policy matrix, an agreement on this issue could become one policy template if it allows for the amount of greenhouse gas reduction to be calculated.

4. Financial issues in developing countries' measures against global warming (mitigation and adaptation)

(1) One of the biggest challenges in shifting to a new protocol will be ensuring the flow of funds needed for developing countries to carry out measures against global warming. The flexibility mechanism in the Kyoto Protocol tended to be explained as the most cost-effective way of reducing greenhouse gases, but in reality this was the way to ensure that funds flowed from developed countries to developing countries.

In developing countries, even some of the BAU projects that are certainly necessary to accompany economic growth are being made candidates for CDM projects by defining them as "unilateral CDM projects" in recent years, and this is one of the problems caused by the Kyoto Protocol's structure.

(2) Further, funding problems for adaptation in developing countries has emerged as a particular problem recently. Total adaptation funds needed for developing countries in 2030 is expected to total from US\$28 to 67 billion (estimate by the UNFCCC; refer to Table 2 below.²⁹

²⁹ <u>http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/</u> potential_for_enhanced_investment_and_financial_flows.pdf

Table 2. Estimated additional investment and financial flows needed for adaptation in2030

(Unit: US\$ billion)

Sector	Global	Non Annex-I Parties
Agriculture, forestry and	14	7
fisheries		
Water supply	11	9
Human health	5	5
Coastal zones	11	5
Infrastructure	8 to 130	2 to 41

(3) There are three points to consider when addressing these financing problems. First, should all developing countries be treated in the same way? As analysis by the IPCC becomes more detailed, the regions that are suffering from global warming, and their special characteristics, are coming into focus. Further, there exists a sharp divide between some developing countries that are now able to take some domestic measures against their increasing greenhouse gases, and other developing countries whose economies are still developing with low emissions, but who are expected to suffer more from global warming in the future.

These differences become extremely important in discussing a new framework because, in the former type of country, projects adapted to CDM such as hydraulic power plants spring up one after the other as electricity demand rises in tandem with economic development. At the same time, in countries such as the latter, there are very few projects that are suitable for CDM. As a result, in the method whereby the Kyoto mechanism is applied between Annex I Parties currently determined by the Kyoto Protocol framework and the other parties, funds do not flow to countries that really need it, and instead money repeatedly goes only to countries that can be expected to make direct investments as their economies develop, even if not for CDM projects. In other words, the disparities between developing countries are widening.

Second, there is a division between adaptation and mitigation. The former is a measure primarily necessary for least developed countries (LLDCs) with low emissions, while the latter is a measure required for strong developing countries whose economies are expanding. Adaptation is an important measure, and we must apply more and more international effort toward this end in the future.

Third is the appropriate division between the government and the private sector. The Kyoto mechanism has been effective in increasing the flow of private funds. However, this mechanism is hobbled by the fact that precisely because these are private funds, the money will only flow to projects that generate profits. As noted above, it is difficult to determine whether the CDM projects that the private sector entities engage in are equivalent to BAU or satisfy "additionality," leading to actual reduction of greenhouse gases. CDM have rather complex procedures for examining whether a project has actually resulted in additional reductions, but recently many have spoken out strongly in favor of simpler procedures. Lobbying for easier regulations will only strengthen as long as private companies are entrusted with funding greenhouse gas reduction projects in developing countries, and it is vital to be aware of the risk that the true purpose of measures against global warming could be distorted.

(4) Given the aforementioned points, under the new framework, a system could be designed to encourage independent efforts by the major emitters with steadily developing economies. Specifically, conditions on use of the original CDM should be imposed on major emitters among the developing countries in the aforementioned Category I, by requiring that those countries commit to internationally legally-binding measures to reduce greenhouse gases and actually implement them.

With this as a prerequisite, developed countries should preserve financial mechanisms used for CDM, and developed countries' governments should commit the funds used to purchase emissions credits generated by CDM to Category I policies through negotiations. In this case, one option would be to require that developed countries purchase enough emission credits to compensate for their shortfall in meeting the Kyoto Protocol targets.

(5) The new protocol should also continue to give a role to the Global Environment Facility (GEF), Strategic Priority on Adaptation (SPA), Least Developed Country Fund (LDCF), Special Climate Change Fund (SCCF) and Adaptation Fund (AF) from the Kyoto Protocol. Also, a fundraising scheme should be developed using funds from the World Bank, which has carbon funds, regional development banks and export financing institutions in countries. In this case, consideration should be given to securing the funds needed for adaptation in the LLDC in particular, not just for mitigation.

(6) Moreover, there is no guarantee that fund transfers alone will ensure that greenhouse gases are limited or reduced. In this situation, it is important to recall that there is a strong possibility that technology transfer on the supply side alone will not lead to actual reductions in greenhouse gases. Focusing on the demand side of energy,

developed countries should commit themselves to help developing countries build their legal capacity by introducing energy conservation laws, renewable portfolio standard (RPS) laws, and other steps. Based on this understanding, Japan should launch a project to support the formation of an energy conservation law system for use in Asian countries (reminiscent of regulations governing automobile gasoline mileage and energy conservation standards for home appliances in China).



About 21PPI

The 21st Century Public Policy Institute (21PPI) is a think tank established in 1997 by Keidanren(Japan Business Federation). The 21PPI renewed its organization in April, 2007. Mr.Fujio Mitarai, Chairman of Keidanren, became the new chairman of the institute and Mr.Kenji Miyahara assumed the presidency.

Since the inauguration of the new leadership team in April, 2007, the 21PPI started research on important topics such as improvement of public-sector productivity, introduction of new system of local government by states, tax system reform, and diplomatic strategy for a Post Kyoto Framework. As an "open think tank", the 21PPI will take up key domestic and international issues and present our views and ideas.

