1. Introduction

The main objective of this project is to analyze possibilities and constraints in developing collaboration between four countries of the Northern Asian region, i.e. between Russia, Japan, China, and Korea in implementing the UN Framework Convention on Climate Change (UNFCCC).

In chapter 2, we briefly summarize international negotiation processes of UNFCCC and Kyoto Protocol, which show the typical patterns of multilateral negotiation. At the most recent activity of COP 7, most of disputable issues among Annex I countries and Non-Annex I countries were more or less settled down. Further expectations and resolutions for UNFCCC of global participation are described in this chapter.

In chapter 3, we briefly describe the existing regional environmental collaborations in this region in terms of the initiatives of specific collaborations. In addition, we also explore the possible collaboration in this region in the field of energy, such as natural gas pipeline project in this region.

In chapter 4, we describe the evolution of major positions of Japan, Russia, China and Korea regarding co-operative efforts in implementation of the FCCC, including the GHG emission profiles and vulnerability and impact of climate change. Particularly, regarding application of such international policy instruments as joint implementation, emission trading, clean development mechanisms, as well regarding co-operation in financial and technology transfers in energy sector contributing to combating global warming are also examined.

In chapter 5, we aim to assess Russia's domestic potential and situations and progresses in economic reforming. Especially, we focus on the economic development of this country with possible developments in its energy sector.

In Chapter 6, we analyze possible international implications of the specific domestic institutional framework both for bilateral arrangements between countries of Northern Asia region, and for design of multilateral mechanisms. For example, the relationship of Japan with Russia will affect the international climate change regime, which is in turn inevitably related to the Russia's role in international emission trading, and possible bilateral collaboration between Russia and Japan in this area

In chapter 7, we analyze the various cases of collaborations in this region. In this chapter, we analyze what CDM projects imply to China and Korea in terms of financial flows in their international activities.

In the last chapter, we summarize the major findings and discussions in this report.

2. UNFCCC and the Kyoto Mechanisms :Toward Implementation Stage of Kyoto

2.1. Role of Bonn and Marrakech

2.1.1. Implication of Bonn and Marrakech

After intensive negotiations from Berlin to Kyoto, the COP succeeded in adopting the Kyoto Protocol at its 3rd Session in December 1997. However, the innovative instruments, called Kyoto mechanisms, were not well understood at that time. The Buenos Aires Plan of Action adopted at COP 4 in 1998 decided that the rules of the Kyoto regime to be adopted at the COP 6.

However, the negotiators could not compromise each other in The Hague at COP 6 in 2000 and decided to postpone the negotiations at the resumed session in Bonn in the following year. After this failure, the US President Bush stated to reject the Kyoto Protocol in a very strong manner. As a result, many people in the world were afraid that the Kyoto Protocol would not enter into force forever.

At the Bonn Conference (COP 6 *bis*), the Ministers were successful in adopting the so called Bonn Agreements, which is the core elements of the achievements of the Buenos Aires Plan of Action. The Bonn Agreements made a package of decisions for highly political issues among the rules of Kyoto regime. The agreements retrieve the momentum of international negotiations to go with Kyoto. Supported by this momentum, the COP 7, held in Marrakech a couple of months after Bonn, finally adopted a set of rules—the Marrakech Accords—of the Kyoto regime.

The Bonn Agreements and the Marrakech Accords completed the process of the Buenos Aires Plan of Action, in other words, they are the milestone or turning point from "scheme design" to "implementation of measures" stages.

For the private sectors, which anticipate new carbon constrained era in the new future and wish to take measures in advance strategically, the Marrakech Accords removed or shrank the biggest risks, *i.e.*, international regulatory risk and risk associated with non-entry into force of the Protocol.

The Bonn Agreements and the Marrakech Accords consists of four elements, namely, the developing countries' items, Kyoto mechanisms, compliance mechanisms, and sinks. As the Kyoto Protocol is characterized by its quantified commitments *without* specifying the measures (such as carbon tax) to meet such targets, how to monitor emissions and calculate units (credits and allowances) are very important to keep the scheme operationable. The Article 5, 7 and 8 items are technical but essential in this sense.

2.2. How Kyoto Mechanisms Work?

2.2.1. Compliance Check

Here let us briefly observe how to check an Annex I country's compliance with its quantified commitment. The check will be done in comparing the two numbers, *i.e.*, GHG emissions monitored and the GHG units the country has at the end of the commitment period (strictly speaking, at the end of the additional period).

The GHG emissions are monitored and reported to the UNFCCC Secretariat in due course annually using the IPCC 1996 revised guidelines and good practice guidance reports. Such report of GHG emissions are to be reviewed.

Each Annex I country is going to establish it national registry for the accounting of GHG units they have. In the registry, the country has its holding account(s) and a retirement account. The country may permit the legal entities to have their accounts in the registry as well. At the end of the additional period (grace-period), the government transfers the units identical to the emissions in the commitment period to its retirement account for compliance check. In addition to the initial allocation to the country (equivalent to the quantified target times five), the country and its legal entities can acquire/transfer the units from/to other country('s company). This process is done as the electrical transfer of units from one account to another. Sink credits (RMUs) can be added to the accounts.

2.2.2. How Units Transfer?

There are four kinds of GHG units, namely AAU, RMU, ERU and CER. The AAU (assigned amount unit) is the unit of initial allocation, the RMU (removable unit) is the sink credit in the Annex I country with net carbon absorption, the ERU (emission reduction unit) is the JI credit converted from AAU or ERU, and the CER (certified emission unit) is the CDM credit generated through implementing a CDM project.

Once the credits (RMUs, ERUs, and CERs) are generated through the sink activities or JI/CDM projects, they are transferred through the mechanism of emissions trading as shown in Figure 1. In other words, the units are traded in the GHG emissions market once they are generated. The prices of the units would not be the same reflecting the minor difference in their characters such as bankability. In addition, we may expect that the derivatives of these units will be developed in the market and traded to meet the needs to hedge risks associated with price change and others. Those derivative trading are not traced as the transactions of "real" units.

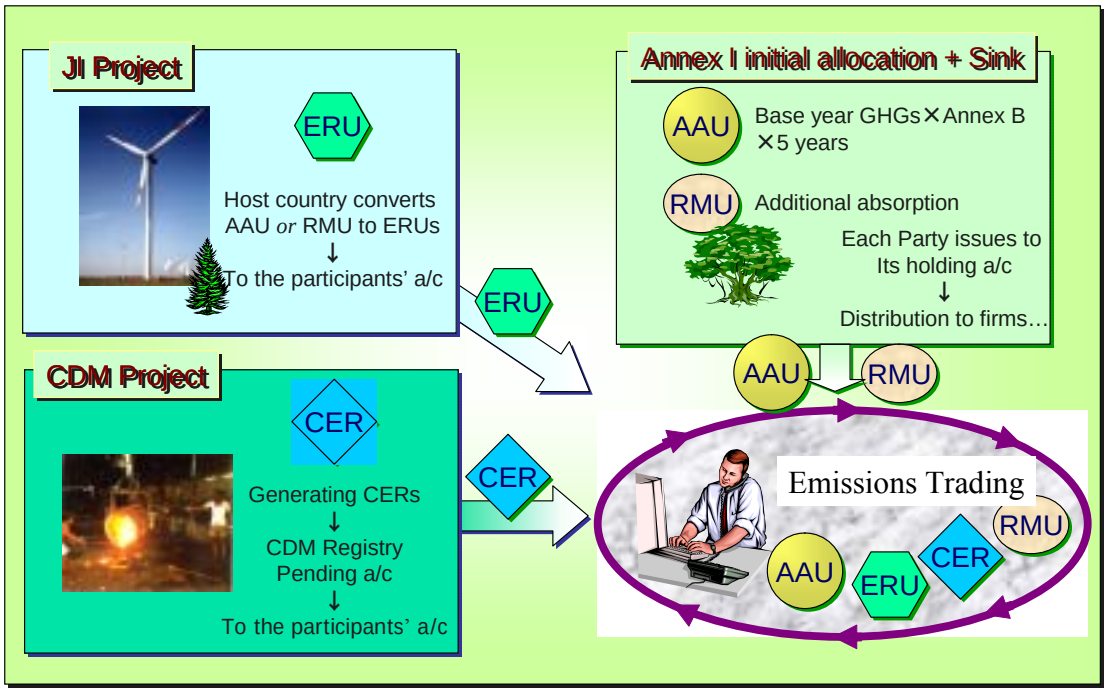

Figure 2-1. Generation and Transfer of Units through the Kyoto Mechanisms

2.2.3. Other Subjects

a. Sinks

Rules were set for the use of credits from sinks activities in forestry and agriculture. Pending decisions on more detailed guidelines for monitoring and reporting (on the basis of IPCC recommendations) make reporting requirements for sinks limited. The Russian Federation has been granted credits for forest management up to a maximum of 33 MtC/yr. Initially, this was nearly 18 MtC/yr.

b. Transferability of units

Emission credits from sinks projects under Article 3.3 and Article 3.4 will be labeled as removal units (RMUs). The RMUs cannot be banked for use in the second commitment period. Assigned amount units (AAUs), credits from Joint Implementation (JI) (ERUs) and Clean Development Mechanism (CDM) (CERs) projects and/or RMUs can be used for complying with the Kyoto targets. Exchange of AAUs, ERUs, CERs and RMUs between Annex I Parties is allowed and unrestricted. AAUs may be carried over without restrictions into the second commitment period. However, ERUs and CERs can each be banked only up to a limit of 2.5 per cent of the initial AAUs, however, this limitation can be avoided through retiring the units from such units.

c. Participation

Turkey will soon be removed from the Annex II list and accede to Annex I of the Convention. Kazakhstan has reconfirmed its wish to join Annex B of the Kyoto Protocol; a target is still to be negotiated.

2.3. What were Left after Marrakech?

2.3.1. Near-Term Issue—CDM

The rules of the Kyoto regime were decided in Marrakech; however, some technical details are remained for future work. The modalities and procedures for CDM is one of the most urgent items left.

Some technical aspects of the sink CDM projects are left to be decided at the COP 9. Afforestation and reforestation projects are eligible for sink CDM as decided in Bonn Agreements. The remaining big issue is how to handle the issue of permanency of the stored carbon.

Some other issues such as accreditation of operational entities, simplified modalities/ procedures for small-scale CDM projects and baseline methodology standardization are the technical but urgent issues to be solved.

One important aspect in the development of CDM is how to utilize public money. It was agreed that the public funding for CDM projects from Annex I Parties is not to result in the diversion of ODA. In other words, the public money can be used if it meets above condition. CDM tries to utilize the market-mechanism as JI and emissions trading. So, in order to meet the requirement of geographic balance of distribution of projects and/or some other area such as capacity building in host countries and information clearinghouse function to match needs and seeds, the public money may play a very important role to compensate the private-money driven activities.

The development of CDM in a non-Annex I country very much depends on the institutional framework to invite projects. In addition, dialogues between host and investing countries are important in both governmental and private sector sides.

In the emission market perspective, the CERs may play a key role in its development. First, CERs are the first Kyoto units to be generated prior to the 1st commitment period. The price—set by cost-basis in the beginning—may be the price signal for future emissions market whose price may be determined as demand-supply relations.

Second, the CERs might be the common currency in the domestic emission markets in several Annex I countries like UK which initiate domestic emissions trading. In such schemes, the CERs

might be used for companies to meet their domestic obligations.

2.3.2. Mid-Term Issue—Domestic Framework

The development of effective domestic framework to mitigate climate change is essential to meet the Kyoto target in a cost effective way. As the Kyoto Protocol introduces innovative market-based instruments, the domestic framework should be designed to utilize the mechanisms as much as possible.

It should be noted that the instruments are used as a *portfolio* to synergize their advantages. In addition, we should design the instruments to meet plural policy objectives simultaneously other than climate change mitigation.

In the aspects of economic efficiency, two market-based instruments—carbon tax and emissions trading—are well-known. In order to utilize the Kyoto mechanisms, domestic emissions trading scheme might be more useful for industry sector. Other non-trading sector might be covered by tax measures.

On the other hand, we must pay special attention to equity issue among stakeholders including the international competitiveness issue.

We tend to focus on the "stick" side of the instruments; however, "carrot" side may play a very important role, especially for high marginal cost countries such as Japan.

In the viewpoint of business sector, the climate issue will never be enforced loosely. In other words, the carbon constrained world is inevitable and should be recognized as a "*predictable* change of business environment". The problem is not whether but when and how strong the regulations will be.

In order to realize above mentioned criteria in designing the portfolio of instruments, IGES proposed a set of measures as shown in Figures 2-2, 2-3 and 2-4.

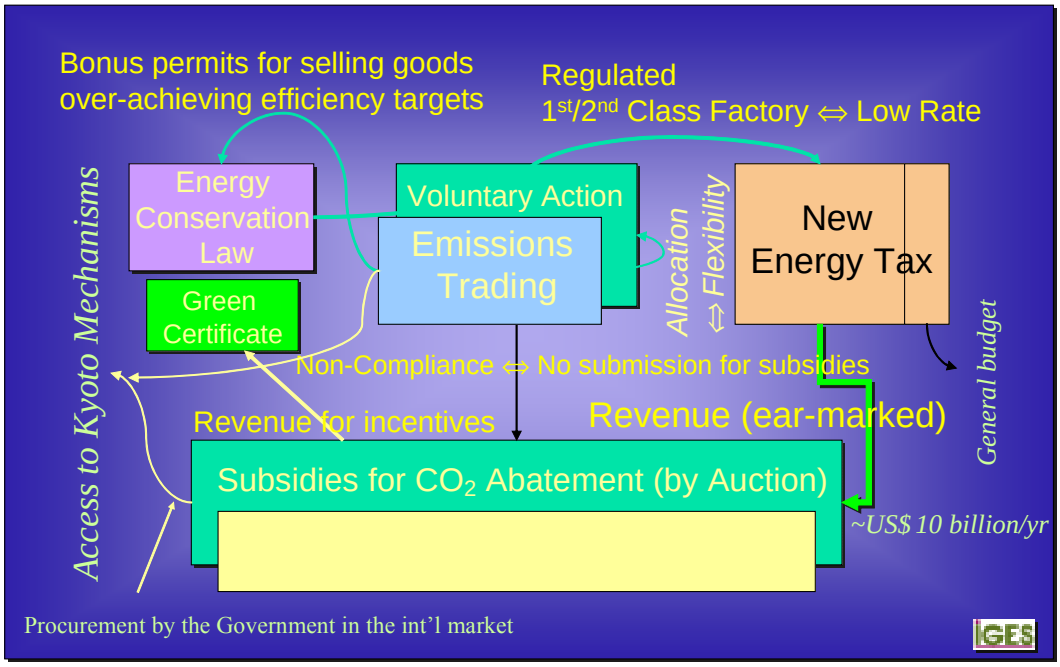

Figure 2-2. The overall sketch of portfolio of instruments proposed by IGES

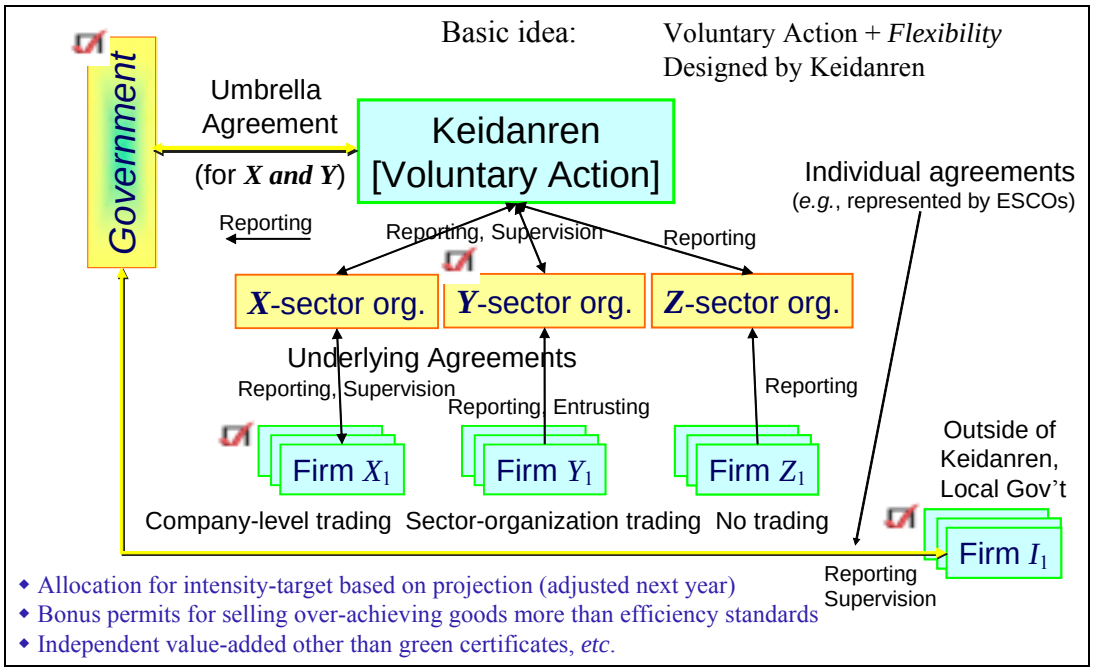

Figure 2-3. Keidanren's Voluntary Initiative-based emissions trading scheme

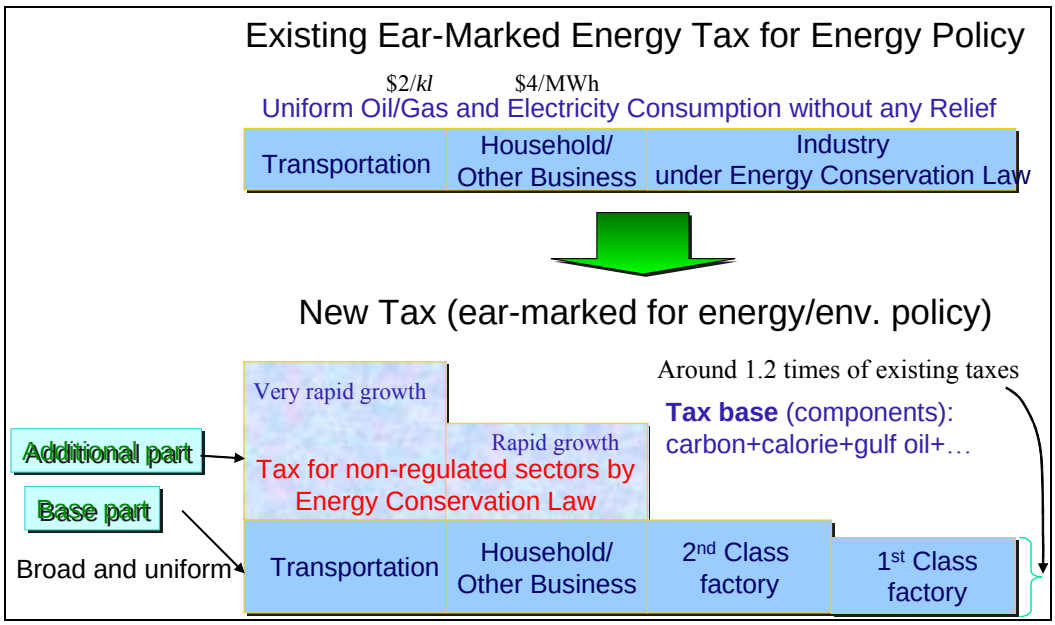

Figure2-4. New ear-marked tax for energy and environmental policy

2.3.3. Long-Term Issue—Global Participation

As issues with the scale of decades, we must consider how to develop the Kyoto regime. One side is the US participation issue and another is developing countries' commitment issue.

a. US Participation

As the US is the only superpower in the world with its emissions make up around a quarter of the world total GHG emissions, the US participation in the Kyoto regime is essential and necessary for its development in the future.

It seems unlikely that Bush administration is going to change its position in the near future, but this Kyoto issue may be a point to be debated in the next Presidential election in 2004 and it is unclear what the new administration starting from 2005 thinks about this.

The positive signal is that climate mitigation measures are being strengthened, especially in the outside of the administration. Some States already set the regulation on CO_2 for fossil-fired power plants; some Congress people submitted their proposals to regulate CO_2 and/or GHGs; and some industry people recognized the inevitable carbon-constrained future and prefer certain signal to be regulated rather than uncertain future regulation which may cause stranded costs for them.

Anyway, it is likely that the US is going to have its domestic framework based on the domestic emissions trading and they well recognize that bigger market is better and has more business opportunities.

Some events may be a trigger for re-debate on this issue in the US, such as some non-Annex I countries' acceptances of the target and/or extreme weather events (hurricane, draught …) attack the US as in the case of 1988, *etc*.

The important aspect of to invite the US to come back to the Kyoto regime is to keep dialogue with every stakeholders in the US with some collaborations in many aspects and seek face-saving solution for them. Facilitation through utilizing the market may be a good incentive for them.

b. Developing Countries' Participation

Another important and long-term issue is the quantified commitments of non-Annex I countries. We must note that non-Annex I countries ARE participating in the Kyoto Protocol with their differentiated responsibilities. However, it might be reasonable that such a country is going to accept some form of quantified commitment as its economy develops and it turns out to be a "developed" country, and/or Annex I provides good incentives for non-Annex I to accept it.

The quantified commitments in the 2nd Period for Annex I countries are to be negotiated starting by the beginning of 2005 and ends by the beginning of the 1st Period. This might be a good occasion to discuss the issue internationally.

There are several aspects/options on this issue:

- Processes and type of new Agreement(s)
  - Kyoto Protocol Amendment (for Annex I & graduated Parties?)
  - UNFCCC Amendment (for voluntary non-Annex I participation?)
- Nature of the Agreement(s)
  - Type of quantified commitments
    (mandatory and/or voluntary?) (hot air?) (automatic graduation?)
    (menu approach?) (relative/intensity target?) (limited/no penalty?)
- Strategic pathway
  - Incentive/attractiveness (Innovative criteria and/or approach for QELRC needed)
- Long-term Goal(s)
  - *e.g.*, 85% emissions in 2030 (for Annex I), 750 ppm in 2100 in total
  - Clear signal where we are going to go…

It is clear that this issue is the most challenging one in the development of the Kyoto regime but the most important aspects to arrest climate change globally in the following centuries.

2.4. The Potential of CDM between China and Japan

2.4.1. Enhancing Success of Future Cooperation

Although various activities have been implemented, Japanese firms' participation in the transfer of Environment Sound Technology (EST) is less than expected. For example, according to statistics, the total amount of received orders for environmental technology in 2001 was 1,166 billion yen. About 83% of the orders came from domestic public and government projects, 14% came from the Japanese private sector. Export orders accounted for only 3% (Japan Industrial Machinery Society 1998).

These figures indicate that Japanese provider (private entities) of environmental protection equipment and services do not put large amounts of direct foreign investment into the overseas market. There are five main reasons for this: 1) insufficient demand in developing countries; 2) lack of information about the developing-country market; 3) ineffective and insufficient mechanisms for government support of technology transfer; 4) characteristics of Japanese business strategy (e.g., reluctance to license technology); and 5) characteristics of environmental protection technology that require a certain percentage of the equipment to be domestically sources.

Therefore, as a trigger, which remove financial and institutional barriers and internalize the externality of the climate change, expectation to the carbon-offset mechanism such as the Clean Development Mechanism (CDM) is very high. Because the introduction of CDM mechanism that involves transfer of capital and GHGs' emission reduction technology means that GHGs will possesses substantial monetary value (carbon credit) and the GHGs emission reduction amount created by other countries can be subtracted from the its own country's emission amount (carbon-offset), which result in the increase of the commercial viability of the EST transfer projects.

2.4.2. CDM Project Expecting Investment from Japan to Asia

In the light of the present circumstance where GHGs emission quotas and carbon tax has not yet been domestically systemized in Japan, in order for private corporations to participate in the carbon-offset mechanism with the developing countries, to select a project with some economic potential and with business opportunities as an CDM project would be a choice with the least risk. Moreover, with its close geographical, historical, and business relationship, a project with Asian countries as a host country of the CDM would be considered attractive, because of its readiness in project finding, the future business opportunity, and the necessity of the emission reduction of GHGs and other air pollutants such as Sulfur dioxide (SO_2) which has been causing serious health problem of the local

people as well as the heavy damage on the ecosystem[1].

Also within the projects with some economic return, demand in developing countries, especially Asia, the rehabilitation of and/or establishment of power generating facilities have a big potential. For example in China, it has been adding yearly new power generating facilities of approximately 10 million kW roughly equal to 25 middle-sized thermal power plant. However, most of it has been conventional coal-fired power plants which is considered to be inefficient compared with the level of the developed countries. With regards to thermal power plants, Japanese electric utility companies, manufacturers, and trading firms have already started survey on the possibility of efficiency improvement at aging power plants in developing countries as a part of international collaboration or as a candidate of a CDM project.

To expect the active involvement of the private capital, several feasibility studies have concluded that constructing a new and middle-or-large sized thermal power plant would be more meaningful as well as economical than just improving efficiency of aging plant which, in some cases, requires enormous efforts as well as substantial fund which is not so different in size compared to that of the construction of new plant (Inoue 1998). Moreover, it is pointed out that the risk and the transaction cost of supply-side power generation projects are smaller compared with other industrial and demand-side energy-related projects (Nordic Council 1998). Therefore, the author considers that from the facts and the study of it, new establishment projects of efficient coal-fired thermal power plants, such as a super-critical unit, are considered appropriate for Japan's CDM projects with developing countries in Asia such as China[2].

With regards to the setting of the emission baseline on those cases, setting the GHGs emission amount per unit amount of power generation of the host country's average power plants as the baseline (benchmark) would make the consensus formation possible and simple. At least in the case of power generation facilities, the assumption of emission amount after construction would be simpler compared with projects of other types. Moreover, in power generation projects over a certain size, the issues on the baseline, additionality, and sharing regarding carbon credit would be able to be dealt as a part of the investment value evaluation issue of the comprehensive negotiation on the project implementation. Furthermore, the gap of the bargaining power between developing countries with

[1] Along with GHGs emission reduction, there are many projects that simultaneously affect other environmental externalities, which reduce the emission of air pollutants such as sulfur dioxide (SO_2), nitrous oxide (NO_X), total suspended particles (TSP), etc. By implementing these projects, 1) emission reduction countermeasures of air pollutants will be avoided at the host country, 2) the local environment will be improved. This means that two types of Secondary-Benefits will occur. This first one is the benefit created by the avoidance of air pollutants emission reduction cost originally needed at the host country (avoided cost). The second is the benefit created by the decrease in damage cost.

[2] China is supposed to become the big suppler of the carbon credit because of its huge potential of low-cost GHGs abatement opportunities. Therefore many developed countries have approached to China. For example, the U.S. government initiated the Technology Cooperation Agreement Pilot Project (TCAPP) in 1997 as a mechanism for the technology transfers to the developing countries in the field of the climate change. China has been one of the host countries which the US government is focusing its efforts through TCAPP. So far, various investment programs and actions to remove market barriers have been identified by the TCAPP China team (U.S. government 1999). In addition, When the U.S. vice president Al Gore and China's Prime Minister Zhu Ronqi met in Washington in April 9th, 1999, both sides agreed that they would establish 100 million dollars fund for technology transfer in the field of energy conservation and power generation from the US to China (Japan Economic Newspaper, April 14, 1999).

conditions that needs the introduction of foreign capital to enlarge power supply and the developed countries is not that big.

In reality, in new power generation projects, it is highly possible that power generation manufacturers in collaboration with trading firms and banks use project financing mechanisms such as Built-Operate-Transfer (BOT) as an Independent Power Producer (IPP)[3]. Moreover, along with taking the air pollution issue into consideration, it should also be possible that the Japanese Government strongly suggest to the Chinese Government, the obligation to install desulfurization facilities at power plants newly built by CDM.

2.4.3. Governmental Correspondence and Usage of Public Funds

Asian countries may be considering the existing financial and technological support from Japan as part of the "post-war compensation"[4]. Therefore, it can be predicted that the issue of "financial additionality", which states that the funds for the international collaboration for global warming mitigation measure with carbon credits should be newly and additional, may strongly be persisted on. Moreover, even if the government of the host country approves utilizing the existing ODA, Japan will be forced to compromise in other parts, and as a result, it is possible that the cost becomes higher.

Therefore, in regards with public funds, it is better to clarify the distinction between the part dealing with fields such as global warming which is a multi-lateral international environmental policy based on economic rationality as well as a domestic industrial economic policy and the part dealing with bilateral development aid which is a diplomatic tool against developing countries with historical complications. Furthermore, it is considered that the Japanese Export/Import Bank loans that does not count as an ODA[5], will be in practical use constructively in the international collaboration on global warming mitigation with carbon credits. In other words, by giving a part of the public fund which is additional to current ODA flow a"fresh new look", with a title as such as in "Climate Fund" and a special budget on an onerous financial support could be provided. Needless to say, such as an expansion of subsidies (i.e. the current Green Aid Plan by MITI) with energy-related tax as the originating fund and flexible application of the trade insurance could be considered as well. For example, it could be considered that the trade insurance system could be modified to be able to absorb the risk of the price volatility of the carbon credit. In this context, establishment of carbon tax as a fund source would be an important issue for further discussion in near future. In any rate, from both sides of the appeal to the international society and of the accountability to the domestic society, the

[3] To attract foreign investment, developing countries could also benefit from effective legislation concerning build-operate-transfer (BOT) and build-operate-own (BOO) methods. In the case of EST transfers, legislation on BOT and BOO will be increasingly important in the power generation, water supply, and transportation sectors. At present, many developing countries have no specific law dealing with BOT, and thus investments in these kinds of projects are viewed as high risk. Recipient countries also need to develop ways to deal adequately with intellectual property rights and their transfer.

[4] Japan's ODA started in 1950's as a compensation of the Second World War II with the Asian countries. See Yasutomo 1986.

[5] There is a divergence of the opinions about the applicability of the non-additional ODA fund for the carbon credit. Many developing countries have been objecting to the use of non-additional ODA.

author welcomes the consideration of the introduction of a budget with a new title regarding the public support of global warming mitigation by international collaboration.

Moreover, if Japan takes the global warming issues as important diplomatic and economic issues, and decides to deal with it more positively, it may well help to construct a mechanism in Asia similar to 1) the carbon brokerage that the World Bank has established (Prototype Investment Fund), 2) the carbon purchase tender scheme that the Dutch government has established. In specific, it can be considered to let the Asian Development Bank (ADB) carry out such function as a brokerage. As a matter of fact, in Europe, the European Bank for Reconstruction and Development (EBRD) has a plan to begin its own carbon-brokering program (Energy Efficiency Equity Fund) other than that of the World Bank.

Furthermore, it should be possible to relate the institution building regarding the global warming issue with the institution building with regard to the acidification issue that is also an urgent issue in Asia. In fact, there have already been plans of emission trading of sulfur dioxide (SO_2) between countries in Europe, and also in the U.S., inter-gas emission trading of carbon dioxide (CO_2) and sulfur dioxide (SO_2) have actually taken place. Therefore, for example, the Japanese government can establish the purchase tender scheme that the Government put the carbon credit from the CDM project which will reduce the SO_2 substantially with higher price compared to the carbon credit from the CDM project which will not reduce the SO_2 so much.

2.5. Concluding Remarks

The Article 2 of the UNFCCC states the ultimate objective to keep the GHG concentration level at a non-dangerous level. Apparently, the Kyoto Protocol is the first step to this direction, but there are many stages we should pass.

The IPCC Special Report on Emission Scenarios (SRES) and the Third Assessment Report (TAR) noted that the *selection* of "underlying" reference world is far more important than implementing the "additional" mitigation of climate change.

It should be stressed that one of the most impressive aspects in the negotiations in Bonn was the world-wide "political momentum" to go with Kyoto. The Kyoto Protocol provides good instruments to integrate the climate mitigation measures to our economic activities. We may expect that the world where the climate is stable w*ithout any special attention* to it in the future.

3. Energy and Environment Cooperation in Northeast Asia

Northeast Asia lacked a centralizing political, economic or social force until the late 1980s due to a diversity of systems[6]. Except for certain bilateral initiatives, there was little cooperation on energy and environmental issues. The end of the Cold War, however, led to joint efforts to promote multilateral cooperation on both issues. In environmental field, Agenda 21, agreed upon during the Rio Summit in 1992, helped to promote regional and subregional environmental cooperation: a number of cooperative programs, plans and forums have been advocated and extended through multiple channels. Some multilateral initiatives target the subregion of Northeast Asia, while some target the whole region of East Asia or, even more broadly, Asia and the Pacific. In energy field, recognizing that effective development of energy resources of the region will lead to economic development and prosperity, several international efforts towards regional development have been made.

This chapter provides an overview of cooperative initiatives undertaken in Northeast Asia on both environment and energy field.

3.1. Existing Regional Initiatives on Environment Field

3.1.1. Multilateral Cooperation within Northeast Asia

a. Northeast Asian Conference on Environmental Cooperation (NEAC)

The origins of multilateral cooperation in Northeast Asia can be traced back to the year 1988 and the Japan-Korea Environmental Symposium. The symposium was co-hosted by the respective environmental agencies in Japan and South Korea. United Nations Environment Program (UNEP) cooperated, China participated, and the Soviet Union and Mongolia attended as observers. It thus developed into a forum for exchanging information and exploring the possibilities for regional cooperation between the five countries.

The Rio Summit in 1992 raised the desire to further develop the framework provided by the symposium, and the Japanese Environment Agency soon hosted the Northeast Asian Conference on Environmental Cooperation (NEAC).

The NEAC provided government organizations associated with the environment from five countries in Northeast Asia including Japan, South Korea, China, Mongolia and Russia and international organizations such as UNEP and United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP) with the chance to meet every year. Japan, ROK and China have hosted NEAC

[6] The Northeast Asian subregion here refers to China, Japan, South Korea, North Korea, Mongolia, the Russian Far East and Chinese Taipei.

in turn, and Mongolia also host for the ninth meeting in 2000.

b. North-East Asian Subregional Program on Environmental Cooperation (NEASPEC)

While NEAC is a forum for frank dialog on strategies between environmental government organizations, local governments and specialists, NEASPEC represents cooperation on environmental issues via foreign ministries (Oversea Environmental Cooperation Center, 1994).

The program was created at the first Meeting of Senior Officials on Environmental Cooperation in Northeast Asia in 1993, hosted by UN/ESCAP. The motivating force behind NEASPEC was the government of South Korea.

Since 1993, senior officials have held meetings every year or every two years, to decide on program activities, including project planning and implementation. The three priority areas identified by NEASPEC are energy and air pollution, ecosystem management and capacity building. Several fundamental projects on energy and air pollution—training workshops, technology demonstration projects, and monitoring-data collection projects—have been identified and implemented with the financial assistance of Asian Development Bank (ADB). Although NEASPEC did not have its own financial mechanisms, relying exclusively upon ad hoc project-based funding, the member governments agreed to establish a core fund for NEASPEC in 2000.

c. Northwest Pacific Action Plan (NOWPAP)

Collaboration focusing on a single subject also started following the Rio Summit. Problems related to the marine environment are under the purview of the Northwest Pacific Action Plan (NOWPAP). This sea plan was initially advocated by UNEP, rather than by countries within Northeast Asia. The participating countries are China, Japan, the South Korea, Russia and North Korea[7]. Those countries adopted action plans at the first intergovernmental meeting, held in Seoul, in 1994 (UNEP, 1997).

d. Tripartite Environment Ministers Meeting (TEMM)

In addition to the founding of the above initiatives, the late 1990's witnessed the emergence of collaborative efforts at the ministerial level. Following a proposal by the South Korea, the Tripartite Environment Ministers Meeting (TEMM) between China, Japan and South Korea was held in Seoul in January 1999. The three major countries in the subregion recognized the need to cooperate and to increase the amount of environmental cooperation. The TEMM is to be held on a yearly basis. The second TEMM was held in Beijing in February 2000, and the ministers agreed to develop and work on specific projects, focusing particularly on raising the consciousness of the environmental community, preventing fresh water pollution and land-based marine pollution and cooperating in the field of

[7] North Korea is not an acting member, to date.

environmental industry. The three countries have already begin designing the project proposals, and steps have been taken toward implementation.

e. Tumen River Area Development Programme (TRADP)

On the economic cooperation front, the Tumen River Area Development Programme (TRADP) is facilitated by UNDP and aims to promote regional economic cooperation between China, South Korea, North Korea, Mongolia and Russia. The Tumen Region has achieved economic development at the expense of the environment and has been threatened by environmental degradation, namely, inland and coastal water pollution, biodiversity loss, deforestation and air pollution.

A Memorandum of Understanding on Environmental Principles governing the TRADP was adopted in 1995. In response, a Strategic Action Programme (SAP) was created for the purpose of developing an effective long-term regional strategy for dealing with international water pollution and loss of biodiversity. The Global Environment Facility (GEF) decided to sponsor the SAP with 5 million dollars over a two-year period, and the program was launched in May 2000.

The Environmental Action Plan was also developed in parallel, focusing on trans-border pollution and other forms of regional environmental damage, such as trade in endangered species. The plan identified four program areas with detailed project proposals. TRADP member states are currently seeking investment and donor assistance for implementing such projects.

f. North East Asian Crane Site Network Center

To protect migratory waterbird, the North East Asian Crane Network Center was established in 1997, based on the "Asia-Pacific Migratory Waterbird Protection Strategy," which was adopted at the Seventh Meeting of the Conference of the Contracting Parties to the Convention on Wetlands (Ramsar). The network links eighteen important sites for the survival of cranes from six Northeast Asian countries, so that those who work at different sites can exchange information and share their experiences. The network also link researchers, conservationists, governmental officers and others concerned about crane protection, and provides a basis for joint research and conservation activities. The network is managed by Wetlands International-Asia Pacific.

The late 1990's also witnessed the establishment of two more waterbird network: the East Asian Australasian Shorebird Site Network, in which twenty-four sites from ten countries participate, and the East Asian Anatidae Site Network.

3.1.2. Multilateral Cooperation covering East Asia/ the Asia-Pacific region

a. Acid Deposition Monitoring Network in East Asia (EANET)

This network was created on the initiative of the government of Japan—all the operating costs are paid by the Japanese Government. Japan also provides financial and technical assistance on monitoring activities to developing member countries through its official development assistance (ODA) channel. The network links ten national governments and their monitoring sites. Using shared guidelines and technical manuals, the network has been collecting, compiling and evaluating monitoring data on acid deposition. The network began its preparatory-phase activities in 1998, and its regulatory activities in 2001. The network center is located in Japan, and Environment Agency (now the Ministry of Environment) of Japan administers and coordinates the network's activities as interim secretariat. The second intergovernmental meeting of the network, held in 2000, designated the UNEP as the Secretariat for the EANET after 2002 (Interim Secretariat [of EANET] and Interim Network Center [of EANET], 2000).

b. Asia-Pacific Economic Cooperation (APEC)

Covering a much broader geographical area of the Asia-Pacific, the Asia-Pacific Economic Cooperation (APEC) forum, inaugurated in 1989 and including 18 member economies, also began to work toward integrating environmental and economic concerns. The member economies from Northeast Asia include China, Japan, ROK, Russia, and Taiwan.

The First Environmental Ministerial Meeting held in 1994 developed an "APEC Environmental Vision Statement." Since this statement and other declarations, APEC has developed a three-pronged environmental work program: namely, 1) integration of environmental and economic considerations in APEC's working groups; 2) attention to sustainable cities, clean technologies, and the marine environment; and 3) long-term focus on food, energy, environment, economic growth, and population.

c. Asia-Pacific Network for Global Change Research (APN)

On the scientific front, the Asia-Pacific Network for Global Change Research (APN) was established in 1995 for the purpose of strengthening links between the scientific community and policy makers in the Asia-Pacific Region. The intergovernmental network aims to promote, encourage and support research on long-term change in the earth's climate, ocean and terrestrial systems as well as research on related physical, chemical, biological and socioeconomic processes.5 Its member states from Northeast Asia are: China, Japan, ROK, Mongolia and Russia.

d. Environment Congress for Asia and Pacific (ECO-ASIA)

ECO ASIA was initiated by the Environment Agency of Japan, with the objective of fostering policy

dialogue and cooperation on environmental and developmental issues among the environmental ministers of participating countries. While ECO ASIA was originally intended as an informal forum for information exchange between ministers, it has endorsed the "ECO ASIA Long-term Perspective Project," aimed at identifying options for environmental policies that promote long-term sustainable development of the Asia-Pacific region. This project will identify major environmental issues confronting the region; examining their links with socioeconomic issues; and forecasting the future social, economic, and environmental issues that may result from different regional development scenarios.

3.1.3. Major Features of Environmental Cooperative Mechanism

The mechanisms for environmental cooperation can be summarized as follows:

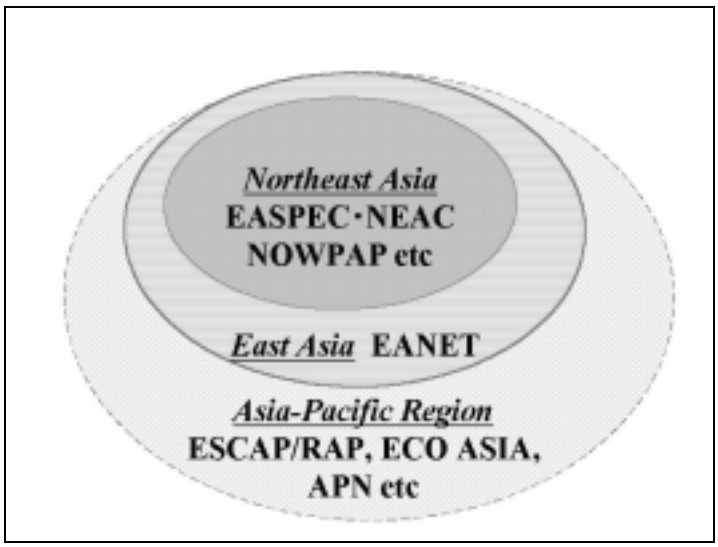

Figure 3-1. Multi-layer Structure of Environmental Cooperation

Parallel institutions: Northeast Asia is characterized by the fact that no comprehensive regional organization equivalent to EC/EU, ASEAN or SAARC exists, resulting in the emergence of several independent initiatives on environmental cooperation. Those institutions were established through different channels, including environmental ministries, official diplomatic channels, officers of environmental agencies and ministries, NGOs, and academics, with little coordination between the various channels. Consequently, some initiatives contain material that is redundant.

Multi-layer structure (see Figure 3-1): Geographical coverage of environmental cooperation initiatives ranges from global, broader-than-regional to subregional. Some multilateral initiatives target Northeast Asia, while some target the whole region of East Asia or, even more broadly, Asia and the Pacific. The evidence shows that South Korea tends to favor a focus on Northeast Asia, whereas Japan focuses on the broader region (East Asia), or the entire Asia-Pacific region.

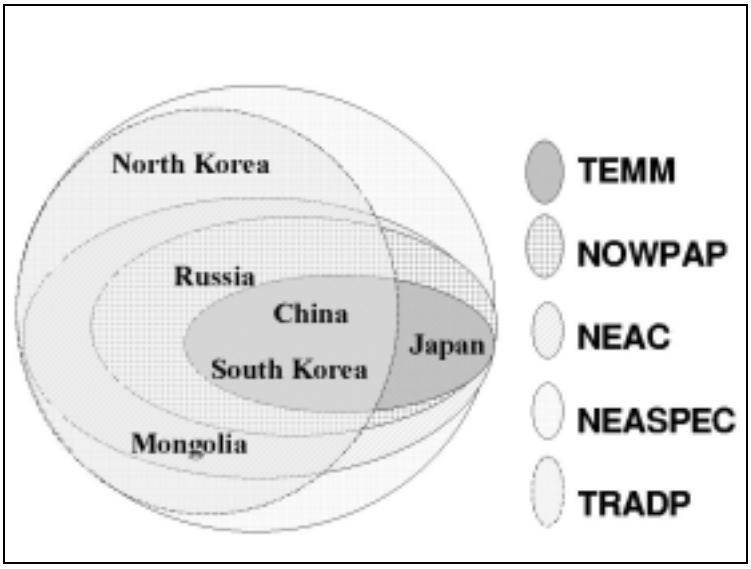

Figure 3-2. Different Membership of Major Environmental Initiatives

Different membership (see Figure 3-2): The status of participating states differs from one initiative to another, depending on diplomatic relations between countries and on the international membership of the host organization[8].

Weak institutional/financial structure: Since most of the regional environmental initiatives have little organizational structure and a weak financial foundation, cooperation has made only slow progress. In the absence of regional organizations which can administer regional environmental plans and programs, each initiative must start negotiations from scratch. Some initiatives have stagnated in terms of institutional and financial development.

The evidence shows that weaknesses and inadequacies of environmental cooperation schemes in Northeast and East Asia have hindered the progress of regional cooperation on single issues such as acid rain and marine pollution control[9]. The question to be answered is whether and how the region can get out of this stagnation.

Northeast Asia needs to create systematic coordination between all the initiatives, in particular initiatives undertaking similar or related subjects. To make it easier, the first step to be taken should be to set up a system that maintains transparency and full disclosure. Recently, some regional and subregional initiatives have set up their own web pages on the Internet[10]. This trend should grow and

[8] For example, North Korea does not attend most subregional programs, except those hosted by UN Organizations. North Korea cannot receive assistance from the ADB, to which it does not belong. Taiwan has no access to many initiatives because its position in international politics is uncertain although it is a member of APEC and ADB.

[9] See Takahashi (2000a) and Takahashi & Asuka (2000) for the case of acid rain, and see Valencia (1998) and Haas (1998) for the case of marine pollution control.

[10] Those include: EANET, TEMM, TRDAP and the Crane Network. Collaborative activities of NEASPEC are also introduced in UN/ESCAP homepage.

be further enhanced.

In the long-term, a comprehensive and strategic environmental action plan should be developed for medium and long-term objectives. Such action plans have already succeeded in other regions and subregions such as the EU, the Baltic Sea region and ASEAN.

One long-term objective should be for Northeast Asia to create a framework which all parties in the subregion attend. Because of the political security situation in the subregion, this objective will not be easily achieved. Therefore, international organizations and NGOs must act for the countries of the subregion.

In addition, countries in this region need to improve their expertise, to manage the difficult political situation. This is particularly true for Japan and South Korea. Although the two countries have much in common with each other in that they are willing to promote and lead environmental cooperation, they are working in different directions, resulting in the inconsistent emergence of several independent institutions and the stagnation of other institutions. Both countries need to develop strategies for regional cooperation which incorporate their own interests, the other's interests and regional common interests.

3.2. Regional Cooperative Activities on Energy Field

3.2.1. Background

Northeast Asia is unique in that it has both large energy markets and vast energy resources, which were untapped until very recently. There are large energy consuming markets in Japan and South Korea, which currently heavily depend on energy supplies from distant areas. China could be added to this list, taking into consideration that Chinese energy demand is expected to grow rapidly in accordance with economic development. On the other hand, there are abundant natural resources, in particular natural gas undeveloped in the Russian Far East and Siberia. South Korea and Japan export LNG only from outside the region. Compared to other regions of the world, natural gas is less-utilized in the region.

During the Cold War, Northeast Asia was divided into two opposing blocs with conflicting political, economic and social ideologies: The US, Japan and South Korea formed one group, and the Soviet Union, China and North Korea formed the other group. However, as a result of the end of the Cold War, the division has disappeared, bringing in a new geopolitical environment and the potential for economic development and cooperation.

If the energy resources of the region are developed effectively, economic development and

prosperity will be promising, and this may eventually lead to regional stability and peace in future. Not only from the economic development viewpoint, but also from the environmental viewpoint, natural gas holds the key to this scenario. Since 1993, China's economic development has been remarkable and its energy consumption, and consequent greenhouse gas emission, is expected to grow accordingly. The relationship between the economic development and increasing environmental load in this region is a trade-off. In this sense, the expansion of the usage of natural gas in Northeast Asia is expected not only to contribute to energy security in the region, but also to play an important role in easing environmental issues at global, regional and local levels (see Figure 3-3).

From this viewpoint, several international efforts towards regional energy development have been made. In fact, several feasibility studies have been made and some natural gas development/pipeline projects are in progress. 3.2 overviews such existing and ongoing regional activities in energy cooperation: It questions by whom and how energy cooperation has been addressed, identified and promoted.

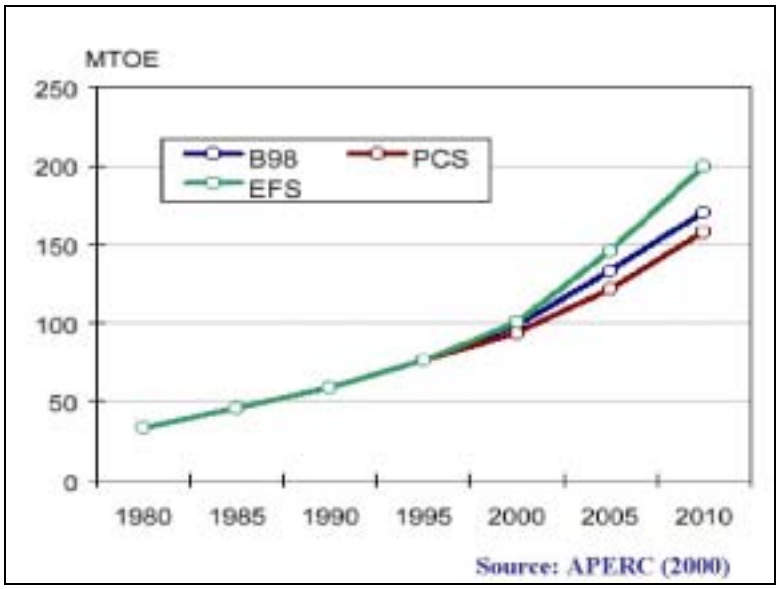

Figure 3-3. Natural Gas Consumption in Northeast Asia

Most of these efforts have been private-sector initiatives, with little direct involvement of national governments. Full-scale resource development in the Russian Far East and Siberia requires vast amounts of funding which cannot be obtained without the support of national governments. In particular, high expectations are placed on the financial cooperation of Japan. Some Japanese industry leaders show strong concern on the issue, whereas other industrial leaders and many governmental officers remain skeptical about the economic and political rationale of regional energy development. Recognizing the crucial role of Japan, 3.3 examines Japan’s natural gas policy and discuss rationales and barriers to the energy development from its perspective.

3.2.2. Regional Activities

a. APEC Initiative[11]

Although there is no intergovernmental economic/energy organization containing all six countries in Northeast Asia (namely, China, Japan, South Korea, North Korea, Mongolia and Russia), the Asia Pacific Economic Co-operation (APEC) grouping established in 1991 with a much broader geographical scope of the Asia-Pacific region, has worked toward promoting energy cooperation in Northeast Asia.

It was 1995 when APEC agreed on Action Program for Energy at the 11th APEC Working Group on Energy. The priorities set out in the Action Program are:

- fostering a common understanding on regional energy issues
- facilitating investment in the energy sector
- reducing environmental impacts in the energy sector
- acceptance of equivalence in accreditation and increasing harmonization of energy standards.

In particular, it was stressed that the action program measures should give effect to the 3Es initiatives (economic growth, energy security and environmental protection).

In order to attain these objectives, five working groups were established: Clean Fossil Fuel, Energy Efficiency and Conservation, Energy Data and Analysis, New and Renewable Energy Technologies and Minerals and Energy Exploration and Development (see Figure3-4).

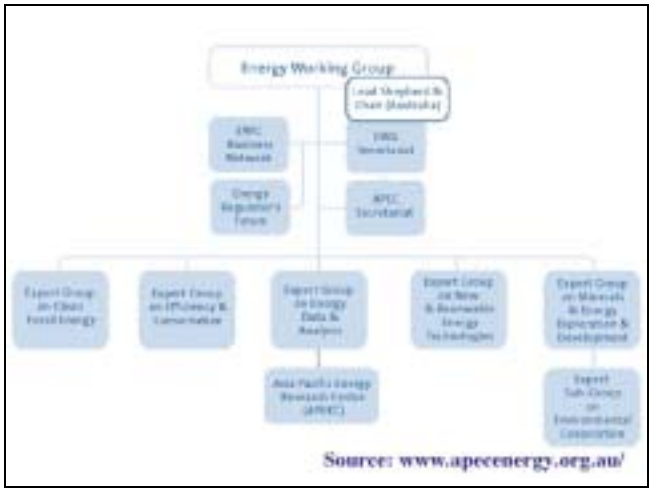

Figure 3-4. Organizational Chart of APEC Energy Working Group

[11] For more information, please see APEC Energy Working Group's web-pages: www.apecenergy.org.au/welcome/home/

In addition, the Asia Pacific Energy Research Center (APERC) was established in Tokyo in 1996 with the purpose of fostering APEC economies' understanding of the global, regional and domestic energy demand and supply trends facing the region, and promoting the formulation of rational policy for furthering energy security, economic growth and environmental quality.

In 1997 APERC produced a long-term energy demand/supply outlook for the Asia-Pacific region extending to 2010. According to it, demand for natural gas in APEC is expected to grow significantly over the next 20 years, and it was pointed out that increased natural gas production and significant new infrastructure development is needed to meet the demand. Hence, APEC Energy Ministers endorsed the initiative "Accelerating Investment in Natural Gas Supplies, Infrastructure and Trading Networks in the APEC Region." APERC produced a report titled, "Natural Gas Pipeline Development in Northeast Asia." The report investigated the economic feasibility of large-scale natural gas pipeline projects, and concluded that "construction of a regional natural gas pipeline network will create new opportunities and potential benefits, as well as providing a solution to environmental problems at global, regional and local levels" (APERC, 2000: 86).

b. Private-Sector Initiatives

Energy cooperation in Northeast Asia, on the other hand, is characterized by active private-sectors involvement.

The early 1990s witnessed several multilateral energy cooperation plans proposed by multiple actors. Among them is "the Asia-Pacific Energy Community" proposed by 32 Japanese companies. This grand scheme envisions a 42,500 km pipeline from Yakutsk to Northwestern Australia, connecting China, Korea, Japan, Taiwan and six ASEAN countries. Right before its collapse, the Soviet Union also proposed a plan to develop Sakha and Sakhalin gas and to construct pipelines from Sakhalin across Russia, North Korea, on to South Korea, and under the Tsushima Straits to Japan[12].

In reality, international joint efforts to develop natural gas resources, especially in Sakhalin, have been started as private-sector initiatives. The Sakhalin-1 project started in 1999, when Exxon Japan Pipeline Co. Ltd began a feasibility study on a pipeline to Japan, together with Japan Sakhalin Pipeline Co., a Japanese Consortium (members: Itochu Co., Marubeni Co., and Sekiyu Kaihatsu Shigen). It was planned that Sakhalin-1 would produce 2.5 million barrels of oil and 15 trillion cubic feet of gas. Sakhalin-2 (including Shell, Mitsui and Mitsubishi) plans to construct a 9-million ton LNG plant. Those investment projects are costly due to difficult drilling conditions and other factors combined. Financing for Sakhalin-2 from international financial organizations, which has progressed furthest, amounts to $1.3 billion. Another $20 billion in investment will be needed for Sakhalin-1 and -2

[12] According to Valencia and Dorian (1998), Japan seemed more interested in a bilateral pipeline link between Sakhalin and Hokkaido, whereas South Korea favored a pipeline through North Korea to South Korea, since it would provide the two Koreas with an energy supply and enhance South Korea/North Korea relations.

projects.

There are several domestic pipeline projects such as the East-West pipeline project in China. As of today, no huge multilateral pipeline plan has yet been realized. Some experts insist there is a need for taking a comprehensive and consistent approach to developing, delivering and distributing Siberian and Far Eastern natural gas to Russia and other countries' markets.

Progress in energy development and pipeline construction, as shown here, has been made slowly. A number of studies analyzing future energy demand and supply and economic rationales of the regional energy development have been made by public research institutes such as APERC, KEEI, ERI, IEEJ and so on.

Several international non-profit organizations (NPOs) were established with the aim of sponsoring and facilitating those research activities, and networking and promoting dialogue relevant to this issue.

Among these is the Northeast Asia Economic Forum (NEAEF) established in 1991[13]. Its secretariat is located at the East-West Center in Hawaii. NEAEF is unique in that it succeeded in ensuring participation from representatives --private companies, academic community, non-governmental organizations, and/or central and local governments– of all countries of the region in the forum-sponsored dialogue. NEAEF sponsors dialogue and research on seven key areas, including scenarios for regional cooperation, regional transportation systems, and regional energy network-focus on promoting natural gas development and on the energy –environment nexus. To this end, the forum organized an expert meeting on natural gas in cooperation with the Japan Committee for the Promotion of the Asian Energy Community. This group intends to supplement existing efforts and frameworks for cooperation in Asia-Pacific.

In addition to the forum, several NPOs were set up in the 1990s, such as the North-East Asia Energy Forum (ESCAP initiative), the Northeast Asian Gas & Pipeline Forum (Korea-centered), and Asia-Pacific Energy Forum (located in Tokyo). Many international symposiums/conferences were held accordingly.

c. KEDO (Korean Peninsula Energy Development Organization)[14]

In 1994, the United States and North Korea agreed on a framework. That is, in return for freezing and ultimately dismantling its nuclear program, the United States agreed to:

finance and construct in the DPRK two light-water reactors (LWR) of the Korean Standard Nuclear Power Plant model and, in so doing;

[13] See NEAEF web-pages for more information: http://www.eastwestcenter.org/

[14] For more information, please see KEDO web-pages: http://www.kedo.org/

provide the DPRK with an alternative source of energy in the form of 500,000 metric tons of heavy fuel oil each year for heating and electricity production until the first of those reactors is completed.

The US intention was to build a new relationship with North Korea, and to create a device through which they could bring North Korea out of its isolation.

Based on the agreed framework, KEDO was established on March 1995, when Japan, the Republic of Korea (ROK) and the United States, expressed their willingness to provide funds to implement the key provisions of the Agreed Framework and signed KEDO's charter. In 1995, , several other countries including New Zealand, Australia, Canada and so on joined KEDO by accepting the principles within the Organization's charter. In 1997, the European Atomic Energy Community (EURATOM) also joined KEDO in recognition of the substantial and sustained support. KEDO has received material and financial support from sixteen other non-member contributing states. KEDO has offices in New York City and at the light-water reactor construction site in Kumho, North Korea.

Construction activity continues on the LWR site (even though striking North Korean workers had to be replaced with Uzbek laborers) and KEDO continues to provide North Korea with 500,000 tons of heavy fuel oil annually as compensation for shutting down its Yongbyon reactor. However, it is likely that the project is to be delayed for several years.

The project's delay creates two major issues for North Korea and KEDO, respectively. Compensation for the energy losses is one, and replacement of LWRs to conventional power plants is the other. The KEDO Process is now at the crossroads.

3.2.3. Japanese Perspective

a. Japanese Natural Gas Policy

The Ministry of Economy, Trade and Industry (METI) released two important reports about future energy policy and about future natural gas policy, in July. The former report shows the long-term energy supply-demand outlook of Japan in general. In it, two scenarios for FY 2010 are shown: a) base case: energy supply-and-demand prediction in the 2010 fiscal year in the case of maintaining the present policy framework, and b) target case: a scenario which realizes energy stable supply, responding to the request of environmental preservation and achieving energy-efficiency simultaneously.

The share of natural gas by total primary energy supply was 10.1 % in FY 1990, and will grow at 13.2% in the base case, and 14% in the target case. The share of natural gas occupied by primary energy is 21% in the United States, 34% in Britain, and 22% in whole of OECD. From this comparison, the METI recognizes the necessity of raising the natural gas share (see Figure 3-5).

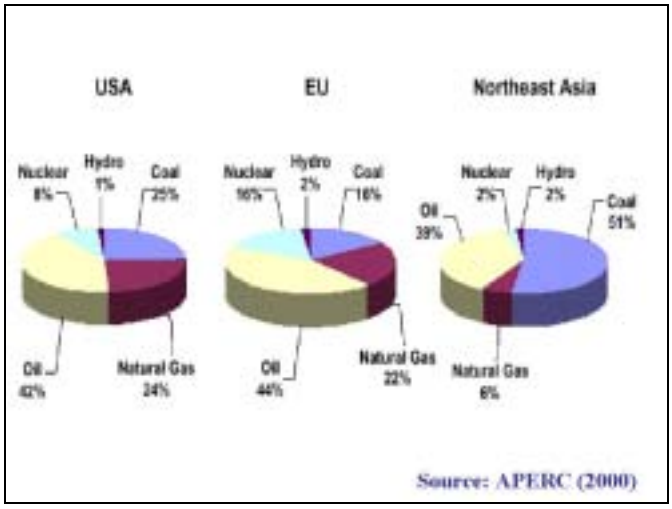

Figure 3-5. Share of Natural Gas in Total Primary Energy Supply in 1997

Nuclear power program of Japan is expected to scale down due to opposition from local citizens[15]. If natural gas fulfil the shortfall, the share of natural gas will grow more.

Japan has imported LNG outside the region, mainly from 8 countries, namely, Indonesia, US, Malaysia, Qatar, Brunei, Indonesia and Australia (see Figure 3-6). Much of this supply is based on long-term contracts, some of which will be ended by 2009-2010. There are certain gap between primary energy consumption and amount reserved under long-term contract (see Figure 3-7)[16].

Sakhalin project (LNG) may contribute to fill this gap, but it is questioned whether a single LNG plant in southern Sakhalin will be sufficient to compete for those demand.

Taking these factors into consideration, METI began to consider the construction of an international pipeline (PLG) to supplement LNG supply. It is interested in a bilateral pipeline link between Sakhalin and Japan rather than a multilateral one[17].

[15] A referendum held in Maki town, 25km southwest of Niigata City, in which over 60% of the voters refused to the proposed construction of a four-unit nuclear power station in the town. A shocking blow not only to the Tohoku Electric Power Co., but to other utilities and the central government. Three other towns/cities in Japan enacted N-plant Referendum Act in order to settle NPS siting disputes. But actual polls have been postponed. The Maki result may have significant influence on the political climate in these localities such as Ashihama, Kubokawa town, and Kushima City. The Ministry of International Trade and Industry (MITI) and the subordinate Natural Resources and Energy Agency say the nuclear energy policy must continue as it is a national policy in the national interest and must take precedence over local interest. In a bid to promote construction of more nuclear reactors, MITI is considering to increase subsidies to local governments which host nuclear power plants.

[16] Current secured amounts under take-or pay long-term contracts account for 47.5 million tonnes in 2004, and Japan has to secure another 22.5 million tonnes if the current secured amount is maintained (APERC, 2000).

[17] In contrast, South Korea favored a multilateral pipeline through North Korea to South Korea, since it would provide two Koreans energy supply and enhance South Korea/North Korea relations.

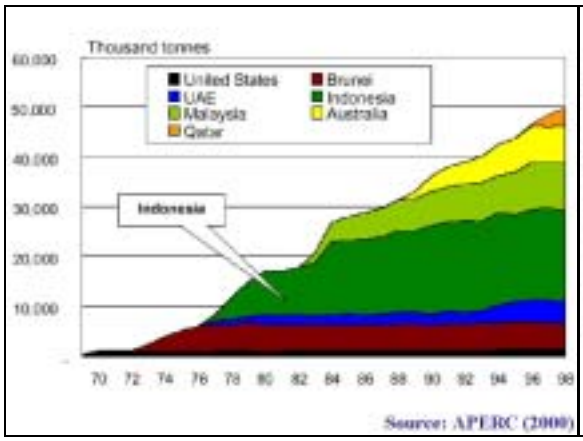

Figure 3-6. Import by Suppliers

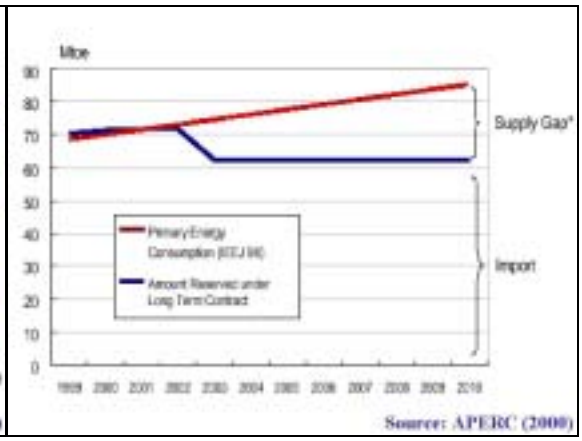

Figure 3-7. Natural Gas Supply Gap

b. Barriers for furthering cooperation

METI began to show its interest in constructing an international pipeline. Considering the many critical factors, METI still remains discreet, and indicates the need of careful consideration of several barriers.

Lack of common legal and regulatory framework between Japan and Russia is among the obstacles. According to Jung (2002), overlapping jurisdiction –both federal and local government control tax laws, regulations, excise fees and licensing requirement- is among the problem with current Russian side. Japan has signed the energy charter which ensure rights of transit, whereas Russia has not yet. Although Russian officials have indicated that charter ratification is a priority, a number of Duma members object to the idea, because the charter has implications for Russia's trade relations not only with Japan but also with former Soviet Union states (Harris, 2000).

Technically, it should be pointed out that Japan has long persisted with LNG rather than PNG, and pipeline network development remains relatively low. It has limited skills and practice inconstructing pipelines. Construction costs will be high, due to geographical difficulties (complicated coastline, uneven land) and high labor costs.

Considering the huge investment expenses necessary not only domestically but internationally, questions have arisen about who will bear the burden. As mentioned earlier, there are high expectations placed on Japan as a dominant funding source. However, the political situation has prevented the private sector from making such substantial investment.

After all, unstable political conditions are among the biggest barriers. Since the "Hashimoto-Yeltsin Plan,"[18] which provided the framework for bilateral cooperation, was agreed in 1997, there has been progress in practical cooperative activities. Those efforts, unfortunately, have not created quantitative

[18] The plan covers seven major issues: investment cooperation, promotion of the integration of the Russian economy into the international economic system, expansion of support for reform, support for the training of entrepreneurs and civil officials, strengthening dialogue on energy issues, cooperation on the peaceful use of nuclear power, and cooperation in the space field.

changes in the bilateral relationship. Japan and Russia attempted to conclude a peace treaty by 2000, but failed. The fact that the two countries cannot conclude a peace treaty is a matter that questions the future of long-term cooperation.

3.3. Conclusion: Toward Multilateral and Integrated Approach

This chapter discussed the current status of regional cooperation on two issues: environment and energy.

It can be said that the cooperation mechanisms differ from each other. In particular, environmental cooperation has been endorsed by government-led initiatives, whereas energy cooperation is characterized by active participation and eagerness in the private sector. In both cases, building partnerships between governments and the private sector is of great significance in furthering cooperation.

Lessening sensitivity to the political climate is another challenge in both cases. To this end, it is high time to set up a multilateral framework and mechanism. The end of the Cold War, unfortunately, did not mean that political problems have disappeared from the region. The sensitivity of the political environment in this region does not allow every national government to come to the table. The late 1990s witnessed several signs of multilateral diplomacy such as the creation of KEDO, the inauguration of Four party discussions between US, China, North Korea and South Korea, the realization of an inter-Korean summit, China's participation in WTO etc. Nevertheless, recent progress of multilateral negotiations in the region, especially after the tragedy in the US on Sep 11, has remained rather disappointing.

Regional instability and fluidity paradoxically can create the opportunity (or potentiality) for collaboration. It is worth remembering that the European integration process can be traced back to joint multilateral efforts to control and manage coal and steel production, which had been of great importance to France and Germany. The creation of the European Coal and Steel Community (ECSC) in 1947 was realized with the strong hope and willingness of then political leaders to prevent another war between France and Germany.

If difficulties remain in promoting a multilateral approach on political and security issues in Northeast Asia, it would be desirable and more realistic to create a multilateral platform on the energy issue only. It is hoped that the realization of idea, which has not been well addressed yet, would be more actively discussed and considered in each country of the region.

Finally, and more importantly, there has been a tendency for environmental and energy issues to be addressed, identified and handled separately. Nevertheless, linkage of the two issues will benefit every

country in the region by promoting sustainable development from both environmental and economic perspectives.

To realize this, more detailed and precise research, especially cost-benefit analyses/feasibility studies of cooperative projects/programs from every dimension–economical, technical, environmental, political and legal—and the dissemination of these results would have great importance. Such efforts will foster a common understanding of the rationality of regional cooperation between relevant actors, and will heighten incentives for promoting the necessary processes. There is also a strong need to consider appropriate process for bringing the relevant actors/institutions together to work in a consistent and comprehensive manner.

4. Policies of 4 Countries to Contribute to Climate Change Mitigation / Adaptation

4.1. Global Warming and Country Profiles

4.1.1. Russia

a. Emission Profile

GHG Emissions and Sinks

Official data shows that Russia is among the world largest emitters of greenhouse gases. In 1996, total GHG emissions in terms of carbon dioxide equivalent accounted for 1.962.441 Gg (FCCC/IDR.2/RUS, 2000). Emissions of GHG in Russia in 1990 and in 1996 are presented in Table 4-1. Carbon dioxide, nitrous oxide and methane annual emissions from various sources during the period 1990-1996 are presented in Tables 4-2~4-4. Two National Communications (NC) were submitted to the FCCC Secretariat (the 1st was submitted in 1995, 2nd -in 1998) are the main source of data for GHG emission profile in Russia; the 2nd NC reports data for the period 1990-1994, and for some emission sources for 1995. However, some additional data for the later years, i.e. for 1995 and 1996 was available from the UNFCC Secretariat and from our interviews with the staff of the Secretariat[19]. Unfortunately, official aggregated GHG emission data for Russia for the years after 1996 is absent[20].

The greater part of the Russia's territory is covered by forests and bogs, and its *carbon sequestration* potential is high. Scientific estimates indicate that boreal and temperate forests are significant carbon sinks. According to recent assessments of the Russian scientists from the All-Russia Research and Information Center for Forest Resources, Federal Forestry Service, in 1996 forest sinks were reported to absorb about 840.000 Gg of carbon dioxide; as a result 56 percent of total domestic annual carbon dioxide emission is sequestrated. However, estimating the carbon sequestration potential of forests and soil even if based on the best scientific knowledge is currently very uncertain and, thus, the accounting methodologies and extent of sinks to be eligible under the Kyoto Protocol are still open.

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[19] Current Report for APN on Russia is based on the primary data collected by the Russian team during 2000-2001, and on its data archives compiled earlier. The extensive primary material is based on the results of field research and interviews with the representatives of domestic government institutions, such as Hydromet, Ministry of Fuel and Energy, Interdepartmental Commission on Climate Change, as well as in non-government experts and private companies; annual reports of two leading Russian companies in the energy sector, i.e. RAO UES and Gazprom, have been studied and information from their web-sites was obtained. Data from the State Committee of Statistics has been analysed, a set of legal acts and codes relating to climate change issues has been studied; Russian press and periodicals have been reviewed. Interviews with representatives of the FCCC Secretariat had been made in 2000; interviews with international experts dealing with Russian climate policy were taken in 2000 and 2001. This Report also uses the results of the study accomplished by Prof. Dr. V.Kotov and Dr. E.Nikitina during collaborative research with IGES in 1999-2000

[20] For example, this was the reason why the recent compilation prepared in 2000 by the FCCC Secretariat *National Communications from Parties Included in Annex I to the Convention: Greenhouse Gas Inventory Data from 1990 to 1998* (FCCC/SBI/2000/11) contains data on Russia mainly for 1990, and only for some gases for 1998, while for almost all other Annex I countries its format was filled in.

Table 4-1. GHG Emissions and Sinks in Russia

	1990 (Gg of CO2 eq.)	**1996 (Gg of CO2 eq.)**	**Change 1990-1996, (percent)**
CO2	2 372 303	1 495 920	- 37
CH4	26 504	18 544	- 30
N2O	225.7	131.7	- 42
HFCs,	9.665	5.915	- 39
PFCs	31.630	30.262	- 4
Total Emissions	3 040 062	1 962 441	- 35
CO_2 Forest Sinks	- 392 000	- 840 000	114

Source: Vtoroe Nacionalnoe Soobshenie Rossisskoy Federacii [Second National Communication of the Russian Federation], Moscow, 1998; FCCC/IDR.2/RUS, 2000, p.8

Structure of Emissions and Sources

The *structure* of Russian GHG emissions is typical for an industrialized country. The share of carbon dioxide is the highest, accounting for 77 percent of total emissions. It is followed by methane 19 percent, nitrous oxides 2 percent, and HFCs and PFCs combined 2 percent.

The major *source* of **carbon dioxide** emissions is energy sector: fuel combustion contributes for about 96-98 percent of total carbon dioxide emissions. Among fossil fuels the input of natural gas into energy related sources of CO2 emissions accounts for 45 percent, oil - 24, solid fuel - 31.The rest of carbon dioxide emissions originate from industrial processes and fugitive fuels. Industrial processes, and especially cement production, account for 1.4 percent of carbon dioxide emissions. Dynamics of carbon dioxide emissions by source is presented in Table 4-2.

The major source for **methane** emissions is fugitive emissions from fuel (69 percent in 1996), including mainly from oil and natural gas (production and losses during transportation), and to a less extent from solid fuels. It is followed by emissions from agriculture (18 percent), waste (10 percent), land-use change and forestry (2 percent) and fuel combustion (1 percent).

The major sector-source for **nitrous oxides** is agriculture. It accounts for 80 percent of nitrous oxides emissions among sector-sources, while input of energy sector is about 7 percent, and wastes - 9 percent, industrial processes - 1 percent.

Emission Dynamics

There have been significant and stable decline in GHG emissions during the last decade. Total GHG emissions were reported to curtail by more than one-third During this period carbon dioxide emissions

decreased by 37 percent; methane emissions - by 30 percent, and nitrous oxides - by about 42 percent (Tables 4-2~4-4) (FCCC/IDR.2/RUS, 2000).

The main *reason* has been in economic crisis and decline in economic activities in the country during post-socialistic transition of the last decade. There has been significant reduction in energy consumption, in industrial and agricultural production. For example, while industrial production declined during the 1990-1998 by more than a half, the decrease in energy consumption by 32.6 percent was registered (Neft, 2000; Rossiisky, 2001; Energeticheskaya, 2000). Such decline in energy consumption during the last decade was attributed to its drop in industry and construction (by 38.1 percent), in transport (29.9 percent) and agriculture (45.1 percent), while residential and municipal sectors increased (5.2 percent). Thus, the Russian economy has become more energy intensive during the transition period due to shortage of investments to replace the aging infrastructure.

Deepness of decline for particular gases varied; it was mainly attributed to dynamics of economic indicators in particular sectors of economic activity. The highest downward rates have been registered for *nitrous oxides*: emissions from industrial processes declined the most (by 69 percent), although their share in total N2O emissions is comparatively small. The major part of decline in N2O emissions is attributed to changed patterns in agricultural activities (emissions from agriculture declined by 48 percent) which is the major source of emissions (for example, decrease in the use of fertilizers by the agricultural producers due to increasing prices). Emissions from fuel combustion declined by 44 percent, while emissions from wastes were reported to be more or less stable. Decline in *carbon dioxide* emissions is attributed mainly to changes in fossil fuel combustion and cement production that curtailed during 1990-1996 by almost two-fold. Changes in methane emissions were a result of dynamics in energy and agricultural sectors, while methane emissions from dumping of wastes and forest fires have been more or less constant during this period (Tables 4-2~4-4). Curtailing in methane emissions was attributed mainly to reduction in fugitive fuel emissions from solid fuel and oil and natural gas, and in emissions from the agricultural sector as a result of decline in a number of livestock. During 1990-1996 the carbon dioxide removals by forest sinks were recently reported to increase (Table 4-2). The main reason for increase was explained mainly by reducing the planned forest cut.

Thus, economic depression in Russia during the last decade appeared to be the major tool in meeting the targets of main environmental programmes, and compliance with international environmental agreements, including the climate change international regime. We consider that a peculiar phenomenon of *compliance without implementation* occurred, as the major part of emission decline was induced by the economic crisis, while implementation of special policies and mitigation measures as a response to climate change accounted for comparatively minor effects (Kotov V., Nikitina E., 1996). The effect of policies and measures was much more modest. For example, the experts from the Russian government suggest that while 60-70 percent of emission reduction in the

energy sector during the last decade were attributed to economic decline, about 8-12 percent to initiation of institutional reforms in the energy sector and the rest due to wider use of natural gas and structural changes in economy(Mastepanov A., *et al*, 2001).

Serious changes in emission dynamics are expected at the turn of the century due to new trends in the current macro-economic situation and economic growth. It is considered as a turning point in GHG emission trends. Stabilization, and then slow growth of GHG emissions are expected simultaneously with economic growth started from the end of the last decade. There is no official data available yet on GHG dynamics at the turn of the century, but they are expected to increase following the trends in major economic indicators. In fact, in 2000 industrial production was officially reported to increase by 9 percent from the previous year[21]. Industries that are important sources of GHG emissions reported higher level of growth than its national average. For example, in ferrous industry the increase in production in 2000 was registered at 19 percent, non ferrous industry - 11 percent, chemical and petrochemical - 16 percent (*Vedomosti*, 2001). Economic growth is expected to have an upward trend in the future. These new trends will have serious implications for national policies and affect patterns of international cooperation under the international climate change regime and prospects in application of its instruments.

b. Vulnerability and Impact

Role of Russia in Global Warming

Russia ranks third in the world for anthropogenic carbon dioxide emissions after the USA and China. It accounts for 8 percent in their world total. During the 1990s Russia's input into the global warming declined as at the beginning of the decade its world's share has been 11 percent. In 1996, its per capita emissions accounted for 10.1 tons of CO2 which is lower than in some developed countries (for example, in USA - 19.8, in Luxemburg – 20.4, in Canada – 15.6)(Ohkrana, 2001). Since GHG emissions are predicted to follow the upward trend in economic growth in the future its contribution to global warming might increase. However, due to efficiency improvements energy demand has been decoupled from economic growth in the West, and this is a probable future trend for Russia s well. Only if there are no investments available to the infrastructure improvements, the intensity may remain the same. The widely debated question today is whether and when its GHG emissions might reach their pre-crisis level of the 1990. At the same time its sequestration potential is considerable, and annually about a half of its carbon dioxide emissions is believed to be absorbed by forests and bogs. Combination of these factors defines Russia's role in the global warming.

National Vulnerability to Global Warming

[21] The national economy started to recover since1997, and for the first time in the last decade some positive growth was reported (about 0.7 percent in 1997) This was followed in 1998 by severe financial crisis and default in the banking sector, resulting in GNP 5 percent annual decline and in domestic currency loosing more than two thirds of its value; in 1999 the GNP increased by about 3 percent (Russian Statistical Annual 2000. Moscow, RF Goskomstat , 2000)

Tracing the *evolution in public agenda* and in public perceptions of climate change it is interesting to note that the issue of climate change has never been a subject of broad public attention in the Soviet Union. Interest was mainly shown by scientists that made the Russian school of climatology famous around the world[22], by some science fiction writers and governmental officials involved in weather-related activities, or within the international environmental debates. On the other hand, climate in a broader sense – regional and seasonal variations and impacts on economic welfare – was always an important topic for such a vast country as the USSR with its twelve different nature-geographic zones and different climate types (one should not forget that the heating season in Russia is much longer than in many other countries) (Clark, Jaeger, 2001). Until recently, the issue of climate change was not of a high priority on the national public environmental agenda. Moreover, domestic environmental concerns and solving local or regional environmental problems is of a much higher priority in scaling various environmental risks. Also, due to quite severe natural and climate conditions in the most part of the territory of Russia (58 percent of its territory is situated in a permafrost zone) the public would not be strongly opposed to global warming which according to their expectations is associated with more comfortable and relaxing leaving conditions, and with a higher agricultural crops productivity. Because the level of environmental culture and public environmental education are still far from the desired in Russia, there is a great need for raising environmental awareness and public education regarding problems of mitigation and adaptation to climate change.

As to *official governmental perceptions* towards the issue of vulnerability of Russia to climate change risk, they indicate at significant modifications during the last decade in contrast to the previous period. Their evolution indicates at combination of completely polar approaches to the issue: from confirmation of general benefits and *positive* impact of global climate change on the national economy, to acknowledgment of a wide range of its *negative* effects for the country. Indeed, negative impacts of climate change were formulated by the mid-1990s, and, particularly, they have been elaborated in detail in the 1996 Federal programme on climate change, and in the RF National Communications to the FCCC (RF Federal Program, 1996; 1st National Communication; 2nd National Communication). They are based on applied scientific assessments performed recently that were focusing on large-scale evaluation and multifactor applied analysis for different sectors of economy.

Until then, formulation of the extent of Russia's vulnerability, and hence, policy options, including mitigation, or adaptation measures have been quite vague in the governmental documents, and they did not contain a clear assessment of possible effects of climate change. Former positions towards national vulnerability to climate change stressed among other items that global warming might have *positive* impacts on national economy, and, especially, on agriculture that would benefit from climate

[22] Russian school of climatology and meteorology is internationally famous: at the beginning of the 1960s, prominent Soviet meteorologist Michail Buidyko together with a group of scientists started research on anthropogenic global warming, and contrasting it to natural induced global climate change that was based on paleoclimatic reconstruction and modeling. His forecasts on future global climate change have a high reputation in the international scientific community. A great deal of research have been performed by the research institutes of the State Committee on Hydrometeorology, and especially in the Institute of Global Climate and Ecology headed by Y.Izrael

change. The notion of *uncertainty* in climate change impacts, in its perspective trends, its main reasons, and particularly, uncertainties in anthropogenic factors versus natural factors input into global warming was also in the core of official perceptions. The basis for such perceptions was that it was 'cheaper to do nothing and benefit from global warming rather than to undertake mitigation measures'; such approach was actively exploited by policy-makers.

Current official approach towards climate change risk for Russia gives a more clear understanding of approaches towards vulnerability. It notes that global warming has a negative impact almost on all spheres of human activities. Particularly, negative effects can be indicated in the regions of high latitudes. Among the most vulnerable sectors are water resources and agriculture. However, since the ecosystems in these two sectors are especially severely affected by mismanagement practices, often, it is difficult to distinguish between negative environmental effects of human activities and negative impact of climate change. Destructive effects of global warming might be felt in permafrost areas: its melting will have negative consequences for infrastructure and settlements. Sea-level rise is regarded as a threat to the settlements, infrastructure and sea ports of highly populated low coastal areas (for example, coastline of the Gulf of Finland and St.Petersburg area); global warming might also affect the water level in such big lakes and internal seas as the Lake Baikal and the Caspian sea. It might have negative consequences for human health due to possibility for spreading of infectious deceases.

Russian agriculture is believed to be directly vulnerable to global warming: increase in frequency of droughts with decline in crop productivity is possible. Reduction in grain and pasture grass output is forecasted. In the future, in case the existing patterns of water management practices and extensive use of water resources would not be altered, the water supply to agricultural sector during dry seasons might be limited. Current official perceptions conclude that, in general, only some regions of agricultural production might benefit from changes in climate conditions; in other areas significant and expensive restructuring in production patterns will be needed. Some recent approximate assessments suggest that losses attributed to climate change, which are mainly associated with changes in agricultural production in NIS countries are estimated as $ 6 billion (EcoAccord, 2001)

Climate change is not expected to have a considerable effect on forest ecosystems. Even, some positive influence on growth of certain wood species and on carbon accumulation in forests, particularly in the Northern Siberia and the Far East, is forecasted. At the same time, it might have negative impacts on forest and peat-lands in the permafrost regions where ecosystems are to be severely affected.

The first steps in integrated assessment of climate change impact on Russia were undertaken in the nineties. Such assessments are based on a comprehensive approach to evaluating the vulnerability of different ecosystems to global warming, using a combination of expert estimates and modeling. International experts evaluate this undertaking as a challenging task, given the size of the country, the

variety in climate ecosystems, and the existence of such unique ecosystems as boreal forests.[23]

At the same time, many experts note that, global warming in Russia is still perceived in many cases as a problem of climatology, and much more efforts are needed to change such approaches in order to consider climate change mitigation and adaptation as a mater of sustainable economic development.

Table 4-2. Dynamics of Carbon Dioxide Emissions by Source, 1990-1996 (Gg)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Fuel combustion	2 298 901	2 123 001	1 948 001	1 805 001	1 601 101	1 550 000	1 463 000
including energy industries						516 890	517 150
Fugitive emissions from fuel	27 100	26 600	22 800	20 500	17 900	17 340	14 000
including from solid fuels	10 900	10 300	9 600	9 100	8 500	7 810	7 000
from oil and natural gas	16 200	16 300	13 200	11 400	9 400	9 530	7 000
Industrial processes	46 301	43 604	35 703	29 802	24 001	23 080	18 920
TOTAL CO_2	**2 372 303**	**2 193 206**	**2 006 505**	**1 855 304**	**1 643 003**	**1 590 420**	**1 495 920**
Land-use change and forestry	-392 000	…	…	…	-568 000	-840 000	-840 000

Source: Vtoroe Nacionalnoe Soobshenie Rossisskoy Federacii [Second National Communication of the Russian Federation], Moscow, 1998; FCCC/IDR.2/RUS, 27 September 2000; FCCC/SBI/2000/11, 5 September 2000

Table 4-3. Dynamics of Methane Emissions by Source, 1990-1996 (Gg)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Fuel combustion	201	243	200	196	130	168	152
Fugitive emissions from fuel	18 900	…	…	…	13 300	13 050	12 860
incuding from solid fuels, and	2 900	2 220	2 290	2 070	1 800	1 750	1 660
from oil and natural gas	16 000	…	…	…	11 500	11 300	11 200
Agriculture	5 061	4 921	4 741	4 511	3 831	3 676	3 362
Waste	1 941	1 951	1 951	1 951	1 951	1 770	1 770
Land-use change and forestry	401	401	401	401	401	400	400
TOTAL CH_4	**26 504**	**…**	**…**	**…**	**19 613**	**19 064**	**18544**

Source: Vtoroe Nacionalnoe Soobshenie Rossisskoy Federacii [Second National Communication of the Russian Federation], Moscow, 1998; FCCC/IDR.2/RUS, 27 September 2000; FCCC/SBI/2000/11, 5 September 2000

[23] At the initial stage of integrated impact assessment of global warming on Russia, climate change scenarios were developed by the Russian Institute for Global Climate and Ecology in cooperation with the Hadley Center, the UK and the Max Planck Institute, Germany using the outputs of five global circulation models. The climate scenarios of expected temperature and precipitation dynamics were then applied to different sectoral models. For example, in case of agriculture it was the climate-weather yield model run by the Academy of Agricultural Science; in case of forests it was the model for boreal forests run by the Institute of Forestry; and for water resources it was a set of water balance models for large Russian river basins of Roshydromet (FCCC/IDR.2/RUS)

Table 4-4. Dynamics of Nitrous Oxide Emissions by Source, 1990-1996 (Gg)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Fuel combustion	17.4	16.8	14.2	13.5	11.1	11.1	9.8
Industrial processes	3.0				1.2	1.0	1.0
Agriculture	200.0				110.0	110.0	105.0
Solvent use	2.0				2.0	1.3	1.4
Waste	0.3	0.3	0.3	0.3	0.3	11.5	11.5
Land-use change and forestry	3.0	3.0	3.0	3.0	3.0	3.0	3.0
TOTAL N_2O	**225.7**				**127.6**	**138.9**	**131.7**

Source: Vtoroe Nacionalnoe Soobshenie Rossisskoy Federacii [Second National Communication of the Russian Federation], Moscow, 1998; FCCC/IDR.2/RUS, 27 September 2000; FCCC/SBI/2000/11, 5 September 2000

4.1.2. Japan

a. Emission Profile

Japan's quantified commitment under the Kyoto Protocol is to reduce its GHG emissions 6% from its Kyoto Protocol baseline.[24] In September 2000, the Environment Agency[25], the latest figures for GHG emissions in Japan since 1990 (see Table 4-5).

Table 4-5. Annual GHG emissions (Mt-CO_2-equivalent) in Japan from 1990

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO_2	1,124.4	1,147.8	1,162.2	1,144	1,214.1	1,221.1	1,236.9	1,233.9	1,187.6	1,234.8
CH_4	32.3	31.9	31.6	31.5	31.1	30.9	30.2	29.0	28.6	
N_2O	18.1	17.6	17.7	17.6	18.9	19.3	20.3	21.1	19.9	
HFCs	17.6	18.1	19.4	20.9	28.1	29.8	30.0	33.6	31.6	
PFCs	5.7	6.4	6.4	8.7	11.7	15.3	16.2	16.4	17.8	
SF_6	38.2	43.5	47.8	45.4	45.4	52.6	50.2	49.7	50.0	
Total	1,236.3	1,265.2	1,285.2	1,268.1	1,349.4	1,369.0	1,383.8	1,383.7	1,335.5	
% change from Kyoto baseline	–2.8%	–0.6%	1.0%	–0.3%	6.0%	7.6%	8.7%	8.7%	5.0%	9.8% (CO_2)

Source: Environment Agency, 2000 (emissions data); Institute for Global Environmental Strategies (IGES), Tentative estimation for Japan's 1999 CO_2 emissions, Dec. 2000.[26]

[24] "Kyoto Protocol baseline" is defined as the aggregated GHGs emissions using global warming potentials (GWPs) with appropriate base years; i.e., the year 1990 for CO2, CH4 and N2O, and the year 1995 for HFCs, PFCs and SF6. Table 4-5 shows its figure as 1,272.5 Mt-CO2(equivalent)/yr.

[25] Currently the Ministry of the Environment after major government reorganization in January, 2001.

[26] The 1999 figures in this paper are tentative ones. CO2 emissions data including non-energy use are based on IGES estimation and energy-CO2 data are by the tentative announcement by MITI.

Table 4-5 shows that Japan's emissions grew to 8.7% above its Kyoto baseline (1,272.5 Mt-CO_2(equivalent)/yr) by 1996, then declined for two years in a row, to about 5% above the Kyoto baseline (or 8% above the 1990 level). However, in 1999, recovery of economy and other factors such as reduced availability of nuclear power plants have increased its CO_2 emissions again, almost to its record 1996 level, at nearly 10% above its 1990 level. As with many countries, weather is also a factor in emissions. The reason for the decrease in CO_2 emissions in 1993 and its increase in the following year can be attributed to an unusually cool summer followed by a very hot one.

For comparison, during 1990 to 1998, GHGs emissions in the United States, Canada, and Australia grew by about 11%, 13%, and 17%, respectively; while those of the European Union (not including fluorinated gases) decreased until 1993, and have crept back up to just slightly below their 1990 levels since then.

It is noteworthy that emissions per unit of GDP, a proxy figure for efficiency, decreased for three consecutive years since 1995. This suggests that, while recession was the chief cause of the latest decline in GHG emissions in Japan, other factors seem to have played a role. An example of such factors is increased capacity utilization of nuclear power plants.[27]

One notable characteristic of Japan's emissions is that CO_2 accounts for 90% of total GHG emissions. This means that energy-related measures must play a dominant role in mitigating climate change in Japan. Sources of non-CO_2 GHGs, such as landfill (CH_4), agriculture (CH_4, N_2O), cattle farming (CH_4), and the aluminum industry (PFCs), are limited in Japan. This is in contrast to the EU and the US, where non-CO_2 gases account for about 20% of GHG emissions, and various measures to drastically reduce non-CO_2 emissions may "alleviate" the burden on CO_2. For example, recovery and utilization of landfill methane provides a major opportunity for GHG reduction in many countries, but much of municipal waste is incinerated in Japan due to the lack of space available for landfill.

In the following, we attempt to clarify the characteristics of the energy-related situation in Japan in the context of the long-term historic background.

Japan's energy situation over time can be divided into the following three periods.

- Period up to 1973
- Period from 1973 to 1986
- Period from 1986 to present

These stages are illustrated in Figure 4-1.

[27] Capacity utilization factor, which affects the CO2 emissions in the electricity generation sector, increased from 727% in the year 1990 to a record 84.2% in the year 1998. It fell to 80.1% in the year 1999.

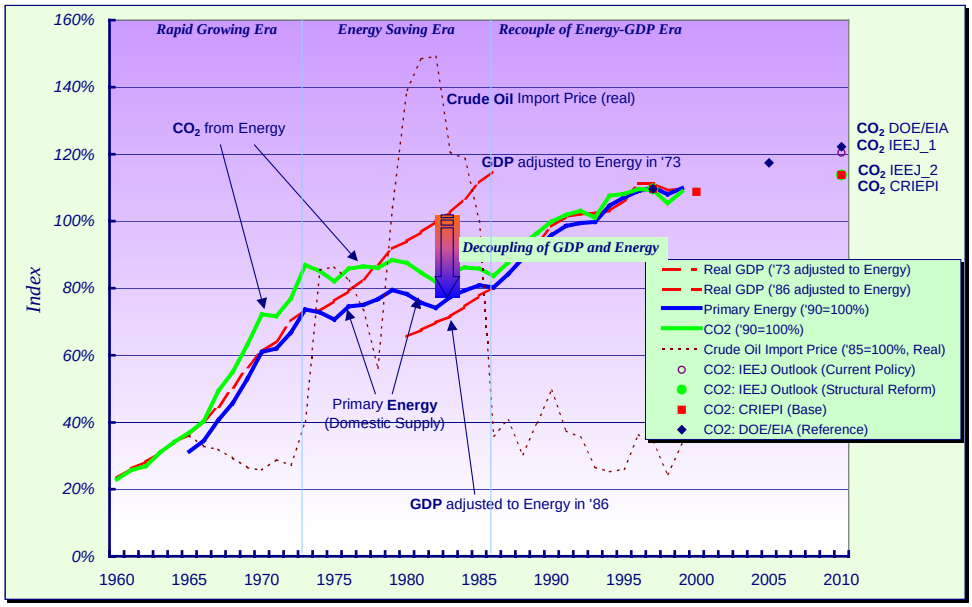

Figure 4-1. Long-Term Trends of GDP, Energy, CO_2 and Crude Oil Price[28]

Period leading up to the first oil crisis (–1973). In the years leading up to the first oil crisis in 1973, GDP, primary energy consumption and CO_2 emissions grew at almost the same pace as the economy (around 10% per year). This indicates that energy conservation and fuel switching to low-carbon energy sources such as gas, hydro and nuclear did not take place. At the time of the first oil crisis in 1973, the energy supply structure of Japan was very vulnerable because the dependence on imported oil in the primary energy supply reached around 77.4%.

1973 to 1986: decoupling of energy and economy. A big turning point was experienced in 1973, when the first oil crisis struck Japan. During the course of the two oil crises, Japan began promoting energy conservation and development of alternative energy sources (coal, nuclear, and renewables) in addition to increasing its oil storage, to mitigate the impact of anticipated elevation of oil prices. As a result, Japan succeeded in decoupling GDP growth and energy consumption growth. The shift from an industry-oriented to a service-oriented economy also helped this transition. Despite the high annual GDP growth (at 3.5% per year), domestic primary energy consumption grew only by 0.7% per year, and CO_2 emissions decreased 0.3% per year during this period. New policies such as the Energy Conservation Law (1979) targeted both supply and demand sectors to reduce oil dependence. Voluntary efforts to conserve energy were taken not only in the industry sector but also in the residential and commercial sectors. These experiences provided opportunities for Japanese industries

[28] "GDP adjusted to Energy in '86" means that the index of GDP is aligned with the index of primary energy consumption of 1986 with respect to 1990. In general, GDP growth drives energy consumptions. This figure shows that the energy traced almost the same trajectory as that of GDP until 1973, and also from 1986 onwards. The intervening period (1973 to 1986) is characterized by sharp increase in crude oil imported price, which promoted energy conservation, resulting in decoupling of GDP and energy. Fuel switching from high to low carbon intensity fuel can be shown from the difference between energy growth and CO_2 growth.

to develop energy efficient technologies and strengthen their international competitiveness.

Japan was one of the countries most affected by the oil crises, since Japan is heavily dependent on imported fossil fuel. Through bitter experience during the oil crises, energy security became the primary objective of Japan's energy policy, and various measures aimed at reducing the dependence on oil imports (especially from the Gulf states) and pursuing an "optimal" energy mix were put in place. This has led to the promotion of diverse energy sources (in particular nuclear) and energy conservation. Promotion of non-fossil energy sources were carried out, using the earmarked taxes on imported oil and natural gas (the General Petroleum Excise Tax and the Petroleum Tariff), and a tax on electricity consumption was used for new power plant development (the Electric Power Source Development Promotion Tax).

From 1986 to present: facing difficulty. The period after 1986 is characterized by two contrasting economic conditions; the period of rapid growth during the "bubble economy" of 1986 to 1991, followed by a period of economic stagnation, which continues until present. Energy consumption soared in the former, but stagnated in the latter. Both, however, can be characterized by the lack of improvement in the overall energy efficiency.

After the sharp decline of oil prices in 1986,[29] GDP and energy consumption resumed a concurrent growth pattern, with both growing by 3% per year or more. The bubble economy of the late 1980s boosted this tendency. Since 1986, it has become ever more difficult to decouple GDP and energy consumption.

The linkage between GDP and energy consumption continued into the 1990s, when the economy hardly grew. From 1996 to 1999, energy consumption was almost stable, while GDP declined. This implies a decline in energy efficiency. As mentioned before, this has not led to increased CO_2 emissions per GDP, due to factors such as increased use of nuclear power.

b. Vulnerability and Impacts

Japanese vulnerability and impacts of climate changes come principally from extreme climate events including sea level rise and possible linkage between the global warming and the local environmental pollution. Compared to the other nations in the Asia-Pacific region, Japan has the technical and economic superiority that helps to build efficient adaptation capabilities.

[29] In spite of the sudden increase in oil prices in the year 2000, prices are at pre-oil-crisis levels in *real* terms in Japan, as shown in Figure 4-1(imported CIF price incorporates the effect of exchange rate). The Plaza agreement of 1985 brought about a continuous appreciation of the Japanese currency, which also helped lower the oil price.

In general, Japanese industries and society heavily depend on imported natural resources that are very sensitive to the extreme climate events. Due to the urban structure and the lifestyle, transportation infrastructure and networks act as a life-line for the socio-economics and daily living in the urban areas which are sensitive to the extreme weather events. About 50 percent of the total country's population is concentrated is the urban areas whose 70 percent assets are located in the flood-prone area (Sakai, 1988). In the case of major road malfunctioning due to flooding, impacts are severe.

Box 4-1. Summary Extreme Events in Japan

1984	Cold winter, hot summer
1985	Hot summer
1986	Low rainfall (western Japan, Autumn)
1987	Warm winter, little rain (spring)
1988	Long rainy season
1989	Warm winter
1990	Warm winter, hot summer, little rain in rainy season
1991	Warm winter, heavy rain in eastern Japan in Autumn
1992	Warm winter, heavy rain in western

In recent years Japan has experienced the growing trend of the less rainfall. This has serious implications to the availability of the water resources, whereas, water demand is increasing due to higher quality of life. Severe droughts were observed in 1967, 1973, 1978, 1984 and 1994 in Japan (Nishioka and Harasawa, 1998). In Sikoku Island, water storage in two reservoirs has fallen to around zero (Takahashi, 1994) and lake Biwa water level has already declined since 1994. Agriculture is the major primary industry which is very much affected by the changes in the climate systems. Major loss in the crop production, including rice, resulted in response to the cool summer of 1993 and hot summer and low rainfall in 1994 (Miyata, 1994; Ito, 1994). Hot summer of 1994 also resulted in dying of dairy cows, pigs, and other domestic animals.

In energy side, hot summer increases the demand of the electricity generation and capacity built-up by off-balancing the demand-supply situation at the critical hours of the day. Although electricity generation from hydropower is less than 8 percent of total generation in Japan, the hydro-power generation might face severe problem due to less rainfall, drought and silt accumulation/increasing runoff.

Japanese coastline amounts to about 34,390 Km (Data book of Sea Level Rise, 2000). Under normal conditions at present, about 861 Sq. km are below the zero-meter altitude area from the sea where 2 million people live with the assets of 54 trillion yen. A study by Matsui et al. (1993) reported that if sea level rise by 1 meter, this zone will expand to 2.7 times affecting population of 4.1. millions with assets of 109 trillion yen. At the same time the flood prone area which is currently 6,270 Sq, km will expand to 8,900 Sq. km by 1 m sea level rise (Matsui et al., 1993). The socio-economic system is considerably vulnerable of such rise in the sea level. Such rise will be accompanied with the

increasing events of the typhoon and the storms whose implication would be site specific. A study by Tsutsui et al. (1993) estimated a significantly high water level for Tokyo Bay in storm surges and intensified typhoon under global warming.

The impact of the global warming on the environmental quality is very evident. Photochemical smog, in particular, has very close relation with the warming. In Gumna prefecture in 1994, 18 warnings of the photochemical smog were issued (nishioka and Harasawa, 1998). Similarly, river water quality, lake water quality and ground water quality area also affected by global warming. However, further research is needed to establish the exact relations between the global warming and their local environmental quality.

4.1.3. China

a. Emission Profile

Economic Development Issues of China. China is largest developing country in the world in terms of the population and the size. After the economic reform and the opening of Chinese market to the world, the economic growth rate is at high level. The total GDP of China will be over 1000 billion US$ in 2000 and the total value of export will be over 200 billion US$.

However, per capita income and GDP are still very low in the world. Per capital GDP was only 760 US$ in 1999. About 34 million peoples are living below the poverty line (world development report 2000/01). A lot of people in rural and remote area are insufficient or no electricity,. Therefore the economic development and improve the living standard are the main target of national development strategy.

The growth rates of Chinese GDP have been going down since 1992, from 14.2 percent in 1992 to 7.1 percent in 1999, which means the economic development of China went into adjustment period or fluctuate period from high increase period. Therefore, the economic growth type went into a over supply and framework adjustment stage from production supply insufficient stage, in other words it went into the quality and value added improvement from the quantity expansion.

According to the “tenth five year plan” and other economic development plans, emphasis was placed on the elements of value added, quality, and framework keeping the same level of economic growth rate. The economic growth rate from 2000 to 2010 is to be kept of about 7.2% every year, and the economic aim is to double the GDP in 2010. But the Chinese government could face some serious barriers on economic development path and it might not be easy to achieve such goals.

The first and largest barrier is consumption tired. China is a largest developing country, the pull parameters of economic development is different as compared to other countries. China can not depend on single parameter such as export, consumption, investment, export, and other parameters are

all very important but, unfortunately the status of consumption tired could not be changed in recent years for the following reasons:

- the wealth distribution may become more serious, the income growth rate of large proportion of populations is relative slow as compared to the economic development. The key elements of barriers in consumption could not be solved though Chinese government kept the continuity of economic reform. It can not be touched due to the fact that's that corruption phenomenon increase following the economic growth. The per capital income of peasants increase only by 1.8 percent from last year (from January to June, 2000) while the growth rate decreased continuously since last three years. Though per capital income growth of people living at city and town is 7.7 percent (from January to June, 2000), government increased subsidy, interest rate decreased and the salary level increased in last year take the key role on it which can not be sustainable.

- the reform of education system, housing, medicine, welfare provided for the aged and others (from government and company to pay by self) all have the strong influence on income. The families must increase saving rate for those needs(though the interest rate is very low) before the built up of any social welfare system. The increase in saving take long time to turn into the real consumption.

The second barrier is the sluggish investment growth in recent year with the following main reasons:

- Over the nearly 20 years of high speed economic growth, the costs in China are higher than southeast Asian countries in some area and other attractive element could not be achieved to desired level (such as technology and others). Therefore, the foreign investment decreased in recent year and the decrease in foreign direct investment growth is 7.5 percent (from January to July, 2000).

- Collective and private investment increased slowly. The growth rate in 1999 is only 2.8% which is lower than the social total investment increase rate (5.2 percent). From January to July, 2000, the collective investment growth rate is 7 percent, private investment growth rate is 8.6% but yet lower than the social investment growth rate (12.1 percent). The private investment barriers could not be overcome due to the lack of relative financial support and constrains in some investment area.

- as the consumption tired and private investment increased slowly since 1998, government investment(activities, financial policy) become the main pull parameter for economic development. The national debts also is main investment composition, government investment from a short period economic adjustment policy turned to the middle period development pull policy. If it is to be forced to policy, maybe it will yield low benefit in future development.

The third barrier is instability of export. After the southeast Asian financial crisis, the export growth rate of China has decrease sharply with few percents growth in some times only, therefore there has been serious influence for economic development. In the beginning of the 1999, the export growth rate went up and had high growth speed in the second half of this year. The total export value increased 53.4 percent in January to June, 2000 compared to the same period in 1999 but it decreased by 2.9 percent in July to September, 2000 as compared to the same period in 1999. The unstable export increase made the economic development unstable in some degree. As the result, the Chinese economic development continued to go up in the recent years, which mainly depend on short period macroeconomic policy and external economic environment improvement. The main barriers that constrained the economic development could not be overcome such as framework issues, organization system issues etc. Therefore the internal forces to pull the economic development are not enough if China want to achieve the 7.2% increase rate of every year in the future ten years and the efforts to overcome some crucial barriers are needed.

Energy Consumption Trend and Energy Strategy of China. The energy structure of China is dominated by coal which depends on the energy resource strongly. Only few countries in the world has similar energy structure like China. The coal consumption accounts over 75 percent of total energy consumption but it decreased in recent years so that it was 67.1 percent in 1999. Yet it is relatively very high. The total energy consumption increased slowly and continued decrease in 1997, 1998 and 1999.

However the per capital energy consumption of China was only 0.97tce (tons of coal equivalent) in 1999 that was only half of the world average. The per capita energy consumption of United State was over 11tce and Japan was nearly 6tce. The per capital electricity of China was 977 kwh in 1999 (the United state was 11800kwh in 1998), per capital household electricity consumption was only about 115 kwh and lots of people living in the rural and remote areas have insufficient or no electricity.

We have to notice that the energy elasticity only was 0.5 in the past 20 years before 1996, and minus in 1997, 1998 and 1999. In other major developing countries, such as India, South Korea, and Brazil, energy consumption growth has exceeded economic growth. China has managed to uncouple energy growth from economic growth more effectively compared to even developed countries.

The main reason for low energy consumption growth in China is contributed to industry sector. The secondary industry had same GDP growth rate, the proportion of GDP were 48.51%(1980), 41.61%(1990), 49.34%(1998), but energy consumption growth rate of this sector was very low, the proportion of energy consumption were 68.51%(1980), 68.36%(1990), 72.63%(1998). The proportion of energy consumption of steel industry and chemical industry were 25.65%(1980), 22.36%(1990), 23.49%(1998), thereby the energy elasticity of secondary industry sector, especially for heavy industry sector make the contribution to low energy increase rate. That is different from other developing

countries and developed countries in the period of high economic growth. The reasons are the followings:

- the expansion of secondary industry sector, specially the heavy industry sector, with the high economic growth in other developing countries and developed countries could not be observed in China,. This is because China has similar industry framework as Russia that secondary industry sector, specially heavy industry sector, was large before the opening the door to the world. The reasons were national security and others, therefore China don't need to expand those sector but only need to reform it.

- the planned economic system made the low efficiency in manufacturing in China. In the planned economic system, the government makes the key role on investment, but the benefit is different as compared to the private investor, the benefit not only include maximum profit but also include tax, employment, and economic coordinate. Thus the local governments only invest in the area that are controlled by themselves, therefore, large amount of small and middle scale manufacturing entities were built up.

The project about energy saving in China that ERI (Energy Research Institute, China) cooperates with MRI, is supported by NEDO and thoroughly investigate and analyzes the energy intensive manufacturing of steel industry, chemical industry, and building material industry (cement, glass, and other) in China and Japan. This came up with the surprising results that, the first technology of energy saving in China enlarged the manufacturing scale which have over 10% energy saving rate. The second technology of energy saving is advantage technology (low than 10% the energy saving rate), the third is improvement of the management that only little low than the second parameter, this part research works was finished in 1997. That means there are huge potentials for energy saving from framework reform in China than technology improvement.

After China opens the door for the world, the local government have been enforced, the acting of government investment become more serious, add economic development on the supply insufficient period (before 1996). That means you can sold it if you can make it, therefore the local small and middle manufacturing entities, especially in the energy intensive industry and power generations area were expand quickly. This also exists now and can not be solved in the short period. Since 1997, the economic development of China turned to the quality improve type from quantity expand, thus type the demand for high quality material was increased and demand for low quality material was decrease. Therefore, the export of high quality energy intensive material increase quickly and low quality domestic production material have been kept long in stock. The Chinese government made the policy to control building of the small manufacturing and enforced to close some low efficient manufacturing entities, thereby the total energy consumption of China have gone down since 1997, and continued to 1999. Because the government could continue to make important role for investment

in China and the lifetimes of energy intensive manufacturing commonly would be 20 years, the low energy consumption growth rate might also be continued for over 10 years, before 2015. The total energy consumption increase rate could be kept at the low level.

Since 1993, China became a net petroleum import country and the petroleum import amount increased gradually. The petroleum import in 2000 could reach to 70 million ton. The petroleum production of China can only be kept at 165-170 million ton per year in 10-15 years of future, and there have serious environment problem (acid rain and air pollution in cities) due to use the large amount coal. The future energy demand growth could be mainly depends on petroleum and gas. The petroleum and gas import could increase steadily, in 2005, 2010, and 2015 when the petroleum demand could reach to 243, 296 and 360 million tons respectively. The imports could also increase and the energy security could become an important issue in the foreseeable future.

The CO2 emissions in energy sector could also increase slowly, the growth rate of it must be lower than the energy consumption growth rate, because the energy form could change in the future.

The vulnerability and impact of the climate changes in China

b. Vulnerability and Impacts

China is already burdened with a range of problems related to climate and natural disaster. Within its large arid and semiarid areas, for example, desertification and recurring drought are serious issues. Global climate change could serve to exacerbate those problems that already exist and may present new ones as well.

Natural Disasters. The East Asia area is monsoon area where the rain is highly concentrated in summer season, climate undulate could become more violent. As the temperature goes up, the natural disasters could be more frequent.

Throughout the history, China has been experiencing many droughts and floods, the frequency of which might increase with climate change. According to historical records, more than 1,000 severe droughts occurred between 206 BC and 1949. Since 1949, severe droughts occurred in 1959, 1960, 1961, 1972, 1978, and 1997. The last three of these were extremely serious and extensive. The historical records also show that, throughout history, there have been a similar number of major floods occurring predominantly over the middle and lower reaches of the Yangtze River, Yellow River, Huaihe River, and Haihe River, which together cover the major agricultural zones of China. Since 1949, most major rivers have been partially controlled and many water conservation projects have been undertaken to help in reducing the flood damage. Despite this work, floods have still resulted in serious damages. Based on statistics, up to 7.34 million hectares of farmland was inundated by floods between 1950s and 1970s. Of this land, over 4 million hectares was seriously damaged.

Despite all the stepped-up control efforts made in recent years, extremely severe floods occurred along the Yangtze River or in South China in 1991, 1996, 1997, and 1998. These recent experiences point to the potential difficulty that China would have in adapting to an increase in the frequency of major floods and droughts, as might occur with global warming.

The potential impact of climate change on the behavior of the El Nino-Southern Oscillation (ENSO) is also of vital importance to China. The frequency of occurrence of droughts, floods, and typhoons in some regions of China has been found to correlate with the occurrence of ENSO. While the relationship is complex, it suggests that there would be further links, in addition to those mentioned above, between climate change and natural disasters.

Agriculture. Agriculture is of vital importance to China, as rural residents make up 70% of the total population. A substantial decrease in precipitation has already occurred over eastern China's farming regions. Some research done on Northeast China, one of the major industrial and agricultural regions of Asia, has indicated that the annual precipitation in that area has been decreasing since 1965, while average temperatures have risen by up to 1°C over the last 100 years. (It has also been found, however, that temperatures have actually dropped slightly in parts of Southern China). The frequency of drought has increased in many agricultural areas, while precipitation is more focused in short periods, leading to increased frequency of floods and inundation of large areas of farmland. Arid and semi-arid areas occupy a considerable proportion of land. All these factors make it potentially difficult to undertake water conservation projects to reduce flood and drought damage. Irrigation has become even more vital, with two thirds of the country’s grain, and 80% of the vegetables being produced on the 45 million ha equipped with effective irrigation facilities. If China were rich in water resources, one of the main approaches ensuring China’s food security would be to increase the irrigated areas. However, China is already approaching the maximum capacity to irrigate farmland. Any potential future water shortage due to climate change would threaten the sustainability of north China's agricultural development and increase the difficulties of increasing irrigated land area.

Forestry. Forestry is another key land use sector in China, that not only supply wood and other forest products, but also play a key role in the environmental protection. Major afforestation projects are underway to help control erosion and provide shelter. The options for extending forested land, however, are limited, principally due to inadequate rainfall in large parts of the country. Forest cover of China, which may be potentially enlarged only to 25%, given rainfall, is currently less than 14%. With temperature rise and other climatic changes, this situation could worsen. Forest fire is a severe problem in China and frequent forest fires have annually caused losses of over 800,000 ha of forests. Any damage to forests caused by various disasters greatly decreases the CO_2 assimilation capacity of forest ecosystems. With temperature rise and other climatic changes, then, consequent changes in forest fire frequency and intensity would also be of great concern.

Water Resource. Water is unarguably the most important natural resource for the future economic development of China. Water shortages have already become one of the greatest constraints on further development of both the urban and rural economy. Climate change may greatly influence water supply and demand and further exacerbate the imbalances that have already been occurring in many parts of China. Potential water shortage due to climate change may be a threat to China's ability to achieve sustainable development of its economy.

Coastal Area. Coastal inundation and an increase in natural disasters in coastal areas potentially brought about by climate change are also serious considerations for China. The Chinese mainland coastline is about 18,000 km long, with the coastal zone accounting for 13% of the nation's total land area, 42% of its population, and 60% of GDP. Consequently, the eight littoral plains and many estuarine deltas that make up the Chinese coastal zone would be very vulnerable to impacts from climate change. Around 11% of the area of China's coastal zone lies below 5 meters elevation and is thus particularly prone to the influence of sea level rise and storm surges, while saline intrusion into estuarine waters and groundwater threatens coastal ecosystems and freshwater supplies. Currently, tropical cyclones, or typhoons, may reach as far as 40°N in China, although most make landfall along the coastline south of Zhejiang Province. On annual average, about 28 typhoons affect the offshore areas of China and about eight affect inland areas, with the number varying greatly from year to year. Storm surges over one meter high occur, on average, six times annually at various locations on the Chinese coast, with those over two meters high occurring at least once annually. Rising sea level and an increase of typhoon frequency or intensity, both potential consequences of climate change, would increase the frequency of such storm surges.

Public Health. The public health is usually influenced directly by natural disasters and indirectly by disease vectors. Climate change may result in rising of temperature and sea level, changes in urban weather, heat stress, and local air pollution, and then may threaten human health. In China, especially, cardio-vascular diseases and vector-borne schistosomiasis, which are closely related to heat stress, would be priority concerns.

4.1.4. Korea

a. Emission Profile

Economic Development.The Republic of Korea has experienced dramatic economic transformation over the three decades based on export-led industrial development. Korea, one of the first "Newly Industrializing Economics"(NIEs), has achieved this economic transformation despite its relatively poor endowment of natural resources. Economic development in Korea was accompanied by a series of 5-Year Economic Plans - there were 8 5-year plans started from 1962 ended in 2000. Growth of GDP has averaged over 8% per annum since 1980 to the middle of 1990's. This industrialization was

largely based on the development of energy-intensive heavy industries. However, Korean economy faced the financial crisis in 1997, together with the Southeast Asian crisis, before the efforts to make a major transformation of industrial structure were started. It is assessed that "the fundamental cause of the crisis lies on structural weaknesses and pervasive moral hazard problems in the Korean economy (First-Half Economic Achievements of Kim Dae-jung Administration, Ministry of Finance and Economy, August 2000)".

The Korean economy is in the process of the structural reform and various policy efforts are being made by the government to recover the crisis for the past three years. However, instability in the financial market still lingers, and its trade surplus has been on a declining trend with import growth outpacing export performance recently. The Korean government is now placing a higher priority on building a knowledge-based economy and nurturing venture businesses (Keynote Speech for the IMF/World Bank Annual Meeting by Jin Nyum, Minster of Finance and Economy, September 27, 2000).

Table 4-6. Trends of GDP Growth Rates

year	1975	1985	1990	1995	1996	1997	1998	1999
growth rates(%)	6.6	6.5	9.0	8.8	6.8	5.0	-6.7	10.7

Source: Major Economic Statistics, Ministry of Finance and Economy, http://www.mofe.go.kr, December 2000[30].

Outlook on Economic Growth. Rebounding from the crisis of 1997-1998, a recent International Monetary Fund (IMF) report (World Economic Outlook, September 19, 2000) predicts that Korea's GDP will grow 8.8 % in 2000 and the recent rapid growth pace will slow to 6.5 percent in 2001. The Organization for Economic Cooperation and Development (OECD) also predicts that output growth of Korea will continue slowing from the nearly 11 per cent rate recorded in 1999 to a more sustainable level close to 6 per cent in 2001 and 2002 (The OECD Economic Outlook 68, OECD, November 21, 2000).

According to the report of the Korea Institute for Industrial Economics & Trade (Lee, 1999), it is expected that the growth leading industries in the Korean economy will be the service industry while the share of manufacturing industry in the GDP will show its slow reduction. However, the intra-structural transformation of manufacturing industry will be expedited due to the development of knowledge-based and technology-intensive industries, increased stability of the existing industries and more flexible production system. Within the manufacturing industry, the share of info-communication equipment, bio-technology, environment and new materials industries in GDP will be increased significantly. Per capita GNP is expected to reach the current OECD average, US$20,000, after the

[30] GDP growth rate indicates % change on year earlier.

year 2010.

Table 4-7. Projection on the Value-added Production by Sectors (Billion Won, 1995 price, %)

Sectors	1995	2000	2010	2020
Primary industries	24,071(7.2)	24,120(5.7)	25,001(3.5)	27,834(2.5)
Manufacturing	94,409(27.7)	116,535(27.6)	199,611(27.9)	302,831(27.3)
Electricity and water supply	7,976(2.3)	9,911(2.3)	16,796(2.3)	26,100(2.4)
Services	213,800(62.8)	271,963(64.4)	474,189(66.3)	754,534(67.8)
Total	340,257(100)	422,529(100)	715,597(100)	1,111,300(100)

Source: A study on the successful transit to the energy-saving and clean industry structure, KIET, '98. 7.

Trend of Energy Consumption. The Korean Government has continuously put top priority on energy conservation and efficiency in implementing energy policies since more than 97% of Korea's energy demand is met by imports. The primary sources of energy are oil, coal and natural gas in Korea and anthracite coal is the only indigenous energy resource that has been commercially produced and sold in Korea (MOCIE, 2000).

Energy consumption in Korea increased rapidly according to the industrialization of the 1970s. Energy consumption by sector shows that the increase in energy consumption was led by the industrial sector as energy-intensive industries such as iron & steel and petrochemicals expanded. Energy consumption by transportation sector has escalated due to the rapid increase of passenger cars (MOCIE, 2000).

Table 4-8. Share of Energy Consumption by Sector (%)

Sector	1975	1980	1990	1995	1998
Industry	38.4	44.1	48.1	51.6	57.5
Transportation	9.0	13.0	18.9	22.3	19.8
Residential & commercial	45.3	37.3	29.3	24.1	20.8
TPES(thou. TOE)	27,553	43,911	93,192	150,437	165,932

Source: Yearbook of Energy Statistics, 2000, Korea Energy Economics Institute (KEEI); Korea's Efforts to Harmonize Energy, Economy and Environment, Ministry of Commerce, Industry & Energy, Jan. 2000).

According to the National 10-year Energy Plan by the Ministry of Commerce, Industry & Energy, the energy demand of Korea is expected to grow steadily, from 150.4 million TOE in 1995 to 328.1 TOE in 2010. The annual average growth rate of energy demand between 1996 and 2010 is expected to be 5.3%.

Table 4-9. Energy Demand Projection in Korea

	1985	1990	1995	2000	2005	2010	AAGR(%)	
							86-95	96-10
Primary energy demand (million TOE)	56.3	93.2	150.4	213.4	272.9	328.1	10.3	5.3
Final energy demand (million TOE)	47.0	75.1	121.9	169.9	212.6	251.2	10.0	4.9
Energy/GDP (TOE/90 million Won)	0.51	0.52	0.58	0.60	0.58	0.54	1.5	-0.6
Per capita energy consumption (TOE)	1.4	2.2	3.4	4.6	5.7	6.6	9.3	4.6

Source: The National 10-year Energy Plan, Ministry of Commerce, Industry & Energy, 1996, National Communication of the Republic of Korea, 1988 submission of the ROK under the United Nations FCCC, February 1998[31].

Trend of GHG Emission CO_2 emissions in Korea have increased rapidly according to the increase of energy consumption. While the transportation sector has the highest emission growth rate due to sharp expansion of vehicles, those in the residential and commercial sector have been decreasing since the beginning of the 1990s by the increase of LNG and electricity use.

Table 4-10. CO_2 Emission Trend by Sector (mil. TC, %)

Year	Total	Industry	Transfor-mation	Transpor-tation	Residential & Commercial
1981	37,076 (100)	12,135 (32.7)	7,525 (20.3)	3,042 (8.2)	14,373 (38.8)
1991	71,616 (100)	27,600 (38.5)	12,139 (17.0)	13,130 (18.3)	18,748 (26.2)
1998	102,077 (100)	38,426 (37.6)	25,865 (25.3)	21,223 (20.8)	16,563 (16.2)

Source: Korea's Efforts to Harmonize Energy, Economy and Environment, Ministry of Commerce, Industry Energy, Jan. 2000.

High growth rates of energy consumption and CO_2 emissions are due to the fact that the Korean economy is still in its manufacturing-based growth stage. It is projected that CO_2 emissions of Korea would increase, at an annual average rate of 5.2%, from 101.1 million TC in 1995 to 217 million TC in 2010 (National Communication, 1998).

[31] The Korean Government is now revising the existing energy demand forecast to reflect repercussions of the recent economic crisis on the future energy demand.

Table 4-11. CO_2 Emissions Projection in Korea

	1985	1990	1995	2000	2005	2010	AAGR(%)	
							86-95	96-10
CO_2 Emissions (million TC)	44.0	65.2	101.1	148.5	187.4	217.0	8.7	5.2
Per capita CO_2 Emissions (TC)	1.1	1.5	2.3	3.2	3.9	4.4	7.7	4.5
CO_2/GDP (TC/90 million Won)	0.39	0.36	0.39	0.42	0.40	0.36	-0.1	-0.7

Source: National Communication of the Republic of Korea, 1998 submission of the ROK under the United Nations FCCC, February 1998.

b. Vulnerability and Impact

Natural Resources. The Republic of Korea occupies the southern half of the Korean Peninsula. Its land area is 99,313km^2 and forest land makes up 65.9% of the national land area. The east, west and south costs of the Korean Peninsula are bordered by the East Sea, Yellow Sea and South Sea respectively, and the extended length of coastal line is more than 11,500km The area of the coastal shelf(sea bed) is 345,000km^2, which is 3.5 times the land area. Average rainfall in Korea is 1,274mm, which is higher than the world average rainfall of 970mm. However, the annual volume of precipitation per capita is 3,000m^3 and this is only 1/11 of the world average 34,000m^3.

Korea's climate is temperate, with four distinct seasons, and seasonal temperature fluctuations are si gnificant. Korea is very densely populated. In 1998, Korea's total population was 46.4 million, placing it among the most densely populated countries in the world, with 467 people per km^2 (National Communication, 1998).

Although it is known that about 70 mineral resources have economic values in Korea, most of reserves are small and extraction costs are high. Coal is the most abundant mineral resource in Korea, but its quality is low and mining cost is high. The energy resource base in Korea is very poor. Consequently, overseas dependence ratio of energy resources is very high. It was 73.5% in 1980, 87.9% in 1990 and 97.8% in 1996 (National Communication, 1998). In Korea, there exist approximately 8,300 taxonomy groups of plants and about 18,000 animal species surveyed and recorded as inhabiting (MOE, 2000). The major agricultural resources are foods and livestock feeds.

Impact on Natural Ecosystem, Society and Industry. Outcomes of the government funded studies in recent years (KIST, 1993) indicated that serious consequences would follow if CO_2 concentration arou nd the Korean Peninsula doubled. The main consequences might include changes in temperature, as w ell as in the amount of precipitation and river flows. According to the studies, done by the Korean Insti tute of Science and Technology (KIST) and other research groups from 1993-1994, the temperature could rise by 1.0-4.0℃, with a probable range expected to be between 2.0℃ and 2.5℃, and North Korea and the East Sea coast would have greater temperature changes than midw

est coastal areas. Amounts of precipitation and river flows would also increase. The southern coastal ar eas and the lower southern regions would be transformed to a subtropical zone from a temperate zone.

While latent crop productivity might increase due to a prolonged summer season, it is anticipated that it would be difficult to maintain normal levels of production of perennial temperate zone fruits such as apples, grapes, pears and peaches. Land areas available for cultivating semi-temperate zone vegetation would expand. But temperate zone and semi-boreal zone vegetation would decrease exponentially in diversity and some would be in danger of extinction. A certain sea level rise would result in many problems, especially for the southern and western coastal areas, and destroy the ecosystem. Marine life around the Korean Peninsula would also face serious consequences including a decrease in the number of cold-water aquatic species (KIST, 1993; National Communication, 1998).

4.2. International and Domestic Climate Change Policies

4.2.1. Russia

a. International Policies

National Commitments. By the end of the century Russia turned into an important player within climate change international regime. Russia has been among the first in the group of countries that signed the FCCC at the Rio Summit[32]: it signed the convention 12 June 1992, and ratified it on 28 December 1994 after the subsequent approval has been issued by the Russian parliament. Russia is a member of Annex I of the FCCC. Under the convention its major obligations can be summarized as follows:

- to develop and implement national policies and measures to mitigate climate change by limiting anthropogenic GHG emissions and by enhancing sinks and reservoirs. All measures to mitigate GHG emissions and enhance their sinks should be aimed to return to the level of its anthropogenic emissions of carbon dioxide and other GHG in 1990, as a base year;
- to assess regional environmental and economic consequences of vulnerability to climate change; to develop and implement measures for adaptation of the economy to climate change;
- to carry out inventories of anthropogenic GHG emissions and sinks according to methodology developed under the convention, and to provide regular national reporting;

[32] During the UNCED conference Russia also signed the Biodiversity convention and supported *Agenda 21*, as well as principles of rational use, conservation and utilisation of forests; UNCED process was combined with further activisation of its participation in international environmental cooperation as a part of formation of its new environmental policies at the beginning of the 1990s. Currently Russia is a party to about 80 international environmental agreements and major protocols to them, the major part of which it has inherited as a successor of the Soviet Union (For details see, V.Kotov, E.Nikitina, 1995)

- to undertake scientific research and monitoring on climate change, to contribute to education and to public awareness to global warming.

Russia has signed the Kyoto Protocol 11 March, 1999, but it has not ratified it yet[33]. It is a member of Annex B group of countries. Together with twelve other parties of Annex B it has a special status as a country undergoing the process of transition to a market economy. It has retained[34] 1990 as its base year, and its quantified emission limitation is established as 100 percent of the base year.

National Compliance. So far, there are several important milestones in Russia's national compliance with its commitments under the climate change international regime[35].

First, Russia is currently among the few countries in compliance, or even significant over-compliance with the quantitative emission limitation targets of the climate change regime. Although official data on GHG emission in 2000 in Russia is not available yet, some expert estimates suggest that emissions were about 31 percent lower than in 1990(Energeticheskaya, 2000). Even if the emissions started to grow at the turn of the century, they are not expected to reach the 1990 level during the first commitment period in 2008-2012. The three decades dynamics (1990-2020) of carbon dioxide emissions from the Russia's energy sector, which is based on the forecasts of the recent Energy Strategy up to 2020, is presented in Figure 4-2. This is a quite unique situation for Russia in terms of national compliance with international environmental commitments, as the USSR traditionally had serious problems achieving the targets of a number of international treaties.[36]

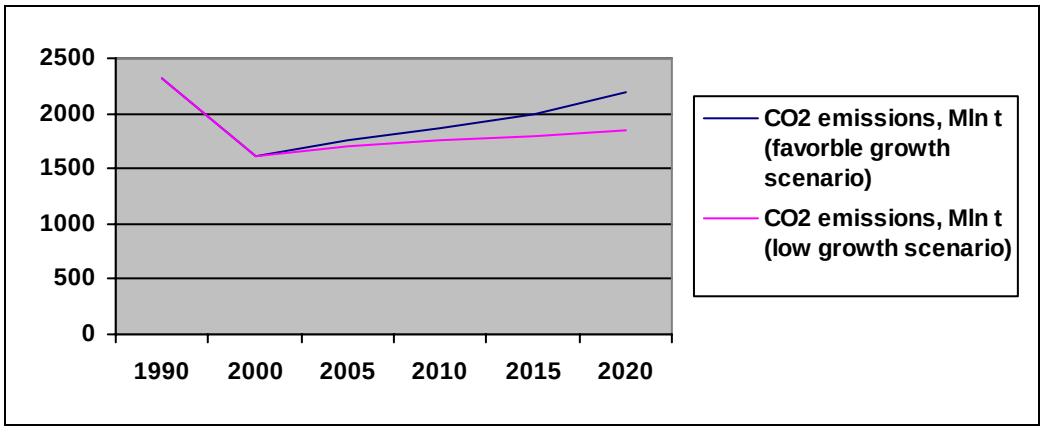

Figure 4-2. Dynamics of Carbon Dioxide Emissions from Energy Sector in Russia

[33] Among the NIS countries Georgia, Turkmenistan, and Uzbekistan had ratified the Kyoto Protocol

[34] Russia did not use the flexibility clause provided to countries with economies in transition under art. 4.6 of the FCCC, to select a base year other than 1990

[35] The results of research on domestic and international policies are published in the following article: E.Nikitina. Russia: climate policy formation and implementation during the 1990s. *Climate Policy*, 1(3), 2001

[36] Similarly to the FCCC, currently, Russia is in compliance with many international environmental agreements and protocols to them which contain quantified targets of emission limitation, such as, for example, the Baltic Sea international regime, the Acid Rains international regime, and some others. It is also attributed to domestic emission cuts mainly due to decline in economic activities

Second, according to articles 4 and 12 of the FCCC, Russia has compiled national inventories of domestic anthropogenic GHG emissions and sinks and has submitted national reports to the FCCC secretariat in the 1st and the 2nd National Communication of the Russian Federation (NC). The second communication contains much thorough data on emissions and sinks, and the IPCC guidelines are followed to a greater extent than in the previous one (Kotov, Nikitina, 1996). For example, it included estimates of the three main GHG, i.e. carbon dioxide, methane and nitrous oxides, and also preliminary estimates for hydrofluorcarbons (HFCs) and perfluorcarbons (PFCs). Its inventory also contains estimates of nitrogen oxides (NOx), carbon monoxide (CO), and non-methane volatile organic compounds (NMVOCs) and partial estimates of sulfur dioxide (SO2).[37] According to the 2nd Report on In-depth Review for the FCCC Secretariat "the inventory was broadly in-line with the IPCC guidelines" being based on the 1996 revised IPCC guidelines for national GHG inventories (FCCC/IDR.2/RUS). However, there are still some problems with transparency, verification, and data quality, with correlating the domestic statistical format with international requirements since inventory was compiled mainly on top-down basis. In addition, there have been problems with reporting about major types of strategies, policies and measures to mitigate and adapt to global warming. For example, 2nd communication contains information on policies and measures to mitigate carbon dioxide and methane only, while other gases were not addressed at all. There was no information about the type of policy instrument used, status of implementation, and especially, about effects of policies and measures achieved so far. More professional expertise is needed for the team undertaking inventory compilation, and particularly, in respect of policy and measures implementation and effectiveness (which are different categories than 'compliance')(Kotov V., et al, 1997).

Among significant recent innovations in domestic inventory process is compilation of regional and sectoral inventories of GHG emissions. In 1999-2001, five regions of Russia, including Archangelsk, Novgorod, Cheliabinsk and Sahkalin oblasts, and Hakassia autonomous republic (Sverdlovsk and Nizhegorodskay oblast were expected to produce their regional inventories in 2001), compiled bottom-up GHG inventories First attempts in GHG inventory compilation have been also undertaken by the companies. In 1998-1999 RAO UES has undertaken inventory of CO2, CH4 and N2O from electricity and energy producing facilities (at 357 energy enterprises contributing to 30 percent of national emissions). These have been an important step to improve the national inventory compilation process and to create the necessary prerequisites for application of the Kyoto mechanisms.

Third, during the 1990s domestic institutional capacity for implementation of the climate change international regime has been under formation, first slowly, and then getting additional impetus from the post-Kyoto process. However, it was seriously affected and deformed by the negative impacts of

[37] Some of the data has been substantially revised and recalculated in the 2nd NC. For example, its estimates for N2O emission levels for 1990 are 72 percent lower than in 1st NC, as they have been totally revised; while emissions for CO2 are 1 percent lower, and CH4 - 2 percent lower

'situational factors' rooted in the specifics of the transition period (see, Ch.5). After a decade of its formation the institutional framework cannot be assessed as well-structured and diversified, and much more efforts are needed to strengthen the climate change related institutions and to make them effective. The legal basis is not thoroughly developed yet, and along with rules and institutions focusing directly on climate policy, it is based on institutional design in related sectors, which was either an innovation, or significantly modernised during the 1990s. There is no special legal code relating to climate change, and existing legal framework includes three major blocks: a) a set of federal environmental laws (framework environmental code, and lows in particular sectors of environmental protection) b) a number of governmental resolutions on various aspects of climate change, and c) legal acts and norms in energy, forestry and other related sectors. In summer 2001, after parliamentary hearings on climate change, the State Duma recommended to the President of the RF to issue a decree on creation of domestic institutional mechanisms for cooperation within the FCCC which is expected to serve as a necessary foundation for capacity building in Russia. The first federal programme on climate change was underway in the nineties, and currently it is planned to adopt the next federal programme for the period of 2002-2006.

During the 1990s the administrative structure to regulate climate change was formed. It is represented by a special governmental body, i.e. Interdepartmental Commission on Climate Change (ICCC) established in 1994 which is presided by the RF State Committee on Hydrometeorology[38] with membership from representatives of 20 ministries, agencies and research institutions, and business. Its major goal is to elaborate and coordinate national climate policy, to be responsible for domestic implementation of the FCCC, and to serve as a national focal point for AIJ projects in Russia. Since its positions are quite weak in the current general structure of the government authority, the idea to elevate its status in the governmental hierarchy is considered.

During recent couple of years the role of the Russian parliament in climate change capacity building increased, and it became more actively involved in domestic and international policy making. In summer 2001, the ecological committee of the State Duma initiated the parliamentary hearings "Legislative support for the FCCC and its Kyoto protocol implementation", which can be regarded as an important milestone in domestic capacity building in Russia. Issues of the Kyoto ratification have been discussed, and most of the participants of the hearings supported its ratification. This issue is planned to be discussed in the government in the mid-March 2002. Among other important innovations has been the expansion of participatory structure and increased role of the business community, the regions and non-governmental organizations in the process. For example, the specialized Energy Carbon Fund (Box 4-2) was established under the RAO UES company; the Archangelsk oblast suggested being a pilot region to test application of the Kyoto tools at the regional

[38] Since recently it is co-chaired by a representative from the RF Ministry of Trade and Economic Development; it was done in order to strengthen its economic compound.

level. Various bodies to regulate realization of JI projects and emission trading are in the process of establishment, and competition among them is high. Starting from 2000 the concept of Green Investment Scheme is being developed in order to create a special fund accumulating revenues from emission trading with their further reinvestment into energy efficiency projects to reduce GHG emissions.

Fourth, during the 1990s Russia has been an active participant in cooperative AIJ activities. Implementation of AIJ and JI projects is an important item in its national climate policy and an important tool in meeting its international obligations under the FCCC regime. This mechanism corresponds to its current national strategies for international cooperation, for attracting foreign investments and for technology transfers. By 2001 nine AIJ projects have been internationally certified, and they are officially adopted by Russia and cooperative country designated authorities (Table. 6.4). Twenty nine feasibility studies projects have been performed in Russia jointly with the partners from Japan to survey the joint implementation potential, and although they cannot be classified as AIJ projects they appeared to be an important step in preparation for JI activities in the future (for details see Ch.6).

Major positions towards international mechanisms and the Kyoto ratification

The Kyoto Protocol appeared to be a turning point in the formation of the Russian national climate policy and in the evolution of its positions in the international negotiations. By the end of the last decade, due to the protocol Russia was turning into an important actor in international climate change regime. This is a new phenomenon for this country: although it was among the first to sign the FCCC its stance within the international negotiations and decision-making process has been quite modest at the very start of the regime formation. The major reason for such evolution has been introduction of the Kyoto mechanisms, in particular joint implementation and emission trading. As a result of its expected surplus, Russia expects to benefit if the Kyoto Protocol enters into force and the Kyoto mechanisms, especially international emission trading system[39], are operationalised. At the same time, this would allow the industrialized countries to meet their collective emission reduction target and to reduce costs of their climate mitigation efforts.

After the US withdrawal from the protocol, Russia's stance in its ratification has become especially important for this international regime entry into force. Along with the EU and Japan, Russia's decision about ratification determines its future prospects. Many experts consider that Russia might ratify it during 2002. In its turn, Russia is fully aware of its new position as a key actor, and actively uses the new situation to bargain for its interests at international level directly conditioning the

[39] Even in case of possible reduced revenues from emissions trading if US would not take part in this international system (demand for Russian emission quotas will be lower, and hence, their prices would be lower, and subsequently the revenues from international emission trading), the regime of the protocol is still advantageous for Russia since it introduces the compliance reserve, i.e. Russia is free to choose whether to sell its all excess quotas or 10 percent of its emissions in 1990 on condition that it is in compliance with the international obligations (provides inventory compilation, national quotas register and national reporting).

prospects of the Kyoto ratification with international support of its major positions. As a result, most of its requirements have been met within international negotiations, and Russia assesses the results achieved at COP-6 and COP-7 as corresponding to its major interests.

The major foci of Russia's international climate policy have crystallized by the turn of the century. The major positions of Russia to the Kyoto mechanisms are outlined below.

Russia is interested in wide application of the Kyoto mechanisms Its interests are defined by the possibility: 1) to attract foreign investments and technology transfers; 2) to generate additional financial revenues from international emission trading; and 3) to generate additional financial flows and reinvestments for energy efficiency modernization projects. Russia's potential sales in the international emission trading system would include three main components: 1) surplus assigned amount units (AAUs) available as a result of general economic dynamics, i.e. economic crisis of the nineties; 2) AAUs generated through mitigation measures aimed at emission reduction; and 3) emission reduction units generated through JI projects performed in Russia.

A vivid debate in Russia and abroad is centered on the evaluation of the market trading potential provided by Russia for the first commitment period in 2008-2012. The overall scale of the market and revenues from potential sales depends on a large number of variables, including the specifics and prospects of macro- and micro-economic development in Russia; unlike in stable societies, these trends are quite uncertain and difficult to predict due to turmoil of the transition period. According to some recent estimates of the Ministry of Energy, Russian carbon dioxide emissions might reach 80 percent of 1990 level by 2010, and 95 percent by 2020. Russia's 2nd National Communication includes several emission scenarios; in two (probable and optimistic) the CO2 emissions for 2010 were below their 1990 level (consequently 97 and 92 percent), while the basic scenario expects them to excess this level. Forecasts of the Environmental Defense suggest, first, that in case of economic development without incentives for energy-savings and for GHG emission reduction, Russia would use about 93 percent of its quota, thus, offering at international market about 1 billion tons of CO2 (in 2012 emissions will reach the base level of 1990); or, second, in case of energy efficiency path of economic development it will use 80 percent of its quota, and thus, will be able to offer at the market about 3 billion tons of CO2. The uncertainty of these forecasts is still high, and more integrated assessment of future emission trends is needed.

Similarly to other members of the Umbrella group Russia opposes any quantitative restrictions on the use of the Kyoto mechanisms. Especially it was against caps on emission trading, following the arguments of the US that quantitative limitations on trading might lead to distortions in market mechanisms. It opposed limits to emission trading even if emission quotas were formed due to economic decline, but are not a result of mitigation measures. Russia opposes attempts to qualify its

GHG emission reduction during the 1990s as a hot air[40]; possible restrictions on hot air trading put forward by some of the EU countries would make the Kyoto Protocol less attractive for ratification by Russia. However, as it stands at the current stage of international negotiations process and despite strong opposition, hot air can be traded with other parties, although wide international debates are still going around this issue (Grubb et al, 1999) . Several proposals have been made by the Russian government officials that revenues from emission trading would be reinvested into energy efficiency projects in order to provide further emission reduction, and the Green Investment Scheme initiative is among them. Together with that, Russia opposes supplementarity in emission trading. It is a crucial point in its positions towards Kyoto mechanisms as the major benefits from international emission trading are expected under "broad international market that is based not only on the results of supplemental actions, but also on excess emission quotas". The early start for CDM is regarded as a discrimination against the other two mechanisms. Many of these were formed under the influence of the US, and they have been substantiated and developed further as a result of their tight collaboration in the 1990s.

Russia supports the early start in implementation of the Kyoto flexible mechanisms. The idea of adoption of such instruments as forward contracts concluded before 2008, as well as banking is widely maintained. Although the Kyoto Protocol does not mention that Annex B countries are entitled to receive credits prior to first commitment period (however, the protocol does not exclude it as well), it is possible that governments may choose to give credits prior to the first commitment period. Russia supported early ERUs offers since it might initiate broader investments into AIJ projects before the first commitments period, as well as to gain practical experiences in application of the flexible mechanisms.

Institutional capacity building for application of the Kyoto Protocol was considered as a main determinant in the success of domestic implementation of the international climate change regime. In response to international promotion of capacity building in the group of countries with economies in transition, Russia was among the first to define its practical approaches to the issue and to elaborate its programme presented in 2000 at the international level, and contains particular items in capacity building scheme.[41] Some of them considered as innovations in the institutional framework (especially those related to institutional design of emission trading, to raising public awareness on climate change mitigation, dissemination of professional information and training). Certain expectations of the government are linked to possible additional external funding and technical support for this

[40] In case of many countries with economies in transition, and particularly Russia, sales of emissions reductions will partly be sales of AAUs generated in excess of emission reduction attributed exclusively to domestic climate change mitigation measures, and are often reffered to as a *hot air*. In 1998 in Buenos Aires Russia officially underlined that "hot air does not exist in Russia", since the emission reduction has been paid for by the decline in the public living standards in a course of economic crisis. Statement of the Head of the Russian Delegation, Buenos Aires, 1998

[41] The RF Programme on Institutional Capacity-Building suggests five major directions: 1) research and monitoring of climate change; 2) national system of GHG emission inventory and reporting; 3) national system of emission trading recording; 4) elaboration of national legislation; 5) promotion of information dissemination and training

programme through bilateral and multilateral channels, although it is aware that the major emphasis is put at the international level on mobilization of domestic resources for these purposes.

Within the negotiations on the international regime formation Russia supports the idea of groups and bilateral alliances and cooperation, which can be regarded as a new feature of its international climate policy. During the recent decade Russia developed closer ties in climate policy with the US than with the European Union, and they have been strengthening after the COP-3 meeting in Kyoto. It was expected that in case the Kyoto Protocol enters into force, Russia was considered by the US as a strategically important partner in international climate policy as cooperation with Russia would allow to meet US commitments under the lower cost and to have an ally in international negotiations. Important steps were signing in 1999 of a statement of intent by the ministers of energy of the Russian Federation and the USA on cooperation on the Kyoto Protocol mechanisms, as well as 2000 Joint declaration on cooperation in global warming mitigation signed by the presidents of both countries. However, the decision of president Bush to reject the Kyoto Protocol altered the patterns of bilateral alliances; at the same time Russia underlines, that the "door should be kept open" for the US. Climate change issues have also been included as a component in some bilateral agreements, for example, with Japan, Germany, the Netherlands, and the Scandinavian countries. Coordination of policy positions towards Kyoto mechanisms took place within the Umbrella group which Russia joined in 1998. During the recent year an accent is put in strengthening the cooperation with the EU and to catch-up with the opportunities missed during the nineties. There are a number of common approaches towards Kyoto mechanisms in EU and Russia; also the European partners are active in developing the Green Investment Scheme.

b. Domestic Policy

Strategies for policies and measures. Formation of domestic climate change strategies, policies and measures was underway during the last decade(Nikitina, 2001). Formulation of policies and measures, and particularly, their implementation is one of the weak points of climate strategy in Russia. Despite a number of steps undertaken by the government and adoption of a number of programmes aimed at GHG emission reduction, the design of domestic policies cannot be assessed as effective. First, many of the measures suggested are characterized by uncertainties with their specific effects on emission reduction. Second, there is a great deal of overlaps between them. Third, they are revised quite often, so stakeholders cannot fully rely on their continuity in strategic planning. Fourth, significant gap occurs between suggested policy options and putting them into practice. The shortage of financial support by the state budget turns most of the governmental programmes into dead letters. Fifth, there are no clear and well structured mitigation and adaptation strategies, apart from the persistent indications that these are equivalent to the major components of the national climate strategy. It could be argued that implementation of climate policy during the nineties was mostly relying not on

implementation of mitigation measures, but to a greater extent on the effects of severe economic depression, and it has extremely negative and 'relaxing' impact on development of strategies and measures.

The major elements of *national climate strategy* were outlined in the 1996 Federal climate change programme[42] adopted to support climate change activities in Russia and intended to be a focal point in elaboration of climate change domestic and international policies. It contained a set of scientific and development subprogrammes aimed at elaboration of policy, strategies, mitigation and adaptation measures, enhancing sinks, supporting GHG inventory compilation, climate change monitoring and research, creation of information systems. The major portion of its financing (72 percent) was coming from the state budget[43], and the major problem with its implementation was that due shortages in governmental financing it was supported for not more than 5 percent of the required resources. This central climate change programm was supplemented by a set of framework energy programmes adopted during the 1990s[44], but permanently revised afterwards. The next in this row was the Energy Strategy of Russia up to 2020 introducing new approaches to modernisation of technologies in energy production and consumption. Other climate related governmental programmes include federal programmes in forestry and in environmental protection.

Mitigation and adaptation. *Mitigation* measures presented in the federal climate programme and in two national communications are not yet developed in detail. They are rather general and it is difficult to define the status of their implementation. It is also hard to distinguish concrete measures in particular sectors, as well as concrete policies to address emissions of particular gases. Based on the information presented in the 2nd National communication of the Russian Federation there is an impression that more or less consistent policies and measures are outlined to mitigate only carbon dioxide and methane emissions, while other GHG have not been addressed.

According to official reporting Russia achieved significant GHG emission reduction during the 1990s, and certain part of it was attributed not only to economic crisis, but also to implementation of mitigation measures and, especially due to economic restructuring, increase in energy efficiency and energy savings (see Ch.4-1). However, their effects were not properly assessed by official reports, and it was difficult to identify the results of concrete mitigation measures in addressing GHG emission reduction. It was one of the critiques of the in-depth assessment of the 2nd communication (FCCC/IDR.2/RUS, 2000), as experts found that although a number of mitigation measures have been really undertaken it was difficult to have a clear picture of their effects.

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[42] Federal Programme *Prevention of Dangerous Climate Changes and Their Negative Consequences* was endorsed by special governmental resolution (RF Governmental Resolution, N 1242, 19 October, 1996), and it was planned for implementation during 1997-2001; currently adoption of the next federal climate change programme is being discussed.

[43] The funding of this programme was approved at about Rbl 240 mln (about $US 40 mln)

[44] 1995 Energy Strategy of Russia, 1996 Federal Law on Energy Efficiency, 1998 Federal Programme for Energy Conservation in Russia for 1998-2005, Fuel and Energy Programme of Russia

Mitigation subprogramme of the 1996 Federal climate change programme has outlined several major directions of measures to be designed and coordinated by the major government bodies (Table 4.-12) at the first stage of realisation of government mitigation strategy during 1998-2000.

Table 4-12. Mitigation Measures under the Federal Climate Programme

Measures	**Implementing Organisations**	**Budget Funding (%)**
Elaboration of comprehensive system of measures aimed at GHG emission reduction, organisation of a centralised data center	Hydromet	9,5
Development of legal and normative basis for GHG emission regulation	Ministry of Economics Committee on Environment	9,5
Improvement of standards (federal, regional) in various sectors	Gosstandart	5,0
Increase in efficiency of energy resources use, energy and fuel savings, use of new types of fuels in:		
Energy and fuel production	MinTopEnergo MinAtom	10,7
Transport	Ministry of Transport	12,0
Chemichals and Petrochemicals	Minprom	8,3
Metallurgy	Minprom	8,3
Machine Construction	Minprom	7,4
Defense Industry	Minoboronprom	6,6
Construction	Minstroy	6,6
Agriculture	Minselhozprod	6,6
Increase of CO2 sinks in forests	Rosleshoz	9,5
		100

Source: 2nd National Communication of the Russian Federation, 1998

Climate change mitigation in Russia depends to a high extent on measures to be performed in the *energy sector* where carbon accounts for 98 percent of GHG emissions and there is a high potential to implement energy saving and energy efficiency improvement measures. The potential is evaluated to be about 45 percent of current energy consumption (Pacific and Asian Journal of Energy, 2000; Mastepanov et al, 2001; Moe and Tangen, 2000). Thus, the national climate strategy relies heavily on energy savings and energy efficiency improvements outlined in energy programmes (major items are also summarized in the recent national communication). Climate change mitigation efforts are tightly linked with the priorities and strategic goals of the energy sector development, especially its technological modernization, and increase in energy efficiency and energy savings in a course of market reforms. Serious institutional and structural reforms, such as changes in the property rights, innovations in legal framework, including adoption of laws on energy savings and on gas supply, removing state subsidies, restructuring of monopoly energy companies such as RAO UES and Gazprom, changes in energy pricing mechanisms are currently underway in the energy sector, and they are expected to contribute to GHG emission reduction.

In Russia, the approaches to *adaptation* measures are not thoroughly developed.

Adaptation of *agriculture* appears to be crucial in a set of adaptation priorities, and some efforts have been undertaken in this sector. They were aimed at structural changes in agricultural production across different regions of the country. Particular efforts relate to creation of new grain species with extended vegetation period in order to use more effectively the warmer seasons, as well as to use a combination with grains with shorter vegetation period to allow the second crop gathering in some southern areas. Another direction of actions is in modification of patterns in the dates of planting grains to adapt to climate change, in the use of fertilizers. At the same time, due to extremely unfavorable economic situation in agriculture as a result of institutional changes during the 1990s it is currently difficult to design and implement particular adaptation measures in this sector. Definitely, more active steps are to be taken, for example, to enhance the stability of agriculture and the soil fertility and to promote genetic developments for crops selection, but they can be considered only as an integral part of general social and economic reforms in agriculture. Adaptation of *water sector* to global warming is regarded as a priority as well, but effective measures can be designed also depending on innovations in water management practices. A number of adaptation measures are being elaborated for the *coastal* regions to be affected by the sea-level rise, and for *permafrost* areas (2nd National Communication, 1998).

Role of local governments and non-governmental sector. So far, in Russia, following the deeply rooted state-centric traditions, the role of the state both in domestic and international climate policies formation and implementation is high. Among the actively debated during the recent years is the issue of vertical subsidiarity between the federation and the regions (89 subjects of the Russian federation). As a result of development of federalism in the course of political reforms in Russia regions are playing an increasingly important role in environmental policy. This is a new phenomenon since during the Soviet regime their impact was educed to zero. Following the decentralization, some regions have recently started to express their interest in more active participation in the local implementation of climate policy. They are especially interested in potential application of the Kyoto tools. A variety of developments in this area took place in the regions at the turn of the century. For example, nine regions have compiled the bottom-up inventories of GHG emissions. Some of the regions attempt to establish regional institutional framework for application of the Kyoto tools. For instance, Archangelsk *oblast* suggested considering it as a pilot region for testing and application of joint implementation and emission trading in Russia. It intends to develop regional legislation, to establish administrative structure, and to adopt regional climate change programme. It is putting an emphasis of hosting the JI projects at the local enterprises focusing mainly on regional efficiency modernization. It intends to establish regional monitoring and control systems for GHG emissions; Archangels oblast was among the first to compile its GHG inventory for 1990-1999.

Increase of *subsidiarity of climate policy* may raise problems and controversies in Russia. Establishing cooperation between the central and regional administration s has a high potential for conflicts in division of control and access to economic benefits and financial flows. The federal government opposed active attempts by the regions to establish broader climate related authority, and currently it seems unlikely that the federal authorities would willingly transfer the major part of control and regulating functions to the regions, particularly, in emission trading (it refers to the lack of experiences and skills in the regions, absence of regional GHG inventory, reporting and verification knowledge, high level of corruption in regional administrations, and absence of emission trading practice). However, comparatively higher roles are possible to be allocated to the regions in hosting JI projects. This particular issue is expected to be less controversial than emission trading in terms of vertical distribution of government authority, since such activities are to be performed at micro-level in the regions. Experiences from current AIJ projects indicate that role of regional and local administration is quite broad and active.

During the 1990s the changes in the public NGOs performance in climate change policy formation and implementation are not dramatic: their role is still quite low. At the same time, in the beginning of the century there is certain increase in the interest of NGOs in climate change and some organizations focusing on this issue have been established. By the end of the nineties there have been a significant increase in the interest of the *industrial sector* in climate change policy, which is a new phenomenon characterizing current participatory patterns in Russia. Industrial companies are much more active here than in other sectors of environmental protection. The major reason is that industries are ready to take part in the expected benefits from international emission trading, and in attracting foreign investments and technologies through joint implementation. Particularly, it relates to big and modernised companies in the energy sector. For example, the gas company RAO Gazprom has been involved for several years in implementing AIJ projects, including gas pipeline refurbishing, and it has wide-scale plans for expanding its participation in international cooperation. Another example is the electric company RAO UES which performs quite aggressive policy seeking the stable niche for itself at initial stages of international climate change cooperation. Since the end of the 1990s it tries to participate actively in FCCC negotiations, in domestic climate policy making, and compiled the GHG inventory on its enterprises. At the turn of the century, it put the major effort into establishing the Energy Carbon Fund (Box 4-2); and it has ambitious plans for expanding energy and climate related cooperation with the partners from Japan.

Box 4-2. Russian Energy Carbon Fund

In 2000, RAO UES adopted the Energy Carbon Fund targeting at GHG mitigation in the Russian energy sector. This initiative was supported by the government and by the parliament. This is a mechanism of financing and implementation of projects aimed at GHG reduction. Its financial support is expected to be provided by domestic and international public and

private entities in the form of loans and grants. It is to support application of the Kyoto tools in Russia, including financing and supervision of Russian companies participation in JI projects, and taking part in reinvestment of finance from international emission trading. Its main goals are the following:

* prepare recommendations for the companies regarding business climate strategies;
* participate in decision-making regarding national and international policies of Russia;
* participate in international negotiations within the FCCC regime;
* establish carbon investment fund and mechanism for financial transfers;
* attract investors into JI projects;
* develop company's green image, and support of emission forecasts;
* support of GHG inventory compilation and reporting at corporate, regional and national levels;
* create a corporate and national registry for GHG emission rights transfers;
* establish the database of GHG emission reduction investment projects;
* provide information, support and dissemination of knowledge regarding climate policy and application of the Kyoto tools.

Source: JIQ, December 2000; Energy Carbon Fund/Facility: innovative mechanism for attracting "green" investments to Russian energy sector, Moscow, RAO UES; interviews ECF officials.

Green Investments Scheme. Since 2000, Russia has been developing the concept of Green Investment Scheme (GIS) with the purpose to establish the special fund accumulating revenues from international emission trading with their further reinvestment into energy efficiency projects in Russia to reduce GHG emissions. This initiative was reported by the Russian delegation at COP-6, and it suggests for the Russia to be the first country to realize the green investment scheme in application of the Kyoto tools(Pluizhnikov O. 2001. Izmenenie klimata i energetika. EcoAccord, Moscow). According to the national policy statement of the Russian Federation at COP-6 its major idea is to ensure targeted use of funds obtained from emission trading for further reduction of greenhouse gases emissions (National, 2000). It will allow to provide additional investments and modernise Russian energy sector. This initiative is supported by the EU and Japan, and actually, experts from these countries are involved in elaboration of its design: this scheme can be a certain "guarantee that Russian excess allowances will be accepted by the EU and Japan which are reluctant to buy the surplus allowances as a legitimate commodity in the emissions trading market, and in return Russia is committed itself to investing the revenues received from GIS to projects leading to real emission reduction" (Moe *et al*, 2000). Experts suggest that GIS can be developed either as a unilateral Russian proposal or an agreement between Russia, Japan and the EU, or in a form of bilateral agreements between these actors; and it is believed to reduce the concerns over the 'hot air", result in additional emission reduction, and contribute to energy efficiency in Russia and to energy security of the EU and Japan. The major challenge for this scheme is whether it would be able to establish real verification

and control mechanisms over allocation of finance from the created fund into environmentally benign energy savings projects, since former lessons from the system of ecological funds which functioned in Russia in the nineties indicate that part of the resources has been siphoned and used for the purposes other than environmental protection.

4.2.2. Japan

a. Domestic Policy

Institutional Framework. The Action Plan to Arrest Global Warming, adopted in 1990, established the framework to comply with Article 4.1 (b) of the UNFCCC. Though its provisions are only on general terms, it clearly specifies the interim goals of Japan for the year 2000 to stabilize CO_2 emissions on a per capita-basis (and possibly in absolute terms) in addition to stabilizing CH_4 emissions at 1990 levels. The importance of climate change was also recognized in the Basic Environment Law (1993) and the Basic Environment Plan (1994), and institutional developments have taken place to improve the integration of climate change concerns into sectoral policies. As the result, the Global Warming Prevention Headquarters, led by the Prime Minister, was established in December 1997 to promote and oversee comprehensive measures.[45] The Guideline on Measures to Prevent Global Warming, which includes principles for achieving the quantified commitment under the Kyoto Protocol (through the blueprint discussed above), was adopted in June 1998. Based on the Guideline, a variety of new measures have been introduced or planned.

In April 1999, The Law for the Promotion of Measures to Cope with Global Warming, requiring action plans to be established by central and local governments, entered into force. The law promotes public reporting of plans and the status of their implementation by the central Government, local authorities, and businesses. The law promotes actions to be pursued by the national and local government (formulation of plans, etc.), and recommends voluntary and non-binding activities to be taken up by the industry and the general public.

The most important institutional framework can be the Law Concerning the Rational Use of Energy (Energy Conservation Law). The original Law has served as a basis for conserving energy since the second oil crisis of 1979. The Law has contributed to enhancing the international competitiveness of Japanese companies and facilitating development of new technologies. In order to meet the Kyoto target, the Law was substantially strengthened in June 1998 following the governmental program of "Comprehensive Energy Conservation Measures towards the Year 2000".

The law designated two categories of energy-intensive factories. Large factories (those consume more than 3,000 kiloliters-oil equivalent of fuel or 12 GWh of electricity annually) must send in future

[45] In addition, the Kyoto Initiative was formulated in December 1997, which consists of strengthening environmental support to developing countries in climate-change related projects.

plans to the Government and promote energy saving with a view to improving energy intensity by 1% annually. Mid-sized factories (those that consume more than 1,500 kiloliters-oil equivalent of fuel or 6 GWh of electricity annually) must appoint energy managers and record energy consumption. Factories with inferior performance in energy conservation will face recommendation by the government

Another notable feature of the Amendment of the Law is the incorporation of a new approach to energy efficiency standards. This so-called "top-runner" approach, which applies to automobiles and several home/office appliances, mandates that new products be more efficient than the most efficient model currently on the market,[46] and those who fail to achieve the target could face punitive measures, including fines. This is a historic attempt, since most similar laws merely attempt to "pull the laggards up to average performance." The law also provides for measures to improve efficiency in the building sector. Discussions are under way to strengthen the existing framework of the Law through broadening the coverage of regulated appliances and strengthening the standards. It should be noted, however, that the law is aimed to improve energy efficiency, but not to conserve energy or to switch to renewables.

Nuclear and renewable energy are promoted by the Law Concerning the Promotion of Development and Introduction of Oil Alternatives and other legal instruments for the energy supply sector. A variety of subsidies like low-interest loans and tax exemptions are used to support these purposes.

Voluntary Approach by Industry. In many countries, voluntary approaches by the industry through agreements, contracts or self-declared targets are important constituents of their climate policies. Japan is no exception. Keidanren (the Economic Federation of Japanese Industries) initiated the Voluntary Action Plan in 1997, declaring that its goal is to reduce overall CO_2 emissions in the targeted industries (incl. energy transformation) to 1990 level by 2010.[47] Contrary to similar plans in some European countries, its targets are non-binding. The Action Plan, however, is regarded by both the government and the industry as one of the key to achieving the blueprint.

The target of the Plan is to "control CO_2 emissions from the industrial and energy conversion sectors as a whole at or below the 1990 level in the year 2010." Specifically, there are four patterns in setting the quantified target, in that each industry sector can choose to establish targets using energy-related CO_2 emissions or energy consumption, and using total amount or energy intensity as the benchmark for reduction. The total emissions target mentioned above is calculated by aggregating industry-specific targets after converting to CO_2 emissions.

[46] This approach well represents the (government-driven) *technology-oriented* policy of MITI.

[47] The definition of "voluntary" action plan differs considerably throughout the world. Keidanren's plan requires reporting to government councils with prescribed formulas to avoid double counting. Unlike similar plans in some European countries, however, it does not mandate formal agreements with the government, nor does it entail punitive measures for failing to achieve the target.

Although each industry does not have direct responsibility to achieve the target, it is required to contribute indirectly to the achievement of the industry specific target. The Action Plan, with the participation of 34 business unions from the industrial and energy sectors, covers 42.6% of total CO_2 emissions in Japan and 76.5% of emissions from both sectors as of 1990. According to the result of the third follow-up in November 2000, emissions have been changing: from 131 Mt-C/yr (FY 1990) to +3.4% (FY 1997), –2.9% (FY 1998), and –0.1% (FY 1999) with forecasting 4.3% increase in FY 2005 and +9.4% BaU in FY 2010 from FY 1990 levels.

Blue Print by the Government. Just after COP 3, the Government produced a framework plan (hereafter referred to as the "blueprint") to achieve compliance with the Kyoto target of 6% reduction, as follows:

- Reductions from BAU to 1990 levels through energy-related measures
  (the Energy Conservation Law, voluntary commitments by the industries, incentives for efficiency improvement, etc);
- Additional 0.5% reductions by measures related to N_2O and CH_4;
- Additional 2.0% reductions through revolutionary technologies and change in social behavior;
- Allowing for a 2.0% increase through increased use of HFCs as CFC substitutes;
- Further reductions of 3.7% through increased domestic sequestration;
- Acquiring the remaining 1.8% through Kyoto mechanisms.

Since Japan's business-as-usual emissions in 2010 is assumed to be about 20% above 1990 levels, this plan would allocate more than 90% of necessary reductions to domestic measures. Thus, despite being an Umbrella group member, the targeted 'ceiling' on Kyoto Mechanisms that Japan set for itself was much tougher than the EU proposal on quantitative ceilings, under which Japan would be able to acquire credits of as much as 94 Mt-CO_2/yr, or about 7% of its Kyoto baseline.

4.2.3. China

a. International Policy

UNFCCC and Kyoto Protocol. The Chinese government participated at the following international climate change events:

- Participated in the international negotiation process since1990.
- Signed the UN Framework Convention on Climate Change at Rio Conference in June, 1992.
- Ratified the Convention by National People's Congress in December, 1992, being the first ten

countries ratifying the Convention.

- Signed the Kyoto Protocol in early 1998.
- Could ratify the Kyoto Protocol, if developed countries can able to perform the permits.

Status of Submission of National Communication. China could begin to prepare the initial national communication in December 2000, it could be finished and submit 2 years later. China have finished the PDF project about key issues, mainly uncertainty, and working plan of initial national communication. It have been improved by GEF about "Brief", and improved by UNDP about "Document". As the largest developing country, China has complex industry system and the technology level is also very different. Therefore, the main coefficients are different as compared to the IPCC default data and this requires a lot of work to prepare the initial national communication.

Chinese government has paid attention to the initial national communication project, began the PDF stage and the project is lead by the office of National Climate Change Policy Coordination Committee. They have organized the best experts of China in energy sector, agriculture sector, forestry sector and other relative sector such as waste, coast, water resource, public health etc. to take part in this project. Few foreign experts are also engaged to assure the research quality and to get a real fact of GHG emission and vulnerability of China.

International Collaboration. As the largest developing country and coal dominated energy structure, the GHG emission issues of China have been follow with great interest by other counties. From the eighties, China have began the international cooperation in the climate change area, in the form of the bilateral and multilateral cooperation, with UNDP, WB, GEF, ADB, EU, US (DOE, EPA and other), Japan, Netherlands, etc. The cooperation field included: Climate Change Impact Assessment, Assessment on GHGs Abatement Measures, National Least Cost GHGs Abatement Strategy, Climate Change Integrated Assessment Model, National GHGs Emission Inventory, National Communication to the UNFCCC and the Strategy for Investment and Technology Choice in China's Energy Sector: Improve Energy Efficiency and Sector Output. The major institutions of China actively participated in activities and international meetings in climate change field and have hosted a number of important international meetings and model training workshops.

The Chinese government also paid attention to the Climate change issues in the past. In February 1990, the State Council advised relevant government departments to form the National Climate Change Coordination Committee. One of the responsibility of this committee is to make policy and take charge of the international cooperation initiatives in the climate change area. Thus a lot of the international cooperation research and cooperation project could be enacted in China for the climate change issues. The major institutions hold rich experience about climate change research, and a lot of renewable energy project and other project which relative with climate change that support by foreign

government, international organization, and others increase very fast in China.

Existing AIJ and CDM Projects. According to the Kyoto Protocol and COP decisions, the CDM can begin in the 2000 but due to lot of technical problems few issues couldn't be settled yet, specially baseline method, financial mechanisms, and used period. The CDM mechanism couldn't be established, thus the real CDM project could not be performed in the world.

The AIJ project is similar to the CDM project, but there is no CERs transfer, could be used as the reference of CDM project. Chinese government support to the AIJ projects. All the AIJ project in China were taken charge of by The Ministry of Science and Technology of China in cooperation with other relevant ministries.It is being operated by the major research group on climate changes in China with concentration at the energy sector. There is several formal AIJ projects going on in China, the detail information is shown in the table 4-13.

Table 4-13. The AIJ Project in China

	Project 1	*Project 2*	*Project 3*	*Project 4*
Project title	CFBC & CHP Project in Shangqiu Thermal Power Plant, Henan Province	The Model Project for Energy Conservation in Electric Furnace used for Ferro-Alloy Refining	The Model Project for Utilization of Waste Heat from Incineration of Refuse	The Model Project on Coke Dry Quenching (CDQ) for Steel & Iron Making in Beijing
Cooperation country	Norway	Japan	Japan	Japan
Type of project	Energy efficiency	Energy efficiency	Waste disposal	Energy efficiency
Location	Shangqiu Thermal Power Plant, Shangqiu, Henan Province	No.21 Zhenxing Road Liaoyang Liaoning Province	The Garbage Incineration Plant of Harbin City, Xiangfang, Harbin	No.1 Coke Oven Shougang Co. Shijingshan, Beijing
Starting date	May 2000, when AIJ project begin in operation	September, 1998	September, 1998	September, 1997
Expected ending date	October 2020, when operation lifetime is due	March, 2001	March,2002	March, 2001

Source: IPCC Website about CDM

Energy Export and Import Policy. China contributes 20 percent of the world's population. It's proved coal reserves is 11 percent of the world's total, crude oil is 2.4 percent, and nature gas is 1.2 percent of the world. The coal dominated energy consumption structure is unsustainable for the economic development since the environmental issues (acid rain, air pollution in city, etc) has become more serious due to the large amount coal consumption. It must be improved and use of the cleaner

energy is the only way for future economic development.

Since 1993, China became a petroleum net import country. The import amount could exceed 70 million ton in 2000. The energy consumption shares of petroleum and natural gas were 19 percent and 2.1 percent in 1998. The natural gas consumption share was far less than the world average of 23 percent. The increased petroleum and natural gas import could become more important for sustainable development of China in the future.

Since the Russia has abundant natural gas resources, especially in the far-east and Siberia, the north part of China, South Korea, and Japan could be the the potential market for it. The natural gas export accounts about 40% the total international trade amount of the world in 1996. Chinese government plan to build natural gas net system in the north part of China began 2000 by three lines to import natural gas. This include east line from Sachalin island (Russia) through Daqing (northeast China) to Qinhuandao (seaport of Hebei province, China), middle line from Irkutsk (Siberian area, Russia) through Erlianhot (Inter Mongolia, China) to Rizhao (seaport of Sandong Province,China) and west line from Turkmenstan (Caspian sea area) through Xinjiang Province(China) to Shanghai. Chinese government also plans to build several large LNG import wharf in the southeast coastal area. The first wharf building began 1999 in Guangdong Province, and would build five large LPG import and transfer wharf (foue in the Guangdong Province, one in the Zhejiang Province) with the total scale of 5 million ton per year (2 million ton is transfer) in this area. This would reduce the environment problem and improve the energy consumption structure of this area. The regional electricity transfer network have been formed so far, the inter regional network also finished in some area. The hole network could be formed in the future making easy to import electricity from Russia. Few electricity transfer line from Siberia and far-east of Russia to Beijing as a plan could be considered. The energy structure and import situation could be changed significantly in the coming 10-15 years than recent years.

Position towards Kyoto Protocol and post-Kyoto Process

1) Technology Transfer and Capacity Building issues

The technology transfer and capacity building are very important issues for international cooperation in climate change field. These are also an important basis for various mechanisms and related technology cooperation. The technology transfer and capacity building could help developing countries to reduce the GHG emissions in the future. It also helps to improve the energy security and to reduce the vulnerability of climate change for developed countries. In the same time, developed countries also can get benefit from pure technology transfer and capacity building. The other way is to get CERs by CDM and other mechanisms. The mechanisms including some technology transfer and capacity building factor also means decreased energy security and increased vulnerability in the future. How to balance these two aspects may be different and difficult for every country.

Chinese government highlight the technology transfer and capacity building issues since it could help in the process of sustainable development of China. Chinese government is also willing to help the countries with real difficulties to achieve the Kyoto target by CDM. As we know, the normal commercial project also includ some technology transfer and capacity building, the project under climate changes such as CDM project have to make some difference in approach as compared to the commercial project. That means, the technology transfer and capacity building have to address those issues that can not be done in the commercial rule, such that it must be promoted by government of developed countries by make special policy or regulation for climate change issues. The governments of developed countries can play key role for the advantageous environment sound technology transfer and capacity building.

2) Prioritized area of CDM in China

The priority areas should hold the characteristics such as: large emission mitigation potential, reliable economic feasibility, high benefits to the energy conservation and environmental protection, and suitable for the national development objectives. According to the current studies in China, the technical sector showed advantages in emission mitigation than other sector because some technology areas related with a lot of sectors.

- The Techniques for High Efficient Industrial Boilers. The industrial boilers are used in all sectors, and they are major equipment for energy consumption and GHG emission in many sectors. The industrial boilers are fueled mainly by coal which annually accounts for 30 percent of the total coal consumption in China. The industrial boilers operate at lower efficiency in China due to the lower quality of coal, burning equipment, and inadequate operation management.

- Technical options for Highly Efficient and Variable Speed Motor. The Electric motors consume over 80 percent of the total annual electricity consumption in China and is used in almost every sector. The average utilization efficiency of electronic motor in China is 60 percent which is much lower than the international level.

- The Technical options for Large Size High Efficient Thermal Power Generation. The coal-fired electricity accounts the majority part of the thermal power generation in China and contributes about 30% of the total annual coal consumption in China. The share of the coal consumption in the electricity generation will continue to grow. The average heat efficiency of coal fired electricity plant is only about 30 percent which is much lower than that of the other countries. The main reason is that the share of big capacity generating units which is above 200 MW is smaller (under 40 percent) while the small units lower than 25 MW account for 25 percent. At the same time, the heat efficiency of the same size units is lower than that of other countries.

- Moreover, there are also large emission mitigation potentials in other related areas, such as high

energy consumption sectors (metallurgy, chemistry, building materials, etc) and TVEs (coking, cement, bricks and tiles). The average efficiency of equipment is much lower than that of other countries due to the fact that the share of big capacity equipment units is lower, efficient equipment are fewer as well as the unsatisfactory operating management.

- The Renewable Energy in the Rural Area. Above 70 percent of China's population is living in the rural area. The development and utilization of rural renewable energy techniques has been attracted the attention of Chinese government. The development of highly efficiency techniques for small hydropower, methane, solar energy, wind power and biomass has produced significant effects on the utilization of local resources, adjustment of energy structure, and mitigation of GHG emission at the rural area in China.

3) The Priority Area of Development by Chinese Government

Since 1980s, the Chinese government has formulated many policies for facilitating the energy conservation technology that focus on the improvement of heat and electricity efficiency, such as co-generation, centralized heat supply, the improvement of the efficiencies of industrial boilers and kilns, and speed adjustment of motor for saving electricity. Facilitation is also provided in technologies that expedite the residual heat and energy utilization, the development of coal washing and selecting, mixed power coal, utilization of briquette, the popularization of energy saving general devices such as wind energy and pump, the encouragement of energy saving building, the improvement of urban gasification rate, and the implementation of resource comprehensive utilization. Those technology areas all very important for CDM project in China.

The SDPC (State Development and Planing Committee) presented Chinese government the revised 'Catalogs of Encouraged industries, Products and Technologies in Current China', and 'Guiding Catalog of Foreign Investment' (include economic incentive policy) in 2000. One of the principle of this two catalog formulation is 'to be consistent with the sustainable development strategy, and beneficial to resource saving and protection of ecology and environment'.

The Catalog has over 10 areas including the climate change related area in part two: environment and comprehensive utility (waste treatment technology of city, coke dry quenching technology, gas retrieve technology of turn furnace in steel production, etc); part five: energy (coal mine gas utility technology, high efficient coal electricity generation technology, large capacity and super boundary fire electricity generation technology, large hydro electricity generation technology, renewable energy technology, etc); and other parts, such as material, manufacture, transportation and buildings.

The prioritized area of CDM should have the feature of potential GHG emission reduction, and are encouraged by Chinese government. That means it should be relatively advanced technology in the potential GHG emission reduction area.

b. Domestic Policy

Policy Mix. The target of climate change policy of China is to comply with UNFCCC (national communication, CDM, etc) and to start from the 'no regret' action to make effort of reducing invalid and unnecessary GHG emission for achieving sustainable development. China has formulated its national sustainable development strategy (China's Agenda 21) in response to Rio meeting of 1992. Climate change is one of the topics in this document. In preparing the social and economic development parts of the Ninth Five-year Plan, the National People's Congress asked the governments at all level to pursue sustainable development strategy which contributes to the GHG mitigation.

Signed by president Jiang, The Law of Energy Conservation in China was issued by National People's Congress in November, 1997, and it went into effect in January 1998. The law identifies the basic principles and the position of energy conservation in the social and economic sustainable development strategy, standardized the behaviors of management organization, management system of energy conservation, energy consuming products and the production and energy consuming products, and determines the system of energy conservation technology provision.

The former SDPC, SETC and SSTC of China formulated 'the new Outlines of Policies for Energy Conservation Technologies' which is an important instructive document for energy conservation of China. Since 1980s, Chinese government has formulated a series of economic incentive policy for energy conservation and new and renewable energy including subsidy policy, taxation policy, pricing policy, credit preferential policy, investment policy and others.

As the macro-coordinating department for the development of national economy, SDPC has been taking increasingly vigorous measure to quicken the development of new and renewable energy. Since 1996, SDPC has successively put forward two state program-'Ride the Wind Program' (promote the development of wind energy), 'Brightness Program' (electricity in remote and rural area by new and renewable energy), and 'Green Light Program' (promote produce and use the energy saving bulb) that put forward by SETC.

At the beginning of 1996, in the 'Ninth-five year' plan, it has been suggested again to accelerate the process of rural energy commercialization, popularize the energy saving stoves and briquette coal for household use, develop small hydropower, wind energy, solar energy, geothermal energy, and biomass energy based on local condition.

The forestry resource conservation has been strengthened by the legal measures. 'The Law of Forestry of China' was officially promulgated in 1981. By 1996 China has formulated and enacted four forestry law and legal document and ten forestry administrative regulation. Public security and police forces for forestry has been set up to crack down the crimes of destroying the forest resource such as the cutting without control and stealing timbers.

The strategies of sustainable forest management have been proposed. The Chinese government has worked out 'The Chinese Forestry Action Plan for Agenda 21', 'The Plan of Ecological and Environmental Construction in China', 'The Ninth-five year Plan of Forestry and the Plan in 1010', 'The Plan of Forestry Development in Mountains', 'The Outline of Forestry Economic System Reform' determine the strategies for classified forestry management and leads the forestry development to new stage.

Since 1980s, China has successfully implemented 10 forestry and ecological engineering project such as Three North Shelter Belt, Shelter Belt System for middle and upper reaches of Yangzhi River. The forestry area in China has maintained the growing momentum and the accumulated artificial afforestation area ranks the first in the world.

China as a developing country with only about 800US$ per capital GNP, only limited resources are available to combating climate change issues. Therefore, the Chinese government encourages international cooperation and regional cooperation. China hasundertaken and completed a lot of bilateral and multilateral international cooperation project with UNDP, WB, GEF, ADB, EU, US, Japan, the Netherlands etc. Chinese government highlight the regional cooperation in the northeast Asia because Russia hold abundant petroleum and natural gas as well as hydropower resource, and China, Japan, and south Korea could be the potential market. Japan hold advantageous technology, China is a largest developing county, Russia is the largest economic transition country, there is a avenue for large regional cooperation among those countries. The region cooperation could be helpful for regional economic development, to improve energy security, to increase the ability of adaptation, and to reduce the cost of GHG abatement. This fact should be paid attention by the governments of each countries in this region.

Adaptation. According to sustainable development strategy, a lot of 'no regret' adaptation policy and measures could be enacted in China, as following:

- improving the production growth and ability of resist the disaster in the agriculture field. This include stability of the grain plantation area, improving the capability of efficient irrigation system, increasing the organic fertilizer use, popularizing the breed that is resistant to dryness disaster, adjusting the framework of plantation, and developing the bio-technology and other technologies.
- adaptation policy for forestry. This includes planting trees, forestry conservation, developing the kind of thees that stand dry and warm weather, improving the protection for bio-diversity, the harvesting policy that is suitable for the climate change, and developing the fast-growing and high-yielding timber.
- water resource conversation. This includes improving the awareness and action of water saving, improving the water conserving building, enacting the water transfer across different valleys,

strengthening the pollution treatment, accelerating the reuse of treated polluted water.

- strengthening the dyke on the coastal area.

Institutional Responses. As early as February 1990, the State Council selected relevant government departments to form the National Climate Change Coordination Committee whose responsibility was to coordinate and formulate policies and measures related to climate change, and to participate in the FCCC's negotiation. The committee has made positive contribution in this regard. In June 1992, representing the government, Mr. Li Peng, Premier of China, signed the FCCC, a gesture that China is willing to cooperation with international communities in the field of climate change. In December 1992, the National People's Congress ratified the Convention, making China one of the earliest in the world. In 1998, in the reshuffling process of central government, the State Council adjusted the Committee by appointing the State Development Planning Commission as the leading agency, and other associated departments such as Ministry of Foreign Affairs, State Economic and Trade Commission, Ministry of Science and Technology, State Meteorological Administration, State Environmental Protection Agency etc, altogether 14 departments sitting in the National Climate Change Policy Coordination Committee (NCCPCC). The office to this committee is located at SDPC.

Some institutes have been doing lot of research projects oninventory, abatement technology assessment and selection etc in China. The CEEC (Center for Energy, Environment and Climate Change Research) of ERI (Energy Research Institute) is the major technical support unit for NCCPCC. It has abundant international cooperation experience and strong research team in climate change area, specially for the issues related with energy. Like CEEC, Nuclear Institute of Tsinghua University in very capable in the energy field, the Meteorological Institute of Agricultural Academy of China and Atmosphere Institute of Science Academy of China in the Agriculture field, and Forestry Ecological Institute of Forestry Academy of China in the forestry field are also doing a lot of work and have abundant international cooperation experience. Other institutes in the vulnerability and adaptation field have been doing some works.

Initiative of Industries, Local Government and NGO. The industry sector and local governments are very interested in CDM projects, especially in the area which has the concentration of the old industries and city waste dispose, because this area could not draw the attraction of investors. These areas have large potentials of GHG emission reduction but the financial conditions in these areas are insufficient. The CDM project could bring the technology and investment, and may bring the new opportunity to the local economic development.

China is the largest developing country where the central government takes part only for the general directions in the CDM project. If the local government is not active for CDM project, it would become very difficult to develop as the large part such as detail work need the support and involvement of the

local government. The process of AIJ project was smooth and successfully in China where the local government played very important role.

The NGO only can make very limited role in China, because the rights is key elements about international cooperation project, it different with a large part other countries in the world. The institution projects also make the key role by national and local institute.

4.2.4. Korea

a. International Policy

UNFCCC and Kyoto Protocol. The Republic of Korea signed the United Nations Framework Convention on Climate Change at the United Nations Conference on the Environment and Development in June 1992. The Republic of Korea became the 47th country to ratify the convention as a non-Annex I country in December 1993. The Republic of Korea also signed the Kyoto Protocol at September 25, 1998 and it plans to ratify the Kyoto Protocol by 2002 if the operational details of the Kyoto Mechanisms are successfully resolved (Speech made by Myung-ja Kim, Minister of Environment, at the COP6 of UNFCCC, Hague, the Netherlands, November 2000).

Status of Submission of National Communication. The Republic of Korea submitted the National Communication in February of 1998 as a part of the Korean Government's effort to comply with Article 12 of the UNFCCC. This also confirms to the agreement made in 1996 when the Republic of Korea became a member of OECD. In 1994 the Government initiated a number of research projects for the preparation of the National Communication and funded participation from various government ministries and research organizations. The base year of greenhouse gas emissions in the National Communication is 1990 and its methodology followed the IPCC 1995 Guidelines. A national climate change committee and expert technical team are proposed in the National Communication.

International Collaboration. As stipulated in FCCC, the Republic of Korea is committed to make its best efforts to cope with climate change within its historical responsibility and capabilities. Korea's policy to reduce GHGs is formulated and implemented through a partnership among government, industry and the public, and targets all GHGs (National Communication, 1998).

Korea is committed to participate in international dialogue for exploring various options for global participation. In an effort to promote such a dialogue, Korea plans to host an expert meeting in 2001 in Seoul to review this issue (Speech made by Myung-ja Kim, Minister of Environment, at the COP6 of UNFCCC, Hague, the Netherlands, November 2000). Korea is willing to actively participate in FCCC-related international projects with multilateral organizations, such as UNFCCC, IPCC, OECD/IEA, in order to effectively execute the related policies in line with global efforts. It also tries to make joint efforts with industrialized countries and developing countries in bilateral projects for the

implementation of the above-mentioned commitments (National Communication, 1998).

Korea is not a member country of 77 Group and homogeneity of Korea with JUSSCANNZ Group is weak. Korea, together with Mexico and Switzerland, formed the Environmental Integrity Group in September 1999 to cooperate in pursuing environmental soundness in resolving climate change issues.

Existing AIJ/JI/CDM. Korea has been implementing a wide range of projects to reduce greenhouse gases. Given that Korean companies are committed to and have longstanding experience in energy conservation and GHG reduction and that the government also has a strong commitment to such projects and supports a very stable and favorable investment environment, Korea can be a very attractive CDM partner (MOCIE, 2000). The Government is reviewing the implementation of a CDM project with Canada, which transforms the landfill gas to electricity.

Energy Export and Import Policy. In an effort to reduce carbon dioxide emissions, the Korean Government has imposed duties on the import of petroleum products and LNG (Liquefied Natural Gas) and taxes on sales of kerosene, LPG (Liquefied Petroleum Gas) and LNG. All revenues from these energy taxes have been deposited in the Special Energy Account and used for energy conservation, district heating, and R&D projects, which are generally considered carbon dioxide reduction measures. Even though the amount of energy taxes is not directly linked to the level of carbon content contained in different energy sources, these taxes play the role of carbon taxes.

Government Position towards Kyoto Protocol and Post-Kyoto Process. Korean government is willing to actively participate in international efforts to reduce GHG emissions, especially of developing countries. Along this line, Korean government plans to hold an expert meeting in 2001 in Seoul to review various options for global participation.

Korean government announced in 1998 that it would comply with the reduction of GHGs from the 3rd compliance period (2018-2022). The Korean government is not revealing any official position on the Kyoto Protocol yet. It appears that Korean government tries to determine the time and level of compliance to Kyoto Protocol after comprehensive and detailed review on the impact of the compliance on the national economy and feasibility of actual compliance is performed.

However, Korea maintains the position that "the implementation of the Kyoto Mechanisms should be based on a win-win global partnership between developed and developing countries, in particular for CDM, technology transfer and capacity building." Korea strongly believes "it is necessary to allow developing countries to initiate their own host-generated unilateral CDM projects individually or jointly in order to encourage them to take advantage of these new opportunities." It also believes that "the architecture of CDM should be carefully designed to open the option for the host-generated unilateral CDM and should not deny the opportunity for developing countries to use their newly found emission reduction opportunities for upgrading their industrial development (Speech made by Myung-

ja Kim, Minister of Environment, at the COP6 of UNFCCC, Hague, the Netherlands, November 2000)."

The Republic of Korea considers that technology is a major response strategy to combat climate change. Korea insists that "technology transfer should be a vital component of global participation and should be focused on the facilitating role of public sector in addition to what is already happening in the market business as usual since the commitment under article 4.5 of the Convention is for the government, not for the private sector (Speech made by Myung-ja Kim, Minister of Environment, at the COP6 of UNFCCC, Hague, the Netherlands, November 2000)."

b. Domestic Policy

Policy Mix. After ratifying the Climate Change Convention in December 1993, environmental consideration became an important factor in policy-making in the Republic of Korea. Considering its heavy dependency on foreign energy resources, the Korean Government has been undertaking a variety of measures to promote the rational use of energy and has intensified its comprehensive efforts to reduce greenhouse gas emissions.

The Government is utilizing the voluntary participation of both public and private sectors as a major policy tool to limit future CO2 emissions effectively. If necessary, the Government will take further actions to have a new legislation promoting more effective mitigation measures. Education opportunities for industry and the general public are provided to promote rational energy use. Early education programs on energy conservation enhance awareness among primary, middle and high school students, the future leaders of the nation. The Government also encourages the industrial sector to design management plans that take into account the limitation of CO2 emissions in accordance with UNFCCC. In addition, the role of the central and local governments is coordinated so that regional energy plans, fully taking into account unique regional circumstances, can be established. Support for regional energy projects is continuously expanded and at the same time local governments is encouraged to enhance awareness and capabilities regarding greenhouse gas issues (National Communication, 1998).

Mitigation and Adaptation.

1) Energy Sector

The Government has been focusing on energy conservation policies to mitigate greenhouse gas emissions. In the industry sector, the Government has been implementing the 5-Year Energy Conservation Plan of Energy Intensive Companies since 1992. It is to replace and renovate old and inefficient boilers and furnaces, to diffuse high efficiency motors, and to expand co-generation. According to this plan, 2,344 billion Won has been invested to achieve 10.6% energy-saving over a

five-year period. The second Five-Year program, which are targeting 196 businesses consuming more than 30,000 TOE per year and 10% reduction of energy consumption, began in 1997 and will continue through the year 2001. For large scale industrial energy users, a Voluntary Agreement (VA) system has been adopted to facilitate energy conservation and GHGs reduction. As the end of 1999, 67 companies are taking part in this program and have signed the agreement (MOCIE, 2000).

Table 4-14. CO2 Reduction Plan of Companies Participating in VA (Korea)

Year	Company (Business units)	Period	Energy consumption (Thou. TOE/year)	Energy reduction (Thou. TOE)	CO2 reduction (Thou. TC)	Investment (bil. Won)	Reduction rate(%)
1998	11(15)	99-2003	18,012	1,360	1,426	1,098.3	10.9
1999 1st	17(31)	99-2003	3,951	574	470	290.0	14.6
1999 2nd	17(21)	2000-2004	6,257	552	403	161.1	12.2

Source: Korea's Efforts to Harmonize Energy, Economy and Environment, Ministry of Commerce, Industry & Energy, Jan. 2000

In the residential sector, the Government has put top priority in inducing rational use of energy by residential consumers. Energy efficiency labeling and minimum energy efficiency standard have been enhanced and district heating systems have been expanded.

The Government has implemented the inter-fuel substitution polices by promoting natural gas consumption, nuclear power programs, and new and renewable energy development. Receiving terminals and a nation-wide pipeline grid will be constructed to expand gas consumption. 16 new units of nuclear power plants will be added to the current 12 nuclear power generation units. Then, the share of nuclear power generation in terms of total electricity generation will rise to 45.5% by 2010 from 36% in 1996 (National Communication, 1998).

The Government targets to supply 2% of total primary energy until 2006 by new and renewable energy technology development. The Ten-Year Energy Technology R & D Plan, 1997-2006, is being implemented to achieve this target.

The Government plans to increase the level of energy prices to those of non-oil producing OECD countries gradually. This is to shift away from its low energy price policies of the past and to induce efficient energy uses. Incentives for saving energy and making investments in development and adoption of efficient energy technologies are also being reviewed. In addition, the Rational Energy Utilization Act was revised in 1995 to require energy supply companies to establish and execute

demand side management (DSM) and investment plans and major energy suppliers including Korea Electric Power Corporation and Korea Gas Corporation have developed long-term plans for DSM since 1996 to improve efficiency and control load management programs (National Communication, 1998; MOCIE, 2000).

2) Forestry Sector

The Government has implemented policies to protect existing forests and to enhance the carbon pool. Included in these policies are forest planning, designation of reserve and protective forests, and control of forest fires, disease and pests as specified in the Forest Law. In an effort to expand the carbon pool, the Government has been carrying afforestation and reforestation with superior species (National Communication, 1998).

3) Agriculture & Animal Husbandry Sector

The Government has been conducting and recommending agricultural policies and practices effective in methane mitigation in rice paddies and providing guidance to farmers for methane mitigation. Methane emission mitigation policies, such as restraining enteric fermentation and promoting effective manure management, have also been implementing in the animal husbandry sector (National Communication, 1998).

4) Waste-management Sector

Waste reduction, recycling, incineration and landfills are the major waste management policies being adopted. In order to carry out effective and systematic management of (solid) waste, the Government established the National Plan for Integrated Solid Waste Management in 1993 and revised and supplemented it in 1996 (National Communication, 1998).

5) Transportation Sector

The Government has carried out and promoted a number of policies to reduce greenhouse gases in the transportation sector. In order to reduce exhaust gas emissions from motor vehicles, exhaust gas emission standards has been strengthened, the recall inspections were divided into preliminary and main segments to guarantee the fairness of the recall inspection system in 1996, emission warranty period has been extended, and LNG/LPG vehicles have been introduced since 1990. CNG(Compressed Natural Gas) buses were introduced in 2000. In order to reduce emissions from vehicles in operation, gas emissions standards have been strengthened since 1996, diesel particulate traps have been developed using purification technology since 1992, and A/F test was added to periodic emission test in 1997. Also, mandatory fuel efficiency labeling as well as fuel economy targets have been implemented since the beginning of 1990's. Demand management policies, such as expansion of public transportation modes and adjustment of gasoline and diesel fuel prices, are also

effective policy tools in Korea (National Communication, 1998; MOCIE, 2000).

Institutional Responses. To cope with the issues of FCCC more efficiently and systematically, Korea established an Inter-Ministerial Committee on FCCC comprised of related government agencies, academia, and industry under the chairmanship of the Prime Minister in April 1998. This committee conducts three levels of meeting: ministerial, vice ministerial, and working-level, under which there are five working groups.

Korea formulated comprehensive action plans in December 1998 to cost-effectively reduce greenhouse gases in the energy, industry, waste and agricultural sectors, and to develop ways to make use of the Kyoto Mechanism, including a clean development system. Since then, Korea has been actively implementing these action plans, which are subject to annual evaluation and regular updates every three years.

The Government is also considering new legislation to effectively address climate change issues. Moreover, the Presidential Commission on Sustainable Development was established in September, 2000, in part to mobilize national resources to address problems such as climate change. In addition, the Parliament is in review of establishing a special committee on climate change issues inside of the Parliament.

Initiative of Industries, Local Government and NGOs. Industrial sector's activities, which aim to mitigate climate change are focusing on energy conservation, preparation of energy management guidelines and audit program, improvement of industrial equipment efficiency, etc. For example, from 1997, 196 companies using more than 30,000 TOE per year began to participate in the 5-Year Energy Conservation Plan in order to achieve 10% reduction of energy consumption. In addition, 67 major energy-using companies, as the end of 1999, are participating in a Voluntary Agreement (VA) to promote energy conservation and GHGs reduction (MOCIE, 2000). According to the Energy Management Guidelines prepared by the government, 350 small and medium companies were audited in 1996.

The Korean Government is reviewing the various policies to establish energy-efficient communities. Plans to support local government that agree to work toward energy-efficient communities and to encourage participation are being prepared. Moreover, new legislation to encourage the construction of energy-efficient housing and commercial buildings, along with the renovation of existing houses to improve energy efficiency drastically, is being reviewed. .

Local governments implement environmental education programs for honorary environment monitors and the public. Environment-related activities of non-governmental organizations include public information campaigns for environmental conservation, academic surveys and research, and seminars on environmental policies. NGOs are represented in the government's environment-related

committees such as the central consultative body for environmental conservation. A "Policy Conference for Non-governmental Environmental Organizations" consisting of more than 20 non-governmental organizations was established to promote cooperation. The conference meets three or four times a year to discuss current environmental issues and policies (National Communication, 1998). More than 225 NGOs are actively involved in energy conservation (MOE, 2000).

5. Transition in Russia: Implications on Climate Policy

5.1. Introduction

Climate policy of Russia has several features. The main part of them is attributed to the fact that Russia is a country with economy in transition (it is not accidental that the FCCC includes Russia into a group of countries with economies in transition). A number of changes in institutional structure in Russia have not been finalized yet, because institutional reforms have been practically stopped in mid-1990s.

In the year 2000, Russia entered the third round of radical reforms of its economic and political system (the first round was associated with the name of M.Gorbachev, the second – with B.Eltsyn and E.Gaidar.). The recent changes seriously affect major investment institutions, institutions in the energy sector, as well institutions of the climate policy. Thus, the framework is currently being built in Russia within which the Climate Convention and the Kyoto Protocol are being and will be implemented. These changes create also a new institutional framework for international cooperation, including international cooperation in North Asia, not only in climate policy, but also both in energy and investment sectors, from which the climate policy directly depends.

This new period of institutional changes Russia entered now is an extremely challenging period. Many forecasts of the development of Russia's climate policy that were made recently and that appeared quite trustworthy are likely to become much less so. It does not mean that these forecasts were bad. It only means that the political and economic situation in Russia is changing now radically compared with the second half of 1990-s and, as the result, economic and institutional shifts are emerging that were hardly possible to take into account in advance.

In a context of Russia's participation in the Kyoto mechanisms a set of important emerge:

- What is the size of the Russia's emissions reduction potential? Is it as extensive as optimists claim, or is it considerably lower as the pessimists note it?
- What are the perspectives for economic growth in Russia since economic growth is one of the major factors affecting GHG emission dynamics and at the same time economic growth is the high priority in the policy of the new Russia's president? Is there any possibility for the situation when Russia would have its emission reduction potential only for its own use? Or, such concerns are unfounded, and Russia would be the largest seller on international emission market as many experts point it?
- What are chances that the progress in market reforms in Russia should have a positive impact on

technological renovation of the energy sector, and result in the decrease of energy intensity?

- What is the institutional structure of the Russian climate policy? Is it possible to realize effectively the forecast reduction potential within this institutional framework? What are the major barriers to realization of this potential?

- What are possible impacts on climate policy of emerging new business opportunities in this field? How the interests of new actors in climate-related business might affect climate policy institutional structure formation and its strategies?

- Would ratification of the Kyoto protocol affect institutional structure of Russia's climate policy to the extent to make it effective? What would be the effect of ongoing current reforms in Russia on domestic climate policy institutions? How these reforms correlate with the Kyoto flexible mechanisms – would they make their application more or less effective?

- What has Russia to do to create inside the country a broad-scale institutional structure for the realization of its potential? What is already done? What are perspectives of further development?

- What are the implications of ongoing domestic institutional changes for international cooperation in climate policy and in energy sector? Do they facilitate such cooperation, or hinder it? What particular barriers for cooperation are removed through institutional reforms? And which of them remain?

The quest for the answers to these questions presupposes thorough analysis of four closely interlined topics: (1) the potential for GHG emission reduction in Russia; (2) institutional structure of the Russian economy, and, particularly, of its energy sector, within which this potential would be realized (or not realized); (3) institutional structure of the Russian climate policy and its changes in the context of the second round of economic and political reforms; 4)institutional structures of the Russian climate policy in the context of the Kyoto Protocol implementation. Success, or failure, in Russia's interactions with the international community in implementation of the UNFCCC and its Kyoto Protocol would depend, particularly, on whether it would be able to establish renovated climate policy institutions in the nearest future.[48]

[48] Results of this study are published in FEEM Series, 2002 (*forthcoming*)

5.2. Russia's Emission Reduction Potential

5.2.1. Peculiarities of scenarios for the countries with economies in transition

Emission scenarios are the projections of anthropogenic gas emissions based on a coherent and internally consistent set of assumptions. In case there are several such scenarios, then inevitably a question arises which one among them is better and more reliable. The first question that arises in a course of scenario's assessment is the question about the criteria for their evaluation. Within this methodological problem I base on the existing experience, particularly, of the IPCC Working Group III which has analyzed and compared different scenarios of emission that have an impact on global climate change. In its report, Working Group III indicated that there were no general accepted assessment methods whether scenarios were satisfactory. Currently "the objective basis for marking the most probable scenario is absent".[49]

On the question whether one emission scenario is more probable than the other is, experts answer that probability that a scenario corresponds to real situation in the future depends on the changes in key parameters of forecasts. Thus, a scenario occupying the intermediary position in a set of scenarios is not equivalent to the most probable one. Experts from WG-III consider that taking into account the high extent of uncertainties, vide range in emission forecasts, and also the absence of the most probable scenario it might not be reasonable to use only one scenario, while a wide spectrum of scenarios should be used for the analysis.

WG-III considers that uncertainty regarding future emission projections can be attributed "only to a certain extent" to differences in the models used: "Differences in the models serve as an explanation only for a small part of the wide spectrum of emission assessments published in the literature. To major extent the broad range is explained by the differences in the assumptions of the scenarios".[50] Emission scenarios and underlying assumptions "are contradictory by definition", since they reflect different views and approaches towards development in the future. Assumptions regarding population growth, economic growth, quality of organic fuel used by economic sectors, and growth rates in efficiency of energy use have the highest impact on the breadth of spectrum of emission forecasts. Since there are no commonly accepted criteria for evaluation of scenarios WG-III suggests as an alternative to analyze "reasonableness" of assumptions. This might be achieved through establishing internal sequence of various assumptions over time, including interactions between the assumptions.[51] WG-III experts indicate at the necessity of renewal of scenarios and development of new scenarios. Particularly, it is underlined that the process of renewal is of utmost importance for countries with economies in transition in order to take into account the recent information on economic

[49] IPCC Report, Working Group III, 1994, pp.31, 34, 37; Russian version.
[50] Ibid., p. 36
[51] Ibid, p. 28

transformation and possible technological modernization. Here new scenarios of economic development are necessary, as well as analysis of climate policy, of new mechanisms and programs, and GHG emission reductions achieved through their implementation.[52] Approaches to assessment of GHG emission scenarios of the WG-III experts are quite important for evaluation of GHG emission scenarios for Russia, - as well as evaluation of calculation of Russia's emissions reduction potential based on these scenarios. They are of a special importance for Russia as a country with economy in transition, as a country where serious systemic changes and modifications in the framework for economic growth are still underway.

5.2.2. Two major scenarios: comparison and results assessment

Below I would like to compare the main scenarios of GHG emission in Russia that have been elaborated during the recent years. Not only their outcomes would be compared, but also assumptions they are built on. Comparison is suggested to be concentrated especially on scenarios of the Second National Communication (SNC) and of the Study on Russian National Strategy of GHG Emission Reduction (SRNS). They have been elaborated by two various research teams consisting of representatives from different organizations. These two teams have different approaches. The institutional and organizational basis for the work of the first group was the Interdepartmental Commission of Climate Change (ICC). This group included first the representatives from Hydromet, and its research institutes. These have been the organizations and personalities that played a leading role in GHG inventory compilation, in preparing the First National Communication (FNC) and SNC, as well as in elaboration of the National Action Plan on Climate Change. Organizational basis of the second research team was located in the RF State Committee of Environmental Protection, Bureau of Economic Analysis and associated structures, and was financed by the World Bank.

As to prospects of GHG emission reduction in Russia, the conclusions from these studies are the following:

1) FNC and SNC were produced with a time difference of 2, 5 years. However, in SNC, the prospects of GHG emission reduction by 2010 in Russia are not so optimistic, and reduction level is not so high; one of its scenarios even envisages increase in emissions from the 1990 base year. Whereas the FNC concluded with confidence that energy related CO2 emission in 2010 would not exceed their 1990 level, the SNC indicated that "only under favourable economic conditions and correspondingly increased investments into energy-saving (optimistic scenario) the emission level in 2010 might equal or comprise 90-92% from 1990".[53]

The Study of the World Bank and the Bureau of Economic Analysis that was finished later than

[52] Ibid. p. 33

[53] First National Communication, p.51; Second National Communication, p.93.

SNC assessed the scenarios of the latter one with criticism:

- the SNC scenarios are trivial;
- the SNC scenarios are only extrapolation of the current situation with different key parameters, which are extremely generalized;
- the SNC scenarios are extremely simplified and they are not based on detailed energy and industry projections;
- analysis of the primary data used in the SNC shows that non-CO2 projections are only extrapolation of CO2 projections;
- analysis of net-sinks in forests shows that only a small part of these values can be considered as the "Kyoto sinks" attributable to reforestation and afforestation in terms of the Protocol;
- data on new gases is the initial estimate that does not allow detecting dynamics of their emissions; no numerical SF6 estimates were obtained at all;
- N2O data relates to high uncertainty usual for N2O emissions from agricultural sector;
- significant part of methane emissions also relates to agriculture and has low accuracy.[54]

2) The SRNS resulted in the following main conclusions:

- With absence of new technologies at all, but with rather rapid GDP growth (4, 5%) Russia will not have in 2008-2012 any significant volume of quotas for trade. There will be a problem with compliance with the national commitments under the Kyoto Protocol: according to calculations during the five-year first commitment, period Russia would possess a potential for trading accounting for 1, 04 billion tons of CO2 eq.
- Implementation of new technologies, but without introduction of carbon tax would not be effective enough. According to this scenario trading potential accounts for 1, 75 billion tons of CO2 eq.
- With carbon tax ranging from $2, 5 to $25 per ton of CO2, Russia would have excessive quota allowances that potentially could be sold in case of early start of transactions, i.e. before 2008. Trading potential during the five years is evaluated in this scenario up to 2, 7 billion tons of CO2 eq.
- The main conclusion of the SRNS: without special policy, under current business-as-usual development, Russia will have serious problems with meeting its commitments under the Kyoto

[54] Study on Russian National Strategy of Greenhouse Gas Emission Reduction, Section 2, p.4

Protocol. In case of implementation of additional intensive GHG emission reduction policy, including international cooperation, Russia could get substantial resources for climate change activity required by the Protocol and future mitigation measures.

Thus, SNC and SRNS have a number of considerable differences, including the difference in the predicted level of emission trading potential. These differences can be clearly seen from the comparison between them.

Table 5-1. SNS and SRNS Scenarios

SCENARIO	GDP, %-YEAR	ENERGY INTENSITY,%-YEAR	ENERGY SUBSIDIES, CO2-TAX	TRADE POTENTIAL IN 2008-12, CO2 BLN T/E
Sec.Nat. Com.				
Optimistic	+4,4%	-2,0%	N/a	0,85
Basic	+4,0%	-0,5%	N/a	Negative
Probable	+4,4%	-1,6%	N/a	0,3
Study on RNS				
Basic	+4,5%	No innovations	At 1997 level	1,04
Probable	+4,5%	Endog.techn.pr	Eliminated	1,75
Optimistic	+4,5%	Endog.techn.pr	Elim.+co2 tax	Up to 2,7

Source: SRNS, sec.1, p.5

The answer to the most important question whether any trade potential would be left in Russia during the first commitment period and what would be its level under renewal of economic growth, the SNC and SRNS give different answers. One of the three scenarios of the SNC predicts the emission reductions during 2008-2012 to account for 0, 85 billion tons in CO2 eq.; another one gives a negative meaning, and the third forecasts small size of this potential. Very different picture is presented by SRNS: 1, 04 billion, 1, 75 billion and 2, 7 billion tons in CO2 eq. during 5 years period of 2008-2012. Thus, the difference in these figures is significant.

Comparisons between the SNC and SRNS scenarios pose a number of questions, and the major among them is how the SRNS was able to estimate the emission reductions at a level considerably exceeding the levels presented by SNC scenarios while the rates of economic growth in both studies were assumed to be almost equal (4,4% and 4,5%)?

It is well known that the size of emission reduction potential is a result of calculations and it depends on the method of accounting, and particularly, on what figures for rates of economic growth and energy saving were selected for calculations. By choosing a particular meaning for these indicators, the experts almost predetermine the size of the emission reductions. Experts from both groups selected similar rates for GDP growth. This fact does not contain any special meaning, since

both of them borrowed these figures from the official Medium-Term Strategy of the RF government.

As to another important factor, i.e. energy intensity, not everything is completely clear. SNC scenarios envisage decrease in energy intensity (from -0,5% to -2% annually). In fact, all three scenarios of the SNC differ from each other, first, by the indicator energy-intensity. These indicators were taken from the RF State Energy Strategy.

SNRS mentions nothing about the size of coefficients for energy intensity. Instead, there is a reference to the lack of (in one scenario), or presence (in two another scenarios) of endogenous technical progress. From the references to the model, it is possible to find out the following: The general assumption of the model was that after the start of market reforms, gradual replacement of outdated technologies by more efficient modern technologies takes place. The latter are characterized by both lower resource-use and by emission reduction. During the adjustment period, "old" and "new" equipment operate in parallel. For "new" technologies corresponding data referring to the USA, Japan, Great Britain and some other developed countries were taken into account. The SRNS gives no information about the year from which new indicators with the more efficient technology are taken in the calculation and about the size of these indicators.

The capital turnover process was simulated by SRNS as follows: "Old" capacities are depreciating, having two sources of depreciation: regular aging, and lack of competitiveness due to trade liberalization. Fixed investments are directed to the sectors, where available capacities are insufficient to produce goods in quantities required meeting expected demand. It was suggested, that all investments produce "new" efficient capacities.

Thus, the model seems to have the following premises:

- "reforms" automatically lead to resuming of the investment process;
- all investments are transferred into so-called "new" equipment;
- the model incorporates this "new" equipment via very high efficiency indicators that exist in the USA, Japan and Great Britain;
- this equipment is characterized by both lower resource consumption and lower emissions (no concrete figures are indicated).

The conclusion might be drawn from the mentioned above that significant emission reduction, and thus, significant level of emission trading potential seem to be accounted, primarily, due to the fact that extremely high levels of energy efficiency indicators have been incorporated into the model beforehand. High probability was predicted (in two from three scenarios) for achieving the goal, which neither Russia's economy, in general, nor, its energy sector, in particular, were able to attain during the

1990s. In particular, it was not possible to provide high investments into energy sector, and use under such investments of the equipment characterized by the highest efficiency achieved in the West. Within calculation process indicated assumptions give a result of emission reduction from energy-saving during the first commitment period accounting for 1,75 billion tons in CO2 eq. (without use of additional instruments). As we have seen from above, the earlier recommendations of the IPCC WG-III on necessity to take into account the whole spectrum of the scenarios are very topical in the context of the assessed scenarios.

5.2.3. IIASA scenario: the value of Russia's carbon surplus

In October 1998, IIASA has published its scenario of the GHG emission dynamics in the countries of the Former Soviet Union (FSU), and particularly in Russia. The specifics of this scenario is that it forecasts emission reduction potential in Russia not only in physical units (t/C), but also it estimates the value of this "surplus" or "bubble" (billion dollars). The size and value of the bubble, according to the IIASA scenario, will depend on the level and timing of economic recovery in Russia relative to the first budget period (2008-2012) as well as on technological choices. IIASA scenario indicates that these factors are especially difficult to predict.

IIASA employs six scenarios that are especially suited to long-term global-scale analysis of the energy system. They encompass three cases of future developments (A, B, and C) subdivided into 6 alternative scenarios (A1, A2, A3, B, C1, and C2). Case A envisions a future of impressive technological improvements and consequent high economic growth. It has three variants, which reflect alternative futures for fossil fuel resources that can be tapped and non-fossil technologies. In scenario A1, oil and gas are abundant and remain dominant fuel sources. In scenario A2, oil and gas are scarce, and, thus, coal becomes a dominant source. In scenario A3, improvements in non-fossil technologies (renewable and nuclear) lead to the long-term elimination of fossil fuels. Case B is a 'middle course' scenario. Case C envisions substantial technological progress. In scenario C1, nuclear power is a transient technology. In scenario C2, new reactor technologies lead to renewed growth in nuclear over the same period. For the Kyoto period, the most important differences between the scenarios are the level of economic growth (high in A, moderate in B and C) and the technologies employed (high carbon in A2; medium carbon in A1 and B, low carbon in A3, C1 and C2).

In all scenarios, the countries of the former Soviet Union (FSU) are in surplus. However, only Russia and Ukraine, according to IIASA, are likely to sell substantial quantities of bubble permits. IIASA considers that other studies overestimate emissions from the countries of the FSU. One of the reasons for that is that «even the few available shorter-term scenarios have systematically underestimated the depth of economic recession». Each IIASA scenario for Russia yields a significant carbon bubble. The smallest bubble (9 Mt/C) occurred in scenario A2 (high economic growth and carbon-intensive technologies). The largest bubble (877 Mt/C) is in the middle course (B) scenario,

which IIASA reviews suggest as the most likely outcome. In this scenario, continued weakness in the FSU economies dampens growth in emissions.

According to IIASA, the emission targets adopted for Russia in the Kyoto Protocol far exceed the likely level of emissions from this country and Russia could sell its surplus if the Protocol enters into force. In the "middle course" scenario of IIASA the value of the total carbon surplus during the budget period 2008-2012 is 20 to 150 billion US Dollars (4 to 26 billion US Dollars per year; the surplus does not burst until 2040). This flow of assets could exceed Russian earnings from natural gas exports ($10 billion in 1997). If directed towards low-carbon infrastructure investments (e.g., gas pipelines, safe nuclear power), surplus transfers could reinforce and partially lock-in decarbonisation of the world energy system. This could yield additional pipelines to ship vast Russian resources of low-carbon natural gas to Asia (which cost approximately $10 billion per 1000km) and thus offset the growth in carbon-intensive coal, which would slow global warming and also combat Asian acid rain.[55] Differences in the valuation of Russian potential within the framework of the same scenario are connected with the fact that amounts of GHG emissions in physical units are multiplied by different prices ranging from $ 20 to $150/tC. The authors explain variations in prices, first, by macroeconomic factors (supply-demand relation), and, second, by the specifics of the international surplus permits market arrangement (monopoly at the market, supply at low prices as the result of successful application of CDM, provisions of banking). However, even under the conditions of a quite transparent market, prices for the lots of surplus permits sold by different countries will be different. These differences will result, primarily, from the variations in the level of organization of these countries' institutional structures and from the quality of their operations.

As the authors of IIASA scenarios note it, other scenarios, in contrast to their own, underestimate the deepness and longitude of recession in the FSU countries. However, the essence is not only in taking into account the character of recession. Appearance in IIASA scenarios of a significant 'bubble' in the FSU countries, including Russia, is defined to a high extent by the fact that its scenarios are based on long time spans for the rates in energy efficiency improvements: -0.9% annually during the period of 1990-2020, and –0.7% annually during the period of 1990-2050 (scenario B). They are even higher in scenario C. In scenario A, they are also higher for the period 1990-2050, but lower for 1990-2020. However, they are not so small also for this period (-0.3% annually during 30 years), especially, if to take into account that during the 1990s in Russia, the energy intensity has in fact not declined, but significantly increased (21%). Explanations of the concrete size of the indicators of energy intensity and their dynamics during the 1990-2020, and during the 1990-2050, are absent. Meanwhile, its incorporation into the IIASA scenarios results in a big 'bubble' for the FSU countries.

[55] International Institute for Applied Systems Analysis, Laxenburg, Austria. Interim Report. 1998/October. The Kyoto Protocol Carbon Bubble: Implications for Russia, Ukraine and Emission Trading. David G. Victor, Nebojsa Nakicenovic, Nadejda Victor, Gordon J. MacDonald, Director; the term "bubble" in the text was changed by authors in the later publication to the term "surplus".

5.3. New Approaches to Economic Growth in Russia

Thus, volumes of GHGs emissions, potential for their reduction, and, subsequently, the capabilities of the country in international quotas trading depend largely on the rates of the economic growth and energy efficiency. GHG emission scenarios, which have been analyzed in the sections above, were developed on the basis of parameters that were used as assumptions, and the latter ones defined the final results of projections. If the authors of these scenarios did not calculate the meaning of these parameters by themselves, they usually used to borrow them from the governmental macroeconomic and energy programs witch were developed in the 1990-s. Today, these programs that served for GHG emission projections became invalid, and the process of their substitution for other programs was initiated. The most important among them is the "RF Development Strategy up to 2010". The government has changed its goals, and its priorities have been changed as well. The instruments chosen for achieving the goals of the government also have been subjected to serious modifications. Russia's transition to a decisive modernization of its economy envisages radical renewal of macroeconomic and energy policies, serious changes in institutional sphere and, subsequently, will inevitably have a dramatic impact on Russia's capabilities in emission reduction and quotas trading.

Today, the main parameters determining the volume of GHG emissions in Russia turned out to be beyond any control of the instruments aimed at the exercise of environmental interests. Currently, the Russian climate policy does not posses such instruments that might be used for GHG emission reduction. Its parameters are currently determined by economic goals, goals of the production growth, rather than environmental constraints. Apparently, the policy of economic growth and energy policy subordinate to it will determine the GHG dynamics, at least in the mid-term perspective. Therefore, I pass to the analysis of the economic growth policy and energy policy and their institutions. They make a direct impact on the volume of GHG emissions today because they form the distant institutional environment of Russia's climate policy.

5.3.1. "Strategy of Russian Federation Development till 2010" (Gref's Program)

Changes that are to take place in Russia in the near future one can find out from the modernisation programme of the new president and the new government. A special Centre for Strategic Developments (CSD) headed by German Gref, the Deputy Prime Minister and Minister of Economy in the government, was established for the drafting of this program. Currently, the 500-page long modernisation programme under the title "Strategy of the Russian Federation's Development till 2010" has been developed.[56]

[56] Strategy of the Russian Federation's Development till 2010. The Centre for Strategic Developments Foundation, 2000. Full text of the programme was put on internet site of Kommersant newspaper. In 2001, on the basis of the Strategy, the volume of which was

"Gref's Program", as it is known in Russia, forms the basis of the Russian government's programs[57]. It is possible to make judgements on the perspectives of economic growth in Russia, the character of pending reforms and the future of its energy sector on the basis of development scenarios contained in Gref's programme. The key objectives that the programme considers being top priorities for the development of Russia are economic growth, renewal of investment process, institutional transformations and energy policy:

In contrast to all previous periods, a qualitatively new situation emerged in the country for the solution of fundamental problems. Political situation stabilized, the economy is recovering, and the population is ready to accept changes. The objective of the RF Development Strategy is to use this chance for radical economic renewal of the country and to undertake modernization.

Key goals of Russia's Development Strategy are to prevent the further widening of the gap between Russia and developed countries in the mid-term perspective, and to re-establish Russia's positions as one of the leading countries in international development in the long-term perspective.

The Strategy of Development believes that it is possible to achieve these goals only as the result of economic modernization. Economic growth with rates consistently exceeding the growth rates of the world economy is the only way to narrow the emerged gap between Russia and the well-developed countries.

The implementation of the Strategy should ensure GDP growth rates of at least 5% per year on average for a ten-year period. This will make it possible to increase GDP volume by some 26-28% by 2005 and by 70% by 2010 (as compared to 1999). In certain years, the rates of growth can increase to 8-10%; in that case there can be a greater growth of GDP volume by 2010.

The Strategy of Development intends to ensure the financing of economic growth to a considerable extent by preventing capital flow from the country. Illegal capital drain exceeded 10% of GDP in 1999. It represents an enormous and currently unutilised domestic potential for economic growth. The decrease of capital flow volumes by 50% could permit to increase investments by approximately 30%.

Foreign investments will represent another source of growth financing. However, significant inflow of foreign capital will be possible only with a certain lag, after the activity of domestic investors becomes sustainable.[58]

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considerable, the "Major directions of social and economic development of the Russian Federation in long-term perspective" were adopted. See, Kommersant, 2001.23.03

[57] On the basis of the Strategy of economic development of the Russian Federation up to 2010 (Gref's Programme) the government has elaborated the "Programme of social and economic development of the Russian Federation for mid-term perspective (up to 2004)". See, Kommersant, 31.05.2001

[58] Strategy of Development of RF.2000. Summary

5.3.2. Programme's reliability

Thus, economic growth is the key priority of the new Russian president and its government. The probability of actual implementation of these ambitious plans for economic growth in Russia is a very difficult question that is too early to answer now. The former governments of Russia were making permanently statements about the transition to economic growth, but their intentions remained wishful thinking. In other words, the question can be asked about the degree of trustworthiness of the economic growth scenario that forms the basis of Gref's programme.

Evaluating the trustworthiness of the RF Development Strategy scenario, it is fair to say that its scenario of economic growth, at least its minimal version, appears to have chances for implementation. One could not say that about numerous scenarios of economic growth and of energy saving that were developed and adopted as guidelines for the government's activities in the past. The principal difference between the scenario of economic growth proposed by the current government and previous versions is the fact that, for the first time, scenarios of economic growth and energy saving are based on radical program of economic and political reforms and serious institutional changes. In addition, for the first time in many years, there is a significant degree of certainty that the government in necessary scale and of necessary quality will not only propose these radical reforms, but the government will actively try to implement them in practice. The new president already demonstrated that the new power had in abundance necessary political will that the previous power had lacked completely. According to World Bank the growth of Russia's GDP during 1999-2001 was 20%.[59]

5.4. Institutional Modernisation in Russia

5.4.1. Major steps of institutional modernisation

Institutional modernisation represents a decisive prerequisite for the implementation of the economic growth programme and for the changes that will serve as its basis in the energy sphere. At the same time, it will be a new framework for Kyoto mechanisms in Russia, which creates the external circle of institutional environment for its implementation.

The Strategy of the RF Development assumes that Russia will be able to return to economic growth through large-scale investments in fixed capital with simultaneous increase of investment effectiveness. Previous programmes of Russia's economic recovery failed primarily because they were unable to solve the problem of the investment process renewal. The desire to return to economic growth was not supported by necessary institutional reforms. The Strategy of Development envisages a whole complex of quite radical measures of Russia's institutional modernisation. Drastic improvement of

[59] Kommersant, 30.01.2002

entrepreneurial and investment climate in Russia represents the third round of Big Reforms.

The Strategy of the RF Development proceeds from the assumption that modernisation in Russia cannot be completed in a short period: its implementation will continue for several years and will consist of several stages. The major goals of the first stage (up to the end of the year 2000) were creation of legislative fundamentals of new conditions for doing business and bringing the state obligations to conformity with its resources. The main measures of the second stage (2001-2003) will be deregulation of the economy, tax reform, guarantee of property rights, establishment of equal conditions for competition, creation of financial infrastructure of the market. The third stage (2004-2010) will concentrate on restructuring of the economy. Tax reform, deregulation and reform of property rights play a key role in the strategy of modernisation.

5.4.2. Third round of Russian reforms: major institutional changes

During two recent years, there have been serious changes in the legislation in Russia. Below, I am analyzing main legal blocks which will define in the nearest future, or are already defining, the institutional framework for now on development in Russia.

a. "Anti-bureaucratic laws"

The government has introduced through the Russian parliament a package of so-called anti-bureaucratic laws. The major goal of this package is to simplify the procedure of access to the market, and to make it easier to perform activities for the small and medium size enterprises. Another goal was to counterface the corruption in the government apparatus, but not through establishing additional control over bureaucrats', but through reducing possibilities for their interference into economic life.

Law on registration of judicial actors. Previously, registration procedures for newly opened companies in Russia required never-ending visits to various organs, and coordination with various bureaucrats. According to the new law the registration is to be passed on the principle of "a single window". It means that a high number of organs and their officers won't participate anymore in registration procedure. All actions for registration are concentrated in a single body responsible for keeping register books on formation, liquidation and reorganization of companies. After submission of registration documents during the following five days the answer that either a company has been incorporated into a register, or its has been denied due to particular reasons.[60]

Amendments to the law on licensing of certain activities. Now, only activities that potentially might threaten the rights and health of the public, and national security and defense are to be licensed by the state. In the draft of the law presented by the government the number of the activities subjected to licensing was reduced from 2000 to 104. During the discussion in Duma their number increased

[60] Kommersant, 13.07.2001

only by a dozen.[61]

Law "On protection of rights of judicial actors and individual entrepreneurs under the procedure of the state control (supervision)". There is a large number of the state organs in Russia which possess the control rights over activities of enterprises, including police, fire control, sanitary inspection, ecological control, etc. All enterprises are subjected to never-ending inspections, and especially intensive they become during holidays (New Year, Easter, Christmas, Independence Day, Constitution Day, etc.). These inspections are guided by instructions developed by inspecting organizations themselves and their duration and frequency is not limited by such instructions. The new law establishes unified rules for inspections, and they cannot last for more than one month, and can be undertaken not more than once a year. But, the new law does not extend its new rules of control over its fourteen types (i.e. tax, customs, licensing, insurance, bank, hard-currency control).[62]

b. Tax reform

Russia's taxation system was characterised by a number of serious drawbacks and turned into an obvious obstacle to economic development. Poor rate of tax collection represented the key problem. All attempts to improve the rate of tax collection failed. The inability of the state to resolve pressing problems for a number of years became one of the main reasons for shadow economy development, wide-scale capital flight abroad, lack of foreign investments. Tax reform envisages, on the one hand, lightening of fiscal burden, and, on the other hand, limitation of opportunities for tax evasion. Tax reform is to play the major role in withdrawing the economy from shadow and it aims at improving the investment climate in Russia. It is supposed to be accomplished with the help of liberal methods, but not via strengthening of control. The stake is made that entrepreneurs would willingly move from shadow as a result of tax load reduction.

The reduction of income tax. In 2000, the parliament adopted the law on reduction of income tax and lift of progression in income subjected to tax burden. It envisaged introduction of the flat income tax with a single and drastically reduced rate of 13%. Shift to the flat income tax has been quite risky, and the government had many doubts before this decision was made. But, soon it appeared that risks have been justified. According to official statistics, during the first quarter of 2001 tax revenues from the income tax on physical actors in comparison with the similar period of the previous year increased by 70 percent[63]. Simultaneously, the statistics noted annual increase in average salaries during this period by 45.2 percent. It indicates at the start of rejecting the illegal schemes of salaries and other revenues payments, and at their withdrawal from shadow.

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[61] *Nezavisimaya Gazeta*, 12.07.2001
[62] *Kommersant*, 13.07.2001
[63] *Kommersant*, 23.07.2001

Introduction of united social tax. Withdrawal of incomes of physical persons from shadow is attributed also to another important measure, i.e. adoption of law on united social tax. This tax incorporated all types of income taxes of physical persons and entrepreneurs they have to pay into various social funds. *First*, its rate was reduced from 38.5 to 35.6 percent, and, *second*, a regressive scale of united social tax was introduced. It meant that high salaries are subjected now to lower social taxes than before. High rates of social taxes on big salaries have been among the important reasons for their evasion from taxes.

Modifications in tax on profits. New regulations on taxation of profits of enterprises have been introduced in Russia: tax on profit has been reduced from 35 to 24 percent. Besides, the regions are allowed to decrease its rate additionally to four percent. Simultaneously, all privileges on this type of taxes have been removed. The share of profit enterprises transfer in practice to the state in a form of tax constitutes today about twenty percent[64]. Thus, the state should not suffer from introduction of the new rate. New tax on profit simultaneously creates conditions for increase in transparency in activities of the Russian corporations, and allows changing the situation when enterprises were falsifying their balances in order to hide profits.

Tax on natural resources. Starting from 1 January 2001 instead of a number of taxes and duties paid by the earth interior developers the single united tax was introduced. It allows making more transparent the activities of mining enterprises. Recently, there have been signs that in the future the major accent in taxation system would be transferred to mineral mining companies, and the state would aim to finance the major part of its spending basing on natural resource rent. Currently, significant part of such rent is left with the mining companies, and they do not invest it into development of the real sector in the national economy, but transfer it abroad.

c. Measures against money laundering and modifications in hard currency regulations

Although, the government has not confirmed it, but it was defeated in Duma while discussion this question, as the parliament has unrecognizably changed the draft of this law, and the government had to agree with the Duma's version as there was a real threat that no law would be adopted at all. Now the government has only to expect that in the future it would be possible to approach its initial version via introduction of certain amendments.

d. New approach to privatization and modernization of corporate management regulation

Privatisation did not result in noticeable investments in Russian enterprises. It happened to a considerable extent because the old rights of the state ownership in the Russian economy were eroded, while new mechanisms guaranteeing ownership rights were not completely formed. Privatization in

[64] *Kommersant*, 23.07.2001

Russia has been the sphere where corruption flourished, and oligarchs managed to appropriate dirt-cheap the most precious parts of national wealth, and particularly to get hold of natural resources in the country. It seems that even more important shortcoming of privatization in Russia has been extremely ineffective forms of property management presupposed by privatization mechanisms. However, the new President has been quite cautious, and he seems not to have an intention to provoke conflicts by suggesting reallotment of property.

Law on privatization. About 24 thousand enterprise (mostly, unprofitable) are still in the state property. New legislation on privatization foresees a number of innovations in comparison with the former 1997 privatization law. It lacks the privatization privileges to the personnel of enterprises. Managers of enterprises made the personnel to transfer the shares into their management; they have not been the owners of an enterprise, but at the same time they have not been under control of the owners. Also, the current law sets a new framework for division of competence between authorities regarding privatization. Decision about privatization of enterprises whose activities are not of a strategic character is undertaken by the government, while decision about privatization of strategic enterprises is made by the President. It will be in a competence of Duma to make a decision regarding privatization of natural monopolies, i.e. Gazprom, RAO UES, and railways.

New edition of the law "On share-holding societies". It entered into force on 1 January 2001, it amends the previous 1996 law "On share-holding societies", and it is the main law in the package of laws adopted during 2000-2001. Its amendments envisage important corrections into the rules of corporate management (about 436 thousand shareholding societies have been registered in Russia). The changes are made according two directions. First, they intend to protect owners of a company, i.e. its shareholders, against tyranny of its own managers. From now on, the board of directors has a right to suspend those managers whose activities are considered to be incompatible with the interests of a company even before the regular annual meeting of shareholders takes place. This amendment appeared to be necessary since the managers in some cases blocked via the instruments they possessed an organization of an extraordinary meeting, thus prolonging their authorities up to uncertain period of time.

New edition of the law enlarges the list of big deals subjected to approval of the general meeting and of the board of directors, including such deals as loans, securities, credits, and guarantees. Also, these innovations are aimed at protection of interests of some owners of a company, such as minor shareholders, against the others, i.e. the against control package holders. New edition has expanded the rights of minor shareholders. It is well known that the most typical tool used by some owners of a company against the others was to erode the share of washing away the disagreeable share-holders, i.e. through liquidation of blocking package, as well as to reorganize a company and to remove its assets under such cover. New law provides a preference to acting shareholders to buy-out new emission both

according to open or closed subscription. It also protects an owner from removal of assets through assuring him a right to get its share in all new companies created in a course of reorganization[65].

e. Legitimate land market emerges

The State Duma has adopted the new land code, which already entered into force. It means that the new market has been created in Russia, i.e. the market of land. In fact, it is not possible to say that land was excluded from a turnover, so far. Land purchases and sales have been executed before, but these transactions have been illegal, or, precisely, semi-legal. Trading with land was forbidden in Russia, but it was possible to sell and to buy houses which have been in private property (houses of rural population, and dachas belonging to citizens). Land plots allocated for construction of these houses were transferred to a new owner of a house as an annex to a building. Not a land strip, but a building on it had a primary role within such transaction.

RF Land Code. New land code has cardinal changed the rules for the land turnover in the country. It significantly enlarges the list of land lots that can be the objects for sale and purchases. These are not only the land plots under buildings in rural areas, but also land cites in the cities, including not only land under the dwelling buildings, but also lands with industrial and other facilities on them. The code does not limit the size of such lots. From now on the purchase of land cite, but not of a building on it, would be of a primary role. At the same time the new Land Code does not regulate trade of rural lands destined for agricultural activities: so far, they remain to be withdrawn from the land turnover. Their turnover will be regulated by a special legislation to be adopted.

The government considers the new land code as an important step towards formation of institutional framework for investment process. Uncertainties in land property rights created risks for investors: they paid rent for local authorities, and have been under constant threat of either increase in its rates, or even termination of a rent agreement. The Land Code is to put an end to this kind of uncertainty. New regulations assign the foreigners similar property rights for non-agricultural lands as to the Russian citizens.[66]

f. Changes in organization of labor market

Until recently, a labor market, similarly to a land market, has been regulated in Russia by the old legislation, i.e. by the Code of laws on labor, adopted under the Soviet regime.

New Labor Code. It has been a result of a compromise between the government and trade unions. Extreme radical trade unions pretended to play on an enterprise equally important role with its owners. However, these aspirations have been rejected by the government. There have been two conflict issues

[65] *Kommersant*, 06.2001, 8.08.2001
[66] *Kommersant*, 16.07.2001

that were characterized by significant deviations in positions of the government and trade unions. The first has been a question of dismissal. The formerly acting code envisaged a dismissal with consent from trade unions, and they struggled for preserving this item in the new code. But, the new code contains 14 basic items according to which a worker can be expelled without notification of a trade union, and 3 item according to which he has to take into account trade union position. In all these cases a trade union, after getting the draft order from administration about worker's dismissal, has its right to disagree and apply for arbitrary decision of the Federal Labor Inspection, or go into court. Another controversy has been with whom the administration of an enterprise has to conclude the collective agreement. According to the new Labor Code not all trade unions on an enterprise have the right to conclude collective agreement, but the largest among them.

g. Modifications in political and administrative system

The question why reforms of the eighties and the nineties did not result in rapid economic growth is still under active discussion in Russia. For a long period of time the critiques of Russian reforms indicated, primarily, at shock therapy as the main reason for their failures, which caused too rapid turn in its economic development, and that the general scheme of reforms has not been adapted to the Russian specifics. But, recently new explanations were given for failures in reforms. According to this approach, "the red thread of post-socialist transformation is in preservation of acting institutions in some countries, and their dismantling in the others." and "capacity of the state to promote powerful acting institutions, in the absence of which liberalization (market economy) does not function"[67]. The contents of third round of reforms realized by the new Russian administration is that together with economic liberalization its foci is, especially, in restoring the capacity of a number of major state institutions in the absence of which a market is not able to function.

After his election the new president initiated long-lasting and stubborn struggle for return of control over federal organs of executive authority. The government supported federal organs in the regions from the federal budget, but governors in the regions and regional elite had established actual control over their activities, and these organs maintained the interests of the latter ones. Such configuration of the state authority resulted in a significant damage to the Russian economy: the regions introduced their own rules for economic activities, and regional laws contradicted to the federal laws. It was impossible to dismiss officers of the federal organs in a region without consent of a governor, but it was also impossible to dismiss a governor even in case of violation of the law. Under these conditioned the uncertainties and risks for investments were not subjected to any reasonable forecasting, responsibility of the state authorities before the actors at the market, and mutual responsibilities of partners at the market was reduced to zero.

[67] V.Popov. China and Russia: from plan to market. Why they succeeded while we failed? *Nezavisimaya Gazeta,* 30.08.2001

In a course of administrative reform, which under these conditions had to go beyond strictly administrative framework, and had a political meaning, the following important modifications were undertaken:

- All territory of Russia was subdivided into seven administrative okruigs each headed by a representative of the RF President, with the federal authorities in the regions subordinated to these representatives coordinating their activities and withdrawing them from control of the governors in the regions.
- One of the major goals of representatives of the President in federal okruigs was to achieve computability of regional legislation with norms contained in the RF Constitution and in federal laws.

5.5. Reorganisation of Russia's Energy Sector

5.5.1. Energy problems and energy policy

In the 90s, the energy sector of Russia encountered a number of serious problems in its development. The character and scale of these problems make many experts predict that the energy sector of Russia will become the most serious obstacle to the economic growth. An impressive list of problems that recently accumulated in the energy sector confirms this view:

In the 90s, domestic consumption of fuel and energy in Russia declined considerably, by 30% for primary energy resources and 23.7% for electrical energy. At the same time, the decline of domestic fuel and energy consumption was significantly smaller than the decline of industrial production (about 50%).

In the 90s, energy intensity of the GDP (energy consumption per GDP unit) increased considerably. Currently, this indicator in Russia exceeds the level of energy intensity in industrially developed Western countries by 3,5 fold. In the 90s, the domestic industries that were characterised by low energy intensity, i.e. machine-building, light and food industries were displaced from economic structure. In addition, energy consumption per GDP unit grew as the result of insufficient loading of facilities. Therefore, energy intensity of the economy grew by 21% in the 90s.

Distortions in the state pricing policy for energy resources deprived energy producers of financing opportunities.

The fuel and energy sector continues to play the main role in subsidizing enterprises and population through low tariffs.

The oil and gas sector of Russia is highly dependent on the state of the world energy market. Fluctuations of oil export prices and subsequent changes in natural gas export prices made the financial position of fuel and energy sector extremely unstable.

The amount of investments in all sectors of fuel and energy complex in 1999 decreased by 70% versus its 1990 level. This makes it impossible to offset natural ageing of production facilities. Taking into account high capital intensity of the fuel and energy complex, this trend can turn the energy sector into a major obstacle to the economic growth in Russia.

The Strategy of RF Development orients the state energy policy at the achievement of the following objectives:

- The volume of fuel and energy production should increase. Reliable fuel and energy supply for the needs of the growing economy is the key goal of the fuel and energy sector development. The fuel and energy complex should not be allowed to become a factor limiting envisaged economic growth. Never less continued negative trends are likely to result in the constraints for fuel and energy consumption already by 2003-2005, and interruptions in energy supply are likely to occur in certain regions even earlier.
- Fuel and energy sector development should be aimed at the increase of fuel and energy efficiency.
- As the Russian fuel and energy complex represents one of the key sources of budget revenues, the strategy of the fuel and energy complex development should provide for the fiscal needs of the budget.

The Strategy of RF Development suggests the transition to the energy saving mode based on the following measures:

- growth of prices for fuel and energy resources to the level stimulating energy saving measures;
- changes in the structure of the Russian industry and GDP; state support of the development of the sectors with low energy intensity;
- implementation of organisational measures aimed at energy saving;
- reorganisation of natural monopolies in fuel and energy production (Gazprom and RAO UES)

According to the Strategy of RF Development the transition from the dominant role of the fuel and energy sector to the prevalence of high technology resource saving industries appears to have no alternatives. However, the economic growth at the initial stage will be supported mainly with the previously created potential of free facilities in combination with their upgrading. At this stage, economic restructuring and increase of energy efficiency will be manifested rather weakly, and Russia

will have to continue its inertial development with the predominance of the fuel and energy complex in the economic structure.

5.5.2. The program of reorganisation

According to the Strategy of RF Development, substantial increase of investments in the energy sector can hardly be expected during the initial period of reorganisation. Therefore, the crucial task is to determine measures that should be implemented at this stage to provide for the needs of the growing economy in fuel and energy. These measures include the following:

- solution of the problem of non-payments by consumers of energy resources, elimination of non-cash forms of settlements and guarantee of budget organisations' payments for energy;
- elimination of cross-subsidising of energy resources consumers;
- increase of prices and tariffs to the level of costs reimbursement with a gradual increase of their investment component; increase of gas prices and/or introduction of tax on gas consumption;
- achievement of monopolies' transparency in the energy sector;
- restructuring in RAO UES Russia and Gazprom; development of competitive relations in the oil industry; completion of the coal industry restructuring;
- introduction of energy use standards;
- implementation of energy saving programmes at municipal and regional levels and in residential sphere.

5.5.3. Pricing policy

In the 1990-s energy prices came down relative to other prices. According to the Strategy energy prices will begin to play their crucial role when the following conditions are fulfilled:

- Prices for fuel and energy resources will grow approaching world prices level.
- Energy tariffs regulated by the state should be raised to the level ensuring costs reimbursement. At the same time, the investment component in energy tariffs should be increased.
- Cross subsidising should be terminated.
- Tariffs for industrial consumers will become equal to tariffs for population. The growth of prices should be accompanied by the creation of the system of subsidies to the poorest groups of population.
- Subsidising of inefficient enterprises through low energy tariffs should be terminated.

- Solution of the problem of non-payments for fuel and energy resources, and fulfilment by different level budgets of their obligations in terms of payments for energy.
- The RF government develops mid-term (up to 5 years) balances of fuel and energy resources production and consumption envisaging the decrease of the natural gas share in the structure of consumption.
- Prices for energy resources should be differentiated by regions.

Taking into account forecast dynamics of the exchange rate, an average price for kWh of electricity will amount to 2.5-2.6 cents in 2005, while an average price for a cubic meter of gas will amount to 2.8-2.9 cents. The growth of tariffs for population will outpace significantly the growth of tariffs for enterprises.

5.5.4. Energy monopolies' restructuring

It is believed that it will be impossible to resolve the problem of energy intencity and of attracting investments without restructuring of natural monopolies in the electrical energy and gas sectors. Restructuring would represent a basis for decreasing energy production costs in these industries. The policy of the state that holds control interest in natural monopolies will be aimed at the solution of the following tasks:

- separation of natural monopolistic and potentially competitive types of business activities; promotion of competition in the former case and increase of the state control in the latter; improvement of costs transparency;
- preservation of integrated systems advantages, i.e. technological unity, manageability and reliability;
- division of tariffs into monopolistic and competitive component;
- levelling out of taxation conditions for producers and consumers of different types of fuel;
- creation of conditions for emergence of new market participants;
- ensuring access of independent producers and consumers to the services of energy monopolies.

The development Strategy envisages a detailed complex of measures to be implemented in order to create the natural gas and electrical energy markets in Russia.

5.6. Modernization: Impact on Emission Trends

The RF Development Strategy up to 2010 does not contain a word on the problem of GHG emission reduction in Russia. However, the mid-term governmental programme, although in a laconic form, indication at the climate policy goals. Nevertheless, this Strategy is directly related to the prospects of GHG emission reduction in Russia, to its potential and mechanisms for reductions. It is the specifics of the climate change problem and of mechanisms for its solution - they are closely linked to economic mechanisms. RF Development Strategy contains a number of projections for such economic development parameters that serve as a basis for elaboration of emission scenarios. Particularly, it relates to such parameters that are used as assumptions in these scenarios. Among them are the rates of economic growth, changes in GDP structure, its energy intensity, structure of energy balance, prices on fuel and energy, subsidies to the industry and public through the level of tariff's, investment mechanisms, etc. The Strategy of RF Development outlines the major directions in development of these parameters, but not always it contains data on their particular level, and all the more information on the methods used to get these indicators.

Thus, a very important question emerges: what is the interrelation between the most important parameters (assumptions) that served as a basis for the former emission scenarios and current parameters that are used as key elements of the RF Development Strategy.

Parameters of Economic Growth. Rates of economic growth that are laid into the RF Strategy are higher than those contained in the mid-term macroeconomic program of the government and were used for the former emission scenarios. The Second National Communication was based on the growth rates of 4,4%, the scenario of the World Bank and BEA - on 4,5%. RF Strategy envisages the rates of growth accounting for 5% only as a minimum and desirable growth rates account for 8% or even for 10%. It results in a significant difference in the level of growth during the period of 2000-2010.

Parameters of Energy Intensity: These have been parameters that particularly predetermined the major differences in emission scenarios. The SNC used for its scenarios the coefficients of changes in energy intensity borrowed from the governmental RF Energy Strategy. The parameters of energy intensity in the World Bank and BEA scenarios played the key role, but no information was provided on their particular level, although some information on the procedures (not always transparent) of their calculations was supplied.

Final results of the emission dynamics, as well as conclusions deriving from the scenarios depended to a high extent on what particular option of changes in the energy intensity was laid into a scenario: this indicator defined either optimistic, or pessimistic character of development. Energy Section of the RF Strategy indicates the new parameters of energy intensity. The changes in these parameters look quite impressive, and even some questions regarding the methodologies for its calculation might emerge. However, no explanations on their calculations are provided. Ultimately, higher growth rates

for Russia contained in the RF Strategy than in the former macroeconomic scenarios, as well as in GHG emission scenarios are provided through significant decrease in energy intensity. If it would not be done, the energy body would have to confirm that energy sector turned into the limit of economic growth of the country. Thus, the way out was found through decrease in energy intensity of the GDP.

Energy Balance. There are considerable differences between the scenarios on this issue. The RF Strategy is based not on the increase in the share of the natural gas in energy balance (that was the assumption of former emission scenarios), but on the contrary, on decline of its share. The share of the natural gas is expected to decrease, while the share of coal and black oil is expected to increase. Inevitable, it will negatively affect GHG emission dynamics now.

Prices and Subsidies. The RF Strategy envisages significant increase in energy prices, as well as lifting of subsidies. Similar assumptions were also compounds of the former scenarios and of energy programs from which they have been borrowed. There is nothing principally new on this issue, except one very important item, i.e. price of the natural gas. According to the former scenarios, the price of the natural gas had to remain at considerably lower level in comparison with other types of fuel. In the Strategy of RF Development, the price of the natural gas would not only grow, but it would be at the same level as prices for other types of fuel, or it might even surpass them. It would be a result of changes in the concept of energy prices formation, i.e. previously the formation of prices was based on costs, from now on they are supposed to be based on the quality of fuel.

Recent assessments of economic growth and energy efficiency. According to recent assessments during the period 1999-2001 the GDP of Russia increased by 20%. The continuation of economic growth is expected in 2002 (approximately +3% GDP). The question is how the problem of emissions reductions would be solved when Russia shifts to long-term economic growth. According to estimates undertaken in a course preparation for hearings on KP ratification in the State Duma, CO2 emissions in Russia in 2010, and in the first budget period 2008-2012 should not exceed their base level (1990).[68] According to the forecast of the RF Ministry of Energy prepared by the parliamentary hearings on the Kyoto Protocol carbon dioxide emissions from the energy sector even in 2020 won't reach the base level of 1990. This forecast envisages two options in CO2 emission dynamics from energy sector in Russia, i.e. "favorable" (option N 1) and "low-emission" (option N 2). According to option N 1, carbon dioxide emissions in 2005 will account for 1750 million tons, in 2010 – 1870 million tons, in 2015 – 2000 million tons, in 2020 – 2200 million tons. In 1990, carbon dioxide emissions from energy sector were 2236 million tons. According, to option N 2, the level of carbon dioxide emissions would be even lower than under option N 1, i.e. by the end of the forecasted period (in 2020) they will account for 1840 million tons. Thus, no excess of emission limit set up for Russia by the international

[68] Papers of the State Duma prepared for hearings on Kyoto Protocol ratification 18.06.2001; RIJA Report on Moscow Workshop 14-15 May2001

regime is expected.

However, the assessment of this forecast is to take into account that future compliance of Russia with its commitments with this international regime even under long-term economic growth is of a conditional character. Indeed, successful forecast is based on the assumption of extremely high growth in energy efficiency rates (decrease in energy intensity). Forecast of Ministry of Energy presented at the parliament hearings was based on annual GNP growth rates of 5-6% and on increase of GNP in 2020 not less than by 3-fold from 1998. "It is supposed that three-fold increase in GNP cannot be accompanied by corresponding growth of energy consumption. We consider the increase of energy efficiency of the national economy to be an obligatory factor in providing economic growth", - is noted in the document of the energy ministry. "In other words, in case the 4-5% growth in energy efficiency is not provided, there would be no 5-6% increase in GNP"[69]. Thus, this forecast is (1) initially based on the desirable GNP growth rates, (2) then the energy efficiency (decline in energy intensity) indicators were calculated that were necessary for providing the GNP growth within these scales, and finally these indicators were qualified as "obligatory". This way, the status of as if really achievable was granted to them. To what extent such assumption is realistic remains to be questionable. However, it does not mean that CO2 emission forecast is doubtful, since according to calculations of the energy ministry without energy efficiency growth the economic growth should not be expected. According to the concept of the ministry, the growth of GNP would take place either under insignificant increase in organic fuel consumption, or it will face an obstacle of lacking additional energy resources. In this case the energy sector would become the main barrier for implementation of ambitious plans for speeding-up of economic growth.

Instruments of Implementation. This item seems to represent the principle difference between the former scenarios and Strategy of RF Development with its parameters that would be laid as assumptions into emission scenarios. The former scenarios have not been realized, at least those of them that envisaged decrease in emissions attributable not to decline in industrial production in Russia, but to decrease in energy intensity It gives certain chances to this Strategy to be realized, chances that the former scenarios were initially lacking.

5.7. The Gap between Macroeconomic and Climate Policy

Main provisions of the Kyoto Protocol open good perspectives for the climate policy of Russia. However, these are external factors. For these favorable perspectives to become a reality, Russia will have to accomplish quite a lot at the domestic, national level. Here, rather serious difficulties and

[69] Papers prepared for hearings on KP ratification in the Environmental Committee of the State Duma, 18.06.2001. Annex 2: "Estimation of Development of Russian Energy Sector"

problems are in store for Russia. Will Russia be able to overcome them, and how will it do this, on the basis of what methods, how will the development of its climate policy progress, what will its potential be in quotas trading: all these are questions that the Government of Russia should answer in the nearest future. It has already delayed too much with answering these questions, though there were very weighty reasons for this delay, such as an extremely unstable political situation in the country. A certain preparation for the solution of these issues was underway, and there were disputes concerning the design of the future institutions. Hence, the opinion that nothing was happening in the institutional building in Russia after Kyoto is not quite correct. Actually, the years 1998-2000 were full of struggle between different projects of institutional construction, the fight between departmental interests that was, presumably, an inevitable and necessary phase in the preparation of the most important decisions on the climate problem. Another thing is that no necessary decisions were adopted. However, the decisions concerning the crucial institutional issues were beyond the sphere of the climate policy itself. It was hardly realistic to expect a high quality and substantiated solution of these issues under the conditions of continues changes of the Governments in Russia.

Now, the period of political instability has been overcome, new development goals have been established, and economic and political reforms are underway. At the same time the rules at the institutional field of the climate policy are not established yet: this field remains free from institutional constraints. The transition period in this sphere is far from over; a lot of things will change here.

The climate policy became fully subordinate to the economic (and energy) policy, which has its own objectives: to speed up economic growth, and to eliminate all obstacles to it. The problem of Russia's climate policy is that all the actions undertaken within the framework of the economic (and energy) policy were beyond influence of the climate policy. On the contrary, the key parameters defining the volume of GHG emissions today are directly dependent on the policy of economic growth and energy policy. The favorable conditions of the 1990-s when it was possible to create a certain balance between the policy of economic growth and the climate policy exist no longer.

It is hardly surprising that the issues of the climate policy turned out to be at the periphery of the supreme state authorities' attention. An overwhelming majority of the population that cannot withstand any longer horrible consequences of a lengthy depression supports the goal of economic growth as a key priority. Meanwhile, further delays with the institutional building of Russia's climate policy will result in the exacerbation of its problems. Russia, having formulated its main strategic objective as the transition to high and sustainable rates of economic growth, did not simultaneously take care of the construction of the mechanisms of domestic climate policy that would have provided an opportunity to control the volume of GHG emissions under the conditions of economic growth. Today, it is necessary to admit that a certain gap exists between the new macroeconomic goals and new macroeconomic policy, on the one hand, and the availability of a necessary institutional infrastructure for the conduct

of the national climate policy, on the other hand.

5.8. Institutions of Russia's Climate Policy

5.8.1. Institutions building during transition period

Russia's co-operation with other countries in realisation of its available potential of GHG emissions reduction, as well as the forms and effectiveness of this co-operation will be influenced by three key factors: first, institutions and instruments that were envisaged by the Climate Convention and the Kyoto Protocol. Second, domestic institutions of the economic and energy policy, and, third domestic institutions that form the national institutional structure of the Kyoto Protocol implementation within Russia. The institutional basis necessary for the implementation of the climate policy is currently unavailable in Russia; it has to be formed. Some people regard it as a certain advantage, believing that it is easier to build anew than to rebuild. However, the actual situation is not so simple: certain climate policy institutions were established in Russia in the 1990s, so now it is too late to describe institutional construction as starting from scratch. Besides, the trouble with these already established climate institutions is that, first, their number is very small. Second, these institutions do not form a comprehensive entity, the whole structure is fragmented. Third, this institutional structure is is ineffective in its current form.

Hypothetically, the application of Kyoto mechanisms in Russia can progress along the following ways:

- through the reorganisation of climate policy specialised institutions and instruments already available in Russia in accordance with the models proposed by the bodies of the FCCC and KP;
- through the creation of new special institutions of the domestic implementation;
- through the utilisation of the institutions of nature protection policy that were created during the reforms of environmental institutions in Russia in the 90s in other sectors of environment protection (atmospheric air protection, natural resources management, monitoring and enforcement);
- through the use of existing institutions of energy and investment policy or those newly emerged during the second round of reforms.

Presumably, the construction of the national implementation system will progress simultaneously along all these ways, rather than along one of them. Thus, the implementation of the Climate Convention in Russia will be transferred to a newly created institutional structure characterised by a very complicated genetics. On the one hand, obligatory mechanisms prescribed by international

regimes that will be imported into the country through institutional transfer will be included in this structure. On the other hand, the foundation of this structure will be inevitably composed of national institutions. It will be impossible to do without these national institutions during implementation, and it will be unrealistic to replace them by international regime institutions. These elements of internal and external origin should form a single mechanism; they should merge in a new comprehensive structure. Therefore, the issues of domestic institutions and instruments adaptation to the international regime requirements, of their compatibility will play a substantial role.

Hence, Russia will have to accomplish a lot in order to create an effective national implementation mechanism and to realize its huge potential of GHG emissions reduction. Russia is far from being doomed to success. If the national implementation mechanism does not correspond to qualitative characteristics established by the international regime, if the international community does not recognize it as effective and reliable, the Russian emissions reduction potential will remain unrealised, and in a few years, nothing will remain of it, nothing but sad reminiscences and regrets over opportunities lost. The value of this potential, its amount expressed not only in physical units, but in money terms as well, represents a financial asset. In addition, its total amount will depend not only on the number of physical units that Russia will manage to offer at the international quotas market, but, primarily, on the level of prices for lots offered. And if lots have a bad reputation, if there are doubts concerning the reliability of certification transactions conducted within the national system, the price of these physical units will plummet catastrophically, nobody will buy them, and a financial asset that just recently was recognized as the biggest in the world will simply vanish into thin air.

5.8.2. Compatibility and adaptation problem

Failure or success in this area will depend largely on the compatibility of the international regime mechanisms with the national institutional structure, as well as on how well they will succeed in their adaptation to each other. The solution of the compatibility problem or, more precisely, of its partial absence through adaptation represents a practical task that Russia will have to solve in the nearest future in the process of the Kyoto Protocol implementation. The emergence of the compatibility problem and a linked problem of adaptation does not appear to be something extraordinary. 182 counties participate in the Convention, therefore the Convention and Protocol thereto are unable to take into account all the diversity of domestic conditions under which they will be implemented. The rules of the Convention and Protocol envisage certain “flexibility”, but it should be constrained by certain limits, otherwise the regime as an international institution with a single code of rules will be destroyed, and, ultimately, everybody will establish these rules for himself.

Nevertheless, the FCCC and KP allowed for some differentiation. It was reflected primarily in the introduction of certain special rules for a group of countries (Annex 1 Parties, Annex B Parties, countries with economies in transition) rather than for individual countries. As far as individual

countries are concerned, differentiation assumed individual character only with respect to quantitative limits for GHG emissions. Thus, such a principle of the international agreement as the application of single rules to different participants operating under substantially different domestic conditions certainly remains despite some elements of differentiation, and, therefore, problems connected with this approach remain, namely, compatibility and adaptation problems.

In comparison with many other countries, these problems have a special urgency for Russia. Russia is included in the group of countries with economy in transition by the FCCC. It should be taken into account that this term does not mean only the status of the country within the FCCC. It is also used to indicate essential institutional specifics of the countries included in this group. These specifics are able to make an impact on the implementation of the Convention and Kyoto Protocol, and, in particular, on co-operation with other countries. In today's Russia, the "transitional" quality is especially marked. Reforms of the institutions forming both a close and distant milieu of the climate policy institutions will make a substantial impact on the character of these institutes' functioning as well.

5.8.3. Institutions building and group interests

One should not think that institutional construction in the sphere of the climate policy would proceed in a vacuum, that various interests would not affect it. It is well known that people are building institutions exactly to create the best possible opportunities for themselves to pursue their own interests. In this respect, the following questions assume a special importance: who will head the institutional construction process, and, therefore, have the greatest influence on its progress, and who will be pushed aside, who will be incapable of doing it. Even today, the attention paid to this issue by the powerful groups of interest is obvious because the climate business in Russia promises to become a sphere with turnover in billions of dollars. Therefore, institutional construction in the sphere of the climate policy will proceed in the atmosphere of conflicts of interests. Will it be possible in this situation to channel economic interests of individual groups in the direction of the realisation of the Climate Convention objectives? It will depend on the characteristics of the national structure for the implementation of the international climate regime that is currently emerging in Russia, as well as on the persons making a dominant impact in the process of this national structure construction. Under the best-case scenario, the international community will receive an institutional structure that will be able to ensure substantial cost reduction in the decrease of GHG emissions, and, under the worst-case scenario, the huge potential of Russia in terms of GHG emissions reduction will not be realised. It will be fraught with enormous losses for the completely international community, but especially for Russia. That is why a timely diagnosis of what is happening in this sphere in Russia now is so important.

5.8.4. Climate policy body

Russia's climate policy in 1990-s was engaged in negotiations within the framework of the Climate

Convention, the formulation of Russia's positions at these negotiations, submission of national communications to the Secretariat of the Convention and scientific research in the area of the global climate. The construction of the national institutional structure was oriented at the solution of these problems. However, the goals of the domestic climate policy can't be limited only to the above-mentioned measures. That's why the situation with institutional building for Russia's climate policy becomes far more complicated.

In the former USSR, the implementation of international environmental agreements was assigned to an institution specially created for this purpose - an interdepartmental commission. The same was done in the 1992 to implement FCCC domestically. An Interdepartmental Commission on Climate Change (ICC) was created with about two dozens ministries and state committees as its members.[70] The numerous group among them were industrial ministries - producers and consumers of fuel and energy. A high number of other ministries and committees were included into ICC also. According to the ordinance of the RF government, the key objectives of the ICC were as follows: (1) co-ordination of the ministries' efforts to reduce the negative impact of economic activities on climate, (2) co-ordination of the ministries' and organizations' efforts to fulfill the obligations of the RF under the Climate Convention, and (3) organization of the RF participation in the official bodies of the Climate Convention. To fulfill these objectives, the Interdepartmental Commission on Climate Change, according to the ordinance of the government, (1) gives recommendations on GHG emissions reduction on the basis of the use of environmentally clean technologies to enterprises; (2) organizes and co-ordinates the efforts of the ministries to undertake measures aimed at the fulfillment of the RF obligations under the Climate Convention; (3) defines the position of the RF delegation at COP and protocol negotiations; and (4) participates in the development of laws on the problems connected with the climate change.

At first glance, it is a construction of the institution entrusted with broad authority; the institution that is capable of pursuing an effective climate policy and of ensuring the fulfillment of Russia's obligations under the Climate Convention; the institution that possesses all the necessary instruments for it. Actually, it is far from true, and, more precisely, not true at all. This ordinance of the government created a very weak, rather than strong, organization. Its weakness predetermined to a great extent weakness and inconsistency of Russia's climate policy in the 1990s.

Although the form of an interdepartmental commission remained the same as further, however the possibilities of this institution have changed. From this point of view, ICC in the 1990-s was a typical institution of the transitional period: old form but without old possibilities, a remainder of the old system not adapted to the new situation. Further, in the command economy each ministry - member of

[70] RF Government resolution №34, 22.01.1994

a commission - possessed enormous authority, especially towards industrial enterprises included into their structure: ministries controlled thoroughly their activities. Within the market economy, industrial ministries have lost the major part of their former power: enterprises united into them are being privatized, and became independent. That is why an Interdepartmental Commission with such ministries as its members also became a weak institution. Formerly ICC was able to give orders to enterprises via their ministries. Nobody can give orders to private firms today. That is why the government ordinance says only about recommendations from commissions to industrial companies, not more. Old methods of management do not function, but an Interdepartmental Commission on Climate Change has not mastered new management methods.

Another reason for the weakness of ICC is in the property of the organization that stays on the top of it. According to government decree, Hydromet (Russia's Federal service on Hydrometeorology and Environmental Monitoring) has to play the leading role in Interdepartmental Commission. According to the decree, the head of Hydromet was put in charge of the Interdepartmental Commission on Climate Change as well. Hydromet was not considered a powerful institution within the national bureaucratic hierarchy. Hydromet's influence and weight were clearly insufficient to pursue independent climate policy within the ICC in order to co-ordinate differences in the interests of individual ministries in the climate policy, in order to ensure its financing and pass laws through the government and parliament, to force ministries to implement necessary measures. Up to now, the inventory of GHG emissions and submission of two National Communications to the Secretariat of the Convention represented the main achievement of Hydromet and ICC. Work on GHG inventory was progressing with great difficulties owing to the shortage of budget financing, and the First National Communication was submitted to the Secretariat with considerable delay, while the quality of the first inventory also left much to be desired.[71]

5.8.5. Climate policy law

A decade passed since Russia signed the Climate Convention and assumed quite serious obligations. It would appear that the creation of a legal base ensuring an effective climate policy would be the first thing that the parliament, the government and, subsequently, the body, which the government entrusted with national implementation of the international climate agreement signed by Russia, should have done during this period. What was accomplished during these years? Was such legal base created? Unfortunately, it should be admitted that such legal support to the climate policy is still absent in Russia. Failures of the climate policy in this crucial issue are the best possible reflection of ICC position in the contemporary system of the authorities.

[71] See, Kotov V., Nikitina E. To Reduce or to Produce? Problems of Implementation of the Climate Change Convention in Russia. In: Verification 1996. Poole J., Guthrie R. (eds.), West view Press, 1996, Boulder, Colo/ Oxford, England

Some people say that the situation with the legal support of the climate policy is not so dismal. An opinion is expressed that certain elements of the climate policy legal support are contained in other legal acts adopted recently. According to this view references are made to the legislation on environmental protection, on atmospheric air protection, the law on the Climate Convention on ratification, the Forest Code, a number of government ordinances and instructions in the energy sphere, and, first and foremost, to the Federal Climate Program. I am going to devote special attention to the Climate Program analysis, but as far as other above-mentioned environment protection laws are concerned, their study clearly shows that they do not create any specific legal base for the regulation of GHG emissions. Nothing similar to the legislation on atmospheric air protection or the Water Code with their regulatory mechanisms has been created in the sphere of GHG emissions regulation yet. In addition, if an urgent need in such regulation and in the adoption of measures to limit emissions emerges in the nearest future, it remains absolutely unclear how to approach the enterprises that emit GHGs with this problem, how to do that on legal grounds. One can only rely on the instruments of quotas trading and joint implementation projects that are based on the voluntary principle. However, the application of these mechanisms in Russia entails a number of stumbling blocks, and the creation of the legal base for these mechanisms will require much time and will be attended by serious difficulties because it will find itself in the center of group interests.

5.8.6. Federal Target Program on Climate Change

In 1996, a special climate program was approved by the ordinance of the RF government. It was awarded a status of the federal target program and was promised budget financing.[72] The Climate Program, according to its provisions, should have ensured (1) «fulfillment of the RF obligations under the Convention» and (2) “implementation of a complex of measures aimed at the prevention of negative consequences of the climate change in the RF”. Thus, one of the declared goals of the Federal Climate Program should have been the climate policy implementation, i.e. the factor that was so obviously missing for many years.

It became clear quite soon that it was a program that was supposed to deal with the design of measures on paper rather than with the climate policy measures implementation, mitigation and adaptation. Only after these measures within the Program 1996 are developed in 1997-2000, the next special program should deal with their implementation in 2001-2020. Hence, the program of 1996 represented merely a certain pre-program: the development of yet another climate program should have been its key outcome. The organizations and the personnel that worked within the framework of the Federal Climate Program (1997-2000) constantly complained that the state did not fulfill its obligations concerning its financing: «...current funding of the Program can not be considered as

[72] Federal Target Program "Prevention of dangerous climate changes and their negative consequences"; ordinance of the RF government, №1242, 19.101996

satisfactory even for the first steps of activity».[73] Unending problems with funding forced the R&D institute of Hydromet that should have developed the new federal program to use the American sources of financing. Preparation of the "Climate Change Action Plan Report" was started in 1997 with the support of the US Department of Energy and EPA. It was focused on the practical problems of climate change activity in Russia. Before that, the work on the inventory of GHG sources, on the first and second national communication and, recently, the work on the Climate Change Action Plan that would probably become a basis for the new Federal Target Program were carried out mainly with the American money. It should have come into effect in 2001, but it has not happened in due time.

The institute of the state programs is not a novelty for Russia: it was well known already during the Soviet period. However, it would be a delusion to believe that this institute can be fully transferred from one system to another. The state program in contemporary Russia where other methods of rare resources allocations moved to the foreground is very different. Such programs were in great abundance in Russia during the 90s. The most of these programs had one common inherent feature: they were not implemented, remaining paper instruments. First, lack of financing was the reason for their failure. The new government intends to reanimate the institute of state programs. For this purpose, the RF government reduced drastically the number of federal target programs, leaving only 61 programs in 2002 and simultaneously improving their funding. It seems that Climate Program not among the programs survived. Significantly weakened Russia's green movement can hardly help. Interest of G-8 towards climate policy issues can enhance the situation in Russia in this field more rapidly. After US exited KP the help from G-8 is also hardly to expect.

5.8.7. Economic Depression and institutional capacity building

During recent years in Russia as a result of economic depression, the level of fuel production and consumption has declined. Together with it, reductions in CO2 emissions took place. Until now, the delay with the construction of real mechanisms of the Climate Convention implementation was excused primarily by the fact that the level of GHG emissions in Russia was considerably lower than the level established for it, and forecasts for the future did not cause any special worry. Why hurry when the level of emissions is low even without any special efforts, and the Kyoto Protocol is waiting for its ratification. However, time passes quickly, and the situation changes. During the period 1999-2001 the GDP of Russia increased by 20%. The question is how the problem of emissions reductions would be solved when Russia shifts to long-term economic growth. According to estimates made recently, especially in a coarse of preparation for hearings on KP ratification in the State Duma, CO2 emissions in Russia in the first budget period 2008-2012 should not exceed their base level of 1990.[74]

[73] "Climate Change Action Plan Report", Executive Summary. Hydromet, 2000

[74] Papers of the State Duma prepared for hearings on Kyoto Protocol ratification 18.06.2001; RIJA Report on Moscow Workshop 14-15 May2001

This data had a favorable impression and calmed down the members of the ecology committee of the State Duma, and they deprived the opponents of Kyoto Protocol ratification of their main arguments.

The decrease of DGP gave to Russia the possibility to reduce GHG emissions. However, at the same time some new problems emerged. Although dynamics in CO2 emissions follows the general trend in economic development, it lags substantially from the latter one. The scope of decline in production exceeds reductions in emissions level. The fuel and energy consumption in Russia had not decreased to similar extent as GDP, and is lagging behind it. Sharp increase in energy intensity of Russian economy occurred: more energy has been consumed per unit of GDP (+21% in the 1990-s). General degradation in Russian economy because of economic recession shifts in the sectoral production structure of GDP, lack of equipment renovation led to more ineffective patterns of energy consumption.

Sharp decrease in economic activities in Russia is dangerous for nature as well. Economic decline stipulates technological degradation: primitivization of industrial production methods, decay of purification facilities, shift to more simplified and crude schemes of purification and absorption. The number and scales of technological catastrophes with grave ecological consequences have increased. In Russia, several leakages in pipelines occurred and huge quantities of oil appeared in water basins. Methane leakages from gas pipelines also have been occurring more frequently. Technological and economic degradation results in postponing and diminishing the possibilities for climate problem solving.

Another problem is connected with extension of the shadow economy in Russia. Level of GDP indicated by official statistics seems to be considerably underestimated. During the Soviet period, there was a stable phenomenon of statistical exaggeration in the levels of industrial production. It was associated with the desire of the heads of enterprises to report fulfillment or over-fulfillment of plans in order to get their premiums. Today there are no plans, but there is a desire to increase incomes, and with this purpose - to avoid taxes. Consequently, there is a distortion of primary statistical data: it results in underestimation both in volumes of GDP, and in fuel and energy production and consumption.

The ICC spent 1990-s on the scientific substantiation of the climate policy, formulation of the delegation’s position at negotiations, compilation of national communications and inventories. All these activities are important and necessary, but they should be regarded as a preparatory work. What was done during the 1990s is insufficient for the creation of the institutional basis that would ensure effective functioning of the climate policy in the nearest future. Main work in the sphere of capacity building was not carried out; the legal base of the climate policy was not created (though the Federal Target Program on the climate change envisaged the conduct of these activities in 1997-2000); its main instruments for the regulation of GHG emissions were not formed. Lengthy economic depression provided more than enough time for this undertaking. However, the advantage was not taken of this

opportunity. Now time is pressing, tomorrow it will be necessary to launch instruments limiting GHG emissions, but they are still absent. Developing them is not enough; it is necessary to pass them through the government and Parliament as well. A serious struggle will start there, because the climate policy instruments, as no other environment protection instruments, affect the interests of powerful groups. All this will require time. However, in addition, the adaptation of these instruments to the specifics of Russia's economic system will require a lot of time.

5.9. Kyoto Protocol and Institutions Capacity Building in Russia

5.9.1. Kyoto Protocol as an external factor of institutional construction

The functioning of the Kyoto mechanisms in Russia will be inevitably under an enormous influence of the domestic institutional structure. However, it is necessary to see another side in the interaction between the domestic institutes and the Kyoto mechanisms: the Kyoto Protocol, after it is ratified by the Parliament, will become a new important (external) factor that will affect the formation of Russia's climate policy.

The Kyoto Protocol contains both norms with hard obligations (Article 3 with the quantitative obligations on limiting GHG emissions) and soft obligations of participants. The latter are formulated in the form of recommendations. In particular, this form is applied to the national climate policy in the Protocol. The element of flexibility is achieved in this case by the "parties aim at" formula in the Protocol. This gives Russia as the country with economy in transition the opportunity to use the policy with instruments and measures corresponding to the greatest extent to the specifics of its transition period.

In order to realize the provisions of the KP, Russia will have to adopt a whole range of legal acts to create a necessary legal framework for the climate policy of the country. Primarily, Russia will have to identify a state body (bodies) that will be responsible for the implementation of the Protocol. The identification of the body responsible for the efficient functioning of emissions trading mechanism and the joint implementation projects will represent a special issue in this context. The question of legal regulation of relationship that will emerge in the process of functioning of allocation mechanisms both inside the state bodies and between legal entities (enterprises and organizations) that are sources of GHG emissions, on the one hand, and state regulating bodies, on the other hand, will assume a special importance. It is deemed necessary to resolve first the following issues in order to ensure legal support of Russia's participation in trading rights for GHG issues:

- who will own rights of property in AAU: a) the state, b) municipalities, c) enterprises (or some combinations of these actors);

- if the state acts as the owner of AAU the following question inevitably arises for Russia as a federative state: what level of the state authority will the owner of these rights represent, i.e. the Federation, the regions (Federation subjects), or the Federation and the regions (here the question arises on the sharing of these property rights);
- who will carry out trading transactions from the Russian side: the state or legal entities (enterprises and organizations) and citizens (or a combined system will be chosen);
- what will be the legal regime that will serve as a framework for undertaking trading transactions: clearly, in the case of Russia it will involve foreign economic deals, since, first, the parties to the deal will have a different state affiliation, and, second, foreign currency will be used for settlements;
- it means that these transactions will have to be regulated in Russia by a special legislation concerning foreign trade deals.[75]

5.9.2. Future institutional configuration: competitive projects

Russia delayed the institutional capacity building in the climate policy. One of the reasons for this delay was the lack of the necessary balance of interests between different agencies for the control over the climate business. Each adversary proposed its own plan of institutional construction. However, these proposals on the design of the future institutional structure though remained unrealized yet are of considerable interest. The institutional structure that should be established in Russia in the nearest future, with increasingly less time remaining for its construction, will be built not from scratch. This aim will be accomplished by (1) using the intellectual reserves that were already accumulated; (2) using, at least partially, the regulatory mechanisms that are available in certain other areas, but that could prove necessary for the regulation of the climate sphere; (3) taking into account interests of the agencies that will manage to preserve their influence on the process of institutional construction when it begins. Thus, the proposals on the institutional construction already available in the past can form the basis for the configuration of the climate policy institutional structure that will appear in Russia in the nearest future.

During the post-Kyoto period (1998-1999), two main projects of the future institutional structure intended to ensure the functioning of Kyoto mechanisms at the national level were competing with each other. The first was the project that expressed the interests of the former RF Committee of Environmental Protection (CEP). This Committee, as well as the Hydromet service, did not have a substantial bureaucratic weight and did not occupy a prominent niche in the Russian government hierarchy. Nevertheless, the CEP resolved to succeed in what Hydromet failed, i.e. to try to seize

[75] O.Orlova. Certain legal issues of adoption of the Kyoto Protocol. The Russian-American Workshop on Quotas Trading. Moscow, 1998, pp. 53-60

control over the future climate business in Russia using some political connections.

The project announced that CEP had mechanisms for rationing atmospheric emissions and issuing licenses for these emissions, as well as the system of emission sources inventory and monitoring, at its disposal. This claim actually constituted a declaration that this agency already possessed a necessary basis for the creation of the national quotas trading structure, at least its most important components: an appropriate personnel and relevant experience. Just a mere trifle was needed to supplement the already available instruments. Therefore, it was a serious claim for establishing control over the future climate business.

What does the system of atmospheric emissions management at the disposal of the CEP look like? First, it is a block of institutes establishing the norms of atmospheric emissions. The process of rationing is based on medical standards of the state of the atmosphere; they determine maximum allowable concentrations (MACs) of pollutants. The territorial bodies of the CEP establish maximum allowable emission norms for each physical source of emissions (there can be several sources of emission at one enterprise) taking into account other sources of pollution located nearby. These norms serve as a basis for granting emission permits to each source by these bodies, as well as for the subsequent control over the fulfillment of obligations established by these permits. Today, MACs are established for a great number of gases. But if we take greenhouse gases, there are norms available only for methane and some ozone-depleting substances (and these are medical norms). Each enterprise having stationary sources of atmospheric pollution submits a report on its atmospheric emissions to the territorial body of the CEP, in accordance with a well-known form “2-tp (air)”. Besides, an ecological passport of an enterprise is compiled based on an inventory that is made once every five years. This passport contains important information on technologies, raw materials and fuel utilized by the enterprise, including per unit of products, harmful emissions, etc.

The idea of the CEP was to use the instruments it had at its disposal, and, primarily, the form “2-tp (air)” and the ecological passport of an enterprise with the aim of managing GHG emissions. The existing system of enterprises’ reporting should have been supplemented by more detailed information on their fuel and energy consumption, by the system of GHG emissions reduction stimulation, by the establishment of a system of limits for their emissions for stationary sources and by the tax on emissions by mobile sources. This plan included an important item whereby it was envisaged to allocate allowances not only among enterprises, but among regions as well. Subsequently, regional authorities became important players in the crucial issue of AAUs allocation. This preposition was made in order to ensure the passage of the project domestically.

Other interesting points were to be found in this plan: a scheme of functions distribution in the control of climate business between different departments. Seven main agencies were supposed to take part in this management, including such bodies as the Ministry of Fuel and Energy, the Ministry of

Economy, the Ministry of Finance, the Ministry of Transport, as well as the Russian Forest Commission and the State Committee for Statistics. It is interesting that Hydromet that was the chair of the Interdepartmental Commission on Climate Change was not mentioned in this scheme at all, as well as the ICC itself.

The scheme allocated the following functions to its most powerful competitor, i.e. the Ministry of Fuel and Energy: 1) primary inventory of emissions (together with three other agencies); 2) development of the monitoring system (together with three other agencies); 3) development of sectoral forecasts (together with two other agencies); and 4) implementation of investment projects (together with three other agencies). The Environment Protection Committee intended to retain the execution of the following crucial functions: 1) transactions certification (solo); 2) accounting of quotas use and registration of deals (in duet with Goskomstat who was bound to deal with purely technical accounting functions in this duet); 3) primary allocation of quotas (in trio with the Ministry of Finance and the Ministry of Economy); 4) organization of financial flows (in trio with the Ministry of Finance and the Ministry of Economy); 5) primary inventory of emissions and development of the monitoring system (in quartet with three other agencies); 6) development of the control system (in duet with the State Forest Commission that would have performed this work only for its sector, while the Environment Protection Committee would have done this monopolistically for all other sectors). Therefore, the Environment Protection Committee would have enjoyed main positions in the institutional structure of GHG emissions domestic regulation under this project.[76]

The plan of this small bureaucratic revolution looked like in mid-1998 was not fated to be carried out in accordance with this scenario. In August 1998, the deepest financial crisis broke out in Russia. Nobody had time to spare for the issues of the institutional construction in the climate policy. However, Russia began to recover from the consequences of the August 1998 crisis amazingly quickly. In addition, since post-Kyoto period already began with its challenges in the institutional sphere, the pause ended. In early 1999, the RF Ministry of Fuel and Energy published its design of the institutional structure (it was made via publication of its research institute). Key features of this project, or, as its authors were saying, "possible institutional schemes", were as follows:

Distribution of functions of the control on climate business between the Federation and the regions. The functions of the future quotas market regulation were supposed to be concentrated at the Federation's level.[77] Therefore, the regional authorities were excluded from the management of climate business. There was a reasonable apprehension the regional authorities would have regarded

[76] "The Russian-American Workshop on Trading in GHG Emissions Quotas. Moscow, July 1998, pp. 71, 73". "The RF State Committee of Environment Protection is the main body of the GHG emissions state management. It is the principal federal body responsible for the policy in the sphere of atmospheric pollution reduction. The regional divisions of the State Committee are charged with the practical implementation of this policy. Proceeding from practical considerations, the regional divisions often work with the regional and city administrations and under their control", said the project.

[77] *"Just the Government of the Russian Federation is finally responsible for distribution and use of quotas"*. "Post - Kyoto Energy". Ministry of Fuel and Energy of the Russian Federation. Institute of Energy Strategy. March 1999

financial resources generated by the sales of quotas as an administrative rent that they rightfully owned, and not much of these revenues would have been invested in energy saving. It is true that the Charters of the regions contain a provision that the management of the regions' natural resources is in the competence of the Federation and the regions. However, the natural resource that the climate policy deals with cannot be tied to a regional territory. It falls under the category of federal natural resources that are envisaged by the RF legislation (it is possible that disputes will emerge in the future between the Federation and the regions on the issue of revenues from sinks as the result of reforestation and restoration of forests). Besides, the Russian Federation received an AAU quota under the Climate Convention and Kyoto Protocol. The majority of big enterprises that could become sources of carbon credit in the future are also in federal, rather than regional, property. The issue of property in natural resources demarcation and management thereof is rather painful for the RF. A prolonged litigation on this issue is underway between the Federation and the regions; the legislation created a considerable confusion in this sphere; and there is a serious overlapping of competence here. Presumably, it will be possible to avoid all this confusion in the AAU issue; otherwise, the quotas market and the RF climate policy will encounter numerous uncertainties and risks unknown to other countries. The greatest trouble can be in store for the Kyoto mechanisms in Russia primarily if these instruments will become an object of the struggle between the Federation and the regions. However, the progress in political stabilization allows hoping that it will not happen.

The role of the ICC[78]**.** In contrast to the project analyzed above that ignored the Interdepartmental Commission on Climate Change, the project of the Ministry of Fuel and Energy treated the ICC much more delicately. However, one bureaucratic nuance should be taken into account: the latter project considers the possibility of preserving the ICC only under the chair of a Minister. It is known that the ordinance of the Government on the establishment of the ICC charges the head of Hydromet with its chair. However, the head of Hydromet does not hold a ministerial rank, and neither does the head of the CEP. Thus, this item in the latter project severs these two competing departments from the governance of the Commission and practically proclaims the replacement of its chair. One cannot ignore the obvious fact that Hydromet, as the head of the ICC clearly did not have enough bureaucratic weight. Hydromet was unable to play the role of an arbiter in the conflicts that occurred in the past and will undoubtedly occur in the future between Russian bureaucratic heavyweights. Two projects of institutional reorganization where Hydromet as the head of the ICC was no longer present clearly show that this issue was ripe. As far as the perspectives of creating a specialized institute managing the Kyoto Protocol implementation activities are concerned, they will be connected largely to whether the abilities to control this new organization will correspond to the plans of the strongest bureaucratic players.

[78] "The high level body might be the Interdepartmental Commission on Climate Change or a new body especially responsible for activities under the Kyoto Protocol which could be chaired by one of the Ministers or Deputy Prime Ministers".

Introduction of the intermediate level in the climate policy management. [79] This level is extremely important. It is clear that the interests of individual departments in the climate policy will be realized through the activities of these sectoral bodies. It is also clear that these sectoral bodies will draw upon themselves a certain proportion of functions that the high-level body (the ICC or a specialized body) would have assumed otherwise, as well as a proportion of functions of the lower level, i.e. the level of enterprises. This proposal, on the one hand, created a space for reaching an agreement between different departments, and, on the other hand, strengthened the positions of the Ministry of Fuel and Energy itself. The enterprises of this Ministry account for the lion's share of CO2 emissions, and it maintains its full control over the climate policy management in this key sector owing to this intermediate body.

Limited role of enterprise.. [80] Free access of enterprises to the international quotas market is not envisaged in this project, though enterprises and organizations are mentioned in its plan only in one context, i.e. solely as project participants (of joint implementation projects). However, even in this status they will not enjoy the right to offer their share of carbon credit for sale under this proposal. In general, the proposed rules of the game at the level of enterprises and organizations are defined extremely unintelligibly by the proposal. It is possible to conclude from what it outlines that enterprises and organizations will be unable either to buy or to sell quotas at the international market. As far as the domestic market is concerned, the character of enterprises' participation therein is simply not clarified by the project.

"Order of organization of AAU quota transfer". [81] It is noteworthy in this point that the "Order" is established through the approval by an ordinance of the government, rather than by the adoption of a law. There is nothing unusual for the Russian practice here; it was done this way many times when countless provisions and instructions developed in the depths of the government were approved. This practice actually means that an interested department develops rules of the game for itself, and this approach was regularly criticized. Nevertheless, it was decided to use this mechanism once again. It is hardly worthwhile to forecast for how long it will be necessary to wait after that for the adoption of the law that would have placed this mechanism on a stronger foundation independent from departmental interests.

Bilateral cooperation. [82] An emphasis on bilateral co-operation is clearly visible in the project. It

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[79] "Intermediate level is Russian ministries and agencies, which serve as general authorised organisations and use quotas in sectors (their volumes should be agreed on the high level body)»; «ministries and agencies can also nominate their authorised organisations for relevant parts of the work".

[80] "Lower level is enterprises and organizations"; "on the early stage of trading in Russia it is practically impossible to organize free access of separate enterprises and organizations on international quota market".

[81] "It is suggested that, authorised Russian organisations work under guidance of its curators - ministries and agencies and also in accordance with Government's "Order of organisation of AAU quota transfer".

[82] "The important issue for institutional arrangements could be practical steps on bilateral basis. If the Russian Federation will start practical activity by some agreement with some country the rules of game could be developed especially for this practical activity"; "If the Russian-US Commission for Economic and Technological Development (Gore-Primakov Commission) will create good incentives for development and use of Kyoto mechanisms it can be a start for creating of special institutional structure"; "If the RF will reach an

corresponds to the general approach to this issue prevalent in Russia: a marked interest in co-operation in the climate sphere on the bilateral or multilateral basis but with a limited number of participants is manifested here. Certain comments to the Kyoto Protocol that appeared in Russia proceed from the assumption that the Protocol envisages four, rather than three (quotas trading, joint implementation projects and CDM), mechanisms of co-operation, and include a mechanism of bilateral co-operation therein.

Mechanism of CO2 emissions monitoring. This point played an important role in the project initiated by the CEP. Its project was based on the claim that the CEP possessed technical mechanisms for rationing of atmospheric emissions of gases, of their accounting and control at the level of enterprises, of their licensing, etc. The proponents of a different approach to this issue proceed, however, from the assumption that, in contrast to other harmful atmospheric emissions, CO2 emissions do not require physical measuring by special metering devices and gas analyzers. Volumes of these emissions are calculated based on different types of fuel consumption. However this information is regularly collected and calculated by the State Statistics Committee, and it is supplemented by sectoral statistics of the Ministry of Fuel and Energy, the Ministry of Transportation, etc. The famous form "11-ter" serves as a source of primary data on this issue. All big and mid-size enterprises are obliged to fill it in, i.e. all stationary producers of energy and heat, and it allows the accounting in accordance with the methodology of IPCC. If the data on CO2 emissions will be included in the form "2-tp (air)", individual enterprises will be charged with calculations and the opportunity to control them will be lost. When Russia has to submit this data on CO2 emissions in the National Communication under the FCCC the calculations will have to be carried out anyway in accordance with the methods recommended by IPCC. Thus, the form "11-ter", rather than "2-tp (air)", is of crucial significance for CO2 emissions calculation. The Ministry of Fuel and Energy and the State Statistics Committee control just these figures. As far as other GHGs are concerned, an extension of the form "2-tp (air)" will probably be needed. Alternatively, if this operation proves to be expensive, these types of gases will have to be excluded from the list of gases that Russia is going to trade in the nearest future.[83]

5.9.3. Prospects for the Kyoto Protocol ratification

From the point of view of the organizations that were responsible for the implementation of Russia's climate policy, it fared quite well during the 1990s. Its main achievement was the signing of the Kyoto Protocol in the form that corresponded to the Russian interests and that reflected many goals that Russia expected to realize in the course of its negotiations:

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agreement with some Annex I country to develop a special program for project investments using the Kyoto mechanisms there could be created a separate structure for implementation of this program".

[83] Russian-American Workshop on GHG Emissions Quotas Trading. Moscow, 1998, pp. 76-77

- Carbon credit became a legitimate method of realization of CO2 emissions limitations.
- Unutilized quotas for CO2 emissions can be sold at the international market in addition to the carbon credit acquired as the result of the implementation of the projects aimed at emissions reduction.
- The 1990 level is fixed as the base line.
- The Russian emissions quota is established at 100% of the 1990 level.
- Quite lengthy five-year effective period of the quotas is established.
- The term "hot air" is, absent in the Kyoto Protocol.
- Sinks (though in a limited form) are taken into account in the process of fulfillment of obligations on emissions reduction.
- A joint fulfillment of quantitative obligations concerning GHG emissions (item 1 of Article 3 and Article 4 of the Protocol) that should be based on the agreement between the countries is allowed.
- Certain flexibility is envisaged for the countries with economies in transition

concerning the fulfillment of their obligations under the Protocol (except quantitative obligations).

However, the text of the Kyoto Protocol contains many unregulated issues which resolution was postponed. The greatest attention was paid in Russia to the following issues:

- The rules of emission trading remained unregulated (Article 17).
- The definition of principles that should form the foundation of the joint fulfillment of obligations did not find its solution in the Protocol (Article 6).
- The definition of principles and rules for accounting and regulation of GHG sinks in the forestry and agricultural sector was missing (item 4, Article 3).
- The duration of the subsequent budget periods and the volume of the quantitative obligations of the parties within the framework of these periods were not determined (item 9 Article 3).

Russia joined the Umbrella Group that advocated the full implementation of the international co-operation principle. Though the positions of Russia and the Umbrella Group on the key issues coincide[84], a certain difference of interests and nuances in the position were inevitable here:

- The common position of the Umbrella Group was that any quantitative limitations of trade are

[84] FCCC/SB/1998/MISC.1/Add.1 or "Canada's proposal"

unacceptable. Article 17 says nothing about the necessity of the quantitative interpretation of the terms. Russia also made an emphasis on the fact that it opposes in principle the use of the term "hot air".

- The Umbrella Group believes that granting of rights for emissions trading to legal entities and the establishment of the rules for the use of revenues generated by emissions trading is an internal affair of a given country. For a long time, Russia maintained a position that it should be specifically stressed that the establishment of the quantitative parameters of reinvestments in the future measures should be a purely internal affair of a given country. A certain evolution in Russia's position on reinvestments took place at the Conference of the Parties held in the Hague. The declaration of the head of RF delegation said, "the RF is ready to consider the option of a target utilisation of funds generated by the application of these mechanism for the further reduction of GHG emissions".[85]

- According to the Umbrella Group's position, each country issues AAU that bears a number indicating the country and the effective period of obligations. Russia's position stressed that a country should issue these documents rather than by a supranational body; they should not contain references to specific projects or enterprises because the state is responsible for the obligations of the country.

- According to the Umbrella Group's position, AAU should not be reviewed depending on their origin, i.e. they should not be dependent on whether JI, CDM or sinks generate them. Russia believed that such an approach will allow avoiding discrimination of sinks and will make it possible to regard the joint implementation projects as a simplified form of trading.

- The position of the Umbrella Group was that the countries should annually report on the activities of emissions trading. Besides, a report should be submitted on the results of the whole commitment period when each country will be assessed in terms of its compliance. Russia made a special emphasis on the fact that this assessment of the country should not allow distortions and arbitrary interpretation of data by an inspecting body or a group of experts. Assessment should be made after the end of the period; annual inspections will drastically increase costs and will have a depressing impact on trading at the beginning of the year.

- The position of the Umbrella Group was that if the country has unused AAU and if it fulfilled its obligations it could use banking for its conservation. The position of Russia envisages the possibility of banking also in the case when some insignificant deviations from the rules by the country were discovered, and the fulfillment of its quantitative obligations under the Protocol does

[85] Declaration of the head of the RF delegation at COP-6 in the Hague dated November 21, 2000

not give rise to doubts.[86]

Thus, certain special emphases in Russia's position are aimed, primarily, at preventing an arbitrary interpretation and arbitrary application by the Convention bodies of the rules that permit their unfair construing and transform the procedures of "assessment" and "compliance" into the instruments of faultfinding and pressure. The desire of Russia to take precautions does not appear unnecessary in view of the position on the Russian surplus taken by the European Union on the problem of the so-called "hot air". A direct threat existed that the positive results that Russia achieved in the course of negotiations on the Kyoto Protocol will be eliminated at the stage of the protocol implementation through purely technical and procedural measures. The declaration of the head of RF delegation at the Hague said "if the procedures and mechanisms of compliance do not take into account the interests of Russia as the country with economy in transition it can become an obstacle to the Kyoto Protocol ratification".[87]

In its turn, Russia disagreed with a number of positions presented by the European Union at negotiations. First, it concerned EC's positions on "additionality". Russia believed that this instrument imposed unjustified quantitative limitations on quotas trading, that the term "ceiling" of the trade introduced a limitation under which it will be impossible to sell a greater number of GHG emission units than were received owing to the realization of national measures. At the same time, a question from which base line these national measures will be calculated remained unclear. As the result, limitations were imposed on quotas trading that are characteristic for the joint implementation projects. Second, it concerned the issue of "eligibility". Within its framework, it was supposed to organize preliminary inspections of the country in addition to the use of the national system of monitoring, annual inventory and submission of reports, as well as the activity of the body on deals registration. A "group of experts" should carry out this inspection with regard to the correspondence of the national system of trading to certain international requirements. The Secretariat of the Convention will inform the participants of the Convention on the eligibility of the country to participate in trading only after such an inspection.

Russia supposed that the groups of experts were endowed with control and permit functions by this proposal of the EC that they do not have under the Kyoto Protocol. According to Article 8, they should only review information contained in the inventory and national communications and confirm (or not confirm) the adequacy of information provided by the countries in these documents. Russia believed that expert inspections always provide an opportunity for arbitrary interpretation of these or that rules and the degree of their observation by the countries, especially in the event of political or ideological engagement of the experts. Hence, the approach from the position of deregulation in this area will

[86] See A.Kokorin. Brief analysis of the results of the session of UNFCCC auxiliary bodies. The Russian-American Workshop, Moscow, 1998, pp. 63-67

[87] Declaration of the head of the RF delegation at COP-6 held in the Hague dated November 21, 2000

safeguard the Climate Convention from excessive debates and transition to an extremely unstable situation. It is necessary to inspect, but to inspect only what is subject to unambiguous assessment and does not leave room for arbitrary interpretation. It should not be allowed to transform inspections and assessments into the method of blocking the mechanisms of the Kyoto Protocol that their opponents were unable to block at the stage of negotiating process, but trying to retaliate, will block at the stage of implementation.

The Kyoto Protocol signed by Russia is an interstate agreement that will become binding to them after its ratification. The Federal Law establishes the procedure for the ratification of international agreements by Russia.[88] The State Duma should adopt the Federal Law on the ratification of the Kyoto Protocol, and, after that, this Law should be considered by the Federation Council, another chamber of the Russian Parliament.

Until now, it was supposed that the Kyoto Protocol would hardly be ratified in an atmosphere of intense struggle in Russia as it is expected in some other countries. The hearings on the Kyoto protocol organized by the Ecological Committee of the State Duma were held in the parliament 18 June 2001 and confirmed this assessment. Most of the participants supported the idea of Kyoto entry into force. The Committee of the State Duma did not support US actions towards Kyoto protocol, and did not exclude that Russia may ratify the Kyoto without the US in case it has a convincing evidence about ratification from the EU, Japan, partners of the Umbrella group, Switzerland, countries of Central and Eastern Europe. At the same time, a number of conditions have been put forward by the parliamentarians:

- the Kyoto text is not subjected to any revisions;
- the door for the US return back should not be closed;
- guiding principles, norms and rules of the Kyoto should stimulate the Russia's participation in this regime, but not to impose additional financial burden;
- the mechanisms of Joint Implementation and International Emission Trading are to have 'a green light' and should not be discriminated in contrast to the Clean Development Mechanisms;
- early start in application of Kyoto mechanisms would allow establishing the preconditions for stable progress in global reduction of GHG emissions.

At the same time, in the hearings in the Environmental Committee of the State Duma it was recommended to the government to prepare and to introduce into the State Duma the projects of the following legislation:

[88] "On International Agreements of the Russian Federation", 15.07.1995

- on quota allocation at different levels, including from the national level to the level of an enterprise;
- amendments to existing legal acts defining the property rights on certified GHG emission reduction and rules for their transfers;
- on institutional procedures for certification of GHG reduction;
- on defining the responsibilities for elaboration and introduction of national monitoring system of anthropogenic GHG emission and their absorption by sinks;
- introduction of incentive mechanisms for elaboration and implementation of projects of GHG emission reduction and of their sequestration according to the procedures of the climate change regime.

5.10. Conclusions: Peculiarities of Climate Policy in Russia

Climate policy in Russia started its formation in the first half of the nineties, i.e. in a course of preparation for signing the FCCC, and then during first GHG emissions inventory compilation, was under a strong impact of specifics of general economic and political development during that period. It was starting phase in economic and political reforms, their halt due to their failures, the period of deep and long economic depression, of flourishing of a shadow economy, the period of political and economic instability. It was the initial phase of transition which faced a considerable number of difficulties, crisises, and institutional chaos. All that had an impact on climate policy formation, and defined a number of its weaknesses and shortages, as well as incompleteness of its institutional framework. Thus, the first important peculiarity of the Russian climate policy is that its formation was, and still, is under the conditions of the transition period, which is not finished, yet. Thus, Russia's inclusion by the FCCC into a group of countries with economies in transition is not only of a formal character; it reflects the state-of-the-art in institutional capacity building in economic and administrative systems in this country.

The second important peculiarity of the Russian climate policy is that the role of the problem of climate change and climate policy in public perceptions during the nineties was extremely low. I consider it as one of the main features of the Russian climate policy, as it shaped some of its other important peculiarities. It's easy to notice that global warming and climate change mitigation appeared to be at the bottom of the public agenda in Russia while comparing the public attitudes to this problem in developed countries and the place of this issue in the programmes of political parties, and in political competition. The reasons to such state-of-the-art are on the surface: the public polls indicated that the public was involved in solving the problems of its survival, and it was primarily interested in

solving the problem of low salaries and pensions which has been below the living wage, of growing level of unemployment, criminalization, and insecurity. In fact, such attitudes to environmental problems are not unusual for the periods of sharp economic depression, and in this respect Russia, where environmental problems in contrast to the period of mid-eighties have been at the bottom of public priorities, is not an exception. It is also necessary to note that within environmental problems scaling the climate change issues were not at the top of the national public agenda in contrast to the problems of radioactivity, drinking water quality, air quality, and wastes disposal.

The effect of another negative factor is added to all that. The governmental body that was responsible for climate policy implementation in Russia, i.e. the Interdepartmental Commission on Climate Change (ICC), was not able to perform solid and independent policy. The major reason was that ICC was headed, according to the decision of the government, by the institution with low bureaucratic powers (Hydromet). Weakness of the main subject of the climate policy was the reason for its passive stance, for the lack of its dynamics, and defined its lagging behind in institutional capacity building. As a consequence, the climate policy entered into the new millennium with inadequately developed institutional infrastructure, considerable gaps in its legislative basis, and with absence of instruments and mechanisms necessary for its implementation. Thus, the third important peculiarity of the Russian climate policy is weakness of its major institutions, and especially, weakness of the institutions at the head of climate policy in the nineties, including its weakness in contrast to other institutions within the structure of the government. When the government lacked resources, then the climate policy was the first to be deprived of financial support. Federal climate programme elaborated by the ICC and approved by the government, was almost a failure, since its major goals (for example, such as passage through the parliament of a set of climate laws) have not been implemented. The state was not able to finance its own programmes. As a result, in 2001, the climate programme was abolished according to the decision of the government[89]

Due to severe deficit of finance to support the prior measures of climate policy, the attraction of finance from foreign sources was initiated. Compilation of GHG emission inventory, preparation of the First National Communication, support of delegations participating in international negotiations was performed on through financial support of the West. The USA was the most active in these efforts. Maybe it is one of the reasons for passive behavior of the Russian delegation at international climate negotiations, and its steps undertaken similarly to the course of the US climate policy in the 1990s (it has been mentioned in the West and Russia was reproached for that)? Thus, another peculiarity of the Russian climate policy in the nineties is its one-sided orientation at position only of a single participant in international climate change regime formation. In the 1990s, there was no public discussion about what is in the national interests of Russia in climate policy, and what the content of such national

[89] Izrael Y., Interview to *Izvestia*, 8.02.2002

interest is. Unfortunately, it has not been done until today, and too many non-clarified, but important details remain. Without that, the climate policy of Russia would be lacking the necessary clearness in its realization. It relates both to domestic and international climate policies. Indeed, inside the country the climate policy is also subjected to pressures and influences of many interest groups. Thus, without singling out the contents of the national interest, the climate policy of the government would not avoid fluctuations and failures. That would reduce its effectiveness, or even make it to strive for the goals that do not correspond to the national interests.

However, at the beginning of the 2000s there have been some changes in the Russian climate policy. It is not possible to say that these changes were cardinal, but they have been quite substantial. Their consequences in some cases are of a long-term character, and these changes seem to proceed in the future. It is another question whether these changes are for bad, or for good and the answer depend on the criteria chosen. I would like to identify these major changes and their main trend, if it can be identified. No less important is tracking the absence of changes in some parameters.

Low priority of climate change problem and of climate policy in public perceptions still remains. There are no considerable changes in attitudes of common public, mass media, and political parties. Recently, there has been certain activation of NGOs on the issue; but, according to many experts the activities of NGOs in Russia, unfortunately, are still of a decorative character, and public does not take a real part in their efforts which are mostly limited to activities of a narrow group of functioners. Comparison between Russia and the EU countries in reaction towards the position of the new US administration to Kyoto indicated at significant difference: the storm on the EU is contrasted to scarce and delayed information in the Russian newspapers that are accompanied by unclear and low professional comments, in the best case.

Nevertheless, certain changes can be observed, and new important nuances appeared. In two quite narrow, but important groups of the Russian society, the interest to climate policy emerged. This interest is of a pragmatic and mercenary nature, and it is linked to the prospects of the Kyoto Protocol entry into force and to opportunities opened by its flexible mechanisms that should be scored to the benefit of the latter. These interested groups are, first, the directors of enterprises in such industrial sectors where application of the Kyoto tools promises considerable benefits, and, second, the bureaucrats at the federal and regional levels that might be involved in regulation of domestic application of the Kyoto Protocol in Russia. Forecasts made in the West regarding multi-billion "windfall" for Russia in case of the Kyoto entry into force excited the entrepreneurs and bureaucrats in Russia. Thus, the possibilities in Kyoto tools application have turned the climate policy of Russia from the traditional environmental protection sector which did not result in nothing more than additional spending and a headache for the Russian government, into the sphere of climate business. Potential incomes of this sector might be comparable with the most beneficial branches of the Russian economy,

i.e. the oil and gas business. Thus, another peculiarity of the Russian climate policy which started to emerge from the second half of the nineties is the struggle between the interest groups for control over it. It might be argued that interest groups affect climate policy not only in Russia, but in other countries as well. One of the examples is the USA exit from the Kyoto Protocol which was initiated by oil and coal companies. However, even in case it is true, Russian climate policy has several national peculiarities. In the USA, the public interest to climate policy is high, and powerful green movement is in existence there; climate policy plays an important role in political struggle between political parties. Thus, in the USA, the actions of administration would be under inevitable control of such forces that would try to realise national interest and to limit that way the impacts of the interest groups. The situation is completely different in Russia. As it was noted above, the public, green movement and political parties do not control climate policy implementation. Thus, climate policy turned into the object of pressures and influences of the interest groups. The major pressure is not from the private or state companies. The most active in this struggle are some groups of bureaucracies. Through establishing control over climate business they try to provide administrative rent for themselves. In Russia, bureaucrats managed to privities separate functions of the state, and climate business suggests being such a domain where the size of administrative rent would be extremely large.

The struggle for establishing control over this perspective climate business was initiated. In this competition either Hydromet, or Committee of Environmental Protection, or Ministry of Fuel and Energy (now, the Ministry of Energy) were leading in turns. However, today the control over climate policy in Russia shifted into the hands of the RF Ministry of Trade and Economic Development (MTED). The representative of this ministry became the co-chair of the ICC, and possible reorganization of this body with elevation of its status was announced. Changes in the leadership of this commission are interpreted in different ways, but it should be noted that during the 1990s the Hydromet guided the climate policy into a deadlock, but not due to its bad-will, but primarily because of the lack in administrative capacity. Entry into the scene of the ministry with high bureaucratic authority (as to this indicator, the MTED is at the leading roles within the government) has been considered logical for a long time, and objectively such changes would have a positive effect. Today, it became obvious that large finance would be circulating in climate business, and interests of influential players would be involved, while the role of arbiter of these processes is not within the power of every actor. There is always a danger that without such responsibility influential actors might block climate policy implementation.

As a result of establishing control of the MTED over the climate policy the stance of the latter has increased within the government bureaucratic hierarchy. Another question can be posed in that respect, i.e. to what extent this policy might be independent from the economic policy controlled which is within responsibility of the same organisation (but, in responsibility of its different departments). Of a particular interest would be the issue of interaction between the climate policy and policy of economic

growth. Objectively, certain conflict between climate policy goals and economic goals always exists. Such conflict was successfully solved in elegant sustainable development schemes. However, most of the countries-members of the Kyoto Protocol are not in a hurry to take obligations for quantitative emission limitations. Such conflict was not of a danger for Russia in the 1990s, since it has been in a deep economic depression. The situation has been modified since then: during four consecutive years the economic growth is registered, and the government poses ambitious plans not only for its maintenance over a long period of time, but for increase in its rates. Policy towards economic growth correlated particularly with the interests and aspirations of the public which is tired from hunger and unemployment. Economic growth is one of the major priorities in the programme of the new president. Under these conditions, it becomes obvious that climate policy instruments are scarcely possible to be realized in Russia in case they are in direct conflict with economic growth. It seems that in the nearest future, not the climate policy with its instruments would define the economic growth rates, but on the contrary, the policy of economic growth would subordinate to itself the climate policy, and would construct a certain corridor for its implementation. For example, in these conditions it is difficult to imagine introduction in Russia of a carbon tax due to climate policy considerations, especially, in case it has a negative impact on economic growth. Thus, currently, the most probable development scenario is such where the conflict between goals would be solved for the benefit of economic policy goals, but not to the benefit of climate policy. Thus, another current peculiarity of the Russian climate policy is its low independence within the general system of the governmental policies. It is subordinated to economic (and energy) policy of the government. It is not able to realise its own environmental goals in case they are in conflict with economic goals, including economic goals that are dictated by the interest groups.

Current changes in energy policy might have impacts acting in similar direction for the nearest future. At the current stage the major goal posed by the government before the energy sector is not to turn into barrier for the economic growth in Russia. The energy policy concept was subjected to endless modifications, which was illustrated in case of adoption of the RF Energy Strategy, as well as changes in the plans for restructuring of two Russian largest energy monopolies, i.e. Gazprom and RAO UES. Now it is difficult to predict concrete effects of cardinal energy reform which envisages creation of gas and electricity markets, liberalization of prices, introduction the elements of competition, as well as transparency in this sector. However, today, it is possible to note the following:

- In the near future the natural gas and electricity tariffs would increase, since their current level does not cover the costs of gas production and transportation; as to electricity, there are different estimates for profitability of RAO UES, and truth can be determined only after transparency in energy companies' activities would be established. But, it became obvious today that increase in the energy tariffs faced serious social discontent. The public is not able to pay the increased tariffs from its incomes which are often lower than the minimum living standard. Under these conditions

the government has braked at the beginning of the 2002 the already announced plans for increase in energy tariffs. The government seems to be afraid to appear in the social situation faced recently by Argentina's government.

- The government would follow its strike against non-payments for delivered energy resources; such practice is so developed in Russia today that it made impossible normal functioning of companies responsible for deliveries of gas and electricity. It is necessary to affirm that during the last year RAO UES managed through a number of very strict measures to improve the financial discipline of its electricity consumers.

- Significant shifts would take place in the national energy balance, i.e. the share of natural gas would decline, while the share of coal and black oil would increase.

- Changes in prevailing technological trends would take place: electric power stations would be switched not from coal to natural gas, as it used to be during three recent decades, but on the contrary - from natural gas to coal.

- Russia will meet its energy export obligations, including construction of new oil and gas pipelines in both Western and Eastern directions in order to meet these obligations; Russia intends to diversify its energy exports.

- The RF Ministry of Energy considers joint implementation projects in energy sector as an additional important mechanism for expanding energy export deliveries, for GHG emission reduction, and energy capacity modernization.

Thus, important specifics in Russia is that a number of energy and economic policy instruments which climate policy intended to use for GHG emission reduction face active social opposition, and they are scarcely possible to be implemented by the government with the necessary persistence.

So-called modernization policy might have a significant impact on enterprises behavior in climate related business, as well as on their potential partners in the West. Under modernization the Russian government foresees innovation of the major institutional structures governing activities of domestic enterprises and foreign investors. In fact, it marks a new round of economic and political reforms in Russia, which have been stopped under the Eltsyn's presidency, and finally were able to be renewed with coming to power of the new president. This is an extremely important undertaking for Russia. In 2000, at the start of his presidency Putin declared about continuation of reforms. Similar intentions have been declared for many times during the nineties, but reforms did not move forward as the government had not enough political will, and the majority in the parliament blocked the renewal of reforms. However, during two recent years the new administration managed to significantly advance them. The government notes that starting from 2002 Russia would be turning into a new country, and a

great deal of reasoning is contained in this declaration. The government managed to pass through the State Duma a set of liberal laws which are able to influence the economic developments in Russia. Being liberal in their contents, they significantly simplify the business in Russia. They reduce the transaction costs, simplify or abolish many bureaucratic procedures, they strengthen the mechanisms of property rights with increase in owners' responsibility over decisions undertaken, they withdraw the economy from shadow, and limit corruption and bureaucratic arbitrariness. Thus, among the features of the state-of-the-art in Russia is expanding opportunities for cooperation between Russian and foreign companies in energy sector, in JI projects, and other investment projects.

As to the climate policy, its institutions, mechanisms and instruments, the legislative basis has not been created yet, and major proposals are to be considered in the State Duma. It is not excluded that lobbyists representing the interest groups of entrepreneurs and governmental bureaucrats would try to pass these laws in such form and with such details, that they would have a possibility to control climate business in their own narrow interest. This danger is quite real, since recently there has been activation of regional authorities intending to seize a significant part of control functions within climate policy, and they intend to implement it at the regional level. In this case it's better to forget about transparency and unification of the regulatory procedures, including those for JI projects performance, i.e. the regional barrier will become the major insurmountable obstacle for application of the Kyoto tools in Russia, and for cooperation with foreign partners.

Certain modifications in the Russian climate policy are attributed to its withdrawal from the significant US influence. Since recently, in international climate policies of Russia the trend more orienting towards national interests, shift away from passive attitudes, more balanced approaches, the desire to interact more actively with the EU and other international partners, including those in the East can be traced. However, there is a certain danger that the niche of USA in the Russian climate policy would be occupied by the EU; but a lot in this domain will depend on the efforts of partners from the East, who could support the new emerged trends towards more balanced approaches in Russia's international climate policies.

There is another danger associated with the US exit from the Kyoto Protocol. The USA was considered as the major potential buyer at future international emission trading market. Now it is obvious that at least during the first budget period (2008-2012) this buyer would be absent at the market. It should significantly affect demand-supply relation, and, hence, it would result in considerable price reduction on tradable permits. In this case there would be no any "windfall" from international trades for Russia. While in spring 2001, preparations for Kyoto ratification in the State Duma were held under the sign of significant and mercenary expectations, after the US exit such expectations might be significantly altered. The future will show how the debates on Kyoto ratification will be developing under these new conditions and whether the voices of opponents fearing negative

implications of Kyoto on economic growth would become louder in the State Duma. Besides that, the fate of climate laws package will be defined in the nearest future after they would be considered by the government and passed to the Duma, and they are expected to create an institutional basis for major climate policy instruments functioning

5.11. Further Discussion

The new authorities should give answers to the principal questions of the climate policy institutional construction in Russia in the nearest future. Its critical points are as follows:

1) Allocation:

- what base line is used for allocation: the year 1990 or the current year (this issue is very closely connected with the macroeconomic policy and will have principally different implications for economic growth and enterprises' behavior at the micro-level);
- under what terms the allocation are carried out: under zero tariffs or under the auction price;
- who will have property rights in AAU: the state, including the Federation and regions, only the Federation, etc.

2) Climate policy management and its bodies:

- what type of body will deal with the quotas allocation: specialized, sectoral, federal; what is the degree of the regional authorities' participation in this process;
- what body will manage the climate policy at the national level: a new one specifically created for these purposes, an old one (Interdepartmental Commission), and a body functioning in the structure of one of the already existing departments;
- will management bodies be created at the sectoral (industry-specific) level; if yes, with what functions and competence, with what structure of relations with the national management body and with the level of enterprises and organizations;
- what rights will enterprises and organizations enjoy in quotas and carbon credit trading;
- will Russian enterprises and organisations get access to trading at the international market, or will they be unable to enter this market directly;
- will the mechanism of domestic quotas trading function, what features will it have;
- what role will the regions play in the climate policy implementation;

- how will the mechanism operate that will ensure linkages between the fulfillment of national obligations and the behavior of enterprises and organizations, sources of CO2 emissions.

3) Mechanism of distribution and reinvestment of revenues from quotas trading:

- how will revenues generated by AAU sales at the international market be distributed, including between the Federation and the regions, what federal agencies will be involved in the control over these revenues;
- how will the transformation of revenues from quotas trading into investments in energy saving and further reduction of GHG emissions be ensured;
- what mechanism will be used for preventing flight of revenues from quotas sales abroad.

4) Monitoring and registration mechanism:

- what mechanism of CO2 and other GHG emissions monitoring, as well as of control over emissions at the level of enterprises will be selected from the mechanisms already available in Russia;
- will the approach to monitoring be differentiated depending on the size of the enterprise and type of GHG;
- what mechanism of transactions registration for AAU trading will be used.

5) Impact of the macroeconomic and energy policy on the climate policy:

- how will the macroeconomic policy and the climate policy be co-ordinated and who will determine the priorities in such co-ordination;
- what plans of Gazprom and RAO UES (United Energy Systems) restructuring will the Government ultimately choose and how will these plans be implemented; what implications will such restructuring have for the climate policy;
- what are the perspectives of carbon tax (or its analogues) introduction in Russia;
- what are the perspectives for the introduction of new energy standards by Russia and the possibility of their efficient application in the new decade;
- is it possible to use an instrument of voluntary agreements in Russia.

Unfortunately, it is impossible to get answers to an overwhelming majority of these questions already now. However, the period of 2002-2003 will be the time when the Government of Russia will have to propose to the society the solutions for the bulk of the above-mentioned questions.

6. Possibilities and Barriers for Collaboration between Japan and Russia in Climate Change Mitigation

6.1. Introduction: Major Recent Trends in Bilateral Cooperation

Today, the general state-of-the art in bilateral ties between Japan and Russia in climate change mitigation can be characterized by lower level of cooperation in comparison to existing collaboration of Russia with the European countries. Existing opportunities are not thoroughly used[90]: active and well designed efforts and refinement of joint policy approaches to climate change problem solving are needed to overcome this gap. How the cooperation patterns between Japan and Russia would be shaped is important for the international community, especially, nowadays, since they define to a high extent the prospects for the Kyoto Protocol entry into force and its implementation. Three main steams where the interests of Japan and Russia overlap and their joint realization can provide benefits to both parties can be identified. They include:

- application of the Kyoto mechanisms, and particularly, joint implementation and emission trading
- cooperation in climate policy formation and implementation on bilateral basis (as a part of bilateral economic and technical cooperation)
- development of joint negotiating positions within the FCCC international regime, and within the Umbrella group.

The encouraging sign in this domain is that since recently there is a wider realization in both countries that cooperation in climate change between them is among a priority areas for the nearest future, and it is necessary to make up for the opportunities lost during the last decade and to develop the institutional framework for climate policy cooperation. It is *in the interests* of both Japan and Russia. For Japan, cooperation in application of the Kyoto mechanisms provides a) facilitation in meeting its national commitments under the climate change international regime, and b) promote its energy security. For Russia, it promotes (1) increase in energy-savings and energy efficiency, (2) foreign investments, (3) technological modernization of the outdated industrial facilities, and (4) potential revenues from emission trading.

Initial steps have been already undertaken by two countries at the *governmental* level, and by the turn of the century the climate policy cooperation emerged as one of the top items of bilateral economic and technical collaboration. For example, the Economic programme signed during the official meeting of the presidents of two countries in September, 2000 in Japan among its major targets

[90] For example, in the nineties – the US, and after COP-6 –the EU have been comparatively much more active in designing cooperative schemes with Russia in climate policy.

underlines the necessity for development of cooperation and coordinated efforts in global warming mitigation and, indicates the mechanisms of the Kyoto Protocol to be the basis for cooperation in GHG emission reduction; development of joint efforts in GHG absorption is regarded as another direction and opportunity for collaboration(Programme, 2000). It also emphasizes that energy sector is regarded as an important strategic direction for cooperation which promotes both (a) stabilization of energy supply in the Asian-Pacific region and (b) increase in energy efficiency in Russia with consequent reduction of GHG emissions. Initiatives between the governments are reinforced by the interests of the *business* community: industries of both countries took the advantage of this higher-level meeting to sign a number of business agreements on fuel and energy. These initiatives are supported by another institutional arrangement in force from the beginning of the 1990s, i.e. the intergovernmental agreement between Japan and the USSR on the environmental protection (Agreement, 1991). During recent environmental protection talks held in Tokyo at the end of 2001 Japan and Russia reconfirmed that they will continue cooperation towards implementing the Kyoto Protocol, and they will expedite preparations to move the process forward and to carry out thirteen joint research projects in environmental protection, including climate change(Japan, 2001). The possibility of implementation of a number of JI projects in energy modernization in Russia selected after feasibility studies performed via the New Energy and Industrial Technology Organization (NEDO) is officially assessed as a real near-term opportunity for cooperation in climate change mitigation (A. Panov, 2000; Japan, 2000a). Designing by Russia of the "Green Investment Scheme" which is underway since COP-6 can be an important mechanism for either bilateral cooperation with Japan, or in a form of trilateral agreement between Russia, Japan and the EU, and promote investments into energy-saving activities in Russia(Moe A., *et al*, 2001).

These initiatives correlate with general new trends in the Russian economic and international policies of the Putin government which stipulate the development of the eastern parts of the country and Siberia, as well as with its foreign policy turning more actively towards Asia, and establishing trade relations in energy sector (especially, natural gas deliveries)in that region as a possible alternative for traditional energy exports to the Western Europe These can be considered as important prerequisites for performance of bilateral climate mitigation efforts between Russia and Japan. At the same time, national policies of Japan actively looking for new means and sources for promoting its national energy security is a decisive factor in bilateral cooperation patterns. Such external factors to climate policy developments appear to be of importance in this particular case.

However, a variety of *obstacles* for expanding bilateral cooperation in climate change area still exists. Some of these barriers are generic to the process of climate change international regime formation and to existing uncertainties and unresolved issues of the Kyoto tools application in general

and of its entry into force, as well as current stance on national ratifications of the Kyoto Protocol[91]. This type of obstacles is faced by all countries willing to apply these new tools. But, some barriers are rooted in poorly developed domestic institutional frameworks, and absence of officially JI and ET[92] programmes in both countries; currently, however, efforts are undertaken in Japan and in Russia to design their schemes[93]. Another cluster of barriers is not attributed to the specifics of climate change policies, but is defined by the main features of the economic and political situation in Russia during the transition period, and by a set of 'situational factors' rooted in its national specifics. For example, success in implementation of the JI/AIJ projects in Russia is determined to a high extent by the prospects of general investment climate and evolution of opportunities and barriers for foreign investments in Russia[94]. The latter peculiarity has possible implications for climate change cooperation of Russia not only with Japan, but with any other Annex I country.

It is important that *specifics* in climate change policy collaboration between Japan and Russia are *embedded* to a high extent into general framework of economic and technical cooperation between the two countries. And it's peculiar, that largely it was driven, so far, not by climate policy, but by economic and political issues, and major trends within them. During recent years this collaboration has been shaped and limited by the political issue of the "Northern territories" dispute[95]. Japan suggests that these political negotiations are to be tied up with economic cooperation, while Russia considers the bilateral economic exchange as a prerequisite for the former ones. The Japanese companies are not able to move forward with their JI plans without approval from their government. But, according to our interviews with the Russian experts, the political barriers to business opportunities in general are sometimes exaggerated, and since recently there is more and more indications towards some alterations in approaches: the environmental, and even to a certain extent economic cooperation, do not depend to the highest extent on political problem solving; although some of the experts still consider it as an important hindering factor (Interviews with D.Trenin, Carnegie Centre, Moscow; A.Astapovich. Bureau of Economic Analysis, Moscow). Some experts from the West also indicate that attempts to separate politics from economics are becoming more frequent since recently in Japan, and particularly in relation to energy sector vital to national security. Many specialists agree that really

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[91] For details see, for example, Matsumura H., 2001; Kokorin A., 2001; Strategicheskaya, 2001.

[92] For example, in Japan, the domestic scheme for ET depends on the outcomes of further international negotiations, on entry into force of the Kyoto Protocol, decisions on rules and modalities of the Kyoto Protocol, and resulting domestic policy measures. As of the end of 2001, no concrete plans for domestic emission trading market are revealed. The only existing measure that involves industries of Japan is "the voluntary action plan" by Keidanren (Japan Federation of Economic Organisation), which covers 75% of total industrial emissions; according to recent reports the Japanese government plans to let industry to choose ways and how far to reduce emissions of GHG (*Yomiuri Shimbun, 03.01.02*)

[93] Serious expectations for further institutional developments for application of the Kyoto tools in Russia are linked with the planned for March, 2002 the meeting in the RF government to discuss the problems of the Protocol ratification; many experts believe that Russia might ratify the Kyoto Protocol in 2002, and proceed with establishing domestic legal framework during 2002-2003.

[94] Among other major domestic specific constraints for application of the Kyoto tools in Russia are the problems associated with macroeconomic restructuring, instability of center-regions relations, formation of powerful groups of interests and regional elites, financial indiscipline, corruption and shadow economy, excessive bureaucratisation, uncertainties in institutional design for property rights regulation, etc.

[95] The two parties cannot agree on the territorial dispute over the Kuril Islands (the 'Northern territories'); according to the 1993 Tokyo Declaration adopted jointly by the presidents of the two countries R.Hashimoto and B. Yeltsyn, there is an intention to proceed with negotiations to conclude a peace treaty on this territorial issue.

important issue is to what extent Russia in general, and its regions and locales, in particular, for example, in the Far East and in Siberia, are ready institutionally to cooperate with the foreign partners, and to reduce uncertainties and risks associated with private investments. Moreover, there are signs at the moment that environmental problem solving, with the climate change mitigation as a component of it, is not to be as tightly conditioned by limitations of political dispute resolution as economic cooperation does, and there are possible ways to overcome these barriers. The question if there are ways to expand bilateral collaboration between Japan and Russia in climate change policy, and to avoid traditionally imposed barriers on economic cooperation is in the core of this chapter.

In the following sections, this chapter presents the general outline of the potential for application of such Kyoto tools as JI and ET in cooperation between Japan and Russia. Then, it turns to analysis of opportunities and barriers for bilateral efforts in the area, where some practical results have been already achieved so far, i.e. in preparation for application of the JI mechanisms. It analyses the unique experience of these two countries, current state-of-the-art, lessons already learned and possibilities and obstacles for JI between Russia and Japan, including participation of their business community. It also discusses not only *pros* and *cons* for JI between Russia and Japan defined by specifics of this tool, but studies broader frameworks and institutional arrangements (in economic bilateral cooperation, in attracting foreign investments in Russia): being an external factor, nevertheless, it considerably affects and shapes the prospects of JI project-based activities, particularly, in case of Japan and Russia.

6.2. Potential for Emission Trading and Joint Implementation

Under the Kyoto Protocol, Japan—which intends to ratify the Protocol during the regular session of the Diet in 2002—will need to offset its domestic excess net emissions over the level of its target in the 1st Commitment Period by the credits and permits obtained through the Kyoto mechanisms. The GHG emissions in Japan in the base year (1990 for $CO_2/CH_4/N_2O$ and 1995 for HFCs/PFCs/SF_6) were 1223.8 Mt-CO_2(eq.) per annum. In 2000, the CO_2 emissions from energy combustion increased around +10% above the base year level, so the GHGs emissions can be estimated as +8% above the base year level.

If we assume that the GHG emissions increase around 18% in the 2010 (mid-year of the 1st Commitment Period) as the naive extension of the 1990s and domestic sink assumed to contribute around –4%, the domestic net emissions excesses around 20% above the Kyoto target level (minus 6% of the base year emissions), which is around 250 Mt-CO_2(eq.)/year. This means that Japan must acquire such amount times five through the CDM (before and during the 1st Period) and emissions trading and JI (during the 1st Period) under this assumption.

Although Japan should prepare a portfolio of options to acquire such a large amount of permits/credits from various sources strategically, Russia—which might be the biggest supplier of

AAUs and ERUs if it is eligible to participate in the Kyoto mechanisms—is considered to be the biggest partner in implementation of JI projects and the OTC(over-the-counter)-based bi-la teral emissions trading.

6.3. Joint Implementation between Japan and Russia

6.3.1. Current State-of-the-art

New challenging perspectives for expanding cooperation between Japan and Russia in climate change mitigation through project-based JI activities have been opened since the end of the 1990s. Some practical steps have been already undertaken in this area, and they represent a unique example of international efforts towards the Kyoto Protocol implementation. Although they cannot be strictly qualified as either AIJ, or JI under the FCCC, they are regarded as feasibility study projects to prevent global warming, enriching the international practice to support the process of climate change international regime formation. They lay the basis and survey the possibilities for application in due time of such Kyoto tool as JI.

From the end of the nineties the government of Japan –i.e. METI (though NEDO:New Energy and Industrial Development Organization and Japan External Trade Organization:JETRO) and the Minist ry of Environment (through Global Environment Centre Foundation)- has been providing Japanese entities with financial assistance to feasibility studies (F/S), aiming at identifying potential CDM and JI projects and accumulate relevant knowledge. The program implemented by NEDO "Basic Survey to Prevent Global Warming" which started in 1998 was the largest in its budget and scope of a ctivities with the maximum budget of Yen around 40-60 million per project for 40-50 studies conducted each year. In total, from 1998 to 2001 NEDO selected and entrusted 183 projects[96] for implementation by the Japanese corporations in 38 countries around the world[97].

From the very start of this programme, the assessment of opportunities for JI performance in Russia attracted Japanese investors' attention. Up to now 29 projects were approved as feasibility studies to be undertaken in Russia under the NEDO programme[98](Annex 6-1).

Most of the survey projects cover assessment of possibilities of JI in such *industrial sectors* where the Japanese technologies for energy conservation and oil-alternative energy can be applied to reduce GHG emission. Particularly, they are undertaken in a broad area, including energy-savings in ferrous industry, in oil refinery, improvement of efficiency in power generation and distribution, fixing

[96] For example, in 2001 the public announcement was made by NEDO for submission of applications from the Japanese corporations for the "Basic Survey Projects for Joint Implementation, etc.": from 77 applications evaluated, 45 were selected for implementation

[97] "NEDO Feasibility Studies for the Purpose of Promoting Basic Survey Projects to Prevent Global Warming", Official NEDO website, September, 2001

[98] In 1998 – the maximum number (21) from about more than four dozen METI/NEDO projects were performed in Russia, in 1999 they accounted for 9 projects; no projects have been undertaken in Russia in 2000 and 2001.

methane leakages at natural gas pipelines, and others; modernization of central electric and heating power stations being the most numerous among them (Table 6-1).

Table 6-1. Major types of NEDO Feasibility Studies Projects Performed in Russia during 1998-1999

Major directions of industrial facilities modernization and increase in energy efficiency	**Number of projects**
TOTAL	29
Increase in energy savings through modernization of equipment at central heating power stations	14
Increase in energy savings through modernization of equipment at oil refineries	6
Increase in energy savings through modernization of equipment at metallurgical plants	4
Refurbishing of equipment at central heating power stations and district heat-networks	3
Optimisation and reconstruction of gas pipeline	1
Reduction of methane emissions at coal mines	1

Source: NEDO Official Website, 2000

It is important to note that these F/S projects have a broad *geographical* coverage all-over Russia - from the Far East to the European Russia, but not only on its Pacific coast, as it is often perceived. Almost half of them are located in the European Russia (14), including Moscow oblast and St.Petersburg, and about one quarter in each - Far East (7) and Siberia (6). Thus, technologies and investments from Japan are expected to be channeled to different regions of Russia. This fact also demonstrates one of the lessons learned from implementation of these projects – the investment interests of the Japanese partners have a wide geographical distribution, and it might relate to decisions that will be undertaken by the Japanese partners regarding designing the JI projects in Russia in the future.

The *participatory* pattern in this type of projects is quite broad. Over two dozen of the Japanese corporations from various industrial sectors took part in F/S in Russia, and some of them were involved simultaneously in several F/S in Russia (Table 6-2). They have gained some support from the government of Japan to perform initial surveys. However, at the current stage, there are no further financial allocations from the government, and most of them are waiting for decisions of the government either for financial support, or additional privileges in their activities in order to move forward with the projects implementation. The result of our interviews with the representatives of the Japanese companies implementing their projects in Russia indicate that their expectations in terms of perspective governmental support are quite high, but at the same time further developments in this

field will be defined to a great extent on future general policies, approaches and decision-making frameworks adopted by Japanese government in terms of application of a such Kyoto mechanism as JI.

The major partners in F/S projects from the Russian side are industrial companies, mainly from energy and metallurgical sectors. The energy companies are represented mostly by the powerful monopolies in the energy field, i.e. RAO United Energy Systems (UES) and Gazprom and their regional affiliations; hosting partners in these projects include Russian companies operating particular industrial facilities surveyed by the F/S surveys. Besides direct partners, there is also an important group of actors from the Russian government. They include: a) regional administration of the regional and local government where the projects are executed, and b) federal government, i.e. mainly the RF Ministry of Energy and the RF Ministry of Trade and Economic Development. Their role in decision-making is significant, and almost no project can be endorsed without their approval. The involvement of local administration and municipalities is quite strong in the course of project implementation as well.

6.3.2. Lessons Learned

Most of the F/S projects in Russia indicate that Russia intends to use the JI mechanisms for technology and financial transfers to upgrade outdated industrial production facilities and processes, and to modernize the infrastructure networks. So far, the modernization towards energy savings and upgrading the industrial facilities has not been adequately addressed in Russia posing a serious problem, and its solution is in the core of the current national energy strategy aimed at energy efficiency. However, modernization and technological innovations in this sector require large investments, and under current domestic financial constraints, Russia is trying to diversify potential investment sources, with JI being among them. Access to new technologies from Japan is at the core of these projects.

All 29 F/S projects executed in Russia at the end of the nineties are assessed by the experts of both sides in terms of their possibilities and potential for realization as JI projects between Japan and Russia in the future. Analysis of the results of these survey projects undertaken so far indicates that potential for GHG emission reduction within the selected projects is significant, and project management capabilities of the Russian counterpart corporations are generally good.

However, the *feasibility* and *cost-effectiveness* of the projects varies considerably from project to project. In fact, projects in the area of power plants modernization involving large-scale innovations entail huge up-front capital investments. For example, the costs of modernization project (modernization of boilers and some supporting and controlling equipment) at Ryazanskaya power station in the European Russia designed jointly by Sumitomo Corp/Electric Power Development Co

and UES/Ryazanskaya TES account for more than $700 million (NEDO, 2001). Reports from the NEDO F/S study indicate that although local authorities identify the large-scale modernization projects as their priority most of them appear to be not financially viable from the standpoint of the Japanese investors. To implement such large-scale projects the bilateral/multilateral long-term concessional finance is necessary, due to their long, i.e. at least 15-20 years (30 years in case of the above mentioned Ryazanskaya TES) capital collection period. Also, most of them are associated with high i*nvestment risks* due to unstable economic situation in Russia and the absence of proper institutional risk guarantees for the foreign investors. On the other hand, there are some projects in the area of power generation and methane leakages capture which are reported to be cost-effective and financially viable. Some study results suggest that projects with relatively small investments (i.e. in a range of about Yen 20-50 billion) are highly cost-effective.

As most of them target the GHG reduction through improving energy efficiency and energy savings at the existing industrial facilities in Russia, among the goals of expert teams was to assess the *GHG emission reduction costs* associated with particular projects. The scale of reduction costs vary significantly across projects surveyed (Table 6-2). Most promising candidates for the JI in the future usually appear to be smaller projects at oil refineries, steelworks, modernization of pipelines systems and local power heating networks. However, despite some successful identification of potential JI projects as a result of feasibility studies, most of the surveyed projects require from middle to large-scale investments, and therefore their implementation will rely on the availability of certain concessional financing.

The design of the most F/S projects surveyed envisages *cost-sharing* approach by the Japanese and the Russian partners, and detailed division of labor between partners is foreseen by each project. But, in most cases the responsibilities and share of the Japanese partners is much higher. For example, in case of the project on optimization of gas pipelines in Perm oblast and Udmuirtia the consortia of six Japanese companies is responsible for financing of production and equipment deliveries, engineering, control over installation of equipment, training of the local personnel, while the Russian partners are responsible for financial support of engineering stage, deliveries of materials and locally produced equipment, and for testing the installed equipment. In case of Kuznetsk Steelworks, the Mitsubishi Corp and Nippon Steel Corp are expected to be involved in design, manufacturing, and delivery of equipment, in trial and demonstration runs, while the Russian partners – to be responsible for preparation of the construction site, provision of the design data, supply of utilities for construction, for pipeline, and electrical instrumentation, and for demonstration run. Khabarovsk power plant modernization foresees that Sumitomo and Chubu provide manufacturing, delivery, installation of equipment and control over civil works, while the Russian partners ensure the construction of the transmission lines, railways, and storage warehouses.

Among the lessons learned is that potential investors should scrupulously take into account possibly high *role of the government* of Russia in decision-making, and, especially, of the local administration in the regions where the projects are undertaken. Their influence, not only at endorsement stage, but also in a course of project implementation is strong; usually, lobbying the interests of particular groups might be considerable. It seems to be natural that under severe shortage of financial resources it is in the interests of the local government to attract foreign investors and use the mechanisms of JI for transfer of technological innovations and finance into their territories and to modernize the outdated industrial facilities. Hence, introduction of a set of incentives and preferences for potential investors in the regions can be expected in the regions in the future, but most likely, in this particular field of activities (JI) they would be coordinated with the federal government. Among the stumbling blocks in the nearest future is the lack of effective institutional basis and official regulations (at the federal level, in the regions, and well defined principles of subsidiarity) for this kind of innovative activities. At the same time it's worthwhile to note that the extent of finance deficit in the regions to modernize the obsolete plants, or energy supply networks, is sometimes exaggerated. Considerable financial flows are channeled through corrupted local officials into their pockets, or transferred to the lobbying partners. For example, the recent severe crisis with energy and heat supply in the Russian Far East is among the striking illustrations for that.

The danger of excessive involvement and possible 'over-control' of the Russian government bureaucracies with all its possible negative implications always exist. F/S projects report that the bulk of technical details on activities undertaken were discussed and approved by the RF government. For example, the report on Khabarovsk power plants modernization notes that even the 'Technical task' presented by Sumitomo Corp and Chubu Electric Power Co was to be discussed and approved not only by their direct counterparts in Russia, i.e. UES and KhabarovskEnergo, but by the RF Minenergo. In case of Kusnetsk Steelworks modernization project in Kemerovo oblast, RF Ministry on Trade and Economic Development and the Kemerovo oblast government took part in approval of technical tasks There is also a possibility that extent of involvement of the government (both from federal and local levels) in control and regulations of the JI projects performance would be comparatively higher than in case of regular economic activities and industrial investments of Japan in Russia.

One of the important features of the NEDO programme is considerable transparency regarding activities within it, as well as reported results on particular projects. The information about projects implementation is opened to the public, and is constantly updated at the NEDO official website. This is remarkable, and it is a big contrast to many similar activities in this field performed in other countries.

6.3.3. Future Opportunities for Business Community: Pros and Cons

Our analysis of NEDO F/S project results, as well as our interviews with the companies indicate high expectations and interest of the Russian partners, both private companies and the government, in realization of these modernization projects with application of JI instruments. Many of them suggest to start necessary proceedings as soon as possible. Among standard conclusions of major project reports to NEDO (of F/S studies performed in 1998 and in 1999) are that the direct Russian counterparts of the projects and their government "strongly desire the realization of the projects, expecting funding by the Japanese government at the same level as Environmental ODA loans. The Russian partners and their government have no objections, and are keen to proceed under the Joint Implementation Programme" (NEDO, 2001).

Currently, the Japanese corporations, after finishing their feasibility studies in Russia and after evaluating the economic parameters of potential projects, are at a certain halt in their activities and are waiting for the decisions and further practical steps to be undertaken by the Japanese government. Those willing to proceed with JI are keen to know what particular additional incentives and preferences their government is ready to offer, that were already promised to them at the start of the METI/NEDO programme to prevent global warming. Thus, they report that the ball is in the hands of the Japanese government and they are waiting for decisions to be undertaken.

According to our interviews with some of the Japanese companies-participants in F/S projects (Mitsui & Co, Mitsubishi Corp), their decisions whether to implement the projects identified under NEDO programme in Russia, are determined by a number of considerations.

First, their final decision fully depends on the policy and strategies of the government towards application of the Kyoto tools, which are not clearly defined so far. Moreover, some of them have additional doubts due to recently reported shifts in the government policy: there are indications that Japanese government does not plan to impose strict regulations on the private sector to cut G HGs at its initial phase of domestic measures implementation up to 2004. Rather, the governm ent allows the industry to choose the level of their GHGs emissions reduction on voluntary basi s (BBC, 2002). According to some Japanese experts, domestic measures to cut emissions under the Kyoto which government wishes to ratify are making slow progress in the face of opposition from industry and other circles. The government advisory body, i.e. the Central Environmental Council had said in the report that for now industries would not be given any regulations to follow and, instead, will be allowed to combat GHG emissions on voluntary basis(Youmiuri Shimbun, 2002). As the domestic policy is not finalized, it adds uncertainties to the companies' stance how far and how rapidly to proceed with already initiated projects in Russia.

Second, companies report that most of them in their further decisions are dependent on the availability of concessional loans that might be offered by the Japanese government for the next

stages of JI projects in Russia. They are waiting for an encouragement from the Japanese government, and it is unlikely that they would proceed without getting it. They link their future activities with the government opening the credit line similarly as it has been done for support of F/S. At the same time they recognize possible difficulties along this path, as raising additional governmental support for executing projects in Russia is not that easy due to political dispute between two countries. Moreover, as officially Russia is not eligible for financial transfers through ODA channels, they underline that it is necessary to seek other possible options. Experts suggest that there is a possibility to consider JI projects within the framework of 'environmental and technical assistance' of Japan to Russia, and in that respect there is a chance to free it from justification on political stance on the Northern territories issue. Thus, during recent years there are growing expectations from the Japanese companies that the whole issue can be pushed through these channels, and they closely tie up climate change policies with environmental issues.

Third, our analysis of METI/NEDO F/S projects to promote JI between Japan and Russia suggests that the biggest bottleneck in JI implementation in Russia is the difficulty associated with risk management and financial arrangements for the projects due to uncertainties in institutional basis for economic activities in Russia in general. Investors are afraid to take risks in Russia. These risks might be even more amplified by additional risks associated with new JI system, and potential loopholes in its domestic institutional design. In this connection, the Japanese potential investors in Russia might seek for a variety of finance sources both domestically and internationally. They might include export credits of JBIC, trade insurance of METI, as well as to turn to other multilateral funding sources inc luding the Prototype Carbon Fund of the World Bank and Dexia – FondElecEnergy Efficiency Fund of the European Bank for R econstruction and Development (EBRD) along with other risk management measures by international financial institutions.

Fourth, another often cited factor which limits expansion of business into project-based activities are uncertainties associated with development of domestic institutional design and procedures for JI realization. The Japanese partners which participated in NEDO F/S studies in Russia are unified in their opinion that another important bottleneck in this area is the absence of clear policies, guidelines, and legal regulations in Russia, and that the JI institutional basis is not organized. They have to take their time, and to be cautious until any clear signs on institutional capacity building would be available for them to take risks in this undertaking. However, our analysis indicates that existing uncertainties regarding JI domestic design equally refer to the absence of its clear framework in Japan as well.

Fifth, while analyzing the positions of the business community both in Russia and in Japan, it was possible to inquire several questions including the following: To what extent realization of some METI/NEDO projects in the future can be regarded by the companies as a 'no-regret' option that would be developing independently from the policies on application of Kyoto mechanisms? Would

there be any follow-up activities within any of 29 F/S projects even in case there would not be any of the expected support from the Japanese government? In this case, would Japanese companies entrusted for their resliasation in 1998-1999 be willing to link these projects to possibilities of expanding their future activities in technology transfers and in investments into energy efficiency in Russia that they could undertake independently from the developments of the climate change international regime? It is easier to have a positive answer while discussing the interests of the participants from the Russian side: these projects could be regarded mainly as 'no-regrets' measures, since, first, they allow attract innovations and finance into important sector of national economy, and second, they completely correlate with domestic policies aimed at increase of energy-savings and technological modernization. These two goals are important from national and from business perspective, and they are to be followed anyway, even independently from JI activities. Besides, almost all these projects are supposed to have other environmental benefits, i.e. reduction in local and transborder air pollution. The answer to this question from the Japanese companies is not that certain: the Japanese investors are almost unlikely to treat these F/S projects as 'no-regrets' for the follow-up activities in Russia even in a highly appealing for them energy sector: their specific preferences and interests are highly dependent on support from their government. In the absence of government support many of them seldom appear to be cost-effective. Thus, the controversy in interests between potential partners from the Russian and the Japanese side might be indicated while trying to approach the JI issue as a 'no-regret' option.

Finally, certain problems might occur with implementation of these F/S as JI projects in the future under the perspective shifts in the national fuel-mix expected in Russia. Indeed, many projects, at least those associated with modernization of power plants envisage technological shifts from the use of coal to natural gas[99] (Annex 6-1). But, supposed reduction in the future share of natural gas within domestic energy balance[100] (in contrast to the opposite trends towards increase in the share of natural gas in the structure of energy balance during the 1990s), might negatively affect the suggested technological options. Today, in Russia some power stations are expected to be transferred from natural gas back to coal and black oil. Such perspective trends in the Russian energy balance might add certain 'corrections' into the plans of the Japanese partners.

One of the conclusions from the above discussion indicates that existing approaches towards assessment of potential and barriers to finance project-based activities in Russia are quite numerous, and these approaches have certain variations. Some Russian experts conclude that Japan is very close to support through NEDO programme the initial stage of modernization of some Russian enterprises to increase their energy efficiency and reduce GHG emissions. At the same time the experts from Japan

[99] For example, the F/S project of modernization of Ryazanskaya plant suggests to change the coal/gas proportion from the existing 90:10 to 60:40 percent after modernisation

[100] According to the RF Energy Strategy up to 2020, the natural gas production will be growing slower over the next two decades than previously, and its share in the national fuel mix in comparison with other fuels will decline. Natural gas production is expected as follows (in *bln cubic meters*): in 2000 – 580; 2005 – 600 (min) - 620 (max); 2010 – 600-690; 2020 – 600-700. (Osnovnye, 2001a)

are much more cautions and reserved in evaluating the prospects in this field, as according to them, financing the JI projects in Russia still faces significant obstacles. Some authors in the West consider Japan to be skeptical towards joint implementation in Russia, and experience it had "with AIJ projects in Russia also undermines business confidence"(Moe A., *et al*, 2001)

Existing barriers from NEDO initiative as viewed by the Japanese companies can be summarized as follows:

- lack of support for large-scale investments of the Japanese corporations in Russia from their government
- availability of more appealing alternatives and options for project-based activities in other countries
- institutional uncertainties in domestic design for application of the Kyoto tools
- uncertainties in legal basis for investments in Russia
- lack of privileges for foreign investments
- high risks associated with investments in Russia
- lack of trust to business partners in Russia
- lack of transparency on enterprises[101]
- loopholes in GHG inventory compilation at Russian enterprises
- necessity of reforms in corporate management and transfer to international reporting standards
- highly bureaucratized procedures in government (federal and local) decision-making regarding project-based activities
- corruption and shadow economy

Table 6-2. Summary of some projects in Russia under NEDO "Basic Survey to Prevent Global Warming"

	Location	**Contents**	**Japan-side entities**	**Russian side entities**	**GHG emission reduction cost***
1	Perm oblast and Udmurtia	Gas pipeline	Sumitomo Metals, Sumitomo Co., C. Itoh & Co., Mitsui & Co., Nippon Steel Corp, NKK	Gazprom, Permtransgaz	16.8
2	Khabarovsk	Oil refinery	Chiyoda Engineering	Khabarovsk Oil	11.9

[101] In the reports on F/S projects, there have been a number of complaints from the Japanese companies that their Russian counterparts in a number of cases were denying the access, or were significantly delaying provision of necessary information from their facilities

				Refinery	
3	Sakhalin	Power plant	Mitsui & Co., NKK Corp., Kawasaki Heavy Ind., Unico International Corp	Sakhalinskaya TES, Yuzhno Sakhalinsk TES	34.1
4	Konakovo	Power plant	Kansai Electric Power Co, Mitsubishi Corp	UES, Konakovo TES	N.a.
5	Ryazan	Power plant	Sumitomo Corp., Electric Power Development Co	UES, Ryazanskaya TES	18.1
6	Khabarovsk	Power plant	Sumitomo Corp., Chubu Electric Power Co.	KhabarovskEnergo, UES	19.7
7	Khamchatka	Centralized district heating	Japan metals & Heavy Chemicals Co, Ltd	City of Petropavlovsk Khamchatsky	15.7
8	Irkutsk	Power plant	JGC Corp	IrkutskEnergo	27.2
9	Sverdlovsk	Machine and heavy industry complex	Padeco	Sverdlovsk machine and heavy industries Co	4.8
10	Magnitogorsk	Steel Plant	Nippon Steel Corp	Magnitogorsk Steel Co.	n/a
11	Nijny Novgorod	Power plant	UNICO International Corp, Tokyo Electric Power Services Co, Mitsui & Co.	Igumnovo TES	n/a
12	Novgorod, Pskov	3 Natural gas power plant	UNICO International Corp, Tokyo Electric Power Services Co, Mitsui & Co.	Novgorodskaya, Pskovskaya, & Iriklinskaya TES	36.2
13	Achinsk	Oil refinery	Chiyoda Engineering Co.	Achinsk Refinery Co	11.2
14	Khabarovsk	Power plant	Mitsubishi Corp	AmurEnergo	16.8
15	Kemerovo oblast	Steel Plant	Mitsubishi Corp., Nippon Steel	Kuznetsk Metallurgical Plant	11.0
16	Primorsky Kray	3 Power plants	Sumitomo Corp., Toshiba Corp., Ishikawajima-Harima Heavy Industries Ltd	DalEnergo, Vladivostok, Partizansk & Ussuiriisk TES	23.4
17	Thula	2 Power plants	Sumitomo Corp., Tokyo Electric Power Co	TulaEnergo, Shekinskaya & Novomoskovskaya TES	8.1
18	Ryazan	Power plant	Sumitomo Corp., Electric Power Development Co	UES, Ryazanskaya TES	18.1
19	Nijegorodskaya oblast	Centralised district heating	Mitsui & Co., UNICO International Corp.	Nijegorodskaya Teploset'	N/a
20	Kuibyshevskaya oblast	3 Oil refineries	Mitsubishi Corp.	Kuibyshev, Syzran & Novokuibyshev Oil Refineries	14.4

***** Emission reduction costs are, in many cases, calculated by dividing capital investment by the volume of greenhouse gas emission reduction (US Dollars/Ton Carbon Dioxide). However the calculation of emission volume and costs differ significantly from one company to another, so the cost comparison between projects needs cautious approach.

Source: Asuka-Zhang Shouchuan (Jusen). The Kyoto Protocol and Russia , 2001 (draft of the article); Evaluations of the experts from the New Energy Industrial Technology Development Institute, Mitsubishi Research Institute, "Analysis of the results of basic study to promote Joint Implementation for the year 1998", 1999 Survey Report NEDO-GET-9901; Reports from NEDO official website

6.4. Institutional Arrangements and Barriers

6.4.1. Economic Cooperation as a General Framework for Application of Kyoto Tools

Attitudes to strategy formulation towards application of the Kyoto Mechanisms in cooperation between Japan and Russia are highly dependent on the existing frameworks and arrangements for economic cooperation between two countries. Moreover, their application, and particularly, as it has been illustrated above in case of potential JI projects, is closely integrated into, and depends on major trends in bilateral economic relations, and cooperation in energy sector.

While, in the 1980s Japan has been among the leading foreign partners of Russia in economic cooperation, in the nineties economic relations have been unstable, including foreign trade and investments, and today the role of each country in foreign trade is relatively modest (Figure 6-1). In 1999 Russia accounted only for 1.2 percent in Japan's import, and 0.6 percent in its export(Ministry of Foreign Trade of Japan, 2001); according to the data of RF ministry of foreign affairs, in 2000 total trade turnover between two countries accounted for $5.1 bln. The share of total investments of Japan in Russia is not high[102] and it declined almost by two-fold during recent five years; Japan ranks 10th among other countries for its investments in Russia(Rossisky, 2000) (Table 6-3). The scales of economic cooperation depend, *first*, on the political dispute resolution, and s*econd*, their decline by the end of the nineties which was attributed to 1998 financial crisis in Russia, unfavourable investment climate and institutional uncertainties, etc. However, at the turn of the century there have been first indications towards revival in mutual economic relations, and increase in the foreign trade (in 2000 foreign trade increased by 21.3 percent against the previous year). In 2000, new cooperation programme in trade and economic field was adopted, and the agreement on mutual protection of investments between Japan and Russia has entered into force(Agreement, 1998). During the next year the discussion on establishing the bilateral body to promote trade and investments in Russia[103] was underway. In the nineties the assistance of Japan to Russia accounted for $6.3 billion(*Business Match*, 2000a). It included loans and trade insurance - $5.6 billion, and grant aid - $700 million (for details, see Annex 6.2) [104](Ministry of Foreign Affairs of Japan, 2001). In 2001, new trade insurance scheme was provided by METI for promoting trade and investments in Russia.

[102] Total investments of Japan in Russia accounted in 1999 for $3.6 billion(Japan. 2000b); 380 companies with the capital from Japan function currently in Russia, including 300 in the Far East.

[103] The proposal to set up this body was made by Mr.T.Imai, Chairman of the Keidanren during his meeting with the RF president Putin in Moscow, June, 2001

[104] *Loans* and *trade insurance* included: $1.2 bln loan from the Japan Bank for International Cooperation (JBIC), $2.9 bln – trade insurance; and $ 1.5 bln – JBIC united loans; *grant aid* included: humanitarian assistance and assistance for dismantling of nuclear weapons.

Table 6-3. Foreign Investments in Russia, 1995-1999

	1995		1996		1997		1998		1999	
	Mln $	% of total	Mln $	% of total	Mln $	% of total	Mln $	% of total	Mln $	% of total
TOTAL	2983	100	6970	100	12295	100	11773	100	9560	100
USA	832	27.9	1767	25.4	2966	24.1	2238	19.0	2921	30.6
Germany	308	10.3	332	418	1647	13.4	2848	24.2	1695	17.7
Cypress	41	1.4	825	11.8	992	8.1	917	7.8	423	9.7
UK	183	6.1	507	7.3	2411	19.6	1591	13.5	733	7.7
Netherlands	85	2.9	981	14.0	540	4.4	877	7.4	541	5.7
Switzerland	436	14.6	1348	19.3	1756	14.3	411	3.5	405	4.2
Japan	75	2.5	22	0.3	139	1.1	60	0.5	42	0.4

Source: Russian Statistical Annual, 2000. Moscow, Goskomstat RF, 2000, p.555

As it was noted above, the financial assistance by Japan to Russia can not be transferred in a form of ODA, and is mainly provided through technical and humanitarian assistance channels. Remarkably, this type of assistance is not strictly subjected to limitations imposed by the political relations. In its turn, the environmental aid can be regarded as a part of technical assistance, and, accordingly, it is not restricted by governmental regulations of external relations with Russia. That is particularly important in terms of potential support of the Japanese government for realisation of JI projects in Russia, which appears to be the major condition today for participation of the Japanese companies. The approach, according to which the Kyoto mechanisms can be treated as instruments for environmental protection, is gradually evolving in Japan. Thus, they are likely to be free from numerous limitations of the Japanese government that were imposed on bilateral economic relations, and this path can be regarded as an important way-out and an opportunity for promoting participation of the Japanese companies in JI in Russia. "Japanese government agencies may feel able to endorse them without the fear of creating the impression that they are caving in on their interpretation of the Tokyo Declaration" (Muller, 2001a, b). In Russia, such approach is regarded as an important milestone in national strategies for attracting investments from Japan, and, thus, active support is provided since recently for expanding cooperation in environmental protection, with Kyoto mechanisms within it.

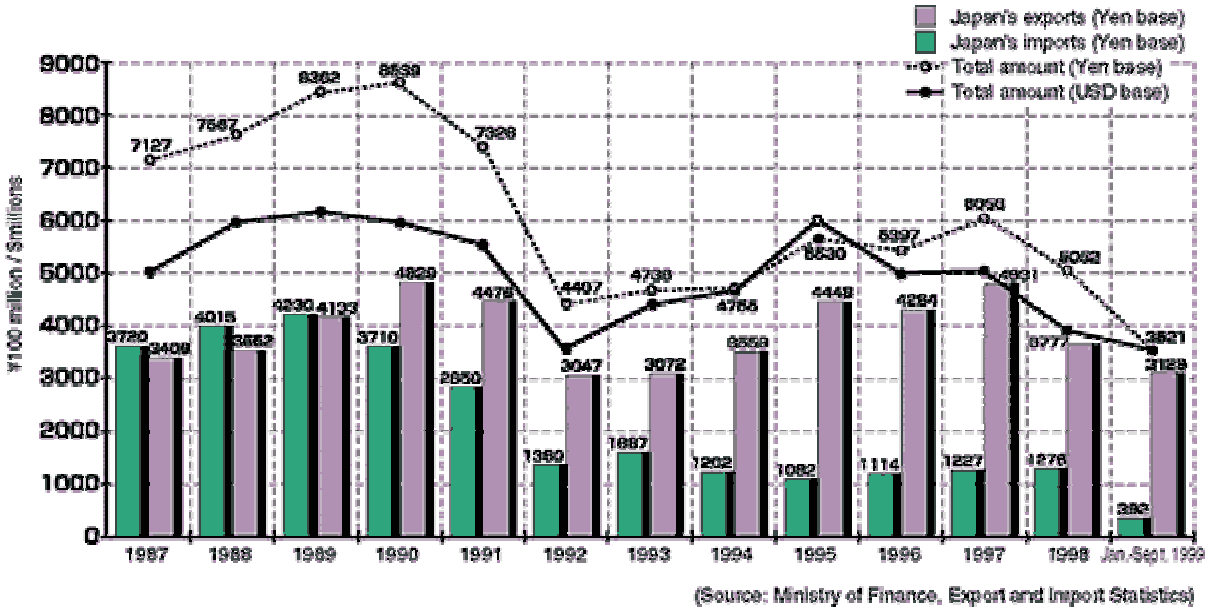


Fig. 6-1. Dynamics of Foreign Trade of Japan with Russia/USSR

The most challenging area for cooperation between Japan and Russia is the *energy* sector where bilateral efforts have been rapidly expanding during the recent years[105]. According to the officials from the RF Ministry of Energy, currently, Japan is the leading counterpart of Russia in this field among other countries. Russian business also sets a high priority to cooperation with the Japanese companies. For example, RAO UES (the biggest electricity producer and supplier in Russia) has its largest foreign project with Japan (Box 6-1). For Japan, with its poor energy resources, the Kyoto mechanisms are approached as an important tool in promoting the *national energy security* and in strategic energy planning. Global warming mitigation is a secondary to this major national priority, and is often considered as an important instrument in its energy policy.

In our particular case analysis based on NEDO F/S projects, the links between results of cooperation in the energy sector and in climate change mitigation are very tight. Most of the potential JI projects between Japan and Russia are supposed to be implemented particularly in the energy sector, or are associated with increase of energy efficiency and energy-savings in other industries. The progress and already achieved results of bilateral partnership in energy sector can be viewed as an important prerequisite for developments in global warming mitigation.

[105] They focus on oil and gas developments on Sakhalin, construction of gas pipeline between Russia and Japan, development of Kavytkynskoe condensed gas field and gas reserves in Yakuitia, projects on energy-savings, cooperation in construction of nuclear energy facilities in the far East with further electricity supply to Japan.

Box 6-1. RAO UES: "Energy-Bridge" between Russia and Japan

Energy-Bridge (EB) is one of the largest export programmes of RAO UES costing according to preliminary estimates about $9.6 billion. During the high-level visit of V. Putin to Japan in September 2000, the 1st Protocol on EB has been signed between RAO UES, Marubeni and the Sakhalin oblast administration. It defines the scheme for development of this project; its detailed technical plan, financial assessment, property schemes are to be elaborated by Marubeni. The implementation of this project is expected to start not earlier than in 2002. The project envisages erection of a power plant (4 Mln kWh) on oil-gas/steam near Sakhalin-1 and Sakhalin-2 developments, construction of electricity network 400 km long to the south of the Sakhalin Island, with laying sea-bed pipeline across the Laperuiza strait to transforming stations on Hokkaido and Honshu.. About of the quarter of the electricity delivered (annually -25.5 billion Kwh) will be consumed at Hokkaido, with the rest - transferred to the Tokyo electricity system. According to RAO UES data electricity cost at the power plant is expected to be about 1.6 cents/Kwh, and taking into account the transportation costs - 3.2 cents; prices for consumers in Japan will be about 6-8 cents, with this difference to cover the costs by 2012-2015 when the project is planned to be implemented in a full-scale. The joint Japanese-Russian company to operate this project is supposed to be established in 2002 with a capital of about $2-2.5 billion. About three quarters of the funding is expected to be mobilized through credits, with the major part expected to be provided by the Eximbank.

Source: RAO UES Annual Report 1999; *Kommersant*, 6 September 2000, p.4; *Vedomosti*, 6 September, 2000, p.A3

These recent trends in energy sector collaboration are especially important for the climate change policy, since the most of the joint efforts and plans in the energy sector are directly interlinked with climate change mitigation. For the future, experts indicate the following as the most promising mutual initiatives in energy sector.

- "Energy Bridge" between Sakhalin and Japan (Box 6-1)
- "Blue Flow" project aimed at delivery of natural gas from Russia to Turkey[106]
- Development and transportation networks from Kovytkinskoe field near Irkutsk

[106] In 2000 Japan and Russia has signed a cooperative contract on the "Blue Flow" project envisaging deliveries of natural gas from Russia to Turkey by a pipeline laid at the bottom of the Black Sea; the share of Japan in financing this project accounts for a quarter of its total cost. Consortia consisting of Mitsui, Sumitomo, Itochi has got a contract for engineering, projecting, equipment deliveries, and construction of a sea pipeline section of "Blue Flow" costing of about $1.7 billion. The government of Japan decided to allocate a credit for the project realisation through the Bank of International Cooperation of Japan; a consortia of private banks headed by Fuji Bank will also participate in the project with the guaranties granted by the MITI (*Business Match*, N 23, 2000, p. 14; N 24, 2000, p.33-34)

6.4.2. Foreign Investments in Russia: General Trends and Institutional Framework

A variety, of both, opportunities and constraints for AIJ/JI project based activities between Japan and Russia are rooted in the specifics of the investment climate in the latter one.

Still existing uncertainties related to *weak investment climate* in Russia are among major limiting factors for development of joint implementation schemes. Russian market is characterized by still underdeveloped institutional investment framework which constraints foreign investments in general, and into AIJ/JI projects, in particular. It explains very cautious approach of the Japanese partners participating in NEDO/METI F/S projects towards evaluating the prospects in the field. Despite some recent legislative measures to improve it, its image is still not appealing: according to the index of non-favourability of foreign investments (among countries potentially very appealing for foreign investors) presented at Economic Forum in Davos in 2001 Russia ranks first, and is followed by China (Interfax, 3 Feb, 2001), and their per capita level is much lower than in other CEE countries. There are various reasons limiting foreign investment activity in Russia, as for example, uncertainties in legislation, overlaps in norms and rules, low transparency, inadequate guarantees for investors, inadequate protection of property rights, low level of privileges, weakness of the government to protect investors' rights, financial intermediaries do not protect investors, but increase their risks, too complicated registration procedures at initial stages, highly bureaucratised reporting procedures, etc. However, together with well-known barriers for foreign investments experts indicate that not even the fear of financial risks, but, mainly expectations of new privileges and guaranties for foreign investors to be granted by the Russian government, prevent dynamic developments in this area.

Discrepancies between the federal and regional legislation regulating foreign investments are often indicated as a significant obstacle for designing the investment strategy. Indeed, in many cases the contradictions and differences between federal and regional regulations and norms are high. Today, about 30 subjects of the Russian Federation adopted their own legislation and norms regulating realization of foreign investment projects on their territories, as well as incentives and privileges for their promotion. Although, the existence of regional policies and institutional framework to attract foreign investments is a decisive factor in decision-making process, the investors are still quite cautious in facing the major challenges. Despite adoption of the 1999 Federal law "On Foreign Investments in the Russian Federation" the fears and uncertainties for investors are still high.

At the same time, recent efforts of the Russian government to develop the institutional design for foreign and domestic investments contribute to improvements at foreign investments market in general, and possible future market of JI projects, in particular. According to many experts, they are becoming appealing in terms of project-based investment opportunities. Indeed, after the 1998 financial crisis in Russia, the revival of direct foreign investments in the new decade has been more rapid than predicted,

and at the beginning of 2000 accumulated foreign investments in Russia accounted for $29.3 billion[107] (Rossisky, 2000). Currently, according to leading experts' evaluations, improved opportunities are opened for direct long-term investments, especially, based on financing of particular projects(Gaidar E. (ed.), 2000).

Currently, the Russian government is struggling with the programme envisaging reforms and innovations to improve the investment climate. The major changes envisage, for example, amendments to the tax code, simplification in registration procedures, restructuring of monopolies, additional rules for protection of the property rights, increasing the role of the managers of enterprises with blocking the voluntarism of government bureaucracy, enhancing transparency, etc. Recent government Programme of Long-term Economic Development envisages special policies towards attracting foreign investments. They include (a) adoption of basic principles for attracting foreign investments, (b) introduction of a set of privileges, (c) a system of investment risk insurance, (d) introduction of legal norms to attract foreign investors. It also foresees granting preferences and guarantees both through domestic legislation and within special governmental agreements with particular investing companies, as well as elaboration of special policies towards transnationals corporations. (Osnovnye, 2001). It is believed that such innovations would contribute to expanding in the future project-based cooperation between Japan and Russia in climate change mitigation. They are to be taken into account while designing strategies of potential Japanese partners for the JI activities in Russia.

6.5. Institutional Framework for JI Development in Russia: Options and Barriers

Experiences from the AIJ in Russia undertaken in cooperation with other Annex I countries, as well as major milestones in formation of domestic institutional framework for JI project-based activities in Russia are important for exploring opportunities in collaboration between Japan and Russia in application of this Kyoto tool.

During the nineties Russia has been an active participant in AIJ activities: it has an interest in developing this kind of joint efforts since they correspond to its current strategies for international cooperation, for attracting foreign investments and technology transfers. According to its official positions AIJ and JI projects is an important mechanism in its national climate policy to meet its international obligations. By 2001 nine AIJ projects are internationally certified and endorsed in Russia (Table 6-4). In addition, a portfolio of projects certified by the Russian side and the number of

[107] The major part of foreign investments in Russia is concentrated in industry, and particularly, in export-oriented fuel and energy sector (about 35 percent of foreign investments in industry) that is characterised by high return on investments

AIJ/JI project proposals is quite extensive. Several AIJ projects are effectively performed[108], and lessons learned from their implementation are to be analyzed and interpreted for the future. Existing projects concentrate on a wide range of sectors, including energy efficiency, municipal district heating, reforestation, landfill gas utilization and reducing methane leakages (4 projects – energy savings, 2 – modernization of natural gas pipelines, 2 - reforestation, 1- landfills). The major active foreign partners are both government and non-governmental organizations from the US; two AIJ projects are performed with the German partners, and one - with partners from the Netherlands. So far, there is no acting AIJ projects in Russia performed with the partners from Japan. Total foreign investments into these activities account for about $16 million. Estimated carbon reduction cost ranks from $0.3 to $20 per ton of CO2.

Table 6-4. Internationally Certified AIJ projects performed in Russia

Name of the Project	**Type**	**Location**	**Life time**	**GHG Impact** (CO2 eq. in metric tons) a/	**Carbon cost** ($ per ton of CO2)	**Stage of Impleme-ntation**	**Participants**
RUSAFOR (SAP)	forestry	Saratov oblast	60	292,72	2,5-4	under implemen-tation	Russia USA
Horticulture Tuimen	energy efficiency	Tuimen, Siberia	1993-na	na	20 b/	under implemen-tation	Russia *(RITZA)* Netherlands *(VEK)*
Natural gas pipeline system optimisation	energy efficiency	Uzhgorod	2	225,00	1,5-2,5 c/	under implemen-tation	Russia *(Gazprom)* Germany *(Ruhrgaz)*
Methane landfill utilisation with energy recovery	methane capture	Moscow oblast	10	255,26	0,3-7 c/	under implemen-tation	Russia *(Geopolis)* Netherlands *(Grontmij)*
RUSAGAS-Fugitive Gas Capture	energy efficiency methane capture	Saratov oblast Volgograd oblast	28	30955,75	0,3-1,5 d/	start of implemen-tation	Russia *(Gazprom)* USA *(Oregon St.University)*
Reforestation in Vologda	forestry	Vologda oblast	60	858,00	1,5-2,5	suspended	Russia *(Research team)* USA *(EPA, EDF)*
Zenenograd district heating modernisation	energy efficiency	Zelonograd	30	1 575,04	no business plan	suspended	Russia USA
Chelyabinsk district heating morednisation	energy efficiency	Chelyabinsk	na	na	0,3-1,5 d/	start of implemen-tation	Russia USA

[108] These 9 projects are at different stages of implementation: 4 of them, i.e. Rusafor, Horticulture Tuimen, Rurhgaz-Gazprom Uzhgorod pipelines optimization, Moscow oblast methane landfills utilization are effectively executed, while 5 others, i.e. Rusagaz, Reforestation in Vologda, Zelenograd, Chelyabinsk and Lytkarino district heating are suspended, or are at the initial stages.

Lytkarino district heating modernisation	energy efficiency	Lytkarino, Moscow oblast	na	na	0,3-1,5 d/	start of implemen-tation	Russia USA

* The projects listed have been accepted, approved and endorsed by the designated national authorities for AIJ of the host and investing countries, and have been reported to the FCCC Secretariat.

a/ Estimated GHG reduced or sequestered (tons of CO2 equivalent) during the lifetime of the project.

b/ ranges from 8 to 80 depending on future development of the project and market conditions

c/ depending on location and year

d/ approximate estimate

Source: UNFCCC-INFO/AIJ. AIJ under the Pilot Phase, List of the Reported Projects; Materials of the RF Interagency Commission on Climate Change; *Joint Implementation Quarterly*, for a number of years; website *http://www. climate.de*

The existing domestic institutional framework for AIJ/JI activities is not exquisitely refined, but some of its internationally required elements are already in place. Currently it's functioning for AIJ projects selection and endorsement. The RF Interagency Commission on Climate Change (ICCC) with its Climate Projects Centre of JI serves as a national focal point for AIJ/JI activities. Five main principles for projects' selection and approval have been adopted[109] by this body, and they govern the AIJ, and will serve as a basis for JI project regulation in the future. Further developments of domestic institutional design are envisaged. Active debates are underway in Russia on possible directions and schemes for this system building (Ploujnikov O., Berdin V., Kokorin A., 2000; Maximov V., Martynova M., Saparov M., 2000), and some experts from the West also seek for incorporation of their advice and recommendations(The Approval, 2001). New impetus for institutional developments in the field is given after the public hearings in the State Duma in 2001, and recent broader involvement of the Russian parliament in climate change policy formation. A number of organizations in Russia are participating in preparation a portfolio of potential JI projects, for example, such as National Pollution Abatement Facility (NPAF), or Centre for Energy Efficiency (CENEF). It is likely that competition between domestic organizations willing to control JI performance and financial flows would intensify. Some of the recently established entities announce their intent to be involved in this field, and the number of such volunteers is rapidly increasing. For example, the Energy Carbon Fund together with its other goals intends to be opened for JI projects; it is supposed to support and supervise JI implementation, establish carbon investment fund, and provide eligibility assessment(New, 2000; Energy, 2001). Similar goals are proclaimed by other organizations, and the future will show who would be strongest among them to survive.

[109] These principles are the following: 1) additionality of JI projects; 2) voluntary participation; 3) monitoring and verification by ICCC; 4) provision of financing; 5) incentives for private investors

A number of problems in development of domestic JI institutional framework design and procedures can be outlined. For instance, some experts indicate high bureaucratization of domestic procedures within the ICCC approval system; that was the major reason, for example, for Russia not taking part, so far, in the activities of the World Bank's Prototype Carbon Fund Initiative aimed at reducing risks of joint implementation projects. Other problems include not thoroughly designed system of criteria for projects approval which needs to be improved. Another loophole is in competition and rivalry between governmental bodies to perform regulatory functions, which had a negative impact on institutional capacity-building, and resulted in a certain slow-down in institutional formation. Some experts even consider that design of the whole "system that has been in place in the AIJ phase until now, has not been efficient in attracting foreign investors, and it has been a barrier towards realization of projects by Russian enterprises and regional authorities. The major explanation is that the structures in charge have lacked authority, and have not been set up to deal with economic and energy aspects of the climate problem" (The Approval, 2001). Recommendations of the Marrakesh Accord on monitoring, verification, and certification of project results, and suggested requirements to controlling organizations, etc. are to be taken into an account, and a variety of a "home-work" is to be accomplished in Russia before the start of the first commitment period.

Annex 6-1. Feasibility Studies Selected for Implementation in Russia through NEDO Programme in 1998 and 1999

No	*Theme*	Entrusted Companies from Japan	Outline of the Feasibility Study
	1998		
1.	***Optimization of Gas pipeline in Perm oblast, including repair and reconstruction***	Nippon Steel Corp. NKK Corp. SumitomoMetal Industries Ltd., Sumitomo Corp. Itochu Corp. Mitsui & Co., Ltd.	The target site of the survey will be a 150-200 km section of Russia's main gas pipeline (approx. 145,000 km in total length) where leakage and rupture problems have become serious. This is a trunk line of Perm oblast, mainly built of 56 inch pipes, which connects West Siberia with Europe. *This project* intends to investigate the actual conditions of the pipeline, develop a plan for repairs, reconstruction and optimization using appropriate technology, carry out actual rehabilitation work and help reduce emissions of greenhouse gases.
2.	***EnergyCconversion at Khabarovsk Oil Refinery***	Chiyoda Corp.	The refinery in Khabarovsk is one of the most important refineries in the Russian Far East area of Russia, with a production capacity of 128,000 barrels per stream-day. However, since it was constructed in the 1930's, it has become outdated and inefficient. *This project* intends to improve the efficiency of plant operation by reducing energy consumption by such outmoded facilities
3.	***Feasibility of Converting Coal-fired Power Plants to Natural Gas in Sakhalin***	Mitsui & Co., Ltd. NKK Corp. Kawasaki Heavy Industries UNICO International Corp.	Two plants of Sakhalinenergo are located at Sakhalinskaya and Yuzhno-Sakhalinsk, and both are outdated. *This project* intends to convert two coal-fired power plants to use natural gas. At the same time, they will be converted to combined cycle power plants (CCPP). It is planned to make maximum use of existing facilities in converting them to a more efficient CCPP status.
4.	***Upgrading of KonakovoPower Station***	The Kansai Electric Power Co., Inc. Mitsubishi Corp.	The Konakovo Power Station consists of eight natural gas boilers and 300MW steam turbine generators, resulting in a total plant capacity of 2,400MW. *This project* intends to improve the total thermal efficiency of the station by introducing a modern gas turbine combined cycle power plant which would substantially reduce the plant's CO2 emissions.
5.	***Modernization of Power Plants in Khabarovsk***	Sumitomo Corp. Chubu Electric Power Co., Inc.	The study comprises of three main elements: 1) Shutdown of Khabarovsk Power Plant No. 1 2) Expansion of Khabarovsk Power Plant No. 3 through addition of one new unit 3) Construction of a new coal-fired power plant, i.e. Khabarovsk Power Plant No. 4 The expected CO2 reduction is 232,000 ton per year.
6.	***Regional Heating System Using Geothermal Hot Water in Kamchatka***	Japan Metals & Chemicals Co. Ltd.	Kamchatka is one of the most active volcanic areas in the world and it is rich in geothermal energy resources. The region's capital city is Petropavrovsk-Kamchatsky, and its hot water is produced using oil burners. *This project* intends to use natural geothermal water instead of oil to produce the city's hot water.
7.	***Fuel Conversion Project at No.1 and No.9 Combined Heat***	JGC Corp.	Irkutskenergo, a power company in Irkutsk Oblast owns a combined heat and power generation station in Angarsk. *This project* aims to provide fuel switch at power station's No. 1 and No. 9 plants from coal to natural gas, including the necessary

	and Power Generation Plants in Irkutsk Oblast		modification of related facilities, in an attempt to reduce the level of CO2 emissions from the power station.
8.	***Study on Factory Modernization at Machine and Heavy Industries Complex and Re-powering of Existing Power Plant in Sverdlovsk***	Padeco Co., Ltd.	This project focuses on improvements at Russia's largest machine and heavy industries company, and a thermal power station supplying electricity to the company. *This project* plans to provide: efficiency improvements in a heat treatment facility; replacement of an open-hearth furnace with an electric furnace; and improvement of an existing thermal power station by introducing a combined-cycle gas turbine.
9.	***Study for Energy Conservation of Magnitogorsk Steelworks***	Nippon Steel Corp.	*This project* intends to make a diagnostic study of Magnitogorsk Steelworks in terms of energy saving, taking into consideration the demand and supply balance of energy by the steelworks. In addition, a master plan will be formulated to introduce the most suitable energy-saving facilities and technology. The master plan will include an outline of the energy-saving facilities and technology to be introduced, expected effects on energy conservation, priorities considering the costs and effects, and recommendations for an implementation schedule.
10.	***Feasibility of Fuel Conversion at the Igumnovo Power Plant, Nizhni Novgorod***	UNICO International Corp. Tokyo Electric Power Services Co., Ltd. Mitsui & Co., Ltd.	This project intends to improve energy efficiency by introducing combined cycle technology gas turbines. It also intends to provide heat to industrial customers in the vicinity (through cogeneration), improve regional efficiency in energy use, and reduce CO2 emissions.
11.	***Feasibility of Repowering Three Gas Based Power Plants in Novgorod and Pskov***	UNICO International Corp. Tokyo Electric Power Services Co. Mitsui & Co., Ltd.	This project intends to determine the feasibility of converting three plants that now use natural gas for steam cycle power generation to state-of-the-art gas-based combined cycle generation. This would have beneficial results in terms of reducing CO2 emissions, improved economic indicators and reduction of pollution in the regions affected. The plants are at Novgorodskaya, Pskovskaya and Iriklinskaya.
12.	***Energy Saving Study at the Achinsk Refinery***	Chiyoda Corp.	The Achinsk Refinery is relatively new in Russia and has a production capacity of 150,000 barrels per stream-day. However, since it was not designed for energy saving, *this project* intends to improve the efficiency of plant operation by reducing energy consumption by this refinery.
13.	***Amursk Power Station Fuel Conversion Project***	Mitsubishi Corp.	The Amursk Power Station (Khabarovsk oblast) consists of nine coal-fired boilers and five steam turbine generators, resulting in a total plant capacity of 285MW. *This project* intends to convert the main fuel of existing facilities at the station from coal to natural gas, which would substantially reduce the plant's CO2 emissions.
14.	***Replacement of Open Furnaces at the Kuznetsk Steelworks with Oxygen Converters in Kemerovo Oblast***	Mitsubishi Corp., Nippon Steel	*This project* intends to replace 12 open furnaces at the Kuznetsk Steelworks with three or four oxygen converters so as to reduce CO2 emission by approx. 210,000 tons per year.
15.	***Rehabilitation, Modernization***	Sumitomo Corp.	This project consists of four elements: 1) Rehabilitation, modernization and reconstruction of existing

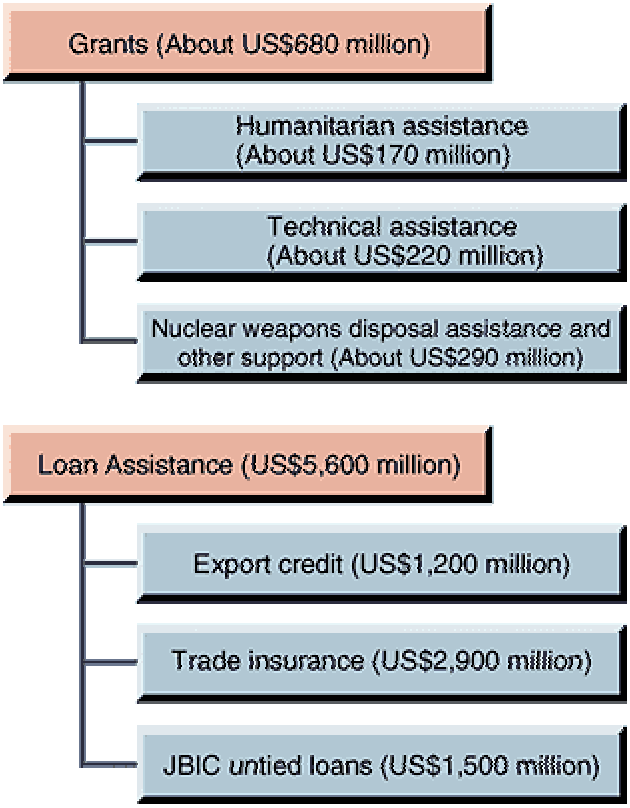
	and Reconstruction of Thermal Power Plants in Primorski Krai	Toshiba Corp. Ishikawajima-Harima Heavy Industries Ltd.	power plants at Vladivostok coal-fired cogeneration power plant. 2) Shutdown of the Partizansk coal-fired cogeneration power plant and reconstruction of new heavy oil-fired cogeneration power plant. 3) Construction of a new heavy oil-fired power plant in Nahodka. 4) Construction of a new coal-fired cogeneration power plant at Usuriisk. The expected CO2 reduction is 1.37 million tons per year.
16.	***Tshekinskaya Power Plant Modernization Project***	Sumitomo Corp. Tokyo Electric Power Company	*This project* studies the possibility to shutdown the existing natural gas-fired plant and construction of two units of natural gas-fired combined cycle plant. The expected CO2 reduction is 1.7 million tons per year.
17.	***Ryzanskaya Power Plant Modernization Project***	Sumitomo Corp. Electric Power Develop. Co., Ltd.	*This project* comprises two elements as follows: i) Shutdown of the existing coal-fired units Nos. 1 and 2, and construction of a new natural gas-fired combined cycle power plant. ii) Refurnishment of the boilers of existing coal-fired units Nos. 3 and 4. The expected CO2 reduction is 6.1 million tons per year.
18.	***Master Plan for a District Heating Boiler Project in Nizhegorodskaya Oblast***	Mitsui & Co., Ltd. UNICO International Corp.	Many of the 5,000 boilers used for heating in the Nizhegorodskaya oblast are outdated and inefficient, thus, they are in urgent need of replacement. In order to alleviate air pollution, boilers using coal or oil should be replaced by those using gas. This project will estimate the number of boilers that should be replaced, the cost, and procedures for implementation.
19.	***Modernisation of Heating Furnaces at Kuibishev, Syzran, and Novokuibishev Oil Refineries***	Mitsuibishi Corp	*This project* intends to modernize 130 heating furnaces at Kuibishev, Syzran and Novokuibishev oil refineries. Thermal efficiency will be increased and CO2 emissions from burning heavy oil will be decreased by approximately 1.2 million tons per year
20.	***Study on Reduction of CO2 Emissions from Coal-fired Thermal Power Plants in Russia***	Electric Power Develop. Co., Ltd.	In *this project*, coal-fired thermal power plants will be fully examined because a reduction of CO2 emissions from such plants will provide the greatest cost-efficiency and CO2 reduction compared to power plants that use other fossil fuels. O2 reduction measures for coal-fired thermal power plants in Russia will be fully evaluated in light of basic research in energy balance and power systems, including operation of the overall power system. The objective of the study is to select coal-fired thermal power plant projects appropriate for Russian-Japanese joint implementation.
	1999		
21.	**Basic Feasibility Study on Energy Conservation at Severstal Steelworks**	*Nippon Steel Corp.*	*This project* intends to realize higher energy conservation by introducing recovery equipment to reutilize heat and gas as steam and electricity in the steelworks.
22.	**Feasibility Study on Energy Conservation at Novo-Ufimsky Refinery in Ufa City**	*Idemitsu Kosan Co., Ltd.*	*This project* intends to realize higher energy conservation and reduction of CO_2 emissions by reforming existing equipment and improving operation and control systems.

23.	**Feasibility study on Surgut No.1 Power Station Upgrading Project**	*Mitsubishi Corporation*	*This project* intends to realize higher energy conservation and reduction of greenhouse gas emissions by replacing the existing thermal power plant (210MW×6=1260MW) with advanced gas turbine combined cycle power plant (400MW×3=1200MW).
24.	**Comprehensive Investigation for Improvement of Efficiency of Existing Heat Stations and Heat Networks in Satellite Cities in Moscow Oblast (Model cities:Khimki and Voskresensk)**	*Marubeni Corporation*	*This project* intends to realize higher energy conservation and reduction of greenhouse gas emissions by removing, or assembling existing old boiler-turbine generators and introducing gas turbine cogeneration systems and converting fuel for boilers in Russian cities where the fall in heat supply ratio and the increase in heat transfer loss are becoming substantial.
25.	**Basic Feasibility Study on Energy Conservation at Novolipetsk Steelworks**	*Nissho Iwai Corporation*	*This project* intends to realize higher energy conservation by introducing exhaust heat and gas recovery equipment to reutilize exhaust heat and gas as steam and electricity in the steelworks .
26.	**Feasibility Study on Energy Conservation and Reduction of CO_2 Emissions at Omsk Refinery**	*JGC Corporation*	*This project* intends to realize higher energy conservation and reduction of greenhouse gas emissions by increasing the heat recovery efficiency in the refinery. The study includes the re-arrangement of heat exchangers and modification of furnaces utilizing the JUMP(JGC's Unified Maximum Performance) technology developed by JGC Corporation.
27.	**Modernization of Combined Heat and Power Plant No 2 and others in St.Petersburg**	*Mitsui & Co., Ltd.*	*This project* intends to realize higher energy conservation and reduction of greenhouse gas emissions while obtaining higher heat efficiency and lower fuel consumption by introducing a combined-cycle cogeneration power plant and scrapping existing boiler-turbine generators by degrees.
28.	**Feasibility Study on Energy Conservation at Norsi Refinery**	*Techno Consultants, Inc.*	*This project* intends to realize higher energy conservation and reduction of CO_2 emissions by adding heat exchangers, modifying process furnaces, or modifying boilers to increase heat recovery ratio and energy efficiency in process units such as atmospheric crude distillation, vacuum crude distillation, and catalytic reforming units; or utility facilities such as boiler plants.
29.	**Feasibility Study on Recovering and Utilizing Coal Bed Methane(CBM) at Kuzunetsk Coal Field**	*Japan Coal Energy Center*	*This project* intends to realize higher energy conservation and reduction of greenhouse gas emissions by introducing a high-efficiency recovery system for coal bed methane such as drilling machines and a gas controller to utilize it for a gas turbine .

Source: NEDO website

Annex 6-2.

Assistance of Japan to the Russian Federation, 1990-1999



Source: Japan Ministry of Foreign Affairs, official website, 2001

7. Various Collaborations in This Region

7.1. State of the Art

At the Annual Tripartite Environment Ministers' Meeting among China, Japan and Korea which has been held since 1999, Japan recognize the importance of environmental co-operation in this region and has actively promoted co-operative measures. Japan's co-operation has been made both through multilateral channels including contributions to international organizations (GEF, UNEP, UNDP etc.) as well as international financial institutions (ADB and the World Bank etc.) and through bilateral assistance. Many of environment projects implemented in the energy area aiming at improvement of local air pollution also has GHG reducing effect, and therefore could be climate change mitigation projects. In this section, we summarize the current situations of Japan's bilateral environmental co-operation, and then draw some lessons and implications for the future co-operation from the experiences of these schemes.

Because of Korea's unique position- being a non-Annex I country but a member of OECD countries- in most cases, Korea is not a targeted country for Japan's below mentioned schemes. Japan's economic co-operation with Korea is mainly made at the level of the private sector businesses through services by the international financial operation of Japan bank for international Co-operation (JBIC).

7.2. Potential of CDM

CDM has a big market potential in Asia, because many low cost abatement opportunities exist, particularly in China and India. It is estimated that the aggregate emissions reductions required of Annex I countries in 2010 amount to 620.6 Mt carbon equivalent (Zhang 2000). Zhang's study, based on a compilation of the national communications from 35 Annex I countries shows that none of the existing estimates indicates that the size of hot air in 2010 is sufficiently large that all the advanced Annex I countries can comply with their Kyoto target merely through acquisitions of hot air. Furthermore, using the 12 region's marginal abatement cost-based model, he estimated the contribution of the three Kyoto Mechanisms to meet the total emissions reductions required of Annex I countries under the four trading scenarios. Zhang then calculated the size of the CDM market, as well as the geographical distribution. The results, together with those of other studies based on economic modeling, are shown in the tables below (see Table 7.1~7.4). The contributions of the certified CDM credits in 2010 are estimated to range from 21.2% under the EU ceilings scenario to 47.1% under the no limits scenario, and to 57.6% under the no hot air scenario. In absolute terms, the supply of certified CDM credits in 2010 ranges from 131.8 MtC under the EU ceilings scenario to 292.1 MtC

under the no limits scenario, and to 357.5 MtC under the no hot air scenario.

Table 7-1. Estimates of the Contributions of Three Flexibility Mechanisms under the Four Trading Scenarios in 2010

Scenarios	Domestic actions	Hot air	Emissions trading and JI	CDM	Total supply
No limits	171.7	105.0	51.8	292.1	620.6
50% of reduction from BAU emissions	310.3	105.0	36.1	169.2	620.6
EU ceilings	387.8	70.2	30.8	131.8	620.6
No hot air	203.5	0	59.6	357.5	620.6

Source: Zhang (2000)

Table 7-2. Value of the CDM Market and the Geographical Distribution in 2010 under the Four Trading Scenarios

	No limits	50% of reduction from BAU emissions	EU ceilings	No hot air
CDM market (million US$)	2795.6	797.4	456.9	4512.8
of which:				
China	60.28%	59.88%	59.63%	60.36%
India	15.08%	15.67%	15.92%	14.86%
Energy Exporting Countries	6.07%	5.57%	5.38%	6.28%
Dynamic Asian Economies	4.91%	4.49%	4.34%	5.09%
Brazil	0.25%	0.21%	0.20%	0.26%
Rest of the World	13.41%	14.18%	14.53%	13.14%
Net CDM market (million US$)	1565.0	432.4	244.6	2559.1
of which:				
China	59.94%	59.43%	59.17%	60.09%
India	15.52%	16.06%	16.28%	15.30%
Energy Exporting Countries	5.71%	5.29%	5.15%	5.89%
Dynamic Asian Economies	4.61%	4.26%	4.14%	4.76%
Brazil	0.22%	0.20%	0.19%	0.23%
Rest of the World	14.00%	14.75%	15.07%	13.71%

Source: Zhang (2000).

7.2.1. CDM and relevant decisions in COP 6-bis and COP 7

CDM was defined in the Kyoto Protocol achieved in COP 3 in 1997 as one of the three flexible mechanisms (CDM, JI and ET). The purposes of CDM are to help Annex I Parties to achieve part of their reduction commitments, and to promote Non-Annex I Parties' sustainable development. CDM has been paid much attention to by both developed and developing countries.

The second part of the Sixth Conference of the Parties (COP 6-bis) and the Seventh Conference of the Parties (COP 7) were still hold successfully this year in Bonn, Germany and Marrakech, Morocco respectively. The "Bonn Agreement" and the "Marrakech Accords & Marrakech Declaration" have been achieved to pave the way for the implementation of the Kyoto Protocol. They formulate detail rules for the implementation of JI, CDM and ET. For CDM, the whole operation process, from

validation and registration, to monitoring, verification and certification, and issuance, are determined. The CDM executive board (EB) members were elected and its functions have been defined, including approving new methodologies related to baselines, monitoring plans and project boundaries. The standards and procedures for the accreditation of operational entities are also stipulated. Some other relevant decisions that might affect CDM potentials are summarized as follows:

- Prompt start of CDM. Projects starting as early as 2000 may be eligible as JI or CDM projects. The crediting period for CDM project may start from 2000, while only after 2008 for JI projects.
- 2 percent of CERs (Certified Emission Reductions) for the adaptation fund to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.
- Simplified modalities and procedures for the small scale projects (less than 15MW for renewable energy projects, less than 15GWh annual savings for energy efficiency improvement projects and less than 15kt annual CO2 emission reductions for all others).
- Exclusion of nuclear from both JI and CDM projects.
- Country-specific ceiling on credits from forest management (including JI), shown in the Appendix of the "Marrakech Accords & Marrakech Declaration", summing up to 69.87MtC per year for the whole of Annex I Parties with USA excluded.
- Cap on CDM sink projects. Only afforestation and reforestation could be eligible for CDM sink projects, but with the limit of 1% of the base year emission for each Annex I Party.
- Not quantitative limit on the use of CERs, ERUs (Emission Reduction Units) and AAUs (Assigned Amount Units).
- ERUs, CERs, AAUs and EMUs (Removal Units) may be transferred between registries and within registries.
- ERUs, CERs and AAUs could be carried-over to the subsequent commitment period. The ceiling for the carry-over of both ERUs and CERs are 2.5% of the assigned amount of each Annex I Party, but there is no limitation on the carry-over of AAUs.

To evaluate emission requirements to achieve the Kyoto target is one of the prerequisite conditions to assess global carbon market. In this study, the Annex I Parties are grouped into six regions, that is, USA, Japan, European Union (EEC), other OECD countries (OOE), Former Soviet Union (FSU), and other Economics in Transition (EET). BAU projection in 2010 for these six regions are taken from national communications, EPPA (Emission Prediction and Policy Analysis) model developed by MIT, GTEM (Global Trade and Environment Model) developed by ABARE (Australian Bureau of Agricu

ltural and Resource Economics), and two other models developed by CICERO (Center for International Climate and Environmental Research) and RIIA (Royal Institute of International Affairs) respectively.

Figure 7-1 shows the reduction requirements to achieve the Kyoto target under different model projections. It could be seen that the results from different models ranges widely. With USA participation, EPPA shows that total reduction requirement would reach as high as 1200MtC, while other models provide close results of around 400MtC. After USA withdrawn, the total reduction requirements would drop to around 550MtC under EPPA projection, and fall significantly to about 35MtC under national communication and CICERO projection. The GTEM and RIIA projection show that without USA participation, no reduction actions need to be taken.

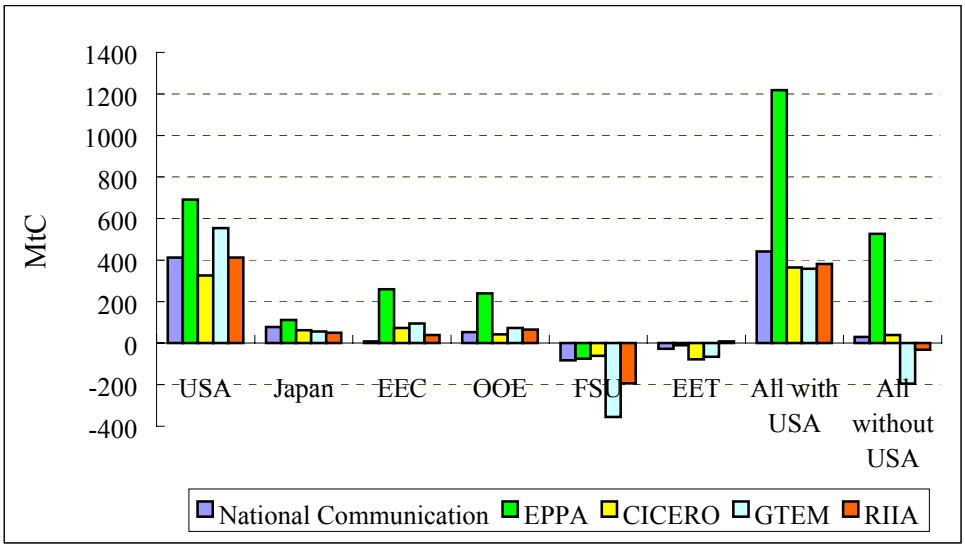


Figure 7-1. Reduction Requirements to Achieve the Kyoto target

In accordance with the COP7 decisions, the cap on JI and domestic sink credits from forest would be 97.87MtC with USA, and 69.87MtC without USA. Jotzo and Michaelowa estimated that the ceiling of JI and domestic sink credits from agriculture activities would be 44.73MtC with USA, and 26.32MtC without USA. For CDM sink projects, only afforestation and reforestation are eligible. Based on COP 7 decisions, the cap of CDM sink credits would be 49.51MtC with USA, and 33.01MtC without USA. Therefore, totally the cap of sink credits would be 192MtC With USA, and 129MtC without USA.

CERT (Carbon Emission Reduction Trade) model was developed by Gruetter Consulting together with the ETH Zürich on behalf of the World Bank in 2001. It is a computational framework to present and analyze the carbon market, and uses inputs of BAU GHG emission projection and marginal abatement cost curves(MACs) from other models.

In this study, BAU projection is taken from national communication and above mentioned models. MACs for both Annex I Parties and Non-Annex I Parties are taken from GTEM modeling results.

Figure 7-2 shows the modeling results. It could be found that with USA participation, CDM potential is estimated to be about 400MtC under EPPA projection, and around100MtC under national communication and GTEM projection. The quota price would be as high as 50US$/tC under EPPA projection, but only about 10US$/tC under national communication and GTEM projection. After USA withdrawn, CDM potential would reduce to about 200MtC and quota price to 18US$/tC under EPPA projection. While for other models' projection, only sink credits and hot air could meet the reduction requirement, no non-sink reduction actions need to be taken.

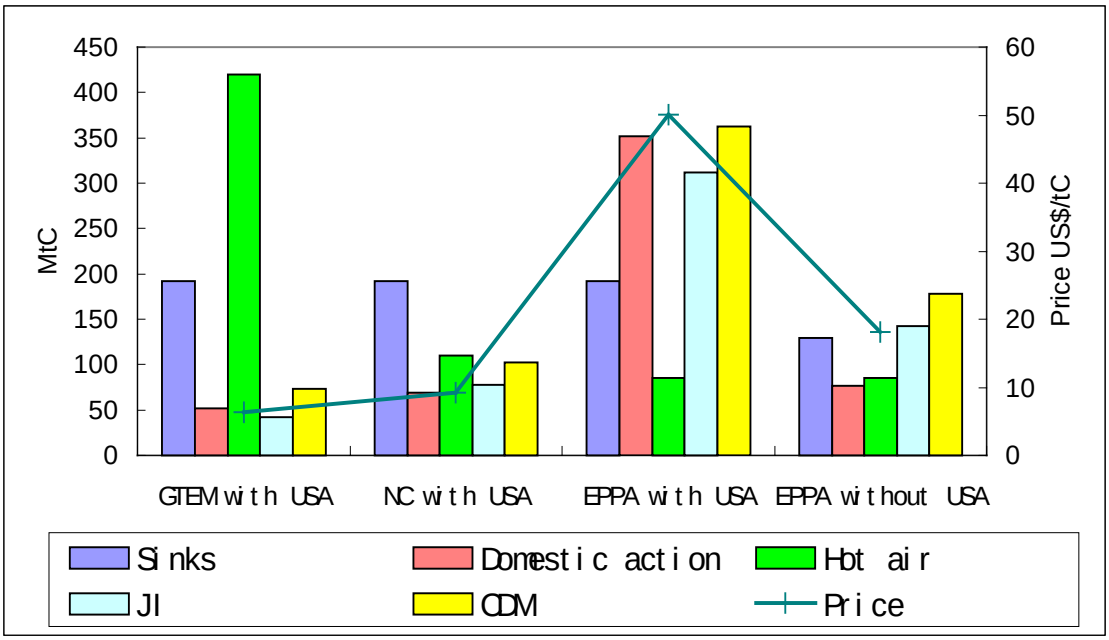


Figure 7-2. CDM Potentials and Carbon Quota Price

It could be concluded that USA' withdrawn from the Kyoto Ptotocol would bring CDM potentials from significant to small. However, some COP 7 decisions might enhance CDM potentials. Figure 7-3 displays the impact of carry-over of hot air on CDM potentials and quota price. It could be seen that carry-over of hot air would raise both CDM potentials and quota price. For example, under GTEM projection without USA, if carry-over of 100% hot air, then CDM potentials would increase from 0 to 50MtC, while quota price from 0 to about 5US$/tC.

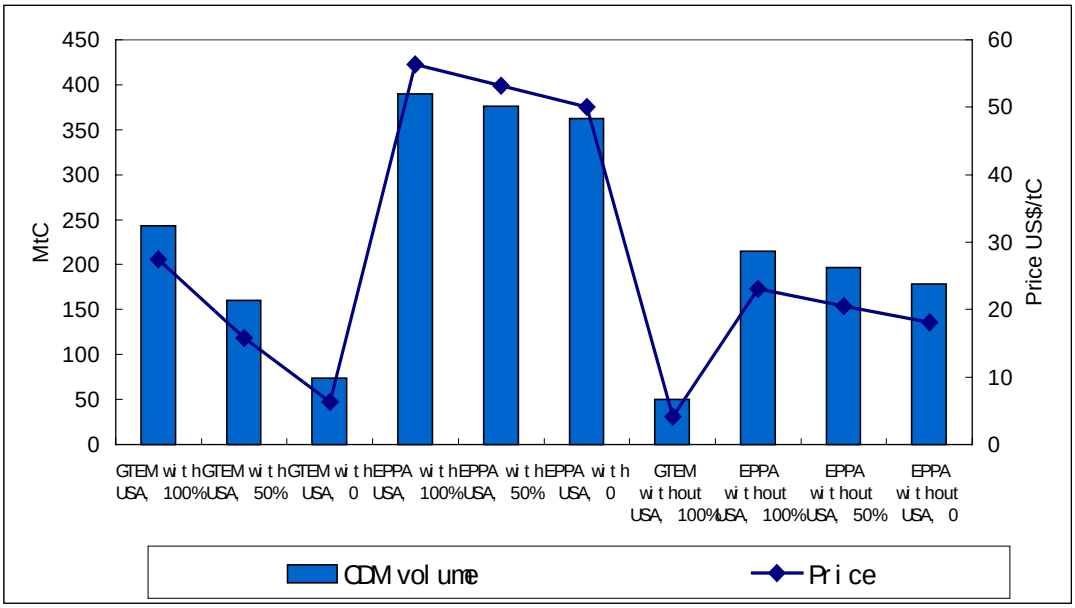


Figure 7-3. Imapct of Carry-over of Hot Air on CDM Potentials and Quota Price

Figure 7-4 shows that the impact of carry-over of 2.5% of assigned amount for both CERs and ERUs on CDM potentials and quota price. Like carry-over of hot air, carry-over of CERs and ERUs would increase both CDM potentials and quota price. Under GTEM projection without USA, if carry-over of 2.5% of assigned amount for both CERs and ERUs, then CDM potentials would further increase to 100MtC while quota price climb up to 12US$/tC.

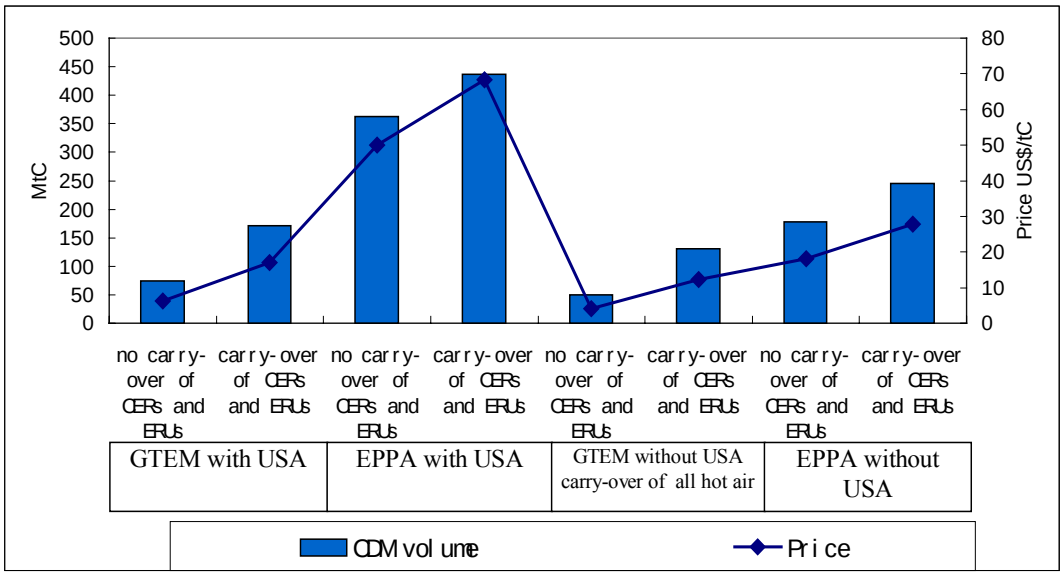


Figure 7-4. Impact of Carry-over of CERs and ERUs on CDM Potentials and Quota Price

7.2.2. Potential of CDM in China

It is very difficult to estimate the exact potential of CDM projects in China. Few researches have estimated the CDM potential in China by the CEG model, but these models have lot of assumptions and assumed coefficients. Therefore such information are subject to argument but can be taken just as a reference.

It's difficult be separated economic framework adjustment and improving managerial level in China from the total CDM potential which researcher estimated to be over 30 percent. Future economic growth rate could be high, thus the technology improvement also progresses, and it would be have strong influence for CDM potential in the future. However, China as the largest country for CDM potential is definite.

The COP6 could not achieve any agreements about CDM. This has made a big deal of uncertainty for CDM potential estimation although the agreement was very near on details related to CDM. The uncertainty of baseline issues, CDM use period, financial additionality, fast track on small projects, use of share of proceeds from CDM for adaptation, and environmental additionality, all could have strong influence on GHG reduction cost and CERs. This would further have a strong influence on the scope and scale of CDM.

As the CDM project include the wide scope and different technology level, the estimation of the CDM potential in China is can only be done by complex model where some uncertainty can not be avoided.

a. The First stage CDM project between China and Japan

The NEDO (New Energy and Industrial Technology Development Organization) of Japan analyzed the past AIJ project and experiences to determine the first stage CDM project between China and Japan. The project list is shown in the Table 7-3.

The main resources of CDM shown in the (Table 7-3) are highly concentrated in the iron and steel industry, chemical industry and waste disposal. All companies were old in Chinese side that needed technology reform. It also has lack of the attractiveness for investor but have large potential of GHG emission reduction. The other feature is that all the companies in Chinese side is large companies. The middle and small company with more disadvantageous technology have a large number in China, specially in the old industry(e.g. northeast area of China), but they need increasing capacity building and large transaction cost, thus it can not be include in the first stage of CDM.

Table 7-3. Initial CDM Project Plan between China and Japan

	Project title	Entrusted Organization	Outline of the Feasibility Study
1	Basic feasibility study on energy conservation at Anshan Iron & Steel (Group) Complex	Sumitomo Metal Industries,Ltd. .	This study intends to utilize exhaust energy more effectively by introducing a gas expander plant and a waste heat recovery plant from sintering equipment and cooler.
2	Basic feasibility study on joint implementation of newly-equipped Coal Moisture Control(CMC)	Nippon Steel Corp.	This study intends to realize high energy conservation and productivity by drying coal used in a coke oven (moisture 11%□¨6%, □£5%) with heat remaining in the exhaust gas from the coke oven decreasing its moisture content and increasing its bulk density.
3	Blast furnace Top Pressure Recovery Turbine(TRT) project at Panzhihua Iron & Steel(Group) Corporation	Kawasaki Steel Corp.	This study intends to realize high energy conservation by recovering pressure energy from the blast furnace gas as electricity through replacing existing valves in the Top Pressure Recovery Turbine(TRT).
4	Steam supply and power co-generation at Yanshan Petrochemical Co.,Ltd.	Japan Consulting Institute	This study intends to utilize exhaust energy more effectively by introducing a gas expander plant and a waste heat recovery plant from sintering equipment and cooler.
5	Energy conservation of calcination furnace	NKK Corporation	This study intends to realize higher energy conservation by introducing a parallel heat regenerative shaft furnace with heat efficiency much higher than its predecessor.
6	Feasibility study on regenerative burner heating furnace at Shougang(Group)Corporation /Anshan Iron & Steel(Group)Complex	NKK Corporation	This study intends to realize higher energy conservation and the reduction of NOx emissions by replacing the deteriorated heating furnace with a honeycomb-type regenerative burner invented by NKK Corporation.
7	Energy conservation in ethylene production at Yangzi Petrochemical Company	TOYO Engineering Corp.	This study intends to realize higher energy conservation and the reduction of greenhouse gas emissions obtaining higher heat efficiency by converting the exhaust gas from the gas turbine generator into combustion air for use in the decomposing furnace of an ethylene plant.
8	Energy conservation project at Dalian West Pacific Petrochemical Co.,Ltd/West Pacific Refinery	CHIYODA Corp.	This study intends to realize higher energy conservation and the reduction of CO2 emissions by reforming and relaying the system units, such as gas turbine generators, that utilize surplus exhaust gas
9	Energy conservation project at Jinling Petrochemical Company/National Refinery	CHIYODA Corp.	This study intends to realize higher energy conservation and the reduction of greenhouse gas emissions by reforming and relaying the Fluidized Catalytic Cracking(FCC) power recovery system that utilizes exhaust gas.

Source: NEDO website

In order to identify the possible potential for CDM implementation in China, a bottom-up type energy technology model was used. The IPAC-AIM/technology model is used. IPAC-AIM/technology model is developed from AIM/Enduse model which a part of the Asian-Pacific Integrated Model (AIM). It is a bottom-up, energy-technology model, focusing on the activities of people who deal with energy consumption and production, plus the improvement in technologies. Based on detailed description of these items, they calculated the total energy consumption and production from the "bottom-up" way. Among the advantages of "bottom-up models", the most important is that their results can be interpreted clearly because they are based on detailed description of changes in human activities and technologies. When introducing new policies, these bottom-up models, with their tangible results and explainability, are indispensable for explaining the directions and effects of policies to politicians.

In order to analyze the effects of CDM projects and their potentials in China, we combined the technology database for Japan and China. Advanced technologies from Japan are regarding as potential CDM projects. However, we should note that the technology used in the study is not the real technology in site, it is a representative of one group similar technologies as national average. Because of the model limitation, we focus on energy technology, not including sink-projects.

According to the current statistics of China's national economy as well as the data availability, energy end users in this study are divided into five sectors, i.e., industrial, agricultural, service, residential and transport sectors. Table 7-4 gives the classification of sectors and theirs lower level division. Every sector is split into several subsectors or products, or service modes. Subsectors are classified in industry sector, and then every subsector includes one or more products. For example, non-ferrous subsector includes number of products such as copper, aluminum, zinc and lead. For transport sector, under every subsector, transport modes by passenger transport and freight transport are given to the detailed analysis. Residential sector is split into urban and rural to match the different development patterns in these two areas. Different technologies for service demand are collected for every subsector and products. Energy service and technology selection for each sector or product is decided so that energy consumption and CO_2 emission can be estimated.

Table 7-4. Classification of Energy End Users Sectors

Sectors	Industrial Sector	Agricultural Sector	Residential Sector	Service Sector	Transport
	Iron & Steel	Irrigation	Energy use in the urban	Space heating	Railway transport
	Non-ferrous	Farming works	Energy use in the rural	Cooling	High way transport
Subsectors or Products	Building Materials	Agricultural products processing	Space heating	Lighting	Water way transport
	Chemical Industry	Fishery	cooling	Cooking and hot water	Air transport

	Petrochemical Industry	Animal husbandry	Lighting	Electric appliance	
	Paper-making		Cooking and hot water		
	Textile		Household electric appliance		
	Machinery				

Table 7-5 lists the major technologies used in this model. In AIM/China, these energy use technologies are mainly broken down into three categories:

- Technologies for service production: they are the technologies to satisfy service supply. These technologies include renovation for different old technologies and newly installed technologies.
- Technologies of energy recovery utilization: including various technologies of residual heat, combustible gases and black liquor recovery and its utilization.
- Technologies of energy conversion: in-plant electric power generator, technologies of thermal energy conversion (e.g. industrial boilers) as well as electric power generation using residual heat and combustible gases etc.

Table 7-5. Energy Service Technologies Used in China

Classification	Technologies (equipment)
Iron & Steel	Coke oven, Sintering machine, Blast furnace, Open hearth furnace (OH), Basic oxygen furnace (BOF), AC-electric arc furnace, DC-electric arc furnace, Ingot casting machine, Continuous casting machine, Continuous casting machine with rolling machine, steel rolling machine, Continuous steel rolling machine, Equipment of coke dry quenching, Equipment of coke wet quenching, Electric power generated with residue pressure on top of blast furnace (TRT), Equipment of coke oven gas, OH gas and BOF gas recovery, Equipment of co-generation.
Non-ferrous metal	Aluminum production with sintering process, Aluminum production with combination process, Aluminum with Bayer, Electrolytic aluminum with upper-insert cell, Electrolytic aluminum with side-insert cell, crude copper production with flash furnace, crude copper production with electric furnace, Blast furnace, Reverberator furnace, Lead smelting-sintering in blast furnace, Lead smelting with closed blast furnace, Zinc smelting with wet method, Zinc smelting with vertical pot method.
Building materials	Cement: Mechanized shaft kiln, Ordinary shaft kiln, Wet process kiln, Lepol kiln, Ling dry kiln, Rotary kiln with pro-heater, dry process rotary kiln with pre-calciner, Self-owned electric power generator, Electric power generator with residue heat; Brick & Tile: Hoffman kiln, Tunnel kiln; Lime: Ordinary shaft kiln, Mechanized shaft kiln; Glass: Floating process, Vertical process, Colburn process, Smelter.
Chemical industry	Equipment of synthetic ammonia production: Converter, Gasification furnace, Gas-making furnace, Synthetic column, Shifting equipment of sulphur removing; Equipment of caustic soda production: Electronic cell with graphite process, Two-

	stage effects evaporator, Multi-stage effects evaporator, Equipment of rectification, Ion membrane method; Calcium Carbine production: Limestone calciner, Closed carbine furnace, Open carbine furnace, Equipment of residue heat recovery; Soda ash production: Ammonia & salt water preparation, limestone calcining, distillation column, filter; Fertilizer production: Equipment of organic products production, Equipment of residue heat utilization
Petrochemical Industry	Facilities of atmospheric & vacuum distillation, Facilities of rectification, Facilities of catalyzing & cracking, Facilities of cracking with hydrogen adding, Facilities of delayed coking, Facilities of light carbon cracking, Sequential separator, Naphtha cracker, de-ethane separator, diesel cracker, de-propane cracker, facilities of residue heat utilization from ethylene.
Paper-making	Cooker, facilities of distillation, facilities of washing, facilities of bleaching, evaporator, crusher, facilities of de-water, facilities of finishing, facilities of residue heat utilization, facilities of black liquor recovery, Co-generator, Back pressure electric power generator, condensing electric power generator.
Textile	Cotton weaving process, Chemical fiber process, Wool weaving & textile process, Silk process, Printing & dyeing process, Garment making, Air conditioner, Lighting, Facilities of space heating.
Machinery	Ingot process: Cupola, Electric arc furnace, fan; Forging process: coal-fired pre-heater, Gas-fired pre-heater, Oil-fired pre-heater, Steam hammer, Electric-hydraulic hammer, Pressing machine; Facilities of heat processing: Coal-fired heat processing furnace, Oil-fired heat processing furnace, Gas-fired heat processing furnace, Electric processing furnace; Cutting process: Ordinary cutting, high speed cutting.
Irrigation	Diesel engine, Electric induct motor
Farming works	Tractor, Other agricultural machine
Agricultural products process	Diesel engine, Electric induct motor, processing machine, coal-fired facilities.
Fishery	Diesel engine, Electric induct motor.
Animal husbandry	Diesel engine, Electric induct motor, Other machines.
Space heating in resident	Heat supplying boiler in thermal power plant, Boiler of district heating, Dispersed boiler, Small coal-fired stove, Electric heater, Brick bed linked with stove (Chinese KANG).
Cooling in resident	Air conditioner, Electric fan.
Lighting in resident	Incandescent lamp, Fluorescent lamp, Kerosene lamp.
Cooking & Hot water in resident	Gas burner, bulk coal-fired stove, briquette-fired stove, Kerosene stove, Electric cooker, cow dung-fired stove, firewood-fired stove, methane-fired stove.
Electric Appliance	Television, Cloth washing machine, Refrigerator, others.
Space heating in service sector	Heat supplying boiler in the thermal power plant, Boiler of district heating, dispersed boiler, Electric heater.
Cooling	System of central air conditioner, Air conditioner, Electric fan.
Lighting	Incandescent lamp, fluorescent lamp.
Cooking & Hot water	Gas burner, Electric cooker, Hot water pipeline, Coal-fired stove.
Electric Appliance	Duplicating machine, computer, Elevator, others.

Passenger & freight transport	Railway (passenger & freight): Steam locomotive, Internal combustion engine locomotive, Electric locomotive.; Highway (passenger & freight): Public diesel vehicle, Public gasoline vehicle, Private vehicle, Large diesel freight truck, Large gasoline vehicle, small freight truck. Waterway (passenger & freight): Ocean-going ship, Coastal ship, Inland ship. Aviation (passenger & freight): Freight airplane, passenger airplane.

One of the key assumptions for CDM analysis is the additionality of technology. According to the study and discussion for CDM project in China, some advanced technologies are selected as CDM technology based on following criteria:

- Advanced mean to China as average level
- Match the need from industry as government planning
- Need localization in China

The technology should be separated from other technologies.

Several cases are defined to analyze CDM cost defined as following.

Comparison case. only used for comparison with other cases, also can be called as no technology progress case. It is presumed that the future service production technologies and energy efficiency will be remained at the status in 1990 without any technology progress. But it does not mean energy consumption for this case will increase with the same growth rate of economic development.

Market case. technologies are selected based on market mechanism. It will conduct technology options after rationally economic benefits assessments carried out to energy service technologies, e.g. non-subsidies and no carbon tax. Other policy cases will compare with this case to analyze the effect of every policy on CO_2 emission reduction. Under this case, energy price, energy supply restrictions are considered.

Policy case is defined to analyze the effects of climate policies in reducing CO_2 emissions. The policy case is defined here as the levying of a carbon tax of 450 yuan per ton of carbon. The introduction of a carbon tax is assumed to begin from 2000. The introduction of advanced technologies would be promoted by the policy to contribute to CO2 emission reduction.

A case study is done for steel sector and several cases are defined for it.

- No CDM case, technology from Japan will not be selected in the simulation. Technology of China will be selected based on market.
- 100% technology substitution through CDM by 2010. Selected technology from Japan could be introduced by 2010 by 100%.

- 50% technology substitution through CDM by 2010. Selected technology from Japan could be introduced by 2010 by 50%.
- 20% technology substitution through CDM by 2010. Selected technology from Japan could be introduced by 2010 by 20%.

CO2 emission in 2010 in China is presented in Figure 7-5 and Figure 7-6. The total emission reduction potential could be more than 400million tons of carbon in 2010. Steel making, building material and residential sector have biggest reduction potential. In other sector, high efficiency boiler and advance electric motor could contribute much the emission reduction.

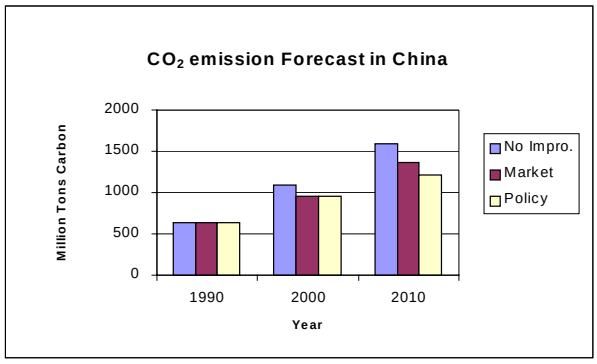


Figure 7-5. CO2 Emission in China

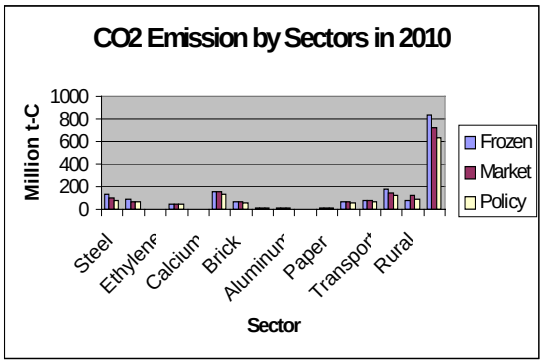


Figure 7-6. CO2 Emission by Sectors

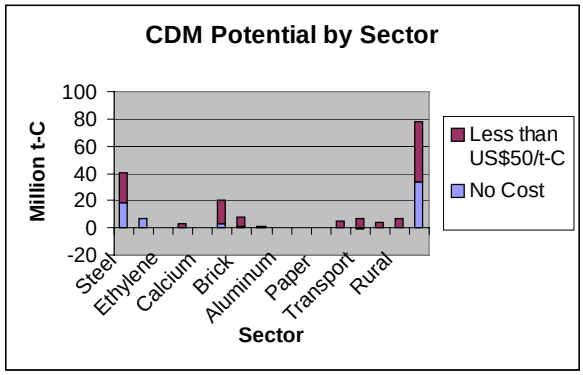


Figure 7-7. CDM Potential by Sector in China

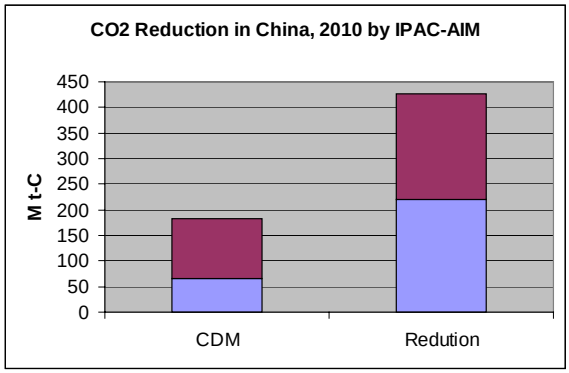


Figure 7-8. Total CDM Potential in 2010

If we look at the CDM potential by sector, in steel making, nonferrous and other sectors there is quite big amount of CO2 emission reduction could be reached with no cost, which is regarded as no-regret project. Total potential for the no cost CDM project could be 65.5million t-C in 2010. There are large potential among sector for CDM cost lower than US$50, the total amount for that could reach 116 MtC in 2010.

Potential of CDM in steel industry is analyzed. Huge reduction in steel industry could be reached if advanced technology could be introduced efficiently. Comparing with technology-frozen case, 22

and 42.7million tons of carbon could be reduced in 2010, 43.1 and 82.1 million tons of carbon in 2030. The technology change may explain the reason for the CO2 emission reduction. In 2010, compare with No CDM case, CO2 emission reduction is 34.8 million tons of carbon for 100% CDM case, 28.1 million tons of carbon for 50% CDM case, and 7.2 million tons of carbon for 20% CDM case. In 2030, it is 49.9, 29.7 and 18.9 million tons of carbon respectively.

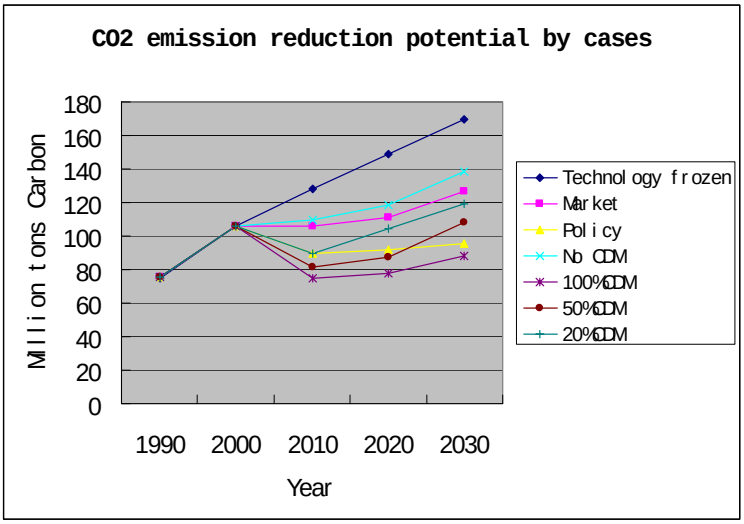


Figure7-9. CO2 Emission by Cases

The financial flow for CDM is more complex than normal commercial technology project. It concerns about CO2 emission reduction when normal production process benefit is focused by commercial project. In order to provide some picture of relationship between investment of technology and the revenue from selling of CO2 emission reduction credit, different price of CO2 emission reduction on investment should be analyzed. If budget from sale of CO2 emission reduction could not cover all the expense, additional investment is necessary. There would be many ways to introduce additional investment, but the source of the additional investment will not be discussed here.

In this study, we found that there would be large among CO2 emission reduction if efficient technology could be introduced to steel industry in China. CDM could be a useful way to implement the reduction and assist Chinese enterprise to get new technologies and investment. There are wide ranges of technology opportunities in China. Demand for advanced technologies also cover wide range from high emission reduction cost to low even negative cost (so called win-win technology). CDM project could include both high reduction cost technologies and low reduction cost technologies. There will be many arguments on the scope of CDM project, but domestic demand for technologies should be paid attention to. Because variety of CO2 emission reduction costs are analyzed above, it could have an opinion that the CER price would not have much relationship with CO2 emission reduction cost. One possible way the price is to be decided by negotiation process or through

government negotiation or through project transaction.

For the investment of CDM project, there will be two possible ways, one is the total investment of the project could be provided through selling of CERs which is regarded as a pure CDM project, another way is to combine the CDM project with a commercial project. There will be two parts for the project, one is the commercial investment that is introduced without any consideration for CO2 emission reduction purpose, and another one is the part through selling of CERs.

7.2.3. Unilateral CDM

Republic of Korea insists host-generated unilateral CDM for win-win global partnership for climate change. CDM is to open a new opportunity in which emission reduction could also become an investment opportunity and market mechanism will work for climate change issues. Conventional perception that developing countries lacking financial resources and technology cannot initiate their own CDM projects is no longer valid in the world of globalization. As long as sufficient CO2 emission reduction potentials are there, developing countries can mobilize financial resources from regional or multilateral financial organizations and adapt advanced technologies, initiating their own CDM projects and pay back with CER from these projects. Current discussions on CDM designing at COPs have following deficiencies and shortcomings.

First of all, discouraging voluntary early action of Non-Annex I countries. Since bilateral CDM allows CERs for the investment of Annex I countries and not of Non-Annex I countries, developing countries will simply remain as by-stander not as proactive participant for the activities of GHG emission reduction activities. Developing countries are simply waiting for the meaningful investment from Annex I countries. Second, there is no guarantee for equitable geographical distribution of CDM projects. Annex I countries' investment will not be large enough to fully capitalize the potentials of Non-Annex I countries' emission reduction. Unless Annex I countries' investment is large enough, emission reduction potentials of developing countries will remain at the level of under-utilization, until Annex I countries' investment is realized. Finally, bilateral CDM will discriminate against domestic firms and distort commercial competition in the market of developing countries. Since CDM allows CERs for the investment of Annex I countries' firms, domestic firms of Non-Annex I countries, who are doing similar activities to reduce CO2 emissions, will be discriminated, discouraging the investment.

If unilateral CDM is allowed, developing countries can leapfrog their industrial level from inefficient stage to advanced and efficient one, reducing CO2 emissions at the same time. Without unilateral CDM, bilateral CDM might work as a strong disincentive for developing countries. They should wait for Annex I countries to come and initiate CDM project to be paid back for their actions to reduce CO2 emissions.

7.3. Institutional Arrangement and Its Barriers

7.3.1. Japanese Institutional Arrangement for Assisting GHG Reduction in China and Korea

a. ODA

Japan has been granting ODA loans for environmental projects at interest rates 0.2% lower than loans for ordinary projects, in order to encourage efforts to tackle environmental problems in developing countries. Areas subject to Japan's environmental ODA include improvements of residential environment, disaster prevention, forestry conservation, pollution control measures, and energy conservation. Furthermore, based on the Kyoto Initiatives proposed after COP3, former Prime Minister Hashimoto announced new measures (Special Environmental ODA), further relaxing the terms, lowering interest rates to 0.75% and extending the repayment period to 40 years on those environmental loans that fund projects designed to improve the global environment (e.g. forestry, energy conservation, new energy sources such as hydropower generation, natural gas- and geothermal power generation as well as mass-transportation) and to promote anti-pollution technology. Since its first commitment in 1979, ODA loans to China recently commemorate the 20th year anniversary.

During this period, 258 loans were approved, totalling the amount of approximately YEN2,500 billion. China is the second largest recipient country following Indonesia. In FY1999, 19 ODA loans were committed to China, totalling approximately YEN192.6 billion. Reflecting the growing need for environmental conservation and improvements, 14 out of 19 loans were for environment-related projects. During the five years beginning in FY 1998, Japan also provides the training to 3000 people in developing countries in the following environmental fields including air pollution, waste disposal, energy saving technologies, forest conservation and afforestation.

b. AIJ

Being the only Annex I country in the Asian region, Japan has made agreements for AIJ implementation with China, Indonesia, Thailand and Vietnam. As of December 2000, 4 out of 10 AIJ projects are implemented in China (for details of AIJ projects in China, please refer to the section of China) The projects are carried out by the New Energy and Industrial Technology Development Organization (NEDO) of the Ministry of International Trade and Industry (MITI) with technological co-operation by Japanese companies. All AIJ projects currently being implemented were also approved as ‘model projects aiming at achieving energy efficiency’ under the Green Aid Plan managed by NEDO.

c. Green Aid Plan (GAP)

Although not a programme specifically addressing climate change in a strict sense, the Green Aid Plan provided by NEDO/MITI has a component contributing to climate change mitigation.. GAP is a technical and financial assistance to pollution and energy-related problem targeted at 7 Asian countries- i.e. China(since 1992), Thailand(since 1992) Indonesia(since 1993) Philippines(since 1993), Malaysia (since 1993), India (since 1995), Vietnam (since 1999) . The implementation of projects are carried out in four different areas such as survey co-operation, human resources development, research co-operation and technological verification survey (which consists of model project for energy efficiency and model project for clean coal technology).

Table 7-6. Budget for the Green Aid plan 1992-1999 (US$ million)

	1992	1993	1994	1995	1996	1997	1998	1999
Survey Cooperation	1.6	2.8	3.4	4.5	3.3	2.1	1.9	13.3
Human Resources Development	1.3	2.3	3.3	4.6	4.4	4.1	4.2	6.9
Research Cooperation	3.7	7.0	12.5	16.1	13.3	8.2	19.2	16.5
Technological Verification	7.1	78.5	94.9	97.6	88.1	76.8	81.3	133.7
Total	13.6	90.7	114.2	122.9	109.0	91.2	106.7	170.5

Source: MITI Note: exchange rate 1US$ @115

Under the scheme of the model project for energy efficiency which has the most relevance to climate change mitigation and accounts for the largest share of GAP expenditure, total 24 projects (10 completed and 14 on-going) have been implemented during 1992-1999. Among these, projects implemented in China are 17 (out of this 4 are AIJ projects), showing strong dominance. This corresponds to financial assistance worth YEN25.6million in the total budget of JPY33.3 billion. The figure clearly indicates that Japan put considerable importance on the co-operation to China.

d. Feasibility studies for potential JI and CDM projects

Since 1998, MITI (though NEDO and Japan External Trade Organization:JETRO) and the Environment Agency have been providing Japanese entities with financial assistance for feasibility studies (F/S), aiming to identify potential CDM and JI projects and accumulate relevant knowledge. Publicly available information of NEFO F/S scheme (for the details of the scheme, also refer to Chapter 5 on Russia) shows that so far 135 studies in 27 countries are conducted. Of this, 26 studies were on projects in China.

Table 7-7. Number of the NEDO F/S Selected for Implementation

FY	Total	Studies in China
1998	40	11
1999	46	9
2000	49	6

Sources: NEDO (1998,1999); NEDO website (www.nedo.go.jp)

7.3.2. Barriers to Further Co-operation for Implementation of Potential CDM Projects

Despite there are a few projects with poor prospects for the recovery of the investment cost which may expect difficulties in securing finance, results of NEDO F/S studies indicate that most of projects seem to perform well in terms of cost-effective of GHG reductions, cost saving, and investment return. Therefore, many studies concluded once the framework of the CDM is decided, feasibility of the implementation of the projects is high. This is because of the high energy saving potential of China's energy sector that is coal-dominant and low efficient due to the use of outdated and numerous small facilities. However, there are some potential obstacles which may affect project implementation. They include potentially high transaction costs associated with complex approval process required (particularly for large-scale investments exceeding 50millonYuen) and relatively high (i.e. 30%) import tax on foreign equipment. However, generally speaking, Japanese investors find China attractive partner of the CDM projects in the future.

In contrast to the huge expectation for future CDM in China, lessons from conventional environmental co-operation like GAP illustrate difficulties involved in carrying out GHG reduction projects. They are relevant to technology transfer and dissemination, which is another element of desirable feature of the CDM. The barriers associated with technology dissemination identified from several years of GAP experience primarily relate to expensiveness of the demonstrated model technologies (it is expensive for most recipient to purchase the transferred technologies on commercial terms) and technological capability of Chinese counterpart. In particular, the absence of Chinese equipment manufactures is considered to be a serious problem (Watoson.et.al.2000).

Another barrier is the problem of the protection of intellectual property right. There is a shared concern by investing companies to China that designs will be copied outside of license agreements. Since weak protection of intellectual property right leads to potential loss of technology and creation of future competitors, investors generally prefer technology co-operation through subcontract manufacturing rather than licensing or forming of Joint venture, so they could retain core technologies (Watson.et al 2000). In order to address this issue, protection of intellectual property right of technologies demonstrated in the GAP are guaranteed in the agreement which stipulate that the transferred technology shall not be owned or re-transferred by recipient company within ten years. Obviously, from the perspective of China (or other recipient countries), this kind of arrangement is

seen as a deterrent against technology dissemination. Beside the issue of intellectual property right, investors' hesitation in forming licensing agreement has to do with their commercial opportunities. Companies usually prefer demonstration facilities as a reference case to enter into a new market, so putting them in an advantageous position in International Competitive Bidding (Evance, 1999)

Despite some barriers mentioned above associate with the interests of investors, dissemination possibilities rely primarily on Chine's policy. Fundamental barriers include relevant investment and trade rules such as restriction on foreign ownership and complex approval process, or Chinese policy which favours domestic equipment. Moreover project economics often depends on the level of environmental standard to internalize environmental externalities and its enforcement. Lack of strong enforcement of some policy measures such as emissions fee provides no incentives for domestic firms to deploy more efficient technologies. In this connection, CDM may play some role in improving the project economics by recovering a part of investment cost associated with GHG reduction, although the degree of its contribution may be limited. It is expected that these obstacles will gradually be addressed as the economy becomes more market- based in the near future.

In any case, for further co-operation between Japan and China in the area of GHG reduction projects including the CDM, China's positive stance towards the implementation of the projects is prerequisite. Also the co-operative relationship between Japan and Korea will bound to be influenced according to the position to be taken by Korean government.

7.3.3. Institutional Arrangement and Barriers in China

The State Development Planing Commission is the leading agency who takes charge of the climate change field in China since 1998 which the reshuffling process of central government. The other associated departments are Ministry of Foreign Affairs, State Economic and Trade Commission, Ministry of Science and Technology, State Meteorological Administration, State Environmental Protection Agency etc. Altogether 14 departments are represented in the National Climate Change Policy Coordination Committee (NCCPCC) whose office is located at SDPC.

The NCCPCC would take charge of the CDM process in China if the CDM could be agreed in the COP.

The main barriers in China as following:

- The government efficiency barriers: the government efficiency is needed to be improved further. If the Chinese government could make special policy for CDM to improve the efficiency and to simplify the process then CDM project could become easy to be undertaken.
- The coordination barriers: if the central government and local government (or sector) all can get the benefit from CDM project, that would be a good project. Some projects might not qualify for

such criteria and might need to build up the policy coordination agency to solve it.

- The capacity barriers: the CDM projects need to hold more advantageous technology than commercial viable projects. That requires better technology environment and high managerial level. Capacity building is the only way to solve this problem.
- The information barriers: the key potential of CERs may exist in the middle or small manufactures and undeveloped area. CDM investor need the information and local government need to play role in disseminating the information that are important for CDM projects. However, information barriers is very obviously and how to overcome it is a big challenge.

7.4. Regional Energy Collaboration

The energy situation in Northeast Asia (Russia, China, Korea and Japan) is in general that this region produces little or no natural gas or petroleum and is large importer. China is an exception from the standpoint that it is a significant gas and oil producer. However, according to the rapid expansion of energy demand in China, China could also become a large energy importer in the future. Japan and Korea have been the large importers of energy. Russia might supply natural gas in this region in the future.

Natural gas is less used in this region, compared to other regions in the world. It is difficult to bring gas into this region. For the case of Japan and Korea, they need LNG facilities, which require very large scale infrastructures. For China and Russia, natural gas fields are too remote from major consumption areas. The shares of natural gas been rising and are expected to rise in this region. Natural gas is one alternative to oil, and unlike oil, a large amount of natural gas is produced outside of Middle Asia. From this region's perspective, the sources of supply are geographically much closer. However, Northeast Asia remains dependent on LNG that must be delivered in special tankers and requires regasification facilities. Natural gas via pipeline is seen as an additional means to diversify supply sources.

'Russia has the largest reserves of natural gas in the world, however, the majority of the proven reserves are in the west, a considerable distance from the Asian markets. Many proposals for gas pipelines have been put forward, but the Irkutsk and Sakha (Yakutsk) areas in East Siberia, and the Sakhalin area in the Russian Far East are the primary sources expected to supply pipeline gas into China, Korea, and Japan.

Current estimates of gas reserves in Irkutsk indicate that reserves may not be sufficient to support a 56-inch pipeline, but considering geological characteristics, more exploration is likely to increase reserves. The likelihood that a pipeline of that size could be supplied increases significantly when Krasnoyarsk gas is included. Current estimates of gas reserves in Sakhalin indicate a reserve base that is regarded as inadequate to support a 56-inch pipeline. Exploration is continuing, however, which could result in expansion of the reserve base. Sakha gas has been proposed to flow both Southeast to

combine with Sakhalin and Southwest to join with the Irkutsk line, but from these estimates, it appears that Sakha gas may be needed to support the Sakhalin reserves(APERC 2000).

As a specific form of regional collaboration in energy field, we may consider the pipeline project that connects the Irkutsk gas field development project. The most frequently mentioned pipeline route is the one that originates from Russia, passes through Mongolia and China, and reaches the western part of the Korean Peninsula. But other lines are also under consideration. This kind of pipeline networking in this region might be a good candidate for regional energy collaboration as well as the increase of energy security in this region.

8. Major Findings, Discussions and Policy Recommendations

As we described in introduction, the main objective of this project is to analyze possibilities and constraints in developing collaboration between four countries of the Northern Asian region. For the initial stage of researches, we study national approaches to joint efforts, strategies and practical steps undertaken, and its impacts to other countries in Asia Pacific region.

This project especially analyzes the specifics of the current domestic trends and institutional framework in Russia, which is becoming an active player in international co-operative schemes in climate change policy implementation. We intend to explain how and to what extent these domestic specifics, especially development of collaborative efforts between Japan and Russia (mainly, JI and ET) affect international policies and co-operation of countries in this region, and also to provide policy recommendations on what can be done to improve its effectiveness. It intends to find out the possibilities and major problems in building mutually beneficial CDM schemes between Japan, China, and Korea and other countries. Major patterns and controversies associated with financial and technology transfers between countries of this region are to be studied.

Especially related to UNFCCC, we have to follow up the discussions after COP7 (Marrakech Accord). Further studies and discussions should focus on the following issues;

- some more technical procedures for operation of the Kyoto regime
- standardized baseline methodologies establishment for the CDM projects
- national inventory and registry system establishment.
- global participation, including the meaningful participation of major Non-Annex I countries
- both domestic and international policies and measures to mitigate GHG emissions

In order to prepare the compliance of commitments and provide incentives for domestic stakeholders, each Annex I country should elaborate its domestic framework by reviewing and settling policies and measures, such as domestic emissions trading scheme. Non-Annex I countries have to comply with the commitments under the Convention. Such efforts like implementing lowest cost mitigation options are a commitment on one hand, but also those are beneficial for them to shift their development paths to more sustainable direction. IPCC suggests that there remains a wide range and huge amounts of negative cost (so-called no-regrets) options, especially in non-Annex I countries.

For the environmental collaboration in this region, we observe the followings, which requires more examination and further studies.

- *Multi-layer structure:* Geographical coverage of environmental cooperation initiatives ranges from global, broader-than-regional to subregional. Some multilateral initiatives target Northeast Asia, while some target the whole region of East Asia or, even more broadly, Asia and the Pacific. The evidence shows that South Korea tends to favor a focus on Northeast Asia, whereas Japan focuses on the broader region (East Asia), or the entire Asia-Pacific region.

- *Different membership*: The status of participating states differs from one initiative to another, depending on diplomatic relations between countries and on the international membership of the host organization

- *Weak institutional/financial structure*: Since most of the regional environmental initiatives have little organizational structure and a weak financial foundation, cooperation has made only slow progress. Some initiatives have stagnated in terms of institutional and financial development.

The evidence shows that weaknesses and inadequacies of environmental cooperation schemes in Northeast and East Asia have hindered the progress of regional cooperation on single issues. The question to be answered is whether and how the region can get out of this stagnation.

In the long-term, a comprehensive and strategic environmental action plan should be developed for medium and long-term objectives. Such action plans have already succeeded in other regions and subregions such as the EU, the Baltic Sea region and ASEAN.

The economic transition of Russia has great implication on climate change policies. We will further elaborate the issues on this matter.

The new authorities should give answers to the principal questions of the climate policy institutional construction in Russia in the nearest future with a certain time lag after the end of the negotiations in the Hague. Unfortunately, it is yet impossible to get answers to many of these questions. The Government of the new President just began to formulate and to implement their policy, and the decisions on many of these issues were not adopted yet. However, the period of 2001 -2003 will be the time when the Government of Russia will have to propose the solutions.

In relation to climate policies, we focus on the possibilities of collaboration between Japan and Russia, both of which are the members of Annex I countries. We analyze opportunities and barriers in cooperation between Japan and Russia in climate policy cooperation, identifying the major features of existing collaboration between Japan and Russia. At micro-level the analysis of the opportunities and barriers has been identified, as well as analysis of the major obstacles for mobilizing investments under current economic and political situation as it is perceived by the Russian companies. However, generally speaking, overall financial cooperation between Japan and Russia particularly in private transactions is rather passive in spite of the grand plan of resource development in Siberia, which is

based on the Hashimoto-Yeltin plan. Currently we observe that Japanese firms could only rely on the limited governmental channel such as JBIC or MITI, and wait for international financial institutions to provide better financial prospects to Russia. On the other hand, European countries and United States has started to take risks and invest mainly in resource development projects in 'European region' of Russia. Japan should further investigate the potential cooperative measures with Russia in the area of climate change and energy issue, and elaborate on more effective strategies for future cooperation, while maintaining current efforts for stabilization of the macro economy in Russia.

The further discussion seeks to answer the following questions:

- What is the role of the regions and local administration in Russia in regulating, promoting the cooperation between Japan and Russia and in implementation of JI projects and international emission trading?
- Are there any opportunities in cooperation between Japan and Russia in application of the CDM mechanisms based on realization of the above mentioned projects, and in case such an opportunity exists, how to use it in the mutual interests to strengthen the regional cooperation patterns and alliances in north-east Asia.
- What are possible options for cooperation between Japan and Russia in climate change mitigation in case the Kyoto Protocol is not ratified? To what extent the basis laid by already adopted joint projects in the energy field can be used as an alternative for climate change bilateral collaboration?

Further discussion and analysis is needed in formulating and assessing possible items and directions in developing bilateral cooperation between Japan and Russia in climate policy formation, and in outlining possible options in promoting joint positions at international negotiations within the UNFCCC process.

One of the distinct features of this research activity is to facilitate the regional research collaboration. For performance of this research, we intend to develop regional multidisciplinary collaboration between researchers (economists, political scientists, engineers, geographers) from a number of institutions from the countries of Northern Asia.

The joint research and scientific links between scholars participating in this study will contribute significantly to national capacity building in the countries of Northern Asia in climate change research. It will support the expanding of skills, mutual knowledge, expertise and exchange of information. Particularly, it refers to knowledge and exchange of information on national perceptions and approaches towards various aspects of climate change problem, which will be of a great value for research in this area.

Recommendations for policy-makers and business on how to expand climate change co-operation in

the region are one of the important contributions of this project. This research has direct links to policy-making process, since on the basis of its research results policy recommendations for governmental institutions in four Northern Asian countries. One of the clear policy recommendations of this study is that the environmental collaboration in this region or subregion is crucially important. Second, the dimension of policy application is quite diverse, so that it is difficult to suggest a criterion for policy performance. However, the clear message from this study is that the policy-integration in various levels is very much important as well as prioritizing policies, depending on the situation of each country. Third, we recognize that the international discussions on climate change issues and negotiation is not only the challenge to each country, but also they provide new and promising business opportunities, while each country intends to implement both domestic and international policies and measures to mitigate GHG emissions.

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Appendix. Introduction of GHG Emission Model for 4 Countries

1. Basic Model Structure of GEMA

In developing GHG Emission Model for four countries, we use the IGES model that is under developing now. This model is called GHG Emission Model for Asia (GEMA). So far, each country model for Japan, China and Korea is completed, and the model for Russia is under construction. The model is to reflect the distinct characteristics of each country, but there are common features in GEMA. There are eight modules in GEMA. The basic structure of GEMA is an open-one country model that is linked with other countries through international financial module. The projection method for this model is basically econometric approach with other method such as Computable General Equilibrium (CGE) model, if necessary. Since GEMA is not global or regional scale model, the proper replication of each economy is quite important. In GEMA, in principle, most of parameters will be estimated, based on country-specific local data, allowing country-specific economic structure of each country. Hence, GEMA can be called 'hybrid econometric country' model.

1) Motivation of GEMA Development

In Kyoto Protocol, there are three types of flexible mechanism to mitigate GHG emissions of Annex-B countries between 2008 – 2012; emission trade, joint implementation and clean development mechanism (CDM). Obviously, the three types of Kyoto Mechanism are supplementary tools to meet the quantified target of GHG emissions among Annex-B countries. So far, emission trade and joint implementation are only available options for Annex-B countries. However, CDM is possible between Annex-B countries and Non-Annex countries (developing countries). By definition, CDM can be available in unilateral, bilateral and multilateral forms. Still core arguments on CDM, such as baseline, eligibility of project, financing, monitoring, and other administrative matters are not settled down. In practical sense, the bilateral form of CDM will be most plausible, if investing country and host country agree on several related issues. Another feature of CDM is that the price of carbon emission right (CER) may be varying, depending on projects, while the price of CER should be same among traders for the case of emission trading.

The motivation of GEMA is to develop an analytical tool that can address the issue of CDM. Obviously, each model has distinct features, depending on the motivation and issues to be delivered. Many of bottom-up models, including AIM are to find optimal technology options for mitigating GHG emissions. Recently, the Integrated Models, such as GCAM, MERGE, IMAGE, so forth is to link climate model with impact model and emission model, in order to figure out the whole picture of socio-economic structures and ecosystem. In other words, each model has been developed to answer

the specific issues that modelers have interest in. In this sense, it is clear that the primary interest of GEMA is to quantify some issues related with CDM. As mentioned, the typical form of CDM will be bilateral, project-base one to mitigate GHG emissions. Hence, at the first stage of development, GEMA will focus on country-specific structure that may properly replicate each economy. Since CDM will be implemented as project base, the potential of GHG emission reduction heavily relies on the choice of technology. Therefore, it is inevitable to apply bottom-up models to analyze technology specific issues. At the same time, CDM will affect both investing and hosting countries through international financial transaction and technology transfer, which has of macro economic implications. Therefore, the objective of GEMA is to develop macro economic energy model that can conduct the analysis on CDM with proper linkage with existing bottom-up models. To meet this objective, it is quite crucial to replicate an economy properly, which means careful model specification of each sector, including energy one requires local expertise.

2) Basic Model Structure

a. Production Module

For the production side of economy, primary industry such as agriculture and secondary industry such as manufacturing and third one, service industries will be classified, following the conventional classification of J. Clark. Again, further detailed classification requires more discussion. In this module, input factor substitutability and technological change will be estimated by defining flexible functional form of production function. The purpose of this module is, in technical sense, to have equality condition with demand side of an economy. Obviously, the economic reasoning and theories will be the basis for this module. The relevant economic theories such as Okun's law, Phillips Curve will be incorporated.

b. Macro Economic Demand Module

The demand side of an economy will be specified. The behaviors of private consumption will be specified, which will be one of important determinants of energy demand in residential sector. Private investment behavior is also important, especially for implementing Kyoto mechanism of GHG reduction. The investment function will be specified, based on simple finance theory of economics. Basic structure of government sector will be specified. Especially, tax structure in aggregated level will be considered to figure out secondary effect of new taxes such as carbon or energy tax to the economy. The international transaction of physical goods will be accounted in export and import specifications. In this module, the critical question is how to establish the long-run economic relationship, allowing the short-run variation in the economy. In technical (modeling) sense, the long-run relationship will be specified by applying 'cointegration method', that is based on new findings in statistic inference. The short-run variation can be explained by building short-run

adjustment equations with error correction terms. The idea of error correction model is basically to implement systematic past trend of economic variables toward current equilibrium. The other issue is how to incorporate the structural changes that occur in most of countries during the period of analysis. Basically, fixed parameters in equations can not capture this important issue properly. Hence, the time-varying parameter estimation method will be applied through Kalman filter technique.

c. Bilateral Financial Module

This module mainly will be determined by the bilateral financial flows. The main reason of separating this part from general macro economic structure is to take the scenario options of CDM or technology transfer into accounts. Since the economic channels of such options are through the international financial transactions, it is technically appropriate to separate this sector from the conventional international part of an economy.

d. Computable General Equilibrium (CGE) Module

This module will be used for analyzing the economic impact of some changes such as implementation of CDM. Such kind of option obviously will affect each industry, in terms of inputs and outputs. The basic economic reasoning behind CGE approach is that the economy is in the situation of equilibrium. The Warlas's law is the important economic principle in this approach. Hence, the equilibrium condition for the economy can be translated as the conditions that in each market, the excess demand is to be zero in technical sense. Many of global models apply the CGE approach. However, in GEMA, the key question here is how to localize the huge sets of parameters that should be given in CGE approach. We try to estimate them with local data as many as possible to reflect the local situation properly. The functional form of specific equation is basically to follow the economic and econometric specifications. The detail classification of sectors is quite flexible, depending on the situation of each economy.

e. Energy Demand Module

This module is directly linked to energy-related GHG projection. The final energy demand in each end-use sector will be specified. The main sectors will be industrial, transport, residential and commercial ones. Like other energy models, the transformation sectors will be considered to figure out the primary energy demand. However, GEMA will follow the engineering and technical approach for this sector. Obviously, further detailed disaggregation in each sector will be specified after more discussion with local experts, investigating the availability of data and considering the situation of each country. Once the detailed sectors are specified, the energy demand of different energy sources will be simultaneously estimated and projected, since in some sectors, fuel substitution occurs, which is not properly captured by individual estimation of each energy demand. Especially,

it is very critical how to treat the effect of fuel substitution in the model for the country where fuel substitution is rapidly occurring. To explain the effect of fuel substitution systematically has important implication for GHG emission projection. Like in macro economic demand module, the issues of structural changes, instability of single parameter estimation will be properly delivered by careful designing of model specification and applying the advanced estimation methods.

f. Linkage Module

This module is quite necessary in terms of model construction. Since the main characteristic of GEMA is open, top-down country specific model. Hence, inevitably, GEMA can not incorporate strong aspects of other approaches or models. In other words, the inter-linkage of GEMA with other models is crucial. In some cases, the outputs or results of other models should be used for important inputs of GEMA. For example, to analyze the effect of CDM options, it is quite necessary to figure out technical aspect of a specific project, which is supposed to mitigate GHG emissions in a host country. Micro evaluation of a specific project in terms of financing cost, so forth, it is also necessary to have a tool to do this. This kind of analysis is usually conducted by bottom-up approach. Also, the technical specification of CDM projects should be evaluated project by project, which is more easily handled by various bottom-up models. Therefore, it is more reasonable to have a module which can links other models, rather than to include all possible aspects of GHG mitigation into one model.

g. Scenario Module

This module is basically to generate scenarios, which means the assessment for the future. The technical question of this module is to generate scenario in systematic and efficient way to be suitable to GEMA. In other words, this module will be a kind of "scenario generator", which is basically the interpretation of future into quantitative terms that can be recalculated through the model structure of GEMA.

h. Output Module

This module is basically to generate outputs; GHG emissions, energy demand, economic activities, so on.

i. CGE Module of GEMA (Basic Specifications)

Production Sector

(Total output of the sector i) $\equiv XP_i$ i = production sector index

1) Top Node: Leontief Production Function

$$XP_i = \min\left\{\frac{KLE_i}{a_{KLE,i}}, \frac{M_i}{a_{M,i}}\right\}$$

By cost minimization,

$$KLE_i = a_{KLE,i}\ XP_i$$

$$M_i = a_{M,i}\ XP_i$$

(Producer Price)

$$PXP_i = a_{KLE,i}\ PKLE_i + a_{m,i} PM_i$$

(Output Price)

$$PP_i = (1+\tau^p) PXP_i$$

2) Lower Node: Constant Elasticity Substitution (CES) Production Function

$$(*) \quad KLE_i = [a_{KL,i} KL_i^{\rho_i^{KLE}} + a_{E,i} E_i^{\rho_i^{KLE}}]^{\frac{1}{\rho_i^{KLE}}}$$

By cost minimizing

$$KL_i = a_{KL,i}\left(\frac{PKLE_i}{PKL_i}\right)^{\sigma_i^{KLE}} KLE_i$$

$$E_i = a_{E,i}\left(\frac{PKLE_i}{PE_i}\right)^{\sigma_i^{KLE}} KLE_i$$

$$where \ \ \sigma_i^{KLE} \equiv \frac{1}{1-\rho_i^{KLE}}$$

$$PKLE_i = [a_{KL,i} PKL_i^{1-\sigma_i^{KLE}} + a_{E,i} PE_i^{1-\sigma_i^{KLE}}]^{\frac{1}{1-\sigma_i^{KLE}}}$$

$$(*) \quad KL_i = [a_{K,i} K_i^{\rho_i^{KL}} + a_{L,i} L_i^{\rho_i^{KL}}]^{\frac{1}{\rho_i^{KL}}}$$

$\Rightarrow$

$$K_i = a_{K,i}(\frac{PKL_i}{PK_i})^{\sigma_i^{KL}} KL_i$$

$$L_i = a_{L,i}(\frac{PKL_i}{PL_i})^{\sigma_i^{KL}} KL_i$$

$$where \;\; \sigma_i^{KL} \equiv \frac{1}{1-\rho_i^{KL}}$$

$$PKL_i = \left[a_{K,i} PK_i^{1-\sigma_i^{KL}} + a_{L,i} PL_i^{1-\sigma_i^{KL}}\right]^{\frac{1}{1-\sigma_i^{KL}}}$$

$$(*) \quad E_i = \left[\sum_e a_{e,i}(\lambda_{e,i} XAE_{e,i})^{\rho_i^E}\right]^{\frac{1}{\rho_i^E}}$$

where e *is index for energy goods and* λ_e *is energy efficiency improvement*.

$\Rightarrow$

XAE's are energy goods, which are Arminton composites.

$$XAE_{e,i} = \frac{a_{e,i}}{\lambda_{e,i}}\left(\frac{\lambda_{e,i} PE_i}{PXAE_i}\right)^{\sigma_i^E} E_i$$

$$where \;\; \sigma_i^E \equiv \frac{1}{1-\rho_i^E}$$

$$PE_i = \left[\sum_e a_{e,i}\left(\frac{PXAE_{e,i}}{\lambda_{e,i}}\right)^{1-\sigma_i^E}\right]^{\frac{1}{1-\sigma_i^E}}$$

$$(*) \;\; M_i = \left[\sum_{ne} a_{ne,i} XAM_{ne,i}^{\rho_i^M}\right]^{\frac{1}{\sigma_i^M}}$$

where ne is index for non-energy goods and XAM's are non-energy goods which are Arminton composite goods.

$\Rightarrow$

$$XAM_{ne,i} = a_{ne,i}\left(\frac{PM_i}{PXAM_{ne,i}}\right)^{\sigma_i^M} M_i$$

$$where \quad \sigma_i^M \equiv \frac{1}{1-\rho_i^M}$$

$$PM_i = \left[\sum_{ne} a_{ne,i} PAM_{ne,i}^{1-\sigma_i^M} \right]^{\frac{1}{1-\sigma_i^M}}$$

Consumption Sector

Typical households are assumed to maximize extended Stone-Geary utility function with budget constraints, which will derive extended linear expenditure system.

$$\max \; U \equiv \sum_1^n \mu_i \ln(C_i - \theta_i) + \mu_s \ln\left(\frac{S}{CPI}\right)$$

$$s.t. \quad \sum_1^n \mu_i + \mu_s = 1$$

$$YD = \sum_1^n PC_i \; C_i + S$$

where YD ≡ (disposable income) = (labor income) + (capital income) + (transfer income) – (taxes)
θ_i is subsistence minimum or floor consumption.

$\Rightarrow$

$$C_i = \theta_i + \frac{\mu_i Y^*}{PC_i}$$

$$Y^* = YD - \sum_{j=1}^n PC_j \; \theta_j$$

$$S = \mu_s Y^* = YD - \sum_{i=1}^n PC_i \; C_i$$

° Aggregate consumption and savings by the household sector (h: index for households)

PA: Armington Price, τ: indirect tax rate, φ: subsidy rate

$$PC_{ih} = PA_i (1 + \tau_{ih}^h)(1 - \varphi_{ih}^h)$$

S_H: Aggregate household saving, $PC_{ih,o}$: after-tax, after-subsidy Arminton price at the reference year

$$Y_h^* = YD_h - POP_h \sum_i PC_{ih}\ \theta_{ih}$$

$$XAC_{ih} = POP_h\ \theta_{ih} + \frac{\mu_{ih} Y_h^*}{PC_{ih}}$$

$$HSAV_h^P = YD_h - \sum_i PC_{ih}\ XAC_{ih}$$

$$S_H = \sum_h HSAV_h^P$$

$$CPI_h = \frac{\sum_i PC_{ih}\ XAC_{ih}}{\sum_i PC_{ih,o}\ XAC_{ih}}$$

Government Sector

1) Revenue Side

GR = (sales taxes) + (tariff on imports) + (property taxes) + (wealth taxes) + (capital taxes) + (labor taxes) + (lump sum taxes) + (non-tax revenue including capital income earned by government enterprises)

2) Expenditure Side

GE = (interest payments on government bonds held domestically or abroad) + (transfer payments) + (net interest payments to household due to social security funds, etc.) + (provision of government goods and services or government production)

3) Current Budget Surplus (Government Savings)

$S_G = GR - GE$

Government Production Function: Leontief Production Function

$$XG = \min\left[\frac{XGA}{a_{XGA}}, \frac{EG}{a_{EG}}, \frac{LG}{a_{LG}}, \frac{KG}{a_{KG}}\right]$$

XAG: Arminton composite of non-energy goods

EG: energy composite goods

LG: labor

KG: capital

Investment and Capital Formation Sector

1) Investment

TI = I + St (Total Investment = Fixed Investment + Storage)

2) Aggregate Capital Stock

$K_t = (1- \delta) K_{t-1} + TI_t$ *(δ: depreciation rate)*

3) Total Saving

$$S = S_H + S_G + \sum_r M_r - \sum_r X_r$$

Total Savings = (household savings) + (government savings) + (trade balance)

4) Equilibrium Condition

TI = S

Emission Calculation (p: index for emission types)

$$E_p = \sum_i \upsilon_i^p XP_i + \sum_i \pi_i^p \left(\sum_j XAP_{ij} + \sum_h XAC_{ih} + \sum_f XAFD_f^i \right)$$

Emission = process emission + emission due to indirect consumption of goods

= process emission + (Arminton composites in production + Arminton composite in consumption + Arminton composite in final demand)

2. Initial Results of GEMA

1) Japan

Energy demand sectors for Japan are classified as residential, commercial, transportation and industrial sector, which are all end-use sectors. In each sector, energy types are classified, depending on energy services in each sector. For example, in the residential sector, coal, kerosene, diesel, heavy oil and town gas are used for heating in Japan. Obviously, the share of coal has been decreased for heating. This trend is reflected in the BAU projection. Country specific characteristics are taken into account when energy demand specifications are constructed in each sector. Further disaggregation to sub-sectors depends on the country and data availability. For example, the gasoline

demand for transportation sector in Japan is further disaggregated into passengers and freights, while for China, total gasoline demand for the transportation sector is projected, mainly due to the limitation of data availability.

For energy demand projection, the electricity demand is included in each end-use sector. However, for CO_2 emission projection, this portion from each end-use sector is all aggregated and calculated in the power generation sector, considering the electricity demand of electric utility's own use and the loss of transmission and distribution, since the total electricity demand and actual power generated are different.

a. Energy Demand Projection

The energy demand in the residential sector has steadily increased except for the second oil shock period of 1980 – 1982. The energy demand in this sector is projected to reach 76 million ton of oil-equivalent (TOE) in 2020. The annual average growth rate from 2000 is less than 2%. However, one distinct feature of the BAU trend in this sector is that the share of electricity demand keeps increasing. After 2010, the share of electricity takes more than half of the total energy demand in this sector. The share of oil in this sector is continuously decreasing. In early 1970's, coal was used for heating. However, it has almost disappeared since mid 1980's. The substitution of oil to electricity in heating service is continuously occurring in this sector, in addition to more utilization of home appliances with the increase of family income level. It is noted that the gas usage in this sector is continuously increased. In Japan, the usage of gas in this sector is for not only cooking and heating, but also for hot water, which is one of the reasons that oil is substituted for gas in both heating and hot water.

The energy demand in the commercial sector has steadily increased except for the second oil shock period of 1980 – 1982, which shows a similar trend to that of the residential sector. The energy demand in this sector will be 87 million TOE in 2020. The annual average growth rate from 2000 is a little higher than 2%. Again, the share of electricity demand keeps increasing. After 2010, the share of electricity takes more than half of the total energy demand in this sector. The share of oil in this sector is continuously decreasing as in the residential sector, while the share of gas is increasing. The fuel substitution for heating is also occurring in this sector.

The energy demand projection for the transportation sector has steadily increased. The energy demand in this sector will be 138 million TOE in 2020. The annual average growth rate from 2000 is around 1.7- 1.8%. In oil demand, the share of gasoline has taken more than a half of total oil demand in this sector. Gasoline will continue to be the number one fuel source in the future in the BAU projection. Diesel is the second largest fuel source in this sector. In freight transport (where mostly trucks are used) its fuel is mostly diesel. Note that, in this BAU scenario, the introduction of hybrid

or electric cars is not considered. In Japan, hybrid cars are already commercialized and soon electric cars will be introduced in the market. If this trend is reflected, the energy demand in this sector will be reduced accordingly and the share of electricity will increase less than the current BAU projection.

The energy demand projection for the industrial sector has steadily increased except for the second oil shock period of 1980 – 1982. In 1980, the energy demand in this sector dropped 10.2%. In 1981, it again decreased 5.9%. The energy demand in this sector will be 217 million TOE in 2020. The annual average growth rate from 2000 is less than 2%. The factors to affect the energy demand in this sector are industrial structural change, energy efficiency improvement and fuel substitution, as well as the increase of production. The main energy in this sector is oil, which is used for boilers. Coal is still used, as long as steel and cement productions are continued with current technologies, which is different from other sectors. It is also notable that the share of gas is increasing like other sectors. The share of electricity is relatively constant around 25%. Many industries try to improve energy intensity per production, which will save overall energy in this sector. However, these activities are not considered in developing BAU scenario in this sector.

b. CO_2 Emission Projection

The CO_2 emission projection for the residential sector is shown in Figure A-1. The CO_2 emission in this sector has steadily increased except for the second oil shock period of 1980 – 1982 like the steady increase of energy demand. The CO_2 emissions in this sector are projected to reach 27 million ton of carbon (TC) in 2020, excluding the CO_2 emissions from electricity usage. The annual average growth rate from 2000 is less than 1%. It is noted that more than a half of CO_2 emissions are coming from gas in 2020.

The CO_2 emission projection for the commercial sector is shown in Figure A-2. The CO_2 emission in this sector shows a similar trend to that of the residential sector. The CO_2 emissions in this sector are projected to reach 35.5 million TC in 2020, excluding the CO_2 emissions from electricity usage. The annual average growth rate from 2000 is less than 1%. It is also noted that more than a half of CO_2 emissions are coming from gas in 2020. However, the share of coal is higher than that in the residential sector.

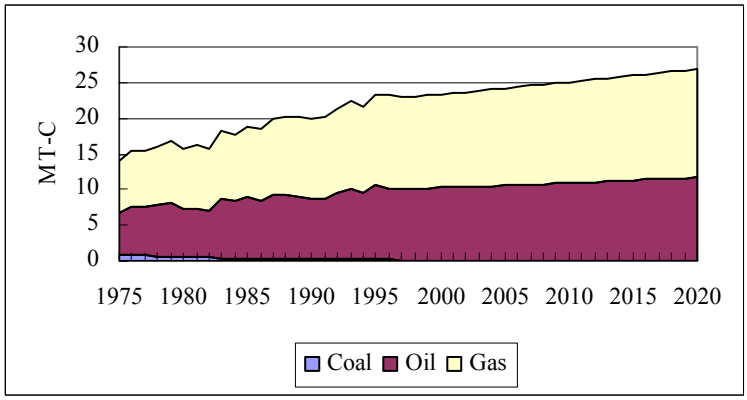

Figure A-1. CO_2 Emission Projection of Residential Sector (Japan)

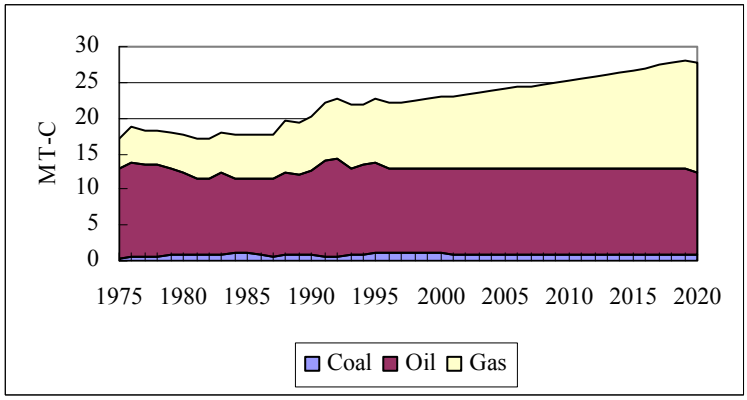

Figure A-2. CO_2 Emission Projection of Commercial Sector (Japan)

The CO_2 emission projection for the transportation sector is shown in Figure A-3. The CO_2 emission in this sector shows that emissions from gasoline and diesel take up more than 80%. The total CO_2 emissions in this sector are projected to reach 104.7 million TC in 2020, excluding the CO_2 emissions from the electricity usage, which are relatively small. The annual average growth rate from 2000 is around 1.8%. The CO_2 emissions from every fuel source are steadily increasing, but the emission coefficient of each fuel is different from each other, so that the profile of CO_2 emissions in this sector is somewhat different from that of the energy demand in this sector.

The CO_2 emission projection for the industrial sector is shown in Figure A-4. The CO_2 emission in this sector shows that the CO_2 emission from oil takes the largest share. The total CO_2 emissions in this sector are projected to reach 138.1 million TC in 2020, excluding the CO_2 emissions from the electricity usage. The annual average growth rate from 2000 is around 1.7 - 1.9%. The CO_2 emissions from gas are steadily increasing, and the CO_2 emissions and the emissions from coal are also increasing, so long as the productions of steel and cement are increasing.

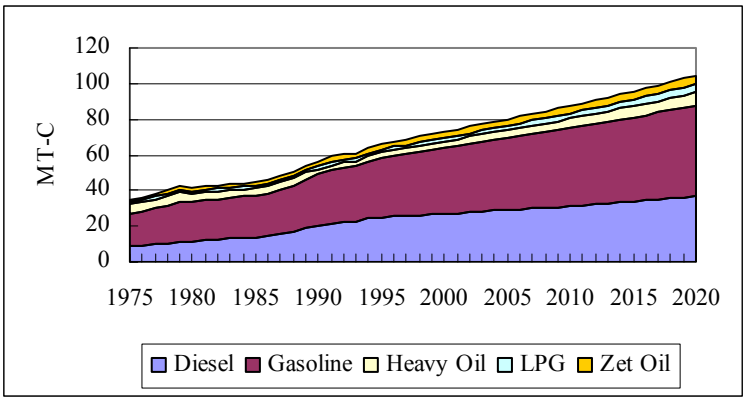

Figure A-3. CO_2 Emission Projection of Transportation Sector (Japan)

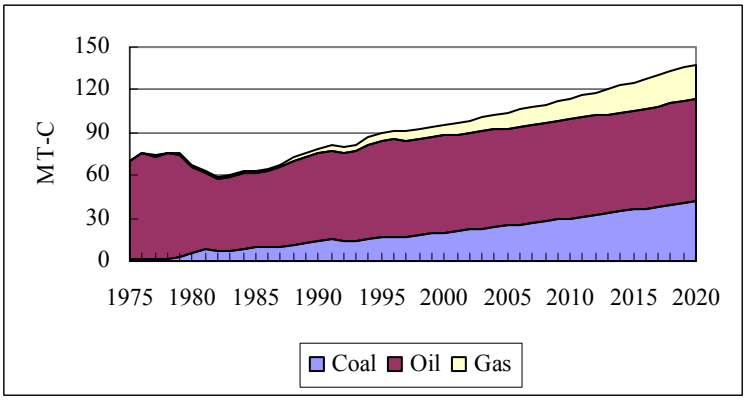

Figure A-4. CO_2 Emission Projection of Industrial Sector (Japan)

The CO_2 emission projection for the power generation sector is shown in Figure A-5. The total CO_2 emissions in this sector are projected to reach 156.7 million TC in 2020, which will be the largest sector of the CO_2 emissions. The annual average growth rate from 2000 is around 2.6 - 2.7%. It should note that the CO_2 emission projection of GEMA is somewhat over-estimated, since this projection does not consider on fuel mixes of power plants and technical progress in the future. It is simply calculated based on CO_2 intensity (Kg-C/Kwh) of 1997 and the rate of loss of transmission and its own use in 1997, which is about 12%. Furthermore, there are many uncertainties for projecting the CO_2 emissions for this sector. The CO_2 emissions from this sector are heavily affected by the fuel mix plans. For example, if Japan expands nuclear programs, the CO_2 emissions from this sector can be reduced a lot, which is uncertain at the moment. The technical progress to improve the efficiency of generators and loss rate of transmission may also contribute to the CO_2 emission reduction in this sector, which is again not reflected in this BAU projection.

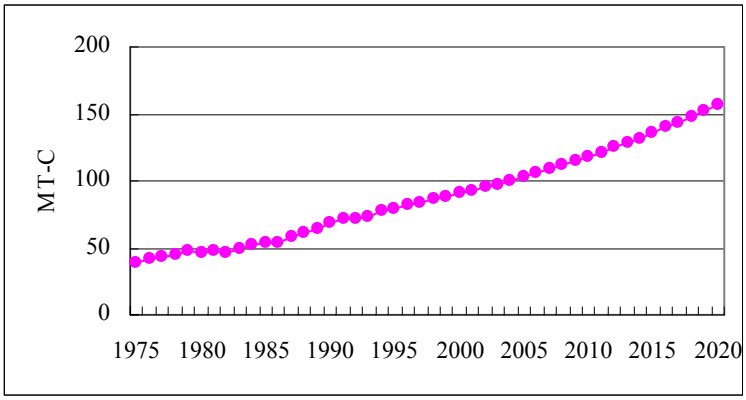

Figure A-5. CO_2 Emission Projection of Power Generation Sector (Japan)

2) China

Energy demand sectors for China are classified as residential, commercial, transportation and industrial sector, which are all end-use sectors. In each sector, energy types are classified, depending on energy services in each sector. For example, in the residential sector, coal, kerosene, diesel, heavy oil and town gas are used for heating in China. Climate conditions in China require more heating demand in this sector and building sector, compared with Japan. Also, the share of coal has been rapidly decreased for heating demand. This trend is reflected in the BAU projection. Country specific characteristics are taken into account when energy demand specifications are constructed in each sector. Further disaggregation to sub-sectors depends on the country and data availability. For example, the gasoline demand for transportation sector in Japan is further disaggregated into passengers and freights, while for China, total gasoline demand for the transportation sector is projected, mainly due to the limitation of data availability.

For energy demand projection, the electricity demand is included in each end-use sector. However, for CO_2 emission projection, this portion from each end-use sector is all aggregated and calculated in the power generation sector, considering the electricity demand of electric utility's own use and the loss of transmission and distribution, since the total electricity demand and actual power generated are different.

a. Energy Demand Projection

The energy demand projection for the residential sector has steadily increased. The energy demand in this sector is projected to reach 362.3 million ton of coal-equivalent (TCE) in 2020. The annual average growth rate from 2000 is almost than 4%. However, one distinct feature of the BAU trend in this sector is that the share of electricity demand keeps increasing. The share of oil in this sector is continuously decreasing. In early 1980's, coal was main energy source used for heating. However,

it will be the quarter level of 1980 in 2020. The substitution of coal and oil to gas and electricity in heating service is continuously occurring in this sector, in addition to more utilization of home appliances with the increase of family income level. It is noted that the gas usage in this sector is continuously increased like Japan.

The energy demand projection for the commercial sector has also steadily increased, which shows a similar trend to that of the residential sector. The energy demand in this sector will be 330.9 million TCE in 2020. The annual average growth rate from 2000 is higher than 6%, which is faster growing trend than that of residential sector. Again, the share of electricity demand will be the largest in this sector. The share of coal in this sector is continuously decreasing as in the residential sector, while the share of gas is increasing. The fuel substitution for heating is also occurring in this sector.

The energy demand projection for the transportation sector has fast increased. The energy demand in this sector will be 358.5 million TCE in 2020. The annual average growth rate from 2000 is around 78%. In oil demand, the share of gasoline has taken more than a half of total oil demand in this sector. Gasoline will continue to be the number one fuel source in the future in the BAU projection. Diesel is the second largest fuel source in this sector. In freight transport (where mostly trucks are used) its fuel is mostly diesel. Again, tin this sector, the demand for coal (train) will shift to other energy sources such as oil and electricity. The expansion of subway system will also contribute to the increase of electricity demand in this sector.

The energy demand projection for the industrial sector has also increased. The energy demand in this sector will be 1445 million TCE in 2020. The annual average growth rate from 2000 is more than 3%. The factors to affect the energy demand in this sector are industrial structural change, energy efficiency improvement and fuel substitution, as well as the increase of production. Coal is still used, as long as steel and cement productions are continued with current technologies, which is different from other sectors. The demand for electricity keeps increasing in this sector. Many industries try to improve energy intensity per production, which will save overall energy in this sector. However, these activities are not considered in developing BAU scenario in this sector.

b. CO_2 Emission Projection

The CO_2 emission projection for the residential sector is shown in Figure A-6. The CO_2 emission in this sector seems to be slightly decreased during 2000- 2010. This trend is mainly due to the large expansion of electricity consumption that in excluded for the calculation. The power generation sector is separately presented. The CO_2 emissions in this sector are projected to reach 73.3 million ton of carbon (TC) in 2020, excluding the CO_2 emissions from electricity usage. The annual average growth rate from 2010 is around than 1%. It is noted that the fuel switching from coal to oil and gas also contributing to the decrease of CO_2 emissions in this sector.

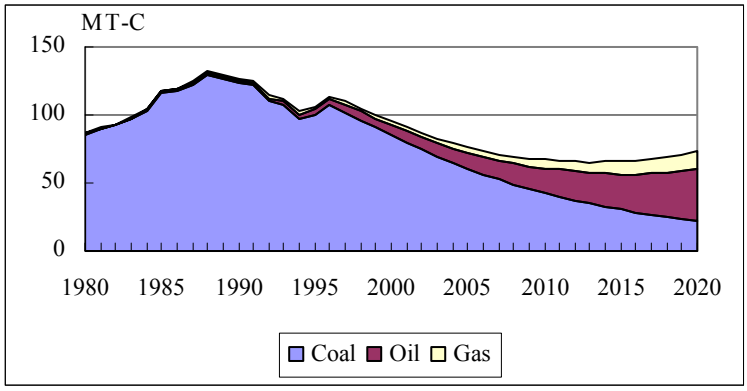

Figure A-6. CO_2 Emission Projection of Residential Sector (China)

The CO_2 emission projection for the commercial sector is shown in Figure A-7. The CO_2 emission in this sector shows a different trend to that of the residential sector. The CO_2 emissions in this sector are projected to reach 120.8 million TC in 2020, excluding the CO_2 emissions from electricity usage. The annual average growth rate from 2000 is more than 4%. It is also noted that coal is rapidly switched to either oil or gas in this sector.

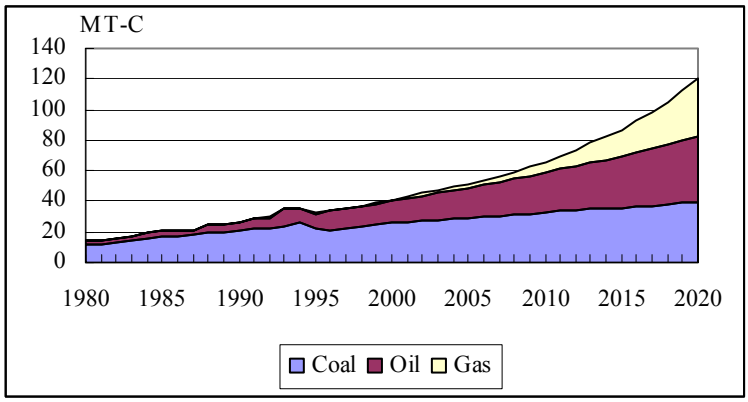

Figure A-7. CO_2 Emission Projection of Commercial Sector (China)

The CO_2 emission projection for the transportation sector is shown in Figure A-8. The CO_2 emission in this sector shows that emissions from coal still takes large portion. The total CO_2 emissions in this sector are projected to reach 170.1 million TC in 2020, excluding the CO_2 emissions from the electricity usage, which are relatively small. The annual average growth rate from 2000 is more than 7%.

The CO_2 emission projection for the industrial sector is shown in Figure A-9. The CO_2 emission in this sector shows that the CO_2 emission from coal takes the largest share. The total CO_2 emissions in this sector are projected to reach 836.7 million TC in 2020, excluding the CO_2 emissions from the electricity usage. The annual average growth rate from 2000 is around 3%. The CO_2 emissions from oil are steadily increasing, and the CO_2 emissions and the emissions from coal are also increasing,

so long as the productions of steel and cement are increasing. In this sector, the demand for coal is the most critical source for CO_2 emissions.

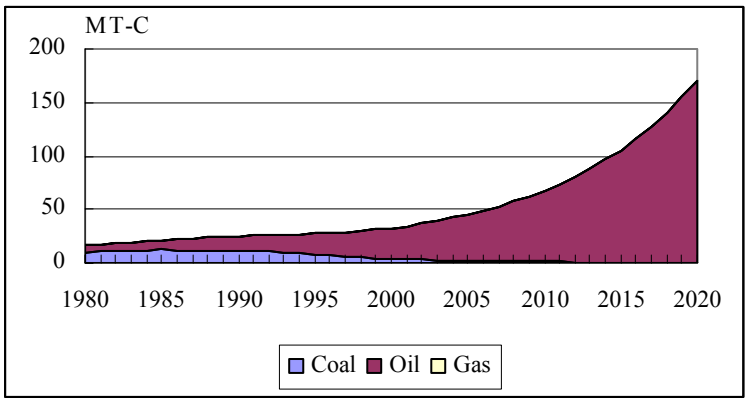

Figure A-8. CO_2 Emission Projection of Transportation Sector (China)

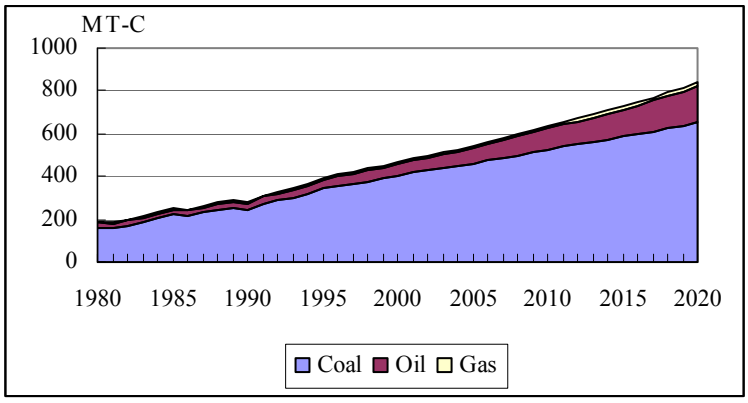

Figure A-9. CO_2 Emission Projection of Industrial Sector (China)

The CO_2 emission projection for the power generation sector is shown in Figure A-10. The total CO_2 emissions in this sector are projected to reach 1499.3 million TC in 2020, which will be the largest sector of the CO_2 emissions. The annual average growth rate from 2000 is more than 7%. It should note that the CO_2 emission projection of GEMA is somewhat over-estimated, since this projection does not consider on fuel mixes of power plants and technical progress in the future. It is simply calculated based on CO_2 intensity (Kg-C/Kwh) of 1996, which is the actual value and the rate of loss of transmission and its own use in 1996, which is about 7.2%. Furthermore, there are many uncertainties for projecting the CO_2 emissions for this sector. The CO_2 emissions from this sector are heavily affected by the fuel mix plans. For example, China has interest in expanding nuclear programs, the CO_2 emissions from this sector can be reduced a lot, which is uncertain at the moment. The technical progress to improve the efficiency of generators and loss rate of transmission may also contribute to the CO_2 emission reduction in this sector, which is again not reflected in this BAU projection.

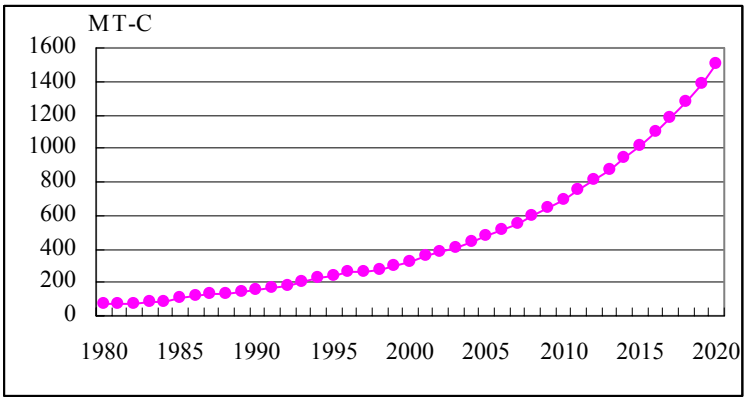

Figure A-10. CO_2 Emission Projection of Power Generation Sector (China)

3) Korea

Energy demand sectors for Korea are classified as residential, commercial, transportation and industrial sector, which are all end-use sectors. In each sector, energy types are classified, depending on energy services in each sector. For example, in the residential sector, coal, kerosene, diesel, heavy oil and town gas are used for heating in Japan. Obviously, the share of coal has been rapidly decreased for heating energy demand like Japan. This trend is reflected in the BAU projection. Country specific characteristics are taken into account when energy demand specifications are constructed in each sector. For example, due to the climate conditions in winter, the heating demand in the residential and commercial sectors in Korea takes more shares of energy use, compared with those of Japan. Further disaggregation to sub-sectors depends on the country and data availability. For energy demand projection, the electricity demand is included in each end-use sector. However, for CO_2 emission projection, this portion from each end-use sector is all aggregated and calculated in the power generation sector, which is same as other countries.

In Korea, it is observed that energy demand has steadily increased except for the period when sudden financial crisis occurred in late 1997. Energy demand in 1998 is decreased in every sector as every economic activity is shrunk due to the severe financial crisis. However, it is projected to recover quickly form 1999.

a. Energy Demand Projection

The energy demand projection for the residential sector has steadily increased. The energy demand in this sector is projected to reach 44.7 million ton of oil-equivalent (TOE) in 2020. The annual average growth rate from 2000 is around 3%. However, one distinct feature of the BAU trend in this sector is that the share of electricity demand keeps increasing. The share of gas in this sector is continuously increasing by replacing coal for heating. In 1970's, coal was main energy source for

heating. However, it has almost disappeared since mid 1990's. The substitution of oil to electricity in heating service is continuously occurring in this sector, in addition to more utilization of home appliances with the increase of family income level.

The energy demand projection for the commercial has steadily increased, which shows a similar trend to that of the residential sector. The energy demand in this sector will be 36.7 million TOE in 2020. The annual average growth rate from 2000 is a little higher than 4%. Again, the share of electricity demand keeps increasing. It is worth to note that the share of gas will continuously increasing by replacing coal for heating. Also, for buildings, demand for cooling is done by gas, which is another reason why gas is rapidly increasing in this sector. The share of oil in this sector is continuously decreasing as in the residential sector.

The energy demand projection for the transportation sector has steadily increased. Again, during the period of financial crisis, energy demand in this sector is decreased. The energy demand in this sector will be 67.4 million TOE in 2020. The annual average growth rate from 2000 is around 3%. In oil demand, the share of gasoline has taken more than a half of total oil demand in this sector. Gasoline will continue to be the number one fuel source in the future in the BAU projection. Diesel is the second largest fuel source in this sector. In freight transport (where mostly trucks are used) its fuel is mostly diesel. However, for trucks, the demand for heavy oil will be decreased due to the tight regulation on environmental pollution standards. Note that, in this BAU scenario, the introduction of hybrid or electric cars is not considered. In Japan, hybrid cars are already commercialized and soon electric cars will be introduced in the market. However, in Korea, this type of car has not yet introduced. If this trend is reflected, the energy demand in this sector will be reduced accordingly and the share of electricity will increase less than the current BAU projection.

The energy demand projection for the industrial sector has steadily increased. However, the growth of energy demand in this sector will be slow down. The energy demand in this sector will be 117.2 million TOE in 2020. The annual average growth rate from 2000 is less than 2%. The factors to affect the energy demand in this sector are industrial structural change, energy efficiency improvement and fuel substitution, as well as the increase of production. In Korea, structural change in industry will be occurred rapidly to less energy intensive industries with higher value-added, which contributes to the slow demand increase in this sector. The main energy in this sector is oil, which is used for boilers. Coal is still used, as long as steel and cement productions are continued with current technologies, which is different from other sectors. It is also notable that the share of gas is increasing like other sectors. The share of electricity is relatively constant around 25%.

b. CO_2 Emission Projection

The CO_2 emission projection for the residential sector is shown in Figure A-11. The CO_2 emission

in this sector has steadily increased except for financial crisis. The CO_2 emission profile in this sector is somewhat different from that of energy demand, since fuel substitution to less carbon intensive ones occur rapidly. The CO_2 emissions in this sector rare projected to reach 33 million ton of carbon (TC) in 2020, excluding the CO_2 emissions from electricity usage. The annual average growth rate from 2000 is less than 1.5%. It is noted that more than a half of CO_2 emissions are coming from oil in 2020.

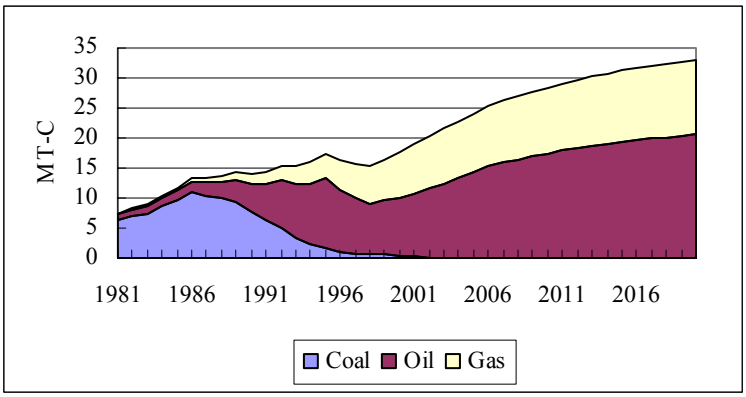

Figure A-11. CO_2 Emission Projection of Residential Sector (Korea)

The CO_2 emission projection for the commercial sector is shown in Figure A-12. The CO_2 emission in this sector shows a similar trend to that of the residential sector. The CO_2 emissions in this sector are projected to reach 18.6 million TC in 2020, excluding the CO_2 emissions from electricity usage. The annual average growth rate from 2000 is more than 3%. It is also noted that more than a half of CO_2 emissions are coming from oil in 2020. However, the share of coal will be disappeared like in the residential sector.

The CO_2 emission projection for the transportation sector is shown in Figure A-13. The CO_2 emission in this sector shows that emissions from gasoline and diesel take up more than 80%. The total CO_2 emissions in this sector are projected to reach 57.6.7 million TC in 2020, excluding the CO_2 emissions from the electricity usage, which are relatively small. The annual average growth rate from 2000 is around 2%. The CO_2 emissions from every fuel source are steadily increasing, but the emission coefficient of each fuel is different from each other, so that the profile of CO_2 emissions in this sector is somewhat different from that of the energy demand in this sector.

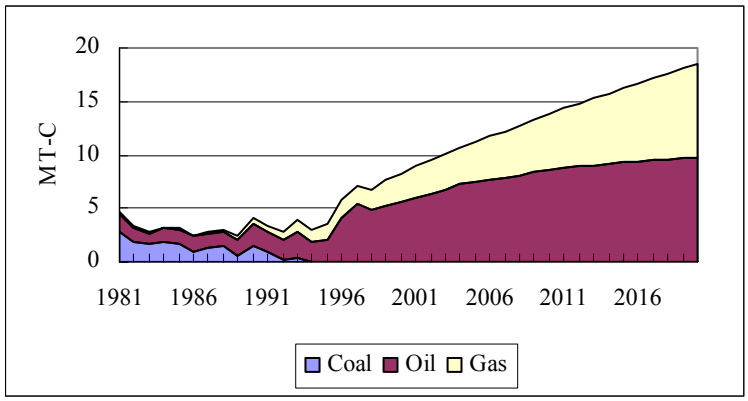

Figure A-12. CO_2 Emission Projection of Commercial Sector (Korea)

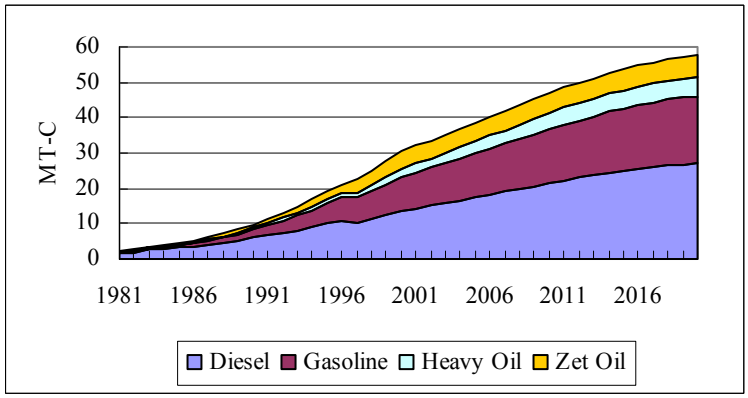

Figure A-13. CO_2 Emission Projection of Transportation Sector (Korea)

The CO_2 emission projection for the industrial sector is shown in Figure A-14. The CO_2 emission in this sector shows that the CO_2 emission from oil takes the largest share. The total CO_2 emissions in this sector are projected to reach 82.7 million TC in 2020, excluding the CO_2 emissions from the electricity usage. The annual average growth rate from 2000 is around 1%. The CO_2 emissions from gas are steadily increasing, and the CO_2 emissions and the emissions from coal are saturated from 2010, since the production of steel and cement where most of coal is used is more or less saturated.

The CO_2 emission projection for the power generation sector is shown in Figure A-15. The total CO_2 emissions in this sector are projected to reach 39.7 million TC in 2020, which will be the largest sector of the CO_2 emissions. The annual average growth rate from 2000 is around 3%. It should note that the CO_2 emission projection of GEMA is somewhat over-estimated, since this projection does not consider on fuel mixes of power plants and technical progress in the future. It is simply calculated based on CO_2 intensity (Kg-C/Kwh) of 1999 and the rate of loss of transmission and its own use in 1999, which is about 10%. Furthermore, there are many uncertainties for projecting the CO_2

emissions for this sector. The CO_2 emissions from this sector are heavily affected by the fuel mix plans. For example, if Korea like Japan expands nuclear programs, the CO_2 emissions from this sector can be reduced a lot, which is uncertain at the moment. The technical progress to improve the efficiency of generators and loss rate of transmission may also contribute to the CO_2 emission reduction in this sector, which is again not reflected in this BAU projection.

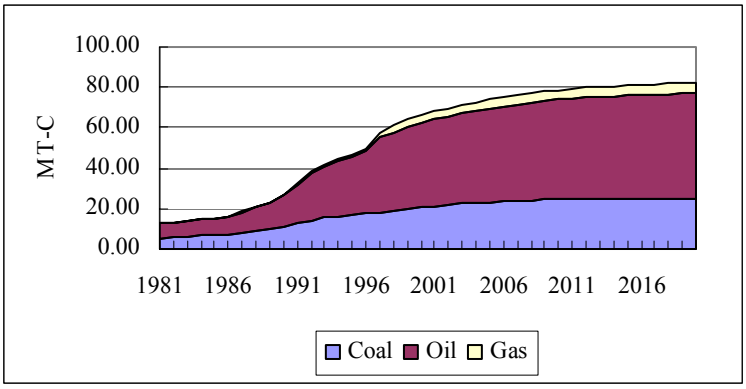

Figure A-14. CO_2 Emission Projection of Industrial Sector (Korea)

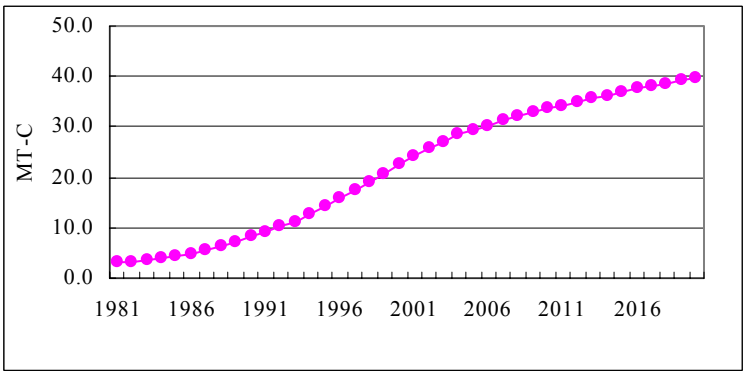

Figure A-15. CO_2 Emission Projection of Power Generation Sector (Korea)

APN 2001-15

Policy Design of Climate Change Collaboration in Northern Asia

- Possible Options and Constraints for Cooperative Effort between Russia, Japan, China and Korea -

March, 2002

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Summary

The main objective of this project is to analyze possibilities and constraints in developing collaboration between four countries of the Northern Asian region, i.e. between Russia, Japan, China, and Korea in implementing the UN Framework Convention on Climate Change (UNFCCC). Also, we are to study national approaches to joint efforts, strategies and practical steps undertaken, and its impacts to other countries in Asia Pacific region, as well as to elaborate policy recommendations how to make joint instruments in the region an effective tool in domestic and international climate policies

In comparison with many other international environmental agreements the FCCC suggests broader options for collaboration efforts by so called 'Kyoto Mechanisms', which are joint implementation (JI), emission trading (ET), and clean development mechanisms (CDM), aiming at greenhouse gases emission reduction. This project explores the appealing opportunities, emerging practical schemes, and constraints for co-operation between countries mainly of the Northern Asia. This region is representing developed, economies in transition, and developing countries (Japan, Russia, China, Korea) through application of these new instruments, as well as for their participation in financial and technology transfers resulting in combating the global warming.

This project especially analyzes the specifics of the current domestic trends and institutional framework in Russia, which is becoming an active player in international co-operative schemes in climate change policy implementation. We intend to explain how and to what extent these domestic specifics, especially development of collaborative efforts between Japan and Russia (mainly, JI and ET) affect international policies and co-operation of countries in this region, and also to provide policy recommendations on what can be done to improve its effectiveness. It intends to find out the possibilities and major problems in building mutually beneficial CDM schemes between Japan, China, and Korea and other countries. Major patterns and controversies associated with financial and technology transfers between countries of this region are to be studied.

In chapter 2, we briefly summarize UNFCCC and Kyoto Mechanism that are the international mechanisms of combating global warming. The most recent activity of COP 7 (Marrakech Accord) is also summarized in terms of how to settle down disputable issues among Annex I countries and Non-Annex I countries. Further expectations and resolutions for UNFCCC are described in this chapter.

In chapter 3, we examine the existing collaboration in the fields of environment in the Northeast Asia. We find that centralizing political, economic or social forces are lacked until the late 1980s due to a diversity of systems. Except for certain bilateral initiatives, there was little cooperation on environmental issues. We briefly describe the existing regional environmental collaborations in this

region in terms of the initiatives of specific collaborations.

In chapter 4, we intend to analyze the evolution of major positions of Japan, Russia, China and Korea regarding co-operative efforts in implementation of the FCCC, including the GHG emission profiles and vulnerability and impact of climate change. Particularly, regarding application of such international policy instruments as joint implementation, emission trading, clean development mechanisms, as well regarding co-operation in financial and technology transfers in energy sector contributing to combating global warming are also examined. The role of these instruments is to be studied in a broader framework of their national policies, strategies and responses to global climate change.

In chapter 5, we aim to assess Russia's domestic potential as the world's largest seller of carbon credits. For this purpose, the analysis will combine the assessment of trends in economic development of this country with possible developments in its energy sector. The major approach of this task is based on the necessity to take into account a variety of 'situational factors' rooted in the specifics of the transition period in Russia. For example, we may list up institutional uncertainties, including uncertainties for investments, in property rights, in vertical and horizontal division of responsibilities between governmental institutions; weakness of the governmental authority; and shadow economy, etc. The above factors have serious impact on development of GHG emission scenarios, on patterns of international co-operation, on design of possible domestic and international policies and its instruments in response to climate change.

In Chapter 6, we are to find out and analyze possible international implications of the specific domestic institutional framework both for bilateral arrangements between countries of Northern Asia region, and for design of multilateral mechanisms. We suggest that part of the reason for current poor design of the two promising international instruments of the Kyoto Protocol to the FCCC (ET and JI) is that it does not take thoroughly into account the peculiarities in economic and political situation in Russia, which has become an important player within the international climate change regime. This task aims to analyze the problems related to assessment of Russia's role in international emission trading, and possible bilateral collaboration between Russia and Japan in this area. Besides, this task intends to analyze possibilities and constraints in performance of joint implementation projects in energy and metallurgical sectors through bilateral efforts with Japan.

We especially focus on the possibilities and barriers of collaboration between Japan and Russia in respect to the issues related to UNFCCC, since two countries are both Annex I countries. However, Japan might be a potential demander for GHG emission right, while Russia might be a supplier. This chapter is to find out main approaches of four countries to such controversial issues as problems of 'hot air', 'supplementarity', 'cap on international trade' that are the subjects of active international policy discussion of nowadays. This task intends to analyze the similarities and variations in their

approaches, as well as to identify their possible joint positions, and to suggest recommendations how to develop them in the future.

In chapter 7, we are to analyze the potentials for collaborations in this region. This chapter is to analyze to what extent the CDM are to open additional opportunities for China and Korea in expanding international trade and foreign investments. Especially, the quantified analysis for the CDM effect to Chinese economy as a whole is added. During the UNFCCC negotiation, Republic of Korea consistently insists the introduction of unilateral CDM, which implies that Non-Annex I countries can generate their own CDM project without Annex I countries. Co-operative efforts between Japan and China, Japan and Korea in this field will be studied. We also plan to perform the analysis of 'no-regrets' options in co-operation between Russia and China in energy sector.

In the last chapter, we summarize the major findings and discussions in this report, identifying further studies. We also derive possible climate policy recommendations in terms of regional collaborations.

At the appendix, we briefly describe a quantified tool for GHG Emission Model, which includes country specific modeling for China, Korea, Russia and Japan and other countries in Asia Pacific Region. This exercise is undergoing through IGES Greenhouse Gas Emission Models for Asia (GEMA). However, at this stage, only Japan, China and Korea models are completed. The model for Russia is still under construction, including major data collection. Especially, it was a good lesson of how to handle the data of Russia, who shows the issues of data consistency and availability after the collapse of former Soviet Union. We present the basic structure of GEMA, technical description of GEMA and initial results for projection of CO2 emissions for three countries, which will be the base for the analysis of bilateral collaboration in this region.

One of the distinct features of this research activity is to facilitate the regional research collaboration. For performance of this research, we intend to develop regional multidisciplinary collaboration between researchers (economists, political scientists, engineers, geographers) from a number of institutions from the countries of Northern Asia.

The joint research and scientific links between scholars participating in this study will contribute significantly to national capacity building in the countries of Northern Asia in climate change research. It will support the expanding of skills, mutual knowledge, expertise and exchange of information. Particularly, it refers to knowledge and exchange of information on national perceptions and approaches towards various aspects of climate change problem, which will be of a great value for research in this area.

Recommendations for policy-makers and business on how to expand climate change co-operation in the region are one of the important contributions of this project. This research has direct links to

policy-making process, since on the basis of its research results policy recommendations for governmental institutions in four Northern Asian countries. One of the clear policy recommendations of this study is that the environmental collaboration in this region or subregion is crucially important. Second, the dimension of policy application is quite diverse, so that it is difficult to suggest a criterion for policy performance. However, the clear message from this study is that the policy-integration in various levels is very much important as well as prioritizing policies, depending on the situation of each country. Third, we recognize that the international discussions on climate change issues and negotiation is not only the challenge to each country, but also they provide new and promising business opportunities, while each country intends to implement both domestic and international policies and measures to mitigate GHG emissions.