

IR-3 Studies on Integration and Systematization for Promoting Global Environment Research (Final Report)

Contact person Gen Inoue

Director

Center for Global Environmental Research

National Institute for Environmental Studies

Environment Agency

16-2 Onogawa, Tsukuba, Ibaraki 305-0053, Japan

Tel: +81-298-50-2402, Fax: +81-298-58-2645

E-mail: inouegen@nies.go.jp

Total Budget for FY 1999 7,919,000 Yen

Abstract

The integration and systematization of researches, *i.e.* reviewing and evaluating the current state of global environment researches and discussing and clarifying the direction of future researches to make the "Prospect on Global Environment Research", has conducted on the fields of "Global Warming (Countermeasures)" and "Human Dimensions of Global Environmental Problems".

(1) Prospect on the Research of "Global Warming (Countermeasures)"

Global climate change has become one of the most important environmental issues. At COP3, Kyoto, the developed country parties to the Protocol committed to reduce their overall greenhouse gas (GHG) emissions by at least 5% lower than 1990 level in the period 2008-2012. Although the Protocol is an important step for stabilizing GHG, a number of studies are left to realize the stabilization. The following important future studies are summarized to find ways to tackle global warming:

- 1) Studies on countermeasure technologies.
- 2) Studies on land-use change.
- 3) Studies on international cooperation.
- 4) Studies on social and economic systems.
- 5) Studies on comprehensive assessment in developing countries.
- 6) Studies on adaptation.

New research activities will help to promote policies for stabilizing global climate.

(2) Prospect on the Research of "Human Dimensions of Global Environmental Problems"

It is recognized so important to understand the impacts of human activities on global environment and the feedback of global environment change to human society, and to analyze the role of human being in global environment and the interaction between global environment and socio-economic system. In order to facilitate the effective response strategies, the researches of HDP have been progressed. The following were reviewed and prospected:

- 1) Trend of HDP Research in World.
- 2) Trend of HDP Research in Japan.
- 3) View of HDP Research.

For promoting the future HDP researches to solve global environmental problems, it should be necessary with the viewpoints of an Asian area and technology, to participate in the international research plan such as IHDP, to conduct the original HDP researches of Japan, and to have interdisciplinary cooperation between social science, natural science and engineering.

Key Words Countermeasures for Global Warming, Global Environment Research, Human Dimension Programme (HDP), Integration and Systematization, Review and Prospect

1. Introduction

Environment Agency of Japan had started the “Global Environment Research Program” from 1990 by establishing a research fund for some fields in proportion to the global environmental problems that UNEP showed. This research program should be promoted internationally and interdisciplinary by participating in many ministries and agencies of government of Japan. Afterwards, as the researches relating to global environment change has increased rapidly and greatly, the situation around “Global Environment Research Program” has changed. The knowledge on global environment has been rapidly and surely accumulated under some international research programs and various research programs of Japan. Today, it is the time to summarize the knowledge and information on global environment change and the results of global environment researches, and to reconsider the direction of future researches on global environmental problems.

As many ministries and agencies of government of Japan have increased the global environment related budget, the research system of global environment has been expanding. Therefore, every research project should be promoted efficiently by considering, adjusting and cooperating with each other. In addition, the international policy on global environment change, such as Kyoto protocol, has been progressed so rapidly that the requests for global environment researches are increasing. As most of the international research networks on global environment are expanding and have been strengthened, the researches of Japan must be more intensified with the viewpoints of international implication.

In the National Institute for Environmental Studies (NIES), the current state of global environment researches in each field has been reviewed and evaluated from 1997, and the direction of future researches has been discussed to clarify. In the meantime, Global Environment Department of Environment Agency of Japan also recognized the necessity of the integration and systematization of global environment researches for reconsidering further researches. Such activities including the workshop of science committee in each field were reported as the “Prospect on Global Environment Research”.

2. Research Objective

The integration and systematization of researches should be carried out on the fields of “Global Warming (Countermeasures)” and “Human Dimensions of Global Environmental Problems”, as we have never conducted such activities on these two fields until now after beginning the “Global Environment Research Program”. Therefore, in this fiscal year 1999, we reviewed and evaluated the current state of global environment researches, and discussed and clarified the direction of future researches. We have made the report of “Prospect on Global Environment Research” on above-mentioned fields as one of the “Integrated Research” which should be conducted by the Center for Global Environmental Research (CGER)/NIES.

A leader in charge of each global environment research field in NIES made the core report at first, and opinions of about 20 members of the science committee was taken through mails, hearings and workshops to make the final report. The original opinion of each member of science committee and some information about each field has been attached in each report. Here, we summarized the contents of each report.

3. Prospect on the Research of Global Warming (Countermeasures)

(1) What future work on global warming response would be useful?

Global climate change has become one of the most important environmental issues of the world today. By the end of October 1999, the number of countries ratified the United Nations Framework Convention on Climate Change (UNFCCC) has exceeded 180. These countries then bound themselves to the terms of the Convention. All the countries of the Parties shall do their best to help mitigate the global climate change considering their “common but differentiated responsibilities and respective capabilities and their social and economic conditions”.

At the Third Conference of the Parties (COP3) to the UNFCCC, held in Kyoto in December 1997, developed country parties to the Protocol committed to reduce their overall greenhouse gas (GHG) emissions by at least 5% lower than the 1990 level in the period 2008-2012. Although the Protocol is regarded as an important step toward meeting the objective of stabilizing GHG concentrations in the atmosphere, a number of studies are left to realize the stabilization. Important future studies are summarized to find ways to tackle global warming.

(2) Studies on countermeasure technologies

Lots of studies have been done so far on developing and introducing carbon-free energy-supply-technologies and efficiency-improved energy-use-technologies. These technologies can reduce emissions if these are appropriately introduced into the market. Studies on climate change policies to promote the introduction of such technologies will have more importance to implement the Kyoto Protocol and further emission reductions.

(3) Studies on land-use change

The studies on land-use change have important aspects not only from carbon sequestration but also from energy sources viewpoints. First attempts to integrate the various aspects of the global land-use problems on a geographically-explicit base have been done with some of the policy evaluation integrated assessment models. In the geographic detail, the models represent the transformation of land cover as it is affected by climatic, demographic and economic factors. It links explicitly the changes in land cover with the flux of CO₂ and other GHG between the biosphere and atmosphere, and conversely, takes into account the effect of changing productivity of the terrestrial and oceanic biospheres. The integration of agricultural and land cover calculations can provide new insights about shifts in agricultural areas related to climate and the influence which changing land cover has on climate. Regional demands for land can serve as a surrogate for regional and local demands for driving local land cover changes, and that land use rules can be used to represent driving forces of land conversions. Another key involves the fierce competition for that could emerge if a large-scale biomass industry is initiated as a response the climate change concerns. If this industry grows rapidly, fierce competition between biomass, agriculture and forests for available land could emerge. Other examples involve the vulnerability of protected areas under shifting vegetation zones, and the consequences for biodiversity and nature conservation, and the determination of risks associated with current productivity levels of specific crops with shifting agricultural patterns. These advanced analyses could well assist regional policy-makers to assess the seriousness of climate change impacts.

(4) Studies on international cooperation

Up to now the emissions from some of the countries with commitments are still going up. One major reason is that the autarkic abatement cost is very high in the developed countries compared to the other countries in the world. The developed countries are looking for "cheaper" approaches to fulfill their commitments at a cost as low as possible. During the Kyoto conference, three mechanisms for international cooperation on global climate change issues had been presented as Emission Trading (ET), Joint Implementation (JI) and Clean Development Mechanism (CDM). Surely, implementation will be difficult as each country has its own objectives based on its own assessment of the costs and benefits of climate change policies, but effective international cooperation may help us find a way out to fight against the global climate change issues more efficiently, economically and fairly.

(5) Studies on social and economic systems

Researches on information system, enlightenment activities, economic instruments also need attention. Among the difficulties in addressing the global environmental issues are that the discharger of a contaminant is not always the same person as the affected, and that uncertainty is so high that no consensus has been built on the cause-effect relationships of those issues. Studies on systems for promoting countermeasures such as education system, social system, industrial system, enlightenment and economic incentives are useful to assist the direct mitigation policies.

If efforts are made to reduce CO₂ emissions even further than as mandated by the Kyoto Protocol, the necessary costs will certainly become larger. These are costs that corporations and households will have to bear. On the other hand, there will be an increase in effective demand for producers of energy-saving technologies. There is a high possibility that the indirect cost will be extremely small through energized environmental industries. The business opportunities for environmental industries will also increase as projects to reduce CO₂ emission jointly with developing countries are implemented. Earlier investment in environmental industries will reduce the total cost in the long term. Studies to promote eco-industry also need attention.

(6) Studies on comprehensive assessment in developing countries

The importance of the non-Annex I countries is growing, as their emissions are increasing. However, for many of the developing countries, tackling global environmental problems is a matter of the utmost difficulty. A new set of strategies is necessary such as eco-policy linkages that link the domestic and local environmental policies of developing countries to global environmental policies, thereby implementing those countries' domestic and local environmental policies while also efficiently advancing global and regional environmental policies. This type of policy integration has been indispensable in implementing climate change policies and acid rain policies in developing countries.

(7) Studies on adaptation

Toward the solution of the global warming, we must urgently setup the concrete actions that should be taken in the coming decades, with considering the long-term efficiency. Together with GHG emissions reduction, adaptation to climate change impact is considered to be an important and efficient strategy. Although there are many difficulties to analyze efficient adaptation strategy, we should positively look for what we can and should do in the early next century in order to mitigate the future negative impacts of climate change.

Future GHG emissions are the product of very complex dynamic systems, determined by driving forces such as demographic development, socio-economic development, and

technological change. Their future evolution is highly uncertain. New research activities will help to promote policies for stabilizing global climate.

4. Prospect on the Research of Human Dimensions of Global Environmental Problems

(1) Trend of HDP Research in world

Global environmental problems, such as global warming and depletion of the ozone layer, are aggravating. The causes of these problems are human activities, such as intensive consumption of fossil fuels, an increase in population in the world, especially in the developing countries. It has been an urgent subject to find out the policy for realizing the sustainable development which could reform resources intensive socio-economic systems, which depend on the present mass production, mass consumption, and extensive disposal, and also to bring poor developing countries rich quality of life and rich economy.

For this reason, International Social Science Council (ISSC) serves as a support organization of international HDP research program (HDP: Human Dimension Programme on Global Environment Change, IHDP hereafter) was initiated in 1990. Its purposes are mainly as follows:

- 1) to understand the impacts of human activities on global environment, and the feedback of global environment change to human society, and
- 2) to analyze the role of human being in global environment, and the interaction between global environment and socio-economic system to facilitate effective response strategies.

In addition, IHDP was originally an international research plan centering on a social science field. However, researches of IHDP were greatly delayed in comparison with global environment related researches of the climate system of the earth, or a natural science field mainly because of the complexity and uncertainties of global environmental problems.

Although IHDP examined the research subject of 8 scientific fields at the beginning, it narrowed down to four science research projects in the past few years, and it has also obtained the researchers or scientists from natural science fields, and has a cooperation of International Council for Science (ICSU). Science research projects are 1) Land Use and Land Use Change (LUCC), 2) Industrial Transformation (IT), 3) Institutional Dimension of Global Environment Change (IDGEC) and 4) Global Environment Change and Human Security (GECHS). IHDP has already decided upon research plans of these 4 scientific research projects and is going to advance full-fledged researches in cooperation with HDP researches of each country from now on. LUCC already started as a joint research project with IGBP, and the research result about land use and human activities is obtained.

(2) Trend of HDP Research in Japan

Soon after IHDP was established, the HDP Special Committee was established by the Science Council of Japan (SCJ), and activity was initiated. The HDP Special Committee aims at promotion of researches while it achieves the functional window as a national HDP and as a counter part of IHDP and it prepares the place of exchange of domestic HDP researchers. It came to have a new appreciation of the importance of HDP researches for solving global environmental problems in Japan as the elucidation in the phenomenon side of the natural science of global environmental problems, such as global warming, progressed.

On the basis of activity of related academic societies, the 11 research sub-committees were installed and the HDP Special Committee has corresponded while it held various kinds of workshops and symposium in order to promote HDP researches in Japan.

While the report into which the view was collected at the Environment Agency about HDP researches, which should be promoted in Japan, was released, it is as one field of "Global Environment Research". "Human Dimensions of Global Environmental Problems

(HDP research field)” established in FY 1995. The national research institutes and the university researchers are promoting the researches of this field henceforth.

On the other hand, aggravation of global environmental problems became the trigger and the company and self-governing body that materialize the zero emission initiative which United Nations University (UNU) advocated also appeared. Researches aiming at the development thorough energy saving and the change to the low-load society for saving resources has been conducted. HDP researches in Japan has leading roles in respect of Industrial Transformation and low-load approach into society and realization, although the science research project of IHDP is not necessarily synchronized.

It is expected that HDP researchers of Japan participates in the science research project of IHDP, and shares the latest result with the researchers in the world, and will contribute to construction of the society further which can be developed continuously from now on.

(3) View of HDP Research

The research scope on human activities, environment, and both of these two as HDP researches is fairly broad. For this reason, a definition of HDP related researches is difficult and sometimes ambiguous for the actual condition. The science research project of the present IHDP tends to decide upon an international research plan, tends to execute researches completely, and advances researches which thought the viewpoints of an Asian area and technology as important as the thing positively participated in such an international research plan and original HDP researches of Japan. In order to implement HDP researches, it is indispensable to have interdisciplinary cooperation between social science, natural science and engineering, and additionally the governments and international organizations’ supports including financial and institutional arrangements.

The network of HDP researchers recently begins to be built and expanded. Solution of global environmental problems is one of the most important and urgent problems, and promotion of future HDP researches is expected to facilitate such solution very much. The necessary research fields and themes were identified through intensive discussion among the researchers and experts. The results are written in the report and published in a book.

5. Discussion on Prospect on Global Environment Research

As everyone knows that the science is an important key to solve the global environmental problems, it is necessary to conduct the integration and systematization of researches and to show the review and prospect not only to researchers but also to policy makers. This is an important function of the science and is one of the responsibilities of the scientists. One of the features of each report was that the draft of core report was made from the responsibility of an active researcher individual. Then, the draft with sharp and deep viewpoints induced so active and earnest discussion in the workshop of each science committee.

The reports of “Prospect on Global Environment Research -Global Warming (Countermeasures)-” and/or “Prospect on Global Environment Research -Human Dimensions of Global Environmental Problems-” will be evaluated by future criticism whether the objective analysis was made and the accurate prospect with wide scope was shown. Further, it will be necessary more contrivance in order to apply these results to the promotion of researches as a frame of policy.

To promote the “Integrated Research” on the global environment change is one of the main research functions of CGER. And the integration and systematization of researches to show the review and prospect on global environment researches as conducted in the present study must be needed periodically in order to investigate the present state and the direction of

future researches. On various global environmental problems, similar activities to prospect the global environment researches should also be carried out periodically in future and CGER should be rolled as a center conducting such works. It is desired that the discussion on future researches on the global environment change have been activated by the present reports as the first step.

Reference

- CGER/NIES (1999): Prospect on Global Environment Research -Global Warming (Countermeasures)- (in Japanese)
- CGER/NIES (1999): Prospect on Global Environment Research -Human Dimensions of Global Environmental Problems- (in Japanese)
- IPCC (2000): A special report of working group III of the Intergovernmental Panel on Climate Change, 2000.