

[総 説]

Environmental Quality Control and International Cooperation —Report for the People in Thailand

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1. Introduction

In Thailand, the air pollution due to the automobiles in Bangkok, and by the exhaust gas from thermal power plants and factories is pointed out.

And the water pollution due to domestic and industrial waste water, and the noise and vibration by automobiles and aeroplanes are noticed already.

Recently, the global environmental problems are presented¹⁾.

Since the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, the necessity for the international cooperation on environment is emphasized, in order to solve these problems.

The author engaged in the study on the air pollution in Keihin Industrial Area near Tokyo which was the largest one in Japan²⁾, and the administrative activities to control the environmental pollution due to the operation of the factories in this area as a researcher of the Industrial Research Institute of Kanagawa Prefecture located in Yokohama since 1953. After this age, the author continued the study on the environmental pollution in this area^{3~5)}.

Since 1982, the author visited Taiwan, Thailand, China, Indonesia and Korea, and discussed on the environmental pollution problems with governmental staffs in these countries and areas in order to research on these problems⁷⁾.

Furthermore, the author coordinated the

International Group Training Course on the air pollution control held by the Government of Japan and the Japan International Cooperation Agency (JICA). And from March 15, 1994 to March 31, 1996, the author had been staying in Thailand as member of JICA project team on the Environmental Research and Training Centre (ERTC).

So, the author reports in this paper on the environmental quality control and the international cooperation by Japan for the people in Thailand, based on the experience for about 43 years.

2. The Outline of the History on Environmental Quality Control in Japan^{8,9)}

After Meiji Restoration in 1868, according as the transfer of modern technologies from developed countries, Europe and the United States, Japanese industrializations were promoted, so the environmental pollution problems have been occurred.

For example, in 1875 the Government of Japan started the operation of the cement factory at Fukagawa Tokyo. The cement industry consist of the crushing, the mixing and the heating processes of rock and clay, then the dust dispersion problems were occurred. In 1903, Asano Cement Manufacturing Company Tokyo Factory taking over this governmental cement factory installed the rotary kiln imported from Allis-Chalmers Manufacturing Company in the United States, then large scale dust dispersion problem was occurred again. This episode was solved by the installation of the electrostatic precipitator imported from Western Precipitation Company in Los Angeles, the United States in

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1920, investigated by Professor Frederick, G. Cottrell in California University.

In Japan, first modern blast furnace was constructed and operated by Mr. Takatou Oushima at Kamaishi, Iwate in order to make steel in 1858.

And his technology was transferred to Yawata Steel Mill established in Yawata City in 1901. So, the people living in Kamaishi and Yawata could't avoid the environmental pollution problems by steel mill operations.

The constructions of seaside reclaimed land were promoted in Japan since very early, in order to operate large scale seaside industrial areas.

The location of large scale factories at reclaimed land is special character of Japanese industry. And four large seaside industrial areas called Keihin, Hanshin, Kita-Kyushyu and Chukyo were constructed until 1900's in Japan.

Then, the environmental pollution problems were presented due to the operations of steel mill and coal combustions facilities located in these industrial areas. For examples, on 23rd June 1938, Nippon Koukan Steel Making Company located in Keihin Industrial Area along seaside of Tokyo bay started the operation of Thoumas Converters. The iron oxide fume was exhausted from these converters into the atmosphere. This concentrated red smoke was noticed by many people.

This Thoumas Converter operated from 1938 to 1960's by the Nippon Koukan Steel Making Company is exhibited at Kawasaki City Museum in Todoroki-Ryokuchi Kawasaki City, Kanagawa Prefecture now. The Converter used for steel making has the same shape as a western pear. The melting pig iron, limestone as flux are charged from the open hole of converter top alternately, and air is blown from the pipe equipped at the bottom of converter. High temperature in converter is held by the chemical reaction heat between the pig iron and the oxygen in blown air. The impurities such as carbon, sulfur and silicon in pig iron are removed by the oxidation reaction in converter rapidly

and steel is refined.

In this period, large quantities of soot, dust and sulfurdioxide were exhausted from the other factories in industrial areas, because main energy source of these factories was the coal produced in Japanese coalpits that contained lot of tar, ash and sulfur. Figure 1 shows the energy supply in Japan since 1920.

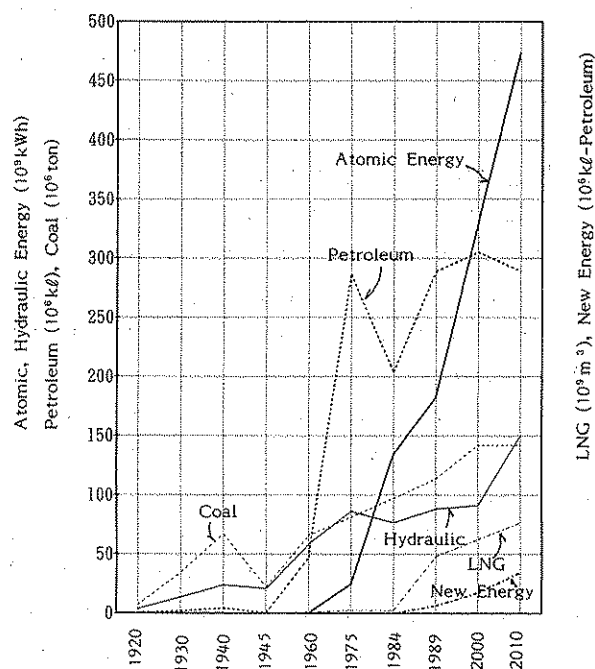


Fig. 1 The Energy Supply in Japan Since 1920

And Dr. Kujiyuro Fujiwara in 1922, and Dr. Kunitarou Arimoto in 1927 carried out their studies on the air pollution in Osaka and Tokyo City respectively.

In 1932, Osaka Prefectural Government established Ordinance of Regulation on Emission of Black Smoke and in 1937, Kanagawa Prefectural Government near Tokyo organized the Committee for Smoke Control respectively.

Furthermore, the water pollution near industrial areas were presented by the operation of factories located along seaside since 1920's.

According to the world war II, Japanese industrial systems had been destroyed, and the atmosphere over the cities or towns and the water of seas, lakes and rivers had become very clear in Japan.

Japanese had to reconstruct their industry

after the war. For example in Keihin Industrial Area, although Nippon Koukan Steel Making Company stopped their blast furnace operation in the end of 1945, immediately after the end of the war, the operations of the steel pipe making factories, the coke oven and the factory of chemicals were started again. Nippon Petroleum Company Yokohama Refinery started the treatment of material oil in October 1945.

Like this, the reconstructions of Japanese industries were promoted, so the environmental pollution problems were presented again.

The Yokohama Asthma was noticed as the health effect of air pollution.

It was the typical respiratory disease due to air pollution. This disease was found between the soldiers and their families of the United Nations Army stayed in Yokohama during 1940's~1950's.

And many studies and surveys on environmental pollution were started again in almost of industrial areas in Japan.

Tokyo Metropolitan and Osaka, Kanagawa and Fukuoka Prefectural Governments enacted the Industrial Pollution Control Ordinance Caused Factory Operation in 1949, 1950, 1951 and 1955 respectively.

In 1958, the serious troubles between the Honshyu Paper Mill Company Edogawa Factory in Tokyo and the fishermen in Urayasu Chiba were occurred, because the fishermen lost the fishing ground by the water pollution due to the waste water from this factory. And in same year, the water of Sakawa River in western part of Kanagawa Prefecture was contaminated by the waste water contained sodium cyanide from Fuji Film Ashigara Factory.

According to these situations, the Government of Japan established the Water Conservation Law in Public Waters and the Regulation Law for Waste Water from Factory in the end of 1958.

Since 1949, many researchers in local governments and universities promoted the study on air pollution, and asserted the necessity of establishment of Air Pollution Control Law. In

1962, the Government of Japan established the Smoke and Dust Emission Regulation Law, in concert with these requests.

Although these laws prescribed strong administrative competence to regulate the source of water and air pollutants, and gave the obligation on the operation of environmental monitoring systems for local governments, the situation of the environmental pollution in Japan became more violent, because high economic growth rate was promoted in this period.

The Minamata Disease due to the waste water contained mercury from Minamata Factory of Shin-Nihon Chisso was noticed widely in Japan¹⁰⁾.

The Minamata disease is a cranial nerve disease due to alky-mercury compounds.

And the people lived in Niigata in Japan¹⁰⁾ and Chiirin in China¹¹⁾ were fallen same disease.

The technologies of the countermeasures for environmental pollution were developed in Japan. For example, the investigation of Limestone-Gypsum desulfurization process for the exhaust gas from combustion facilities and chemical plants was carried out by professor Keiichi Murakami and professor Shouichiro Hori in Faculty of Engineering, Tohoku University in 1954.

And the Government of Japan established the Basic Law on Environmental Pollution Control in 1967 and the Air Pollution Control Law in 1968.

In 1970, the environmental pollution provoked many people in Japan. The 64th Special Session of the Diet was held in this year and 14 bills on the environmental pollution control passed in this session.

Also, before this session, the Prime Minister Eisaku Sato has told that high economic growth rate has to be denied, if we have no strong environmental control policies at Public Hearing on Government held in Utsunomiya City.

The Environment Agency (EA) was established in the end of June 1971.

And EA enacted the regulations of total pollutant emission for Sulfur dioxide (SO_2),

Nitrogenoxides (NOx) for air pollution control, Chemical Oxygen Demands (COD) for water pollution control, and promoted the regulation for the automobile exhaust gas.

The local governments inspected the factories caused environmental pollution and operated the environmental monitoring systems in order to improve the environmental pollution in Japan. Many institutes on environmental study were established by the local governments, in order to promote the study, survey and monitoring for the administration on environmental pollution control since 1968.

And then, National Environmental Training Institute (NETI) and National Institute for Environmental Studies (NIES) were established by EA at Tokorozawa and Tsukuba in 1972 and 1974 respectively.

National Institute of Pollution and Resources belonged to Ministry of International Trade and Industry (MITI) started the study on the environmental pollution control technologies since 1960's.

The enterprises operated the factories improved the production process management and installed the pollution control equipments such as desulfurization plant and waste water treatment facility, in order to improve the environmental pollution.

The Organization for Economic Cooperation and Development (OECD) reported that the environmental pollution in Japan has been improved already in 1976.

Like this in Japan, environmental control technologies were developed very widely since 1970 and many researchers and engineers were grown up already.

Furthermore, the many academic and technical societies on environment were established in order to discuss on the environmental science and technology.

For example, trend on the number of general reports in Annual Meeting of Japan Society for Atmospheric Environment that is the oldest academic society on environmental pollution in Japan is shown in Figure 2.

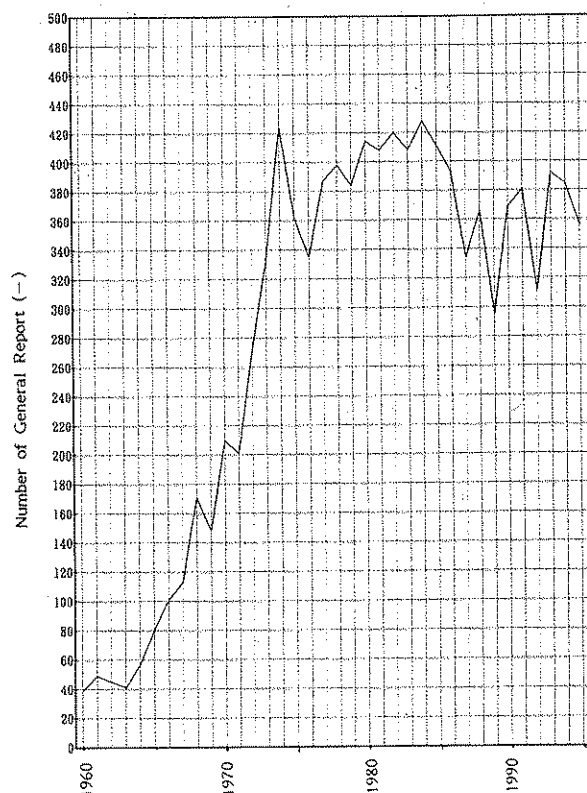


Fig. 2 The Trend on the Number of General Report in Annual Meeting of Japan Society for Atmospheric Environment

And the opinions that the international cooperation on environment has to be promoted are spreading. The Government of Japan has many Official Development Assistance (ODA) plan, and try to promote new ODA plan on environment especially. EA established Global Environmental Fund in order to promote the international cooperation on the environment by the Non Governmental Organization (NGO) in 1993.

3. The International Cooperation on Environment by Government of Japan

The Government of Japan has promoted the international cooperation on technology by the activities of JICA. JICA has many kinds of activities about the international cooperation, such as the dispatch of experts, the training of engineers and the grant aid of instruments or facilities for the developing countries. And these activities have been promoted as combination of its two or three other items frequently.

3.1 The Technical Cooperation on Environment in Thailand

3.1.1 Outline

In Thailand, many JICA-experts on environment are dispatched now as shown in Table 1. In Table 1, the individual dispatch is the system that one expert is dispatched to the one organization on one subject individually, and the dispatch to international organization is same. These experts in Thailand are dispatched to Bangkok Metropolitan Administration (BMA), Asian Institute of Technology (AIT), and the United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) as shown in Table 1.

solve the environmental pollution, it is not easy to grow up the environmental researchers and engineers for this activity. So, the Government of Thailand had a plan to promote the environmental study and training of the environmental engineers.

And they requested the technical cooperation for the establishment and management of the institute to research on environmental pollution and to train the environmental engineers to the Government of Japan in 1983, because Japan had many experiences on these problems as mentioned above.

In 1985, the Minister of Science, Technology and Energy in Thailand and the Vice

Table 1 List of JICA-Experts on Environmental Pollution in Thailand

Individual Dispatch		Number of Expert	Organization
	Solid Waste Management	2	BMA
	Sewage Planning	1	BMA
Dispatch to International Organization			
	Environmental Engineering	2	AIT
	Environmental Control	1	ESCAP
Project Type Technical Cooperation			
	Environmental Study	1	ERTC
	Air Pollution	1	ERTC
	Water Pollution	1	ERTC
	Toxic Substances	1	ERTC
	Noise & Vibration	1	ERTC
	Others	2	ERTC
	Chemical Analysis of Water	1	TCSW
	Others	4	TCSW
Total		18	

And the project type technical cooperation is system that organizing the technical cooperation project team, the experts in team are dispatched under the project. In Thailand, the technical cooperation project team for ERTC, and Training Center for Sewage Works (TCSW) are organized and managed now.

3.1.2 ERTC-Technical Cooperation Project^{1) 12~14)}

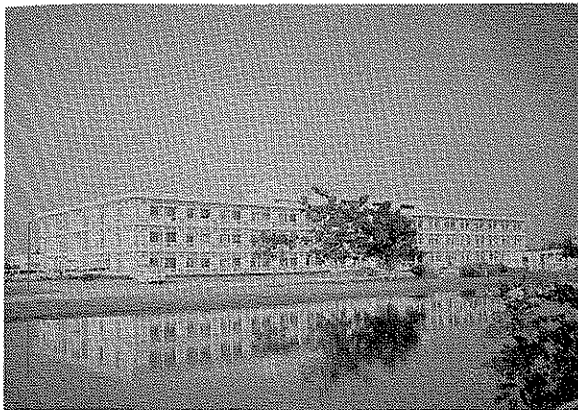
Although the Government of Thailand established National Environment Board (NEB) and Office of the National Environment Board (ONEB) in 1975, and promoted the environmental administration, in order to

Minister of Environment Agency in Japan met in Bangkok, and they agreed the promotion of this project.

Since 1985, the Government of Japan has dispatched many JICA-missions and experts on environment in order to establish this organization.

In this case, requested organization has been called Environmental Research and Training Centre (ERTC) already. The building of ERTC was constructed at Technopolis in Pathumthani province near Bangkok as shown in Photograph 1, and the instruments for study, research and training were installed in 1991 by grant aid from

the Government of Japan.

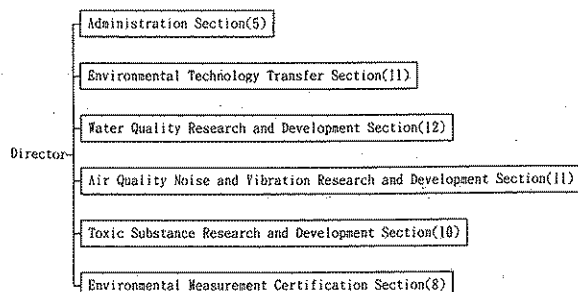


Photograph 1 Appearance of Environmental Research and Training Centre (ERTC) in Thailand

In March 1992, the opening ceremony of ERTC was held, and activity of JICA-project team on this institute since 1990 started at this new building.

This project team was consisted of chief advisor, senior advisor, experts of air pollution, water pollution, noise and vibration, toxic substances and coordinator. They played roles as adviser on the promotion of the environmental study, research and survey in ERTC. Members of JICA-project team cooperated to the technical transfer and management of ERTC activities.

The organization of ERTC is shown in Figure 3. And 58 permanent staffs and 62 temporary staffs are working now.



The number in () is the number of permanent staffs in each section

Fig. 3 Organization of ERTC in Thailand

The study themes of ERTC are as follows, Study on the polycyclic aromatic hydrocarbons (PAHs) in the atmosphere, Study on the

acid rain in Thailand, Hydrocarbons in the automobile exhaust gas, The prediction method of automobile traffic noise, Treatment technology for the domestic waste water, Ground water contamination due to arsenic mine activities, The environmental pollution due to pesticides and Monitoring method on environment in Pathumthani province.

The researchers have analyzed many test samples on the environmental pollution such as river water, sediment and soil sent from the Department of Pollution Control, Ministry of Science, Technology and Environment (DPC-MOSTE).

And, they have reported their study results at the meetings of academic societies and the academic journals^{15~17)}.

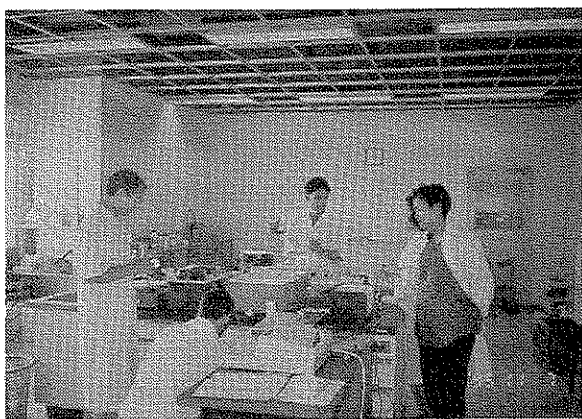
Environmental Technology Transfer Section holds 15 training courses on the environment in one fiscal year, in order to help growing up the environmental engineers in Thailand. Recently, they hold training courses on environment for the environmental engineer in ASEAN and Indo-China countries.

The examples of ERTC activities are shown in Photograph 2~4.

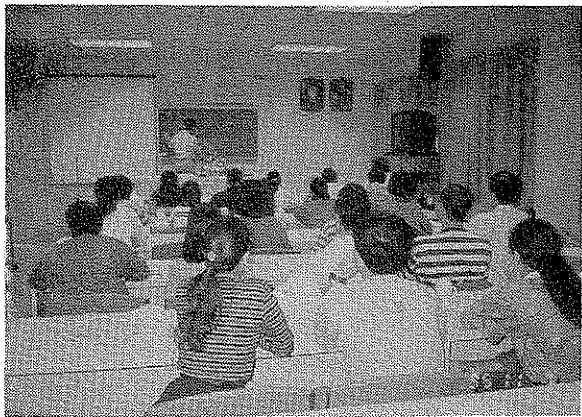
Like description in the country report on Thailand in UNCED¹⁾, ERTC may develop as the national institute for the environmental studies and for the development of human resources on environment in Thailand.



Photograph 2 Gas Chromatograph Mass Spectrometer in ERTC



Photograph 3 Training Courses (Experiment) in ERTC



Photograph 4 Training Courses (Lecture) in ERTC

3.2 The Outline of Technical Cooperation on Environment in Other Countries

After the request to ERTC by the Government of Thailand, the governments of many developing countries requested the establishment of same organization to the Government of Japan.

According to these requests, the Government of Japan established "Environmental Management Centre" in Indonesia, "Japan-China Friendship Environmental Protection Centre", "Research Centre for Waste Water Treatment" and "Water-Recycling Center" in China, "Environment Centre", and "Resources and Environment Training Centre" in Chile already.

And the individual experts on environment pollution control are dispatched to Bangladesh, Indonesia, Korea, Malaysia, Sri Lanka, Egypt,

Jordan, and Paraguay respectively.

3.3 The Training on Environment by JICA

3.3.1 The Group Training Courses on Environment

The group training courses on environment have been held as JICA-activities.

And these are coordinated by many organization in Japan.

For example, Japan Environmental Sanitation Center (JESC) in Kawasaki City that is NGO to research and survey on environment authorized by the Ministry of Health and Welfare and the Environment Agency coordinates 3 group training courses and 1 seminar on environment.

Namely, in 1995 JESC has coordinated Group Training Course in Solid Waste Management and Night Soil Treatment, Group Training Courses in Environmental Engineering (Air pollution Control), Group Training Course in Environmental Policy and Seminar on Promotion of Ozone Layer Protection.

And about 10 trainees from developing countries have participated one group training course or seminar usually.

The trainees in these courses participate lectures, practical experiments and field observations and study tours during 1~3 months.

For example, the curriculum of Group Training Course in Environmental Engineering (Air pollution Control) is shown in Table 2¹⁸⁾.

3.3.2 Training of Counterpart of Technical Cooperation Project on Environment

The counterparts of JICA-project can visit and stay in Japan as trainees on some subjects. For example in JICA-project on ERTC, 3 counterparts were staying in Japan in order to study on environmental technology in 1995.

In this project, 30 researchers have visited Japan in order to participate in this training of counterpart already. And many organizations in Japan cooperate with JICA for this activity on many projects.

Table 2 Curriculum of "Group Training Courses in Environmental Engineering (Air Pollution Control)"

1) Introduction
a) Opening Ceremony and Curriculum
b) Environmental Pollution Issues in Japan
2) Administration
a) Air Pollution Control Administration
b) Ambient Air Quality Standards
c) Emission Standards
d) Automotive Exhaust Gas Emission Control
e) Offensive Odor Gas Emission Control
f) Air Pollution Control Administration by Local Government
3) Principles of Air Pollution
a) Transport and Diffusion Theory
b) Photochemical Air Pollution
c) Global Air Pollution Problems
4) Planning for Air Pollution Control
a) Pollution Control Investment by Private Sector
b) Emission Reduction Technology-Cost and Benefit
5) Measurement and Assessment
a) Techniques for Measurement of Air Pollution
b) Malodor Measurement Technology
※ a) and b) for Laboratory work at JESC
c) Environmental Impact Assessment
d) Case Study of Technical Cooperation for Developing Countries in the Field of Air Pollution
e) Introduction of Technical Cooperation by JICA
6) Comprehensive Study
◆ Presentation by Trainees of the Status of Air Pollution Control in their Countries
7) Field Observation and Study Tour
◆ Environment Agency, NIES
◆ Local Government, Local Environmental Institute
◆ Private Sector (Steel Mill, Thermal Power Plant etc.)
8) Closing

3.4 Developing Study on Environment

Since 1980's, the Government of Japan promoted the developing study on the environment in developing countries as JICA activity in order to make the environmental pollution control master plan.

In Thailand, Master Plan of Sewage Construction in Bangkok, Plan for Energy Saving in Thailand and Air Pollution Control Plan in Samut Prakarn Industrial Area near Bangkok were settled on already.

Since 1994, developing study projects on

the Environmental Management Plan in Bangkok Metropolitan Area are promoted now. And in another countries, Air Pollution Control Plans in Ankara and Shanghai, and Water Pollution Control Plan of Dahu lake near Shanghai etc. were settled on already.

3.5 The Outline of International Cooperation on Environment by Yen Loan¹⁹⁾

The Oversea Economic Cooperation Fund (OECF) has been established by the Government of Japan, in order to assist the

developing countries by supplying low-interest and long-term loans.

OECF has promoted the international cooperation for the construction of economic infrastructure, transportation system, and electric power plant etc. in developing countries by Yen Loan, considering environmental protection. OECF has promoted another environmental control projects such as the installation of desulfurization plant for heavy oil at petroleum refinery in Mexico, the construction of sewage systems and waste disposal in China, India, Indonesia and Korea, the installation of desulfurization plant for exhaust gas from thermal power plant, managements of Environmental Protection Promotion Program and Environmental Fund Project in Thailand etc.,

4. The International Cooperation on Environment by Another Organizations

The international cooperation on environment has been promoted by another organizations such as local governments, academic societies, enterprises and another non-governmental organizations.

For example, Kanagawa Prefectural Government has training course for the environmental researchers belong to Liaoning Province in China since 1983.

Yokohama City is promoting the study on air pollution in Bangkok now.

And Japan Society for Atmospheric Environment⁹⁾ has continued to open the academic meetings on study of air pollution with scientists in Asian countries.

Many enterprises have cooperated to JICA activities on environment.

The activities on the international cooperation on environment by many NGOs are accelerated by the Global Environmental Fund.

5. Final Remarks

The author has referred to the outline of

environmental pollution control and the international cooperation on this problems in Japan.

The environmental pollution problems are considered as one of the restrictions of human development. And necessity of international cooperation on environment is emphasized now. But the author thinks that there are many problems to promote this.

This paper is the outline of the author's lecture in the seminar of the "Development, Environment and Human Resources Development" held by Government of Japan at Technopolis, Suranaree University of Technology, Nakorn Ratchasima, Thailand on December 1995 during the period of Worldech'95²⁰⁾.

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環境保全と国際協力—タイ国民への語りかけ

財団法人 日本環境衛生センター 氷見康二

本報告では、わが国における環境汚染問題の歴史の概要を述べ、これが、長期にわたる技術開発と環境行政の展開により克服されたことを紹介した。そして、わが国に環境保全に関する技術的蓄積があり、人材が育成されていることを説いた。そのうえで、現在強調されている環境国際協力について、著者が2年間従事したタイ王国環境研究研修センターの状況を紹介し、わが国の環境国際協力における無償資金協力、技術者養成研修、開発調査、円借款、NGO活動などにつき概説した。