

Seminar activities in 1995-1996 (Air Pollution and Noise Section)

Item	Place	Year
1. The Simple Measuring and Evaluation Method on Air Pollution	Princess Hotel (Bangkok)	24-26 Jan., 1995
2. Technique of noise measurement	ERTC	16 Jan., 1996
3. Noise Prediction Model for Road Traffic Noise	ERTC	23 Jan., 1996
4. Sensitivity to acid deposition : Mapping validation (International)	ERTC	10-12 April, 1996
5 Urban Environment and Sound	BMA	27 Nov, 1996

Technical Advices (Noise) in 1995-1996

Training Course	Technical Field	Trainer	Year
1. Noise Pollution	◆ Noise monitoring for traffic	◆ Thanapan Uteian	1995
2. Noise Pollution	◆ Noise monitoring for factory	◆ Thanapan Nattapong Virat Thanavut	1996
3. Environmental Impact Assessment	◆ Noise monitoring for Environment	- ditto-	1996
4. Environmental Monitoring System	◆ Noise monitoring in Airport	- ditto-	1996
5. Noise Pollution	◆ Noise monitoring for factory	- ditto-	1996
6 University Students	◆ Technique of noise measurement	- ditto	1995-1996

Technical Advice (Air Pollution) in 1995-1996

Training Course	Technical Field	Trainer	Year
1. The 2 nd ASNEM Workshop	♦ Technique on Sampling and Analysis of SO ₂ in Ambient Air	♦ Hathairatana	1995
	♦ Technique on Sampling and Analysis of NO _x in Ambient Air	♦ Dusanee	
		♦ Wanna	1995
2. The 3 rd ASNEM Workshop	♦ Technique on PAHs Sampling in airborne particulate	♦ Hathairatana	26 Feb.-6 Mar. 1996
	♦ Technique on PAHs Analysis in airborne particulate	♦ Wanna	26 Feb.- 6 Mar. 1996

Training Course	Technical Field	Trainer	Year
3. The Measuring Methods of the Concentration of the Air Pollution in Flue Gas	<ul style="list-style-type: none"> ◆ Technique on Determination of NO_x in Flue Gas ◆ Technique on Determination of SO₂ in Flue Gas 	<ul style="list-style-type: none"> ◆ Wanna ◆ Hathairatana ◆ Teeranuth 	19-23 Aug. 1996 19-23 Aug. 1996
4. Training Individual	◆ Technique on Determination of Hydrocarbons Composition of 4-stroke Gasoline Engine Exhaust Gas	◆ Wanna	1996
5. University Student	◆ Technique for air pollutant analysis	<ul style="list-style-type: none"> ◆ Wanna ◆ Teeranuth ◆ Dusanee ◆ Veerathep ◆ Pornchai 	1995-1996

ASNEM activities

Item	Place	Year
1. The 2 nd ASNEM Workshop : Air Pollution Monitoring and Analysis	ERTC	20-28 Feb., 1995
2. The 3 rd ASNEM Workshop : Air Pollution Monitoring and Analysis with emphasis on PAHs	ERTC	27 Feb.-5 Mar., 1996
3. The 4 th ASNEM Workshop : Air Pollution Monitoring and Analysis with emphasis on Acidic Deposition	ERTC	24 Feb.-5 Mar., 1997

Requirements for Noise and Vibration Project

- I. 1 long-term expert (2 years) for noise and vibration (to be the advisor of 3 new projects).
 1. **Effect of noise to human health in Bangkok area.** (Thanaphan)
 2. **Influence of noise to communication.** (Nattapong)
 3. **Study on road traffic and construction vibration.** (Thanawut)

- II. 2 short-term experts (3 months)
 1. **Vibration prediction model and vibration control technology**
 2. **Determination of human hearing ability**

- III. Equipments
 1. **Noise Dose Meter**
 2. **Audiological Test Equipment**

Requirement for Air Pollution Projects.

I. Short term experts

1. Measurement of offensive odor. (6 Month)
2. Study on chemical state of aerosol in tropical urban environment (1998). (3 Month)
3. Study on acidic deposition in Thailand (Data analysis) (3 Month)

II. Equipments

1. Automatic Meteorological Box
2. Automatic Rain Volume Recorder
3. Solar Detection meter

Future Plan for Air Pollution Project (1997-1999)

Theme	Objective	Procedure	Work Plan	
			1997	1998 1999
<p>1. A Study on Air Pollution by Airborne Polycyclic Aromatic Hydrocarbons (PAHs) in a Tropical Urban Atmosphere : A case Study in a Bangkok urban area</p>	<p>To evaluate profiles and distribution Characteristic of PAHs airborne particulate in a tropical urban environment and demonstrate the relative importance of source contribution of these pollutants in that area.</p>	<p>Estimation of source contribution of PAH airborne particulate pollution in Bangkok urban area: - data collection - Analysis of chemical components contained in particulate matter - Source apportionment of SPM at the selected site by FA-MR model - Data evaluation and report writing</p>	<p>← -- →</p>	

Future Plan for Air Pollution Project (1997-1999)

Theme	Objective	Procedure	Work Plan		
			1997	1998	1999
2. Study on Acidic Deposition in Thailand	<ol style="list-style-type: none"> 1. To increase the knowledge of acidic deposition in Thailand 2. To improve quantitative measure of the deposition fluxes and their temporal and spatial variation 	<ul style="list-style-type: none"> - Sampling of rain water and aerosol - Analysis of chemical Composition in rain water - Dissertation and Technical paper writing 	←	→	
3. Critical Loads (CL) of Sulfur in the Northern Part of Thailand	<ol style="list-style-type: none"> 1. To collect prerequisite data in the northern part of Thailand for calculation of critical loads of sulfur 2. To calculate the critical loads and exceedance of sulfur at the level of sensitive ecosystem damage of 5 percentile 3. To provide and express results of these calculations in term of GIS maps for the study area 	<ul style="list-style-type: none"> - Selection of Pollutant - Selection of receptors - Identification of indicators - Selection of computation approach - Choosing of scale for research 	←	→	

Future Plan for Air Pollution Project (1997-1999)

Theme	Objective	Procedure	Work Plan	
			1997	1998 1999
<p>4. Atmospheric behavior and fate of aerosols in tropical environment</p>	<p>4. To determine and identify sensitive receptors and location where abatement strategies would be implement to reduce environmental impacts of acidification on forest and agriculture</p> <p>To study the transport and transformation such as the aging process, chemical reaction and "aerodynamic elusion" mechanism of an aerosol in the tropical environment</p> <p>Expected outcome :</p> <p>The research outcome could be used as a reference for the assessment of the air pollution due to the toxic substances present in this area as well as the establishment of control strategies to mitigate the adverse health and environmental effects of those toxic substances in the future.</p>	<ul style="list-style-type: none"> - Collection of input data - Calculation of CL of sulfur and their exceedances - Literature review and survey for the selection of studied area. - Preliminary study - Sampling and Analysis - Data evaluation and report writing 		

Work plan

Noise & Vibration Sub-section

Research Theme	Objectives	Procedure framework	1997	1998	1999
1. Road Traffic Noise Prediction model for elevated road		<ul style="list-style-type: none"> -Measurement of Correction Value from noise barrier and road structure -Making a Road Traffic Noise Prediction Model for elevated road -Measurement of noise level (Leq) for 500 data at the height of 1.2 m. from ground surface and comparing with predicted noise level -Data analysis and program development -Checking the accuracy of Precision Model for elevated road at the point higher than 1.2 m. for 500 data and comparing with predicted noise level -Data analysis and program development -Report 	↑		
2. Development of Factory Noise Prediction Model		<ul style="list-style-type: none"> -Collecting noise data from various factories -Data analysis -Making a Factory Noise Model -Checking the accuracy of the prediction model -Data analysis and model development -Report 	↑		
3. Development of Aircraft Noise Prediction Model		<ul style="list-style-type: none"> -Measurement of aircraft noise level -Data analysis and making an Aircraft Noise Prediction Model -Checking the accuracy of the model -Model Modification -Report 	↑		
4. Environmental Noise Measurement in Bangkok		<ul style="list-style-type: none"> -Measurement of noise levels (Leq) in Bangkok Metropolitan area -Data analysis -Making noise level map of Bangkok -Report 	↑		
5. Effect of Noise to Human Health in Bangkok Area	<ul style="list-style-type: none"> -To study effect of noise to human health emphasis on hearing ability/loss of people in Bangkok 	<ul style="list-style-type: none"> -Literature review -Coordinate with other organizations in research co-operation -Hearing ability/loss testing of persons sampling from various occupations in sound laboratory -Data analysis/evaluation -Report 		↑	

Noise & Vibration Sub-section(continue)

Research Theme	Objectives	Procedure framework	1997	1998	1999
6. Influence of Noise to Communication	-To study influence of noise to communication by determining Preferred Speech Interference Level, PSIL	-Literature review -Coordinate with other organizations in research co-operation -Measurement of PSIL in classrooms located along main roads and etc. -Data analysis/evaluation -Report		↑	
7. Study on Road Traffic Vibration	-To study vibration pattern of road traffic vibration and make a road traffic vibration model	-Literature review -Field survey, measurement of vibration levels along main roads -Data analysis and making a road traffic vibration model -Checking the accuracy of the model by sampling data and compare to predicted vibration level -Data analysis and model development -Report		↑	

(8) 有害物質課：実績・将来計画

Hazardous Substances Research and Technology Development Section

Technical Advice in 1995-1996

Training Course	Technical field	Trainer	Year
1. Toxic substance analysis (Organophosphorus pesticide)	<ul style="list-style-type: none"> - Introduction - Situation and trend of toxic chemicals (organophosphorus pesticide) in Thailand. -Technique on sampling and analysis of organophosphorus residue in soil samples, water samples and agricultural products. 	Ms. Sukanya Ms. Sakanya Mr. Panomporn	1995
2. Toxic substance analysis (Organochlorine pesticide)	<ul style="list-style-type: none"> - Technique on sampling and preservation (soil, water, agricultural product etc.) - Technique on analysis of organochlorine pesticide in water and biological samples 	Ms. Sukanya Mr. Panomporn Ms. Ruchaya	1995,1996
3. Basic analysis of heavy metals	<ul style="list-style-type: none"> -Technique on sampling and preservation. 	Mr. Janewit	1995,1996

Hazardous Substances Research and Technology Development Section

Term of Research Oct 1994 - Sept 1996

Theme of Research	Researcher	JICA expert	out come	Publication
<p>1. Study on the distribution of polycyclic Aromatic Hydrocarbons (PAHs) in water resources of urban and industrial areas.</p> <p>Objectives</p> <p>1. To get the analytical techniques (including sampling and preparation) for PAHs in water and sediment samples.</p> <p>2. To get the data of PAHs concentration in the water resources of urban and industrial area of country.</p>	<p>1. Ms. Vanvimol P. 2. Ms. Chuappit B.</p>	Mr. Hoshino II.	<p>1. Determine the appropriate analytical method and set up equipment condition for PAHs analysis by using standard reagent.</p> <p>2. To Obtain the present situation of PAHs contamination in the environment of country and the data information from this research can be used for setting up policy and strategies for controlling and solving PAHs problems in the country.</p>	

Theme of Research	Researcher	JICA expert	out come	Publication
<p>2. Monitoring on toxic chemical residues in the Gulf of Thailand by using Green Mussel (<i>Perna viridis</i>).</p> <p>Objective</p> <p>To evaluate the situation of toxic chemical residues (heavy metals and pesticides) in green mussels from the gulf of Thailand and the source of these chemicals distribution as well as to develop the appropriate methodology for biological analysis.</p>	<p>Ms.Sukanya B.</p> <p>Ms.Ruchaya B.</p> <p>Mr.Sutiab S.</p> <p>Ms.Areerat J.</p>		<p>Obtained the situation of toxic chemical residue in the coastal areas by using green mussel as indicator.</p> <p>The data information from this research has been used for policy maker to set up policy and strategies for preventing and controlling the toxic chemical distribution in the coastal area as well as for international cooperation on monitoring research training and information exchange under mussel watch project.</p>	<p>Paper "Concentration of Organochlorine Pesticide residues in green mussels (<i>Perna viridis</i>) from gulf of Thailand" and paper "Monitoring on heavy metal residues in the gulf of Thailand by using green mussel" are under preparing for publishing.</p>

Theme of Research	Researcher	JICA expert	Outcome	Publication
<p>3. Study the arsenic residue in Pak-panang bay by using biological sample.</p> <p>Objective</p> <p>To monitor and evaluate the situation of arsenic contamination in Pak-panang bay and the possible influence of long term arsenic in put from the upstream of Pak pa-nang river to the marine environment of this bay.</p>	<p>Ms.Sukanya B.</p> <p>Mr.Janewit W.</p> <p>Mr.Sutiab S.</p>	<p>Mr. Fukuda M.</p>	<p>1. Obtained the present situation of Arsenic residues in Pak Panang bay since this data information is very useful for both local and central government offices to set up strategies and plan for controlling and solving the arsenic contamination in that area.</p> <p>2. Obtained the suitable biological index for Arsenic residue monitoring.</p> <p>3. Developed the arsenic analysis method on water, sediment and biological samples.</p>	<p>Paper "A study of arsenic contamination in Pak panang bay Nakorn Srinangraj province, Thailand" was presented and Published in the proceeding of EOPC on ASEAN marine science conference in Penang Malaysia 24-28 June 1996.</p>

Theme of Research	Researcher	JICA expert	out come	Publication
<p>4. Development analytical method of organochlorine pesticides by using micro-extraction technique.</p> <p>Objective</p> <p>To develop the methodology of organochlorine pesticides analysis in water sample by using microextraction technique which can be reduce chemical solvent glassware and time consume.</p>	<p>1. Ms.Ruchaya B. 2. Ms.Areerat J.</p>		<p>Obtained the simple technique for analyst 22 organochlorine pesticide compounds in water samples. This technique can be applied to use instead of ordinary method for improving efficiency of water quality monitoring in the future due to the need of shortest time, small amount of chemical solvent and minimal glassware.</p>	<p>Paper "Development of recovery factor for analysis of organochlorine pesticides in water sample by using micro-extraction technique" was present in Florida USA.. 4-5 september 1996.</p>

Theme of Research	Researcher	JICA expert	out come	Publication
<p>5. Studied on pesticide residues in the agricultural area.</p> <p>Objective</p> <p>To evaluate the situation of pesticide residues in agricultural products and environment and develop the appropriate methodology for pesticide monitoring and analysis.</p>	<p>Ms. Sukanya B.</p> <p>Mr. Sutiab S.</p> <p>Mr. Panomporn V.</p>		<p>Obtained the situation of pesticide contamination in the agricultural product and environment. The data information will be informed to policy maker for setting up policy and strategies to control and solve the problem of agricultural chemical in the country.</p>	

Paper ที่ได้เคยเสนอในการประชุมและได้รับการตีพิมพ์ด้วยของฝ่ายสารพิษฯ

1. " A Study of arsenic contamination in Pak Pa-Nang bay Nakorn Sri - Tammaraj province, Thailand " presented in EOPC conference on ASEAN Marine Environment Management in Penang Malaysia, June 24-28 ,1996.
2. "Development of recovery factor for analysis of organochlorine pesticides in water sample by using micro-extraction technigue" presented in florida USA, 4-5 September 1996.
3. "Concentration of organochlorine in the Chao Phraya river , Thailand " *Journal of Environmental chemistry Vol.6.No2. pp195-201, 1996.*
4. "Study on lead residue from battery factory in Pathumthani province by using hair samples" (in Thai) presented and published in proceeding of the seminar on the role of ERTC in the environmental quality development 1995.
7. "Development of quatification methodology for polychlorinated biphenyls by using Kanechlor products as the secondary reference standard" Published in *Fresenius Journal Analytical Chemistry, 1995.*
8. "Distribution of Organochlorine Pesticides in the Chao Phraya river, Thailand" presented in Fifth symposium on our Environment at Singapore on June 8, 1995.

Paper อยู่ระหว่างการจัดเตรียมตีพิมพ์เพื่อถามขอแพร่

5. "Concentration of organochlorine pesticide residues in green mussels (*Perna yiridis*) from the gulf of Thailand" under preparing for publishing
6. "Monitoring of heavy metal residues in the gulf of Thailand by using green mussel" under preparing for publishing

Hazardous Substance Research and Technology Development Section

Future plan

Theme	Objectives	Activities	Work plan		
			1996	1997	1998
1. Environmental Management Planning survey for Arsenic contaminated area of Nakorn Sri-Tammaraj Province, Thailand.	<ul style="list-style-type: none"> - To identify / characterize contaminant source and design the most feasible solution for treatment arsenic contamination. - To relief the people from risk of further arsenic poisoning by controlling arsenic contamination and providing safe water source. 	<ol style="list-style-type: none"> 1. Contaminant source identification/characterization study, such as geological investigation of tin ore, mining activities, surface soil geochemical survey, high density hydrogeochemical survey, evaluation of relative importance of sources to human health etc. 2. Contaminant distribution study such as groundwater study, geophysical resistivity survey, regional surface soil geochemical survey. 3. Contaminant movement and forecasting study such as hydrogeological study, water balance study, regional river/stream study etc. 4. Remedial countermeasure design and planning study, such as contaminant source remedial design, contaminated ground water plane control design, contaminated water treatment design, and economic evaluation. 5. Alternation water sample planning study such as deep aquifer development design, etc. 	↕	↕	↕

Theme	Objectives	Activities	Work plan	
			1997	1998
2. Study on the distribution of Polycyclic Aromatic Hydrocarbons (PAHs) in water resources of urban and industrial areas.	<ol style="list-style-type: none"> 1. To get the analytical techniques for PAHs in water and sediment samples. 2. To get the data about PAHs concentrations in the water resources in Thailand. 	<ol style="list-style-type: none"> 1. Sample collection (water and sediment) in hot and rainy season. <ul style="list-style-type: none"> - Bangkok city (Chao Phraya River) and major cities such as Chaing Mai (Ping River) Khon Kaen (Chi River) and Songkla (Songkla lake). - Industrial areas (Laem Cha Bang industrial Sector, Chon Buri and Maab-Ta-Pud industrial sector, Rayong). 2. Quality and quantity analysis of samples and data analysis. 3. Data evaluation and report. 4. If the result shows high concentration the further study will extend and concentrate on contamination of PAHs into food chain. 	<p>↕</p> <p>↕</p> <p>↕</p> <p>↕</p>	<p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p>

Theme	Objectives	Activities	Work plan			
			1997	1998	1999	2000
3. Monitoring on toxic chemical residues in coastal areas of Thailand by using green mussel (<i>Perna viridis</i>).	<ol style="list-style-type: none"> 1. Monitor and evaluate the situation of toxic chemical residues in green mussel from coastal areas of the country. 2. To develop the appropriate methodology for monitoring and analysis. 	<ol style="list-style-type: none"> 1. Survey and collect samples (green mussel and sediment) along the coastal area of the country. 2. Sample analysis for pesticide and heavy metal. 3. Data analysis and report. 	↔			↔
			↔			↔
			↔			↔

Theme	Objectives	Activities	Work plan					
			1997	1998	1999	2000	2001	
4. Monitoring on pesticide residues in agricultural area.	<p>1. To monitor and evaluate the situation of pesticide residues in agricultural product and environment.</p> <p>2. To develop appropriate methodology for pesticide residue analysis and monitoring.</p> <p>3. To submit data information for policy maker to set up policies and strategies for protecting environmental quality and pesticide management of country.</p> <p>4. To exchange information with international organization.</p>	<p>1. Literature review and collecting background information from related organizations.</p> <p>2. field observation and collecting samples in each region of the countries northern part north eastern part central part eastern part southern part</p> <p>3. Sample analysis.</p> <p>4. data analysis.</p> <p>5. report.</p>	↑					

Theme	Objectives	Activities	Work plan	
			1997	1998
5. Development of analytical method of Polycyclic Aromatic Hydrocarbons (PAHs) in sediment sample.	To develop analytical method of PAHs in sediment sample by using GC/MS.	<ol style="list-style-type: none"> 1. review method and plan for PAHs analysis. 2. order PAHs standard. 3. Check the instrument and glassware for analysis. 4. determine GC condition for PAHs standard. 5. spike recovery test (QA & QC by using SRM and CRM). 6. Data analysis and report. 	<p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p>	<p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p> <p>↔</p>

Theme	Objectives	Activities	Work plan		
			1998	1999	2000
6. Toxicity test of environmental pollutants on aquatic organisms.	<ol style="list-style-type: none"> 1. Toxicity test of each kinds of toxic substances on aquatic organisms. 2. Toxicity test of toxic substances existing together in aquatic organisms. 3. Study on behavior of aquatic organisms in water resource which contaminated by toxic substance for both short time and long time effect. 	<ol style="list-style-type: none"> 1. Literature review and select the appropriated method. 2. Set up equipment and laboratory. 3. Study the related information of aquatic organisms. 4. Select aquatic organisms for toxicity test. 5. Breeding the selected organisms which will be used for study. 6. Toxicity test of toxic substances to aquatic organisms. 7. Data evaluation and report. 	↑	↕	↕

Short term expert requires to transfer toxicity technology and set up laboratory.

Theme	Objectives	Activities	Work plan	
			1998	1999
7. Development on characterization analysis of solid waste from industry plants.	1. To analysis characterized of solid waste from industry plant process of production (such as canning marine product) in order to develop waste treatment plant and appropriate waste management.	<ul style="list-style-type: none"> - Survey and collect basic data informations related to food industry. - Select the factory for study. - Sampling the waste from the process of production. - Sample preparation and analysis for characterization of waste. - interview progress Report. - Data analysis and preparing final report. - Final Report. 	<p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p>	<p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p> <p style="text-align: center;">↔</p>

Long term expert requires for sampling technique, waste characterization, analysis technique and data analysis.

Theme	Objectives	Activities	Work plan			
			Work plan	1996	1997	1998
8. Study on the role of Sulfur bacteria in polluted water	To study the role of sulfur bacteria in two biochemical pathways of sulfur reducing bacteria as well as sulfur oxidizing bacteria, the result will be useful as a application of treating the extremely polluted water especially in anaerobic condition.	<p>1. The sulfur bacteria will be isolated from water and sediment in terms of quality and quantity by agar plate count techniques in anaerobic condition.</p> <p>2. The sulfur bacteria will be isolated from water and sediment in terms of quality and quantity by agar plate count techniques in aerobic condition.</p> <p>3. Taxonomy and Identification of the both isolated bacteria according to Bergey Determination method.</p> <p>4. Study and purify some useful sulfur bacteria which will be able to modify the compound of sulfide precipitation.</p> <p>5. The most efficiency isolated sulfur bacteria will be introduced to find the method of decreasing the level of pollution pass through applicable media.</p> <p>6. Study knowhow of maintenance and collecting valuable isolated sulfur bacteria for future uses.</p>	<p>1. Literature Review and collecting concerned data</p> <p>2. Collect sulfur bacteria and others in water and sediment</p> <p>3. Isolation bacteria</p> <p>4. Biochemical test and Research the suitable maintenance species</p> <p>5. Study role of isolated sulfur bacteria to improve of pollution and its application</p>	↔	↔ ↔ ↔ ↔	

Technique transfer items Expert required

Method	Necessary technique	Transfer items	Expert required	Year
1. Sampling technique	/	/	long-term	first year(1997)
2. Culture and isolation	/	X and O	long-term	:
3. Identification	/	X	long-term	:
4. Application	/ X		short-term	second year
				(1998)

Not:

/ Need advice

X Need technique transfer

O Can do by myself

(9) 精度管理課：実績・将来計画

Technology transfer (Environmental Standardization Section)

Training course/Place	Technical Field	Trainer	Year
1. Water Quality Sampling Equipment Technology/ERTC, Universities, Local Government	Water Pollution	Mr.Solos	1991-1996
2. Organochlorinated HC Analysis/ERTC Heavy Metals Analysis/ERTC	Water sample analysis	Ms.Sirinapa	1991-1996
3. Ion Chromatograph Analysis/ERTC	Water sample analysis	Ms.Orasai	1994-1995
4. Environmental Auditing/ERTC	Environmental Standardization	Mr.Solos	1996
		Ms.Orasai	
5. State of Environment Database/ERTC	Environmental Database System	Mr. Prapatsit	1995-1996
		Ms. Wimonrat	
		Ms.Supranee	
6. Environmental Database evaluation/ERTC	Environmental Information	Mr.Solos	1995-1996
		Ms.Wimonrat	
		Ms.Supranee	
7. University student/ERTC	Technical for Environmental Samples Analysis	Ms.Sirinapa	1992-1996
		Mr.Solos	1995-1996
		Ms.Supranee	
8. Training Individual/ERTC (from Gov. Agency, NGO)	Technical for Environmental Samples Analysis and QA/QC	Mr.Solos	1992-1996
		Ms.Supranee	
		Ms. Sirinapha	

Technical advices by JICA Experts (Environment Standardization Section)

Research Theme/Equipment	Research	JICA Expert	Output/Year
1. Water Quality Analysis by using Ion chromatograph	Ms.Orasui	Mr. Mizobuchi	Report/1995
2. Ion chromatograph (shimadzu)	ditto	ditto	1995

Seminar activities/Training courses/and study Tours

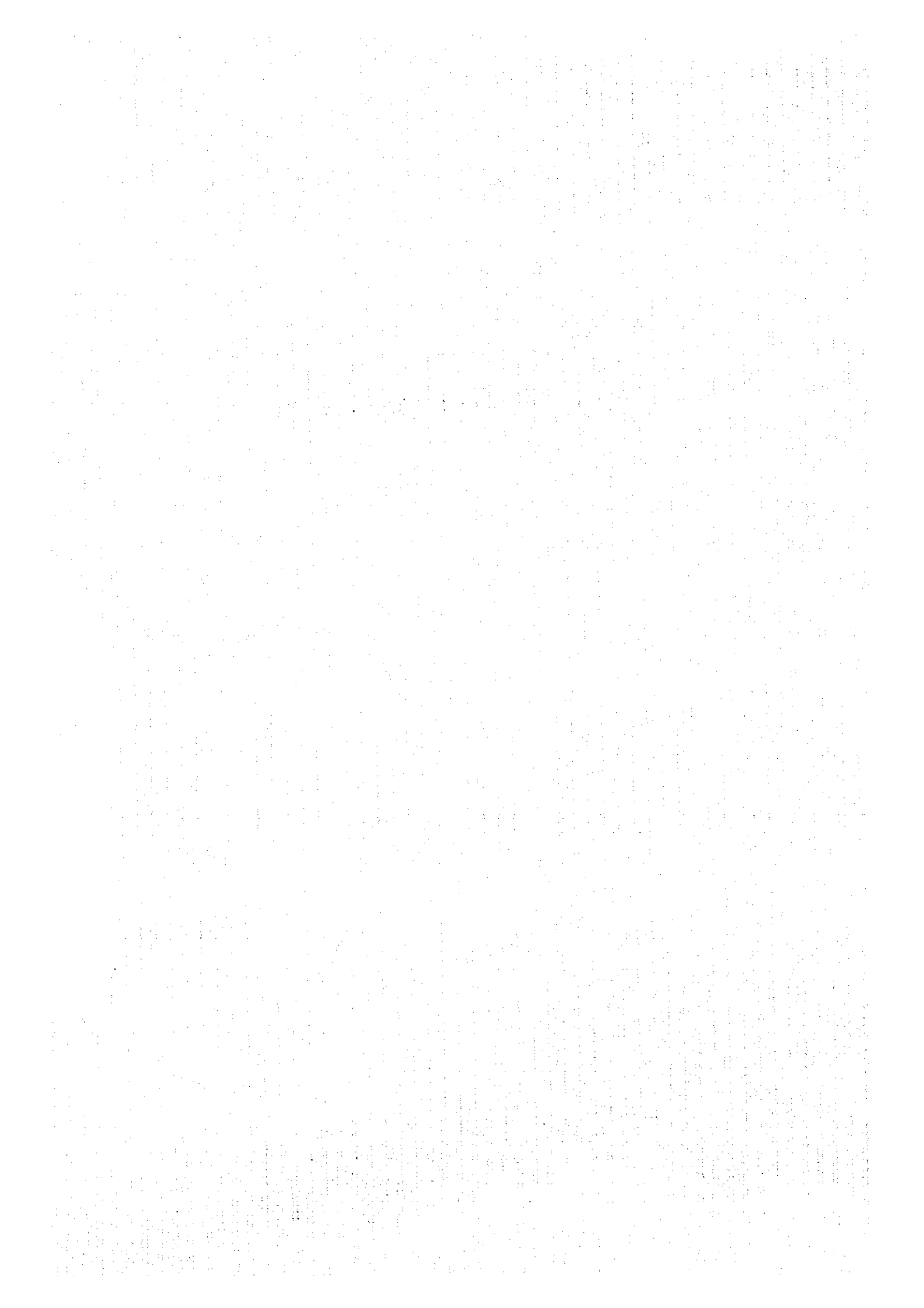
Item	Place	Year/participation
1. SEMENAR on the role of ERTC in the Environment Quality Development	Siam City Hotel/Bangkok	1995(100)
2. State of Environment Database and Reporting	ERTC	1. 1995 (14 Persons from ASEAN COUNTRIES)
3. Environmental study Tours	THAILAND/Bangkok and Local Cities	2. 1996 (13 Persons from ASEAN COUNTRIES) 1993-1996 (192 Persons from Vietnam)

**PROJECT DESIGN MATRIX (RDM)
ENVIRONMENTAL RESEARCH AND TRAINING CENTER PROJECT (FUTURE PLAN)**

Section : Environmental Standardization

Narrative Summary	Verifiable Indicators	Means of Verification
Overall Goal : Develop research and technology appropriate in analysis of environmental sample and to provide standard reference materials	Research and development	ERTC Annual Report
Project Purpose : Enhance ERTC capacity in research and service to support environmental administration	Research results	Technical Report
Outputs : - standard methods - standard reference materials - appropriated technology : advice and recommendation	- No. of Technical report on research results - No. of reference materials	- Technical Report of Research - Reference materials
Activities : - QA/QC - Set up "Good Laboratory" fellow ISO Guide 25 - Prepare standard materials - Develop methodology for analysis - Set up standard methods	Inputs : <u>Japaness side</u> Provide : equipment, chemical : Training staff in Japan <u>Thai side</u> Allocate budget, maintain project facilities and equipment	
RESEARCHER : Mr. Solos, Ms. Sirinapha, Ms. Orasai, Ms. Chayanin		
PRESENT THEME : - Cooperated with JESC, UNU, IAEA - Allocated budget for equipment and chemical - Analysis Pesticide by GC/MS		

(10) A S N E M事業実績



ASNEM事業実績

1996/10/16現在

開催時期	参加国	人数	成果
第1回 (平成3年度) ワークショップ 1991/3/12--3/15	5か国 (インドネシア、マレーシア、フィリピン、シンガポール、タイ、)	15人	ASEAN各国の大気汚染の現状把握 5か年間の事業計画の内容が合意された。
平成4年度	事務局を努めるERTC 所長と大気担当阪田 専門家がASEAN5か 国の環境行政、環境 対策、汚染状況の視 察調査を実施		各国との意見交換により今後の ASNEM事業の内容検討に資する情 報を収集した。
平成5年度	中止		
第2回 (平成6年度) ワークショップ 1995/2/20--2/28	8か国 (インドネシア、 マレーシア、フィリピン、 シンガポール、タイ、カン ボジア、ラオス、ミヤンマ ー)	12名	UNDPと共催によりインドシナ2か 国、ミヤンマーより3名参加。 「Air PollutionのMonitoring」技術お よび知識の習得がなされた。
第3回 (平成7年度) ワークショップ 1996/2/19--3/1	10か国 (ブルネイ、イ ンドネシア、マレーシア、 フィリピン、シンガポール、 タイ、ヴェトナム、カンボ ジア、ラオス、ミヤンマー)	17名	UNDPと共催によりインドシナ2か 国、ミヤンマーより3名参加。 「大気中PAHSのMonitoring」技術お よび知識の習得がなされた。

International Cooperation Projects

1. Asean Network on Environmental Monitoring (ASNEM) Project.

This project is a cooperation programme between ERTC and JICA.

Objective

1. Provide and exchange appropriate technology.
2. Study suitable technique for ASEAN region.
3. Standardize monitoring technique.
4. Study effective monitoring system.
5. Assess existing conditions.
6. Set up the action plan.

The third ASEAN Workshop was held during Feb. 27 to Mar. 5, 1996 in the topic of Air Pollution Monitoring and Analysis with Emphasis on Polycyclic Aromatic Hydrocarbons (PAHs). A participants were invited from 10 countries in ASEAN and Indo-China.

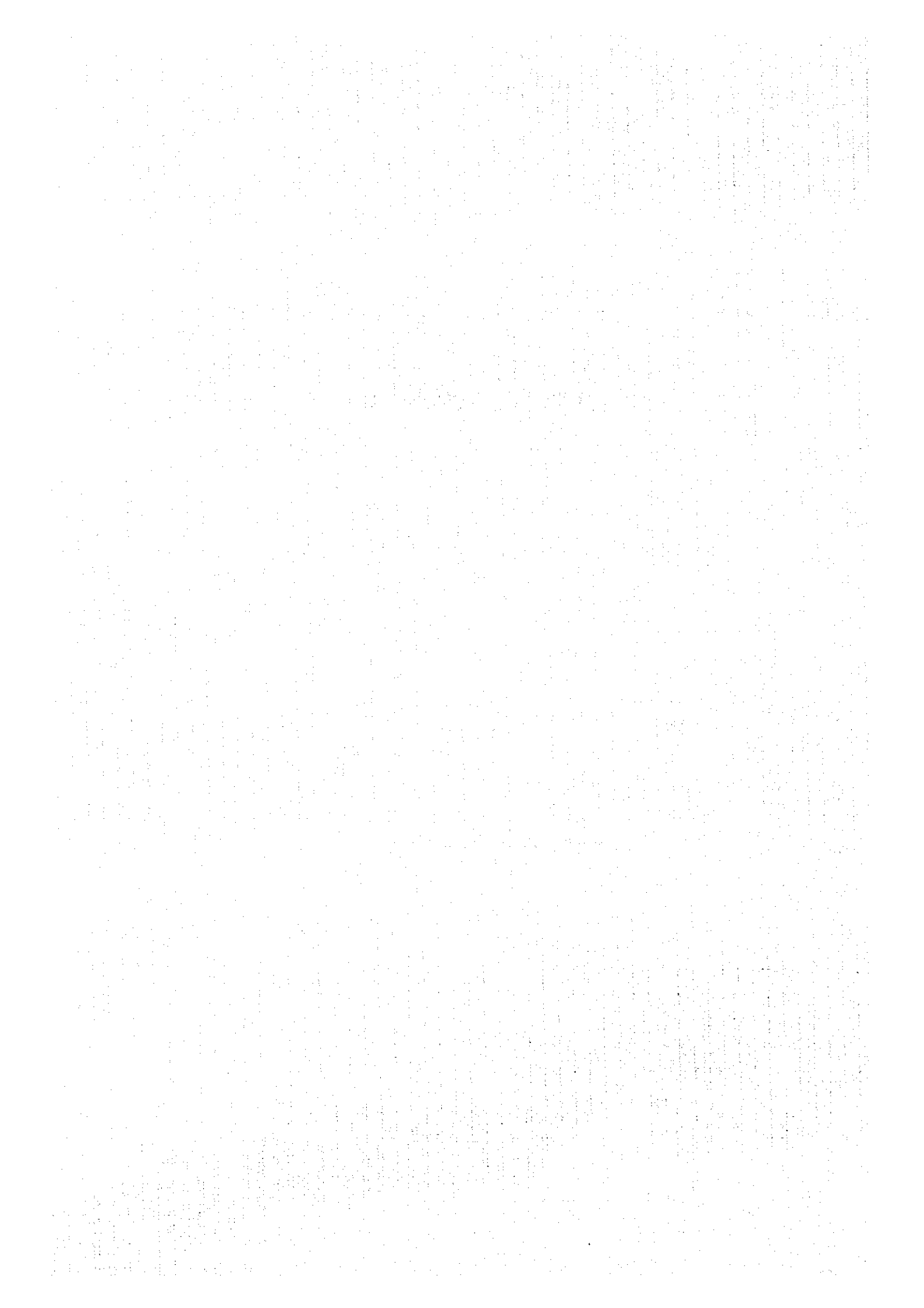
2. Measurements of Tropospheric Ozone in Kanchanaburi, Thailand. (1996-1998)

This research is the joint cooperation research (1996-1998) between the Environmental Research and Training Centre and University of Tokyo. This study focuses on daily and seasonal variations of surface ozone at remote sites in Thailand. The results will provide necessary data for the analysis of local background ozone concentration in central Thailand.

3. Study on Acidic Deposition in Thailand Project. (1996-1998)

The project is under cooperation between Environmental Research and Training Centre, Thailand and the Stockholm Environment Institute, Sweden. The objectives of this project are to study current state of chemical composition of rain water in Thailand and to improve analytical method of rain samplers.

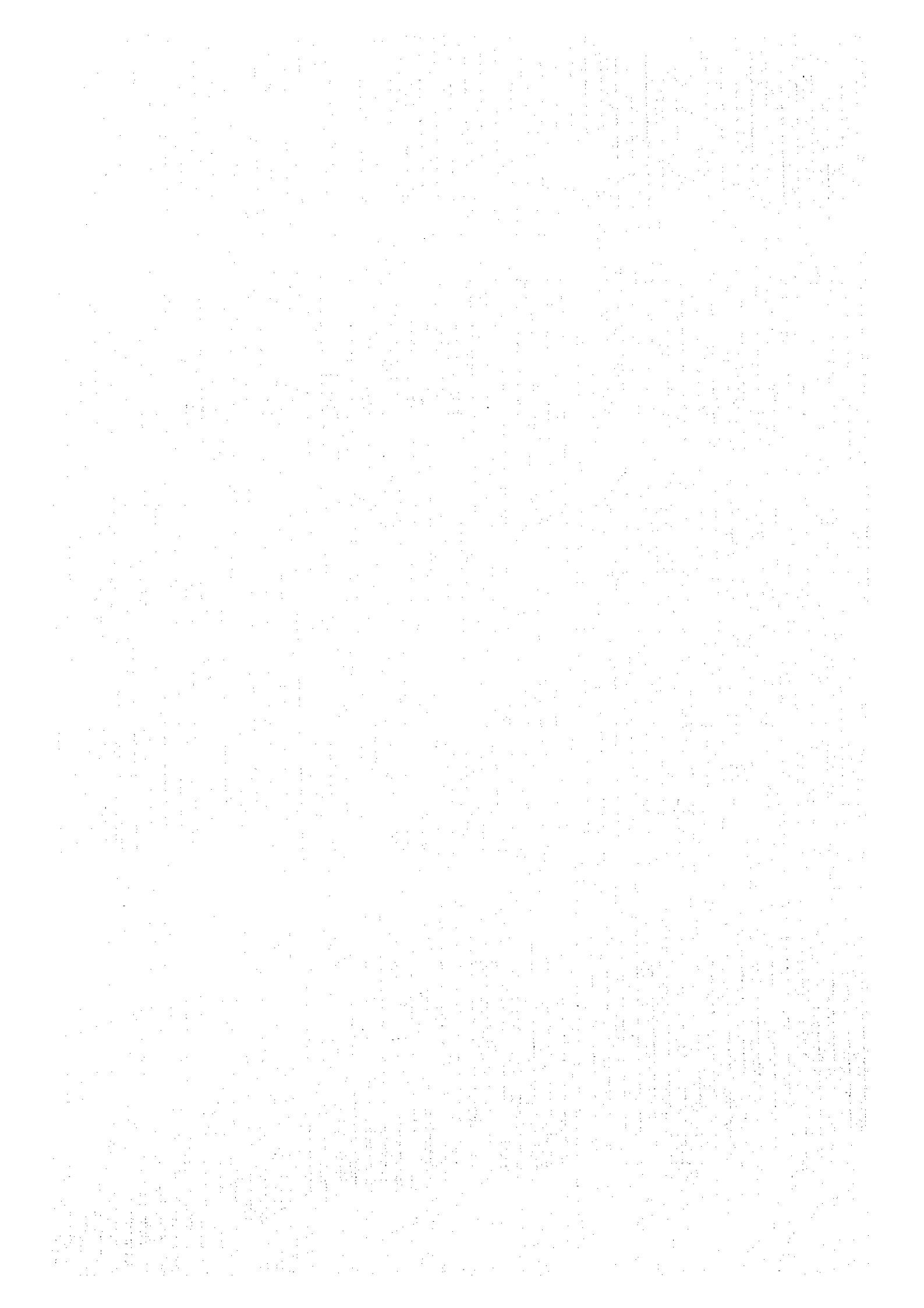
(11) 出版物リスト



List of Publications

- | | |
|--|----------------|
| 1. Annual Report of DEQP | 1993 |
| 2. Brochure of DEQP | 1995 |
| 3. National Environmental Quality Act. (BE 2535) | 1993 |
| 4. News Letter of DEQP | 1996 September |
| News Letter of DEQP | 1996 June |
| News Letter of DEQP | 1996 April |
| News Letter of DEQP | 1996 June |
| News Letter of DEQP | 1996 January |
| News Letter of DEQP | 1996 September |
| News Letter of DEQP | 1996 August |
| 5. New Letters of ERTC No. 1 | 1994 August |
| New Letters of ERTC No. 2 | 1995 August |

(12) プロジェクト終了後の協力について



プロジェクト終了後のERTC各課の研究計画とサポート要望の動向について
ERTC専門家(矢島、植田、田中、星野)

ERTCは来年4月以降について次ぎの点については認識していると思われる。

- 1 プロジェクトは終了すること。
- 2 JICAのサポートは個別専門家ベースとなること。

上記の認識に基づき、現在、各課では、10月21日(月)の評価調査団との会談時に各課の課長が次ぎの点を説明することで準備を進めている。

- 1 現在までに行ってきた研究等の活動成果
- 2 来年度以降計画している研究等の活動内容
- 3 2を実施するために必要なJICAのサポート(具体的には長期、短期の専門家)

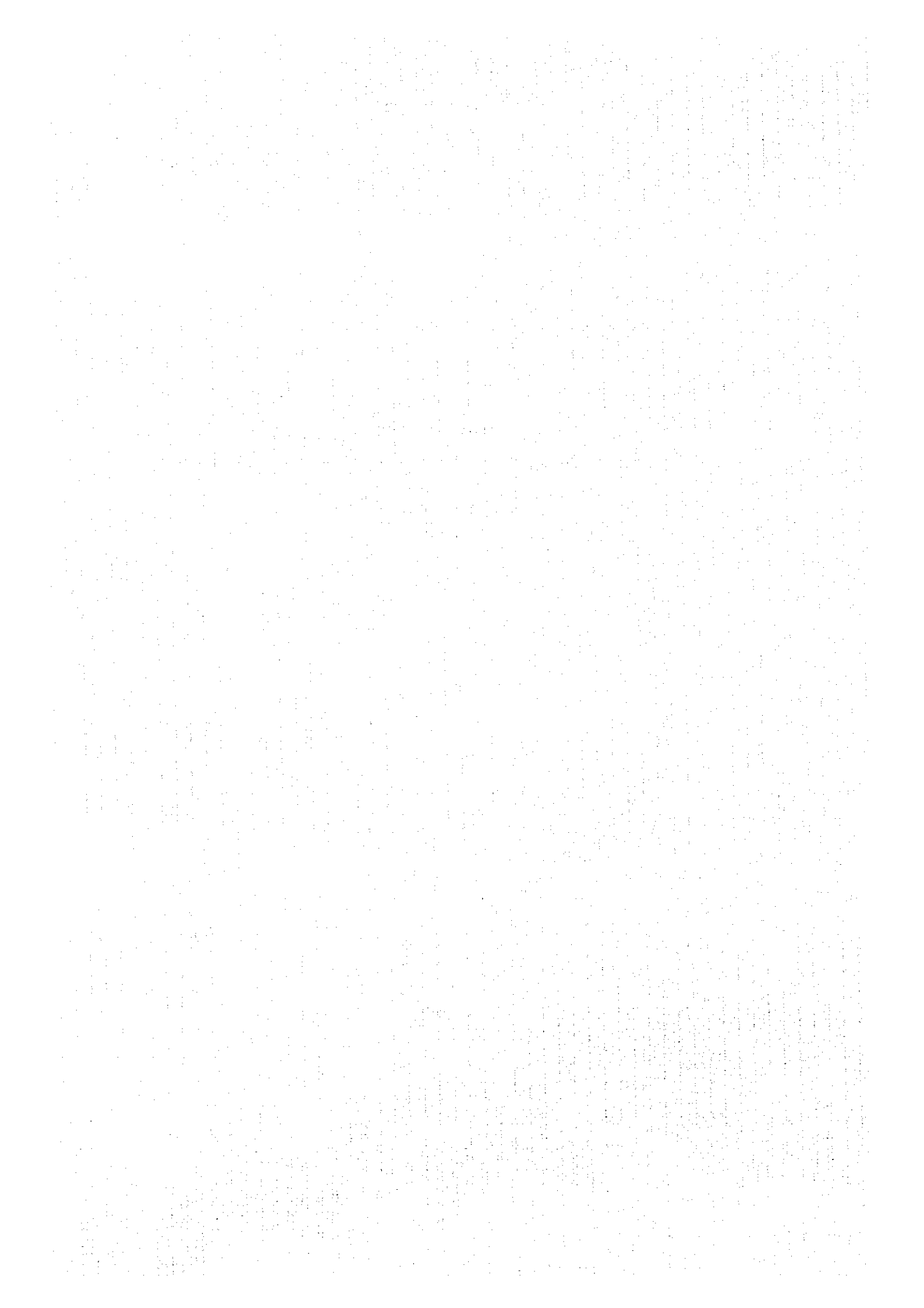
3については、個別専門家ベースのサポートがどの程度のものかという認識がないこと、あつたとしても、各課がそれぞれの要望を自分達で調整する気がないこと、モンチップ所長も調整する気がないことから、次ぎのとおり現状のサポートレベルを上回る内容となっている。

課名	研究等の計画	要望する専門家
水質課	地下水汚染調査：当面は継続、将来的には浄化技術へ展開 河川生物指標調査：本年よりベントス等調査開始 排水処理：当面は人工湿地法を継続 河川調査：新規に底質への有害物質等の蓄積状況、その擦掃等を研究する予定	底質分野の長期専門家 生物分野の短期専門家
大気課 (大気分野)	酸性雨：継続 拡散モデル：既存モデルの応用と修正 エアロゾル：新規 悪臭：新規	悪臭分野の長期専門家 その他は必要に応じて短期専門家
大気課 (騒音振動)	道路騒音、環境騒音、航空機騒音：継続 騒音影響(人体影響等)：新規 道路振動、作業振動：新規	全般的な長期専門家 個別分野の短期専門家
有害物質	固形廃棄物管理：新規、有害産業廃棄物の成分分析等 リサイクル：新規(留学職員の掃国に伴う新分野) 環境毒性試験：新規(日本研修からの展開) 農薬調査：継続(新規にカルバメート系に着手) 嫌気汚濁水におけるイオウ細菌の役割：本年より新規	廃棄物の長期専門家 イオウ細菌の専門家 毒性試験、カルバメート系農薬分析の短期専門家
研修課	研修事業の継続、展開	なし
精度管理課 (情報分野を含む。)	情報データベースシステムの構築：継続 精度管理：国環研、国連大学等のプログラムの継続、ISO25への取り組み 標準分析手法の確立：継続	各分野での短期専門家等によるサポート

専門家からは、明言はさけながら、次ぎのような趣旨のコメントをしている。

- 1 各テーマの必要性を明確すること。
- 2 各研究を進める上で、どういった技術が不足していて、どういったサポートが欲しいかを明確にすること。
- 3 個別専門家ベースでは、技術移転以外の必要機器の準備やその他予算措置はすべてタイ側で行うこととなる点を十分に認識すること。
- 4 多くとも現状のプロジェクトベースより多い専門家は期待できないこと。
- 5 共同研究や国内の専門家との交流など様々なチャンネルでのサポート等を検討すること。
- 6 現在の専門家自身が4月以降の専門家の必要性を判断は出来ないこと。

**(13) Capacity Development in Environment: Thailand's
Experiences in Environmental Research and Training**



CAPACITY DEVELOPMENT IN ENVIRONMENT : THAILAND'S EXPERIENCES IN ENVIRONMENTAL RESEARCH AND TRAINING

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OECD/DAC Workshop on Capacity Development in Environment
at Rome, Italy on 4-6 December 1996

D) INTRODUCTION :

Thailand is a country in the midst of dramatic changes : changes in the nature and quality of life of its people, in the structure of its communities and in foundations of its economy. In the past, Thailand was a rural society, in which local communities were dependent on the natural resources which surrounded them and the national economy relied on the export of a small number of native crops. The sustainable use of resources was a fundamental aspect of rural life ; people understood the inter - relationships between the different components of their local environment and their activities were defined by the need to protect their surrounding resources.

Over the last two decades, Thailand has undergone considerable industrial development and urbanization, such that it is approaching the converted Newly Industrialized Country status. Economic growth has been rapid and is continuing unabated. In the last five years average growth in GDP has exceeded 8 percent growth per annum and it is predicted to achieve at the same rate over the next five years.

However, economic growth and industrial development have been achieved at the expense of the environment and the country's natural resource base. The challenge for Thailand, therefore, is to manage the changes taking place in the country in such a way that the well - being of the people is enhanced without sacrificing the national, regional or global environment. In

order to successfully combat environmental degradation and move towards genuine sustainable development, developing countries like Thailand must strengthen their indigenous capabilities in the skills and techniques required for environmental management. Capacity building and human resources development are crucial to the advancement of Thailand.

II) THE DEVELOPMENT OF ENVIRONMENTAL POLICY

The first five-year National Economic and Social Development Plans (1961-1976) emphasized economic growth as the primary objective in the country's development. The rich natural resource base was viewed largely in terms of its economic potential. Development activities focused on the construction of infrastructure, such as roads and railways, to improve access to rural areas, and allow natural resources to be utilized. In general, the emphasis of the development plans during 1960s and early 1970s was to promote growth and economic productivity in the short term, while the long term environmental impacts of natural resource consumption were given relatively little attention.

However, a noticeable depletion of forest resources, deterioration of soil quality, and shortages in water supply in the mid - 1970s led to the introduction of resource protection and rehabilitation strategies under the Fourth Plan (1976-1981).

The Fifth Plan (1981-1986) introduced a more integrated approach to natural resources development in which planning strategies were co-ordinated with local socio-economic development, with the aim of increasing the efficiency of natural resources utilization and restoration.

Natural resources and environmental planning under the Sixth Plan (1986-1991) marked a turning point in the government's environmental strategies. While the first five plans viewed the country's natural resources as a somewhat limitless natural stock contributing to overall economic growth. While natural resource planning and policy has undergone several philosophical shifts over the last 30 years, these shifts have not always been matched by implementation. At the same time, escalating urban environmental problems such as air pollution, water pollution and the growing volume of hazardous waste, all reflect the negative aspects of increasing industrialization and energy consumption. The Seventh and Eight National Economic and Social Development Plan (1991-1996, 1997-2001) has the similar principal objectives, namely :

- To sustain the country's economic growth at an appropriate level, with stability.
- To promote more equitable income distribution and rural development.
- To develop human resources, improve quality of life, and enhance the quality of the environment and natural resources.

The Seventh Plan encourages the revision of existing legislation and the formulation of new laws and regulations for the conservation of natural resources and the protection of the environment. The Plan clearly supports the "Polluter Pay Principle" and set definite targets to improve environmental quality throughout the country.

2.1) Overhauling Environmental Legislation.

In November 1991, a new comprehensive environmental law was considered by the Cabinet. When adopted by Parliament, it has a profound effect on the environmental management practices in the country. The legislation contains the following key elements.

- Recognition of the urgency of environmental issues in Thailand, which requires immediate collective action. The legislation empowers policy and planning agencies with enforcement authority, so that regulatory measures can be undertaken hand-in-hand with other precautionary actions.

- Decentralization and delegation of environmental authority to provincial and local governments. This will facilitate participation by the people who are directly affected by changes in their environmental conditions.

- Recognition of the public's right to know and to participate in national environmental affairs and the constructive role of the private sector and NGOs in environmental rehabilitation.

Under the "Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992)" three new government departments have been established to replace the former Office of the National Environment Board (ONEB) which are the Office of Environmental Policy and Planning (OEPP), Pollution Control Department (PCD) and the Department of Environmental Quality Promotion (DEQP), with the mandate to promote public awareness and public participation in pollution abatement, and to enforce standards based on the Polluter Pay Principle.

2.2 The Environmental Fund

The Environmental Fund is an initiative which the Government has taken in order to facilitate the application of the Polluter Pays Principle, which has been endorsed by the Seventh National Plan. The Fund is designed to be an instrument for promoting investment in pollution control by industry and the local government to manage their wastes.

III) CAPACITY DEVELOPMENT IN ENVIRONMENT

3.1 Background

During the last decade, economic development and the shift to a more industrialized economy have brought about some critical problems which, if not urgently addressed, might constrain future economic expansion and threaten the quality of life of the people. Prevention and management of environmental problems is, therefore, of central importance to sustainable development.

Environmental problems cover a wide range of scientific, economic and humanitarian disciplines ; knowledge and skills in all of these areas must be well developed in order to realize the goal of the sustainable development. Five important areas in the Thai context, given the effects of increased generation of pollutions and a dramatic rise of problems on water pollution, air pollution, noise, toxic substances, hazardous waste and solid waste are environmental concerns of the country. In addition, pollution control technology is increasingly recognized as technology that will help accelerate the development of key economic sectors.

Shortage of qualified staff in the environmental field is well recognized in Thailand. Without increased provision for trained personnel in these disciplines, it will not be possible to apply them to the environmental and industrial needs of the nation. An improved knowledge of environmental research in methodology development for environmental sample analysis and pollution control technology, particularly within the tropical condition will help to identify the nature and scale of the problem faced and thus assist in the formulation of appropriate response strategies.

Another area where Thailand has traditionally experienced problems is in the monitoring and enforcement of environmental regulations and policy. These problems derive from a wide variety of sources. In the area of

environmental monitoring, technical incompatibility in equipment design due to the different design parameters in the manufacturing country (usually a developed country) can mean that state-of-the-art equipment is not available in Thailand. A shortage of suitably qualified and trained personnel available for technical and managerial positions in government makes enforcement of environmental legislation extremely difficult. This in itself reflects the difficulty experienced by training and academic institutions in acquiring and retaining good researchers and trainers.

In order to address the problems, Thailand must strengthen its own resources and capabilities such that it is less dependent on developed countries for expert knowledge and technological assistance, and more able to offer assistance to its regional neighbors. A successful program will need to encompass a number of areas :

- research which addresses local and regional environmental problems ;
- high quality training programs for the government, academic and private sectors
- information exchange and dissemination to increase awareness of key issues related to the environment and human health.

IV) THE ENVIRONMENTAL RESEARCH AND TRAINING CENTER (ERTC)

4.1 The Role of the Center

The Environmental Research and Training Center (ERTC) was established in Pathumthani Province in March 1992. The ERTC is first operated by the Office of the National Environment Board (ONEB), under the overall jurisdiction of the Ministry of Science, Technology and Energy. After the new enhancement and conservation of National Environmental Quality Act B.E.2535 (1992), ERTC was operated by the Department of Environmental Quality Promotion (DEQP) under the Ministry of Science, Technology and Environment. The fundamental purpose of the ERTC is to carry out research and provide technical support in the implementation of environmental policy and environmental management initiatives in order to support the activities of all Departments concerned, in particular, environmental research, monitoring and training activities which are conducted nationwide.

The objectives of the ERTC can be summarized as follows :

- To undertake practical research programmes on environmental management, particularly in the fields of water pollution, air pollution, noise and vibration, solid waste and toxic substances.
- To promote and encourage research studies on environmental quality in cooperation with educational establishments and other agencies.
- To strengthen environmental monitoring programs for use in the planning and determination of national environmental quality standards and to formulate guidelines for the improvement of environmental quality.
- To provide training programs in environmental management and environmental sample analysis for government organizations, local government and other organizations.
- To provide environmental education programs for staff at all levels and to train people with the appropriate technical expertise to be qualified instructors.

The activities of the ERTC are based on the principle that environmental monitoring, research and training cannot be undertaken in isolation of each other, rather these programs must be planned and executed through a systems approach, treating each activity as an integral component of the whole environmental protection system.

4.2 International Support for the ERTC.

The ERTC has been set up with support from the Government of Japan in a bilateral arrangement which represents a working example of technology transfer between developed and developing countries.

Since 1980, Japan and Thailand have been involved in a joint project called the "Promotion of the Environmental Quality Analysis and Pollution Control Project". The purpose of this project was to identify effective means of promoting pollution control activities, to reinforce the function of environmental laboratory services at the national level, and to organize a system of research and training. This project emphasized the need to support basic research on the mechanisms of environmental pollution and its control, particularly in the context of the increasing need for, and complexity of pollution control in Thailand.

The success of this initial collaboration between Thailand and Japan led to proposals for the establishment of the ERTC and to a further bilateral agreement and technical and financial support for the ERTC project. The Government of Thailand has provided the land for the project, running costs and personnel salaries, while Japan has contributed significant funds for the construction of the buildings and installation of equipments, and will continue to provide technical assistance in terms of long term and short term experts throughout the early years of the ERTC's operation. Some 40 Thai professionals are trained in Japan and 30 Japanese experts are stationed in Thailand. Over the longer term, seven Japanese experts are alternately resident in Bangkok for a period of seven years. The establishment of the ERTC with the assistance of the Japanese Government is an exercise in capacity-building which is very beneficial to Thailand.

4.3 Activities of the ERTC in Sustainable Development

1) Research Programmes

The ERTC performs practical and applied research studies in the area of environmental protection and resource management, as a technical input to the development of government policy. The research arm of ERTC is able to provide the necessary information and data to assist government, perform field monitoring studies and carry out research and development in response to specific requests. Table 1 shows the outline of the research programmes at ERTC. These research will enable Thailand to develop its environmental policies in response to original research work on the particular factors affecting Thailand and neighboring countries. At present many of the environmental quality standards being adopted in the developing countries are based on those adopted in the industrialized countries, where environmental conditions are very different. There is clearly need for Thailand and other developing countries to have a sufficiently strong research base to be able to set their own environmental quality standards : the ERTC will help to support that need.

The ERTC also engaged as much as possible in joint projects and other forms of co-operation with other research institutes, both within and outside Thailand, in order to make maximum use of the research resources and to avoid duplication in research effort. Table 2 shows the cooperative research programmes with other countries. Joint projects also maximize the scope for effective transfer of technology and knowledge between research institutes.

2) Training Programmes

The ERTC has developed a fully integrated program of research and human resource education and training which covers technical and administrative courses in the area of methodology for monitoring, different kinds of environmental sample analysis, environmental and natural resources management and public awareness. The training is focused on government, semi-government, non-government organization and private sectors ; about 30 training courses are conducted within and outside of ERTC. More than 2,000 Thai trainees and 300 foreign trainees are trained by ERTC as shown in Table 3 ; it is envisaged that ERTC plan to train 1,000 trainees per year. Table 4 shows outline of the 38 training courses at ERTC. At present, there are high demand from different governmental departments and local government in requesting ERTC to provide human resource development programmes (HRD). Table 5 shows the present needs of HRD in the field of environment in Thailand. Many of the courses will consist of a rolling programmes of vocational training which will extend over several years. They are designed for a variety of professional levels, such as technical analysis, engineers operating waste treatment works, researchers, etc. One of the important tasks of ERTC under the jurisdiction of Cabinet Resolution in 1994 is to transfer know how to local government officials at different levels who are involving in formulating the master plan for environment and natural resource management. The cabinet provided a special budget for 1 million dollars to train the government officials in 3 particular courses such as

- Environmental Policy and Plan
- Pollution Control Technology
- Financial Mechanisms for Managing the Treatment Technology

Courses include lectures and practical sessions, to provide knowledge and hands-on experience of practical techniques. The training programs make good use of expertise from Japan available through the bilateral funding arrangements ; this is an ideal mechanism for technology transfer.

3) Regional Co-operation

3.1) ASNEM : ASEAN Network on Environmental Monitoring

This network was formed in 1990 to establish regional cooperation among ASEAN countries in the field of environment through an agreement made during the Japan-ASEAN Environmental Experts Meeting (JAEEM) held in Tokyo in 1990. The project plan was also agreed to the ASEAN Senior

Official Experts on Environment (ASOEN). The network covers the field of air pollution, noise pollution, water pollution and toxic substances. The workplan on air quality monitoring program was agreed to be implemented as the first network. ERTC acting as the focal point of the ASNEM. The objectives of the project to establish ASNEM are to :

- Provide and exchange appropriate technology
- Study suitable technique for ASEAN region
- Standardize monitoring technique
- Study effective monitoring system
- Assess existing conditions
- Set up the action plan

3.2) Subregional Environmental Monitoring and Information System (SEMIS)

The SEMIS project is one of the environment sector projects originally proposed under Asian Development Bank (ADB)'s regional technical assistance (RETA 5535) to promote subregional economic cooperation among the Greater Mekong Basin (GMS) countries. The goal of SEMIS is to enhance the capacity of the GMS countries to integrate and exchange environmental information to support decision making. The specific objective is to establish a subregional information exchange network with a minimum uniform and mutually compatible data set, which will enable governments to make informed decisions regarding sustainable development, and will provide an early warning system for environmental management.

The SEMIS project is being implemented by ADB, UNEP EAP-AP, and the MRC, along with the environmental agencies in the six countries, and is expected to result in 17 concrete project outputs including, among others, a core data set definition, a conceptual spatial database design, metadata standards for information to be held in national and subregional databases, and a workshop on data and metadata standards. ERTC is responsible in coordinating as the focal point in the said program.

3.3) Subregional Environmental Training and Institutional Strengthening (SETIS)

The SETIS project is one of the environment projects originally proposed under ADB's RETA 5535, which was endorsed by the Ministers at the Third Conference on Subregional Economic Cooperation in 1994. The

project was approved by the ADB Board of Directors in May 1996. The objectives of the SETIS project are to improve the GMS countries' capacities to plan, formulate, and implement environmental policies and programs; to establish environmental and natural resource management training centers in the countries; to provide a forum for sharing experiences in environmental capacity building and to provide training in areas of critical environmental concern; and to formulate mutual agreement upon environmental standards and natural resources management. The role of ERTC is to co-ordinate and help assist in formulating the plan for training and institutional strengthening in Thailand.

IV) THE ASIA-EUROPE ENVIRONMENTAL TECHNOLOGY CENTER (AEETC)

During the Asia-Europe Meeting (ASEM) in Bangkok in March 1996, Thailand proposed the establishment in Thailand of an Asia-Europe Environmental Technology Center (AEETC). The proposed AEETC was envisaged to promote collaboration between Asia and Europe in the field of environmental management mutually beneficial to the two regions, and to complement existing national environmental institutions in various Asian and Europe countries.

The AEETC was seen as an effective means of collaboration between the two regions to enhance :

- (1) trade flows in environmental services and technologies
- (2) exchange of scientific and technological expertise
- (3) the knowledge and understanding of tropical environmental, ecological system and natural resources and
- (4) capabilities of national environmental institutions. Considering the trends of natural resources, environmental problems and economic development of most Asian countries, Asia would be a large market for environmental management expertise and environmental technologies. The AEETC could contribute to the development of this market. In addition, Asia is also a fertile ground for basic and applied research on tropical environment and ecological resources. AEETC could make a significant contribution to studies and research on environmental problems and issues of common interest.

The form of center setup for AEETC will be the expanding of the existing ERTC and networking existing environmental institutes in selecting

participating countries and establishing ERTC/AEETC as a center for planning, coordination and managing jointly initiated regional programs and projects.

VI) CONCLUSION

Thailand is in a position to respond to the environmental challenges facing the country because its recent economically strength-financial resources generated by a growing economy can be used to invest in environmental rehabilitation. The framework of environment policy is already established in the Seventh National Economic and Social Development Plan. Although the country is still far from developed economically, there is a high level of public consciousness of environmental issues in Thailand and a willingness on the part of government to take action. The timing is opportune for Thailand to collaborate with its foreign allies in solving both the domestic and international environmental problems facing us to day. Capacity building for research and human resources development is also an ideal area for North South collaboration in which technology and expertise can be transferred from developed to developing countries. ERTC-AEETC are good examples of how effective such collaboration can be.

VII) REFERENCES

* Tabucanon, Monthip Sriratana, 1991. Thailand's Experience on Environmental Research and Training. A United Nations Conference on Environment and Development (UNCED) Research Paper No. 23

* National Economic and Social Development Board, Office of the Prime Minister. 1991.

Table 1.: Shows the Outline of Research Programmes at the Environmental Research and Training Center (ERTC)

No.	Research Title	Objectives	Publication
1	Treatment of Shrimp-Farming Discharge by Constructed Wetland	To set up the experimental scaled model, in gravel basin with <i>Acrosichum aureum</i> , of constructed wetland	Water Quality International'96 18 th Beinnial IA WQ International Conference, Singapore, June 23-28
2	The Development of Road Traffic Noise Prediction Model	To apply the noise model for environmental impact assessment in Thailand	Inter-noise'94, Yokohama, Japan August 29-31
3	Monitoring program of Organochlorine Pesticide Residues in Green Mussel (<i>Perna viridis</i>) from the Gulf of Thailand	To identify the level of organochlorine pesticide residues in green mussel when compare with maximum residue limit for aquatic animal	Proceeding of the Seminar on "Role of ERTC for Environmental Development in Thailand" March 1995
4	Study of Lead Residue from Battery Factory in Pathumthani Province by using Hair Samples	To study the pathway of lead in different environmental media which can influence to human health	Same as 3
5	Behaviour of Polychlorinated Biphenyls (PCBs) around a Storage of Used Capacitors in a Tropical Environment	The study was designed to identify the pathway of PCBs to the ambient environment at a storage site of capacitors filling with PCBs containing oil	Proceeding of the NRCT-JSPS Joint Seminar on Marine Science, Songkhla, Thailand December 2-3, 1993
6	Development of a Quantification Methodology for Polychlorinated Biphenyls by using Kanechlor Products as the Secondary Reference Standard	To develop technical PCBs products as secondary reference standards for the analysis of PCBs	Fresenius J. Anal Chem (1995) 352 : 261-267

No.	Research Title	Objectives	Publication
7	Study in Water Quality Classification by Biological Index based on Aquatic Insects	To develop the biological index to classify water quality of some watershed area by using aquatic insects	Poster Presentation at the Conference of Aquatic Living Resulted, Bangkok, Thailand, 19-20 January 1995
8	Determination of Hydrocarbon Composition in Exhaust Gas from 4 Stroke Gasoline Engine	To develop the appropriate method of analysis for the determination of hydrocarbon composition in exhaust gas from 4 stroke gasoline engine	Same as 3
9	Study on Environmental Quality of Pathumthani Province	To develop the environmental monitoring program using Pathumthani Province, the second largest industry in Thailand and the pilot project	Same as 3
10	Monitoring heavy metals in the Gulf of Thailand using mussel watch approach	To determine the level of heavy metals in the Gulf of Thailand using green mussel as predictors of heavy metal concentration	The Science of the Total Environment 139/140(1993) Elsevier Science Publishes B.V., Amsterdam
11	Persistent Organochlorine Pesticide Residues in Green Mussel (<i>Perna Viridis</i>) from the Gulf of Thailand	To assess the current status of the contamination of the Gulf of Thailand by persistent organochlorine pesticides using green mussel as bioindicators	Marine Pollution Bulletin, Vol 28, No.6, pp.351-355, 1994
12	Thailand's Experience on Environmental Research and Training	To highlight the role of the environmental research and training center	United Nations Conference on Environment and Development, Research Paper No.23 July 1991

No.	Research Title	Objectives	Publication
13	Organochlorine Pesticide Residues in Green Mussel (<i>Perna Viridis</i>) from the Gulf of Thailand	To determine the distribution of Organochlorine pesticides in green mussel (<i>Perna viridis</i>) from the Gulf of Thailand	Marine Pollution Bulletin, Vol.22, No.10, pp 510-516, 1991
14	Development of a Recovery Factor for Analysis of Organochlorine Pesticides in Water Sampling by Using Micro-Extraction Technique	To develop the recovery factor for assure the result of analysis	Proceeding Seventh International Hormonalization Symposium on the Use of Recovery Factors, organized by IUPAC/ISO/AOAC, 4-5 September 1996 Orlando, Florida, USA.
15	Distribution of PCBs around a used capacitors storage : concrete floor soil ground and canal sediment	To study the distribution of PCBs around a used capacitors storage	Proceeding of the "Second International Conference on Environmental and Industrial Toxicology : Research and Its Application
16	State of Air Quality and Management in Thailand	To develop and improve the air quality monitoring control in Thailand	Proceeding of the ASEAN Network on Environmental Monitoring (ASNEM) on ASEAN Workshop on Air Pollution Monitoring and Analysis, March 12-15, 1991, Bangkok, Thailand
17	Regional Background Acidity and Chemical Composition of Precipitation in Thailand	To investigate regional features of rainwater composition and wet deposition in Thailand	Atmospheric Environment Vol.30, No.10/11, pp.1589-1598, 1996
18	Feasibility Study of Short-term Method for Environmental Noise Measurement in Bangkok	To know the situation of noise problem in Bangkok Metropolitan Area	1996 Annual Symposium of INCE/Japan, Kyoto Japan, September 10-11

Table 2 : Co-operative Research programme with other Countries

No.	Research Title	Objectives
1.	Monitoring of Organochlorine Pesticides in the Mekong River Basin	<p>This monitoring programme consists of regional co-operation between Thailand, Laos, Cambodia and Vietnam under the Water Quality Monitoring Network in the Lower Mekong Basin Project This project is coordinated by the Interim Committee for Co-ordination of Investigation of the Lower Mekong Basin. The main purpose is to monitor the trend of pesticide residues on water and fish in order to evaluate water quality among the riparian countries.</p>
2.	Mussel Watch Programme	<ul style="list-style-type: none"> - To monitor the heavy metals and organochlorine pesticides by using the green mussel (<i>Perna viridis</i>) - To ascertain the quality of coastal marine waters <p>The programme is being conducted in Thai coastal areas with the cooperation of countries in the West Pacific Region.</p>

No.	Research Title	Objectives
3.	Acidic Deposition in the Rainwater in Thailand	<ul style="list-style-type: none"> - To monitor the quality of rainwater - To formulate the mathematical modelling for predicting acid rain problem - To exchange data and information as two of the stations under the Global Environmental Monitoring System (GEMS)
4.	ASEAN Network on Environmental Monitoring	<ul style="list-style-type: none"> - ERTC act as the focal point of the network for water, air, noise, toxic substances - To provide and exchange appropriate technology - To study suitable technique for ASEAN region. - To standardize monitoring technique - To study effective monitoring system.

Table 3 : Show the Training Courses and the Number of Trainees (1992-1996)

No.	Training Course	Govt.	Semi Govt.	NGO	Private Sector	Total number
1	Heavy Metals Analysis	35	29	15	18	97
2	Waste Water Treatment Technology	46	119	51	15	231
3	Solid waste analysis	22	67	10	7	106
4	Environmental Management Plan	26	28	4	8	66
5	Air Quality Management	41	56	35	14	146
6	Environmental Management Plan	44	66	11	51	172
7	Noise Pollution	53	37	27	9	126
8	Environmental Education	6	13	1	55	75
9	GIS and Natural Resources and Environmental Management	13	8	1	1	23
10	Water Pollution management	32	57	19	17	125
11	Environment Impact Assessment	25	28	10	40	103
12	Water and Waste Water Analysis	29	51	16	58	154
13	Solid Waste and Sewage Management	20	105	20	4	149
14	Air Quality Analysis from Industry	20	25	28	1	74

No.	Training Course	Govt.	Semi Govt.	NGO	Private Sector	Total number
15	Treatment of Waste from Laboratories	-	-	-	37	37
16	Toxic Substances Analysis (Organochlorine Pesticides)	14	10	7	10	41
17	Toxic Substance Management (Agriculture, industries) (class 2)	17	23	2	12	54
18	Natural Resources and Environmental Administration (class 2)	15	25	2	12	54
19	Ambient Air Quality Analysis	12	11	5	3	31
20	Toxic Substance Analysis (Organophosphorus Pesticides)	15	14	2	12	43
21	Air Pollution Analysis of Industries and Automobile Exhausted Gas	6	6	6	2	20
22	Natural Resources Management (soil, water, forest, coastal resources)	7	13	1	-	21
23	Noise and Vibration Management	4	7	4	2	17
24	Environmental Policy and Plan	195	-	-	-	195
25	Financial Mechanisms for Managing the Treatment Technology	192	-	-	-	192
26	Pollution Control Technology	280	-	-	-	280
27	Community Waste Management	48	-	-	-	48

No.	Training Course	Govt.	Semi Govt.	NGO	Private Sector	Total number
28	Waste Water and Solid Waste Management	55	-	-	-	55
29	Environmental Management	70	-	-	-	70
30	Natural Resource Management	60	-	-	-	60
	Total	1,402	798	277	388	2,865

Table 4 : Shows the Outline of Training Courses at ERTC

Course	Main Topic of Training	Purpose of Training
1. Environmental Management Plan	<ul style="list-style-type: none"> - Principles of environmental analysis - Principles in evaluating environmental conditions - Methods in developing principles to countermeasure environmental problems - Methodology practice in developing management programmes and developing mechanical management - Monitoring systems in checking and evaluating results - Basic methodology practice in formulating management programmes 	<ul style="list-style-type: none"> - To develop knowledge and understanding of environmental management - To train on environmental management - To produce knowledgeable and skilled personnel with capabilities to implement environmental management
2. Environmental Impact Assessment	<ul style="list-style-type: none"> - Basic principles and continuous studies in evaluating environmental impacts - Project implementation and developing TOR - Technical proposals - Analysis of environmental systems and evaluating conditions - Methods to evaluate environmental impacts - Plans to solve environmental impacts - Developing systematic solutions and evaluation of results 	<ul style="list-style-type: none"> - To develop knowledge and understanding on evaluation of environmental impacts - To train how to evaluate environmental impacts - To produce knowledgeable and skilled personnel with capabilities to implement evaluation of environmental impacts

Course	Main Topic of Training	Purpose of Training
3. Environmental Information Management (I)	<ul style="list-style-type: none"> - The environment and conservation of each type of natural resources - The present environmental situation in Thailand and throughout the world - Environmental quality standards - Environmental laws - Moral conduct towards the environment - Different types of media communications - Types of target group in Thailand - Ways of producing different means of media 	<ul style="list-style-type: none"> - To understand present environmental conditions - To understand the principle environmental conservation - To produce communication appropriate for the specific goal of each group
4. Environmental Information Management (II)	<ul style="list-style-type: none"> - The environment and the principles and importance of environmental information - Environmental quality standards - Environmental laws - Anticipated environmental problems of Thailand in the future - Policy and environmental information planning - Principle and importance of environmental information 	<ul style="list-style-type: none"> - To understand present environmental conditions. - To formulate policy and make plans for dissemination of environmental information in Thailand. - To understand the priority and importance of environmental problems in Thailand for providing environmental information
5. GIS and Land Use Planning (I)	<ul style="list-style-type: none"> - Land use and its environmental impact - Application of GIS in land use planning and evaluation of environmental impacts - Land use planning 	<ul style="list-style-type: none"> - To provide knowledge in technology and its application in land use planning and in evaluating environmental impacts - To modify ideas in the application of GIS to various work on the environment

Course	Main Topic of Training	Purpose of Training
6. GIS and Land Use Planning (II)	<ul style="list-style-type: none"> - Land use and its environmental impacts - Evaluation of environmental impacts - GIS in land use planning - Case studies in use of GIS and environmental impacts (Demo) 	<ul style="list-style-type: none"> - To be familiar with the latest technological instruments to help evaluate environmental impacts - To know the mechanical and electrical properties of GIS and to prepare personnel and instruments that would accept GIS technology appropriate for specific departments and throughout the planning stage
7. Forest Resource Development and the Environment (I)	<ul style="list-style-type: none"> - General knowledge in ecosystems and forest ecology - Forest and factors in the origination of forests in Thailand - National forest policies and forest laws - Principles in zoning natural resources and forest land 	<ul style="list-style-type: none"> - To know the importance and uses of forest resources - To know the present problems and conditions of forest resources - To know the effects of forest abuse towards the environment
8. Forest Resource Development and the Environment (II)	<ul style="list-style-type: none"> - Ecosystems and the role of forestry to the environment - Present condition of forest resources - Problems and causes of deforestation - Policies and guidelines in forests 	<ul style="list-style-type: none"> - To know the present problems and condition of forest resources - To know the effects of forest resources abuse towards the environment - To know the policies and trends in forestry development and to be able to make plans for forestry development
9. Water Resource Development (I)	<ul style="list-style-type: none"> - Water situation in Thailand - Flood and drought - Solutions to water pollution - Water management and the environment - Guidelines in water resources management 	<ul style="list-style-type: none"> - To give practitioners the opportunity to gain additional knowledge and to exchange knowledge and understanding between other practitioners in the various agencies - To enable those working in water resources understand their duties and responsibilities towards the

Course	Main Topic of Training	Purpose of Training
<p>10. Water Resource Development (II)</p>	<ul style="list-style-type: none"> - Situation and importance of water in Thailand - Conservation of water and water demand - Flood disasters and droughts and their solution - Water pollution and its solution - Real estate development and water demand - Water resources management and its environmental impacts 	<p>environment</p> <ul style="list-style-type: none"> - To give basic knowledge in water resources management to senior government and private sector water resources personnel - To increase better understanding between water resources management in accordance with government development policy
<p>11. Fisher Resources Management</p>	<ul style="list-style-type: none"> - Status of fishery resources and fishery laws - Different factors affecting fishery resources - Concept used in the management of fishery resources - Fishing industry impacts - Theory used in resources management - Principles in fishery management through biochemical species - Management of fishery resources in Thailand - Measures on fishery resources management 	<ul style="list-style-type: none"> - To consider the importance of the various fishery resources and to manage these resources in such a way that they are always in abundant supply
<p>12. Coastal Resource Management</p>	<ul style="list-style-type: none"> - Coastal resources (soil, water, forests, wildlife, aquatic animals and human beings) - Coastal ecosystems - Economic value of coastal resources, its uses and impacts - Management of coastal resources for sustainable development 	<ul style="list-style-type: none"> - To create a system to promote a basic understanding of coastal ecosystems and management by administrative personnel in both the public and private sectors - To create a better understanding between coastal resources administrative management in

Course	Main Topic of Training	Purpose of Training
		<p>response to the government's development policies for the country</p> <ul style="list-style-type: none"> - To install a deeper understanding amongst coastal resources management administrators
<p>13. Industrial Safety and Working Equipment (I)</p>	<ul style="list-style-type: none"> - Mankind's working conditions and the environment - Knowledge regarding environmental laws and other relevant laws - Causes of different types of accidents - Knowledge on the different kinds of equipment used in various factories - Prevention of the different types of personal hazards - Fire prevention in working areas - Health measures within working areas 	<ul style="list-style-type: none"> - To enable trainees to know and understand : - The general environment in industrial factories - The various instruments and equipment in industrial factories - Safety precautions in handling and using equipment and instruments in industrial factories - Ways of maintaining instruments as well as security measures, preparedness, and solutions to problems regarding safety
<p>14. Industrial Safety and Working Equipment (II)</p>	<ul style="list-style-type: none"> - Environmental laws and other relevant laws - Prevention of personal hazards and plans in emergency and dangerous situations - Enhancement of the atmosphere and environment in working areas of industrial factories - Formulate plans to prevent accidents 	<ul style="list-style-type: none"> - The enable trainees to know and understand : - The general environment in industrial factories - Safety in using instruments - Ways to administer management and planning during emergency situations
<p>15. Waste Water Treatment Technology (I)</p>	<ul style="list-style-type: none"> - Water and waste water conditions in Thailand - Technological principles in water treatment 	<ul style="list-style-type: none"> - To know the condition and to understand the importance of water and waste water in Thailand - To know the technological

Course	Main Topic of Training	Purpose of Training
	<ul style="list-style-type: none"> - Principles in computing the amount of polluted water and waste in waste water - Considerations taken in using materials, equipment and choosing simple technologies 	<ul style="list-style-type: none"> principles of simple waste water treatment - To know the principles in designing waste water treatment systems
<p>16. Waste Water Treatment Technology (II)</p>	<ul style="list-style-type: none"> - Water and waste water conditions in Thailand - Basic knowledge regarding waste water - Technological principles in waste water treatment - Ways to choose simple technology - Designing and planning simple waste water treatment 	<ul style="list-style-type: none"> - To know the conditions of water and waste water in Thailand - To know and understand the principles of simple waste water treatment systems - To be able to formulate waste water treatment plans and management policies
<p>17. Water and Waste Water Analysis</p>	<ul style="list-style-type: none"> - Basic knowledge and understanding of waste water - Technical preparation of glassware and equipment and selection of stations for collecting water samples and preservation of water samples - Fieldwork methodology analysis - Laboratory analysis 	<ul style="list-style-type: none"> - To understand the importance of water and the need to treat waste water - To be able to perform water analysis both in the laboratory and field
<p>18. Solid Waste Management</p>	<ul style="list-style-type: none"> - Basic knowledge of solid waste - Analysis of the composition of solid waste - Separation and transferring of solid waste - Considerations in selecting appropriate locations for solid waste eradication - Technologies in eradicating solid waste 	<ul style="list-style-type: none"> - To impart knowledge and understanding on solid waste and dirt and its environmental impacts - To know and understand the technology on the eradication of solid waste - To be able to select the appropriate technology to eradicate solid waste

Course	Main Topic of Training	Purpose of Training
	<ul style="list-style-type: none"> - Considerations used in selecting appropriate technologies on solid waste 	
<p>19. Instrumentation Management of Environmental Laboratories</p>	<ul style="list-style-type: none"> - Classification of instruments, chemicals and testing methods used in laboratories and fieldwork - Care and maintenance of instruments when/when not in use - Storage of chemicals and laboratory equipments - Area design plan specifying the position of instruments, electrical, waste water, chemical disposal and ventilation systems 	<ul style="list-style-type: none"> - To understand the classification of instruments, chemicals and methods used in the laboratory - To understand how to store chemicals and other materials used in laboratories and how to maintain the various equipment - To understand laboratory management so as to perform analysis efficiently and safely
<p>20. Water Pollution Management</p>	<ul style="list-style-type: none"> - Basic knowledge on water sources and water pollution - Regulations to set standards - Relevant environmental laws - Technological waste water treatment - Analysis of environmental systems and evaluation of environmental impacts - Management plans 	<ul style="list-style-type: none"> - To know the condition of water and water pollution - To know the present environmental laws concerning water pollution - To be able to adopt plans for the management of water pollution on the on the policy and operational planning level
<p>21. Air Quality Analysis</p>	<ul style="list-style-type: none"> - Basic knowledge in air and air pollution - Situation regarding air pollution - Air sampling techniques - Solutions and preventive measures and guidelines in air pollution 	<ul style="list-style-type: none"> - To know the air pollution situation - To be able to check the quality of air
<p>22. Air Quality Management</p>	<ul style="list-style-type: none"> - Situation regarding air pollution - Principles in air sampling and methodological analysis - Air pollution control 	<ul style="list-style-type: none"> - To know the present situation of air pollution - To understand the methods in checking and control of air

Course	Main Topic of Training	Purpose of Training
	<ul style="list-style-type: none"> - Management and solution to problems on air pollution 	<ul style="list-style-type: none"> - pollution and its application
23. Noise Pollution Control (I)	<ul style="list-style-type: none"> - The condition of noise pollution - Basic principles of sound waves - Calculation of noise level - Measurement of noise level and analysis of results - Technical control of noise pollution - Measures in noise pollution control 	<ul style="list-style-type: none"> - To have basic knowledge about noise - To know the laboratory principles measuring and decreasing noise level efficiently
24. Noise Pollution Control (II)	<ul style="list-style-type: none"> - Basic principles of sound waves - Measurement of noise level - Noise pollution control - Assessing the effects of noise pollution - Control measures on noise pollution 	<ul style="list-style-type: none"> - To gain basic knowledge in noise and its hazards - To learn ways on planning controls to minimize noise pollution
25. Solid Waste Analysis	<ul style="list-style-type: none"> - Situation and importance of problems of solid waste - Sampling and analysis of solid waste - Classification of different types of solid waste - Analysis of chemical solid waste 	<ul style="list-style-type: none"> - To learn how to conduct analysis of solid waste - To gain basic knowledge and situation of solid waste
26. Toxic Substances Analysis	<ul style="list-style-type: none"> - Situation of toxic substances - Principles in sampling and extraction of toxic substances from agricultural products, soil, water and biochemical species 	<ul style="list-style-type: none"> - To understand the importance of toxic substances in a modern agricultural production system - To know the principles in the analysis of toxic substance and to gain analysis experience
27. Agricultural Toxic Substance Management (I)	<ul style="list-style-type: none"> - The importance of using toxic substances in agriculture - Poison and treatment of persons affected by toxic substances in 	<ul style="list-style-type: none"> - To understand the importance of using chemicals in agriculture - To understand the proper use of chemicals in agriculture

Course	Main Topic of Training	Purpose of Training
	agriculture - Contamination of agricultural products with toxic substances - Principles in prevention and eradication of insects through non-use of artificial toxic substances - Principles of harmonious insect management	- To understand the principles in the management of plant insects
28. Agricultural Toxic Substance Management (II)	- Situation of toxic substance in agriculture in Thailand - Toxicology and its treatment - Principles in the use of agricultural chemicals and translation of data - Principles of environmental management in agriculture - Principles of harmonious insect management	- To know the situation of toxic substances in agriculture in Thailand - To know the principles of toxic substances management in agriculture - To be able to conduct appropriate policy planning and implementation
29. Industrial Toxic Substance Management (I)	- Production process - Prevention and treatment of liquid waste - Prevention and treatment of solid waste - Air and its treatment - Toxic substances and their treatment - Laws and standardization of industrial toxic substances - Monitoring the results of waste treatment in factories	- To let practitioners understand their duties and responsibilities - To understand the methods in the analysis of important toxic substances in industry - To understand management methods of toxic substances in industry - To understand the standard and methods in checking the standards of industrial toxic substances
30. Industrial Toxic Substance Management (II)	- Impacts of toxic substances to life and health - Methods to reduce and eradicate toxic substances - Government plans and policies	- To understand the duties and responsibilities of administrative personnel - To understand the problems and causes and the procedures to carry

Course	Main Topic of Training	Purpose of Training
	<ul style="list-style-type: none"> - Problems facing factories 	<ul style="list-style-type: none"> out solutions - To exchange ideas and opinions and to understand the problems that occur in specific factories
<p>31. Treatment of Wastes from Laboratories</p>	<ul style="list-style-type: none"> - Managing conditions within the laboratories, and the control and storage of waste from laboratories - Collection and removal of dry waste and contaminated substances from laboratories - Treatment/management of liquid waste from laboratories - Considering how to choose a waste treatment system for a laboratory - How to solve problems regarding waste from laboratories 	<ul style="list-style-type: none"> - To understand the methods in treating waste from laboratories - To be able to choose a treatment system for waste from laboratories - To be able to solve waste problems from laboratories
<p>32. Man and the Environment</p>	<ul style="list-style-type: none"> - General knowledge of the environment and its physical, biochemical and social aspects - Ways to solve problems on the bilateral relationship between man and the environment - Guidelines and developing techniques and the dissemination of information regarding the life-style in a society where there is a bilateral relationship between man and the environment 	<ul style="list-style-type: none"> - To let trainees know and understand : - That human beings as a part of society should live harmoniously together - That human being as a part of the environment, must give to, as well as use the environment - The types of relationships and problems between mankind and the environment and ways to find solutions
<p>33. Public Awareness on Natural Resources and Environment</p>	<ul style="list-style-type: none"> - General environmental situation - Life in a society where a bilateral relationship causes no problems - Guidelines and mid-line policies in developing understanding on the conservation of resources 	<ul style="list-style-type: none"> - To let trainees know and understand : - That human beings, as a part of society, should live harmoniously together - Living with and using natural

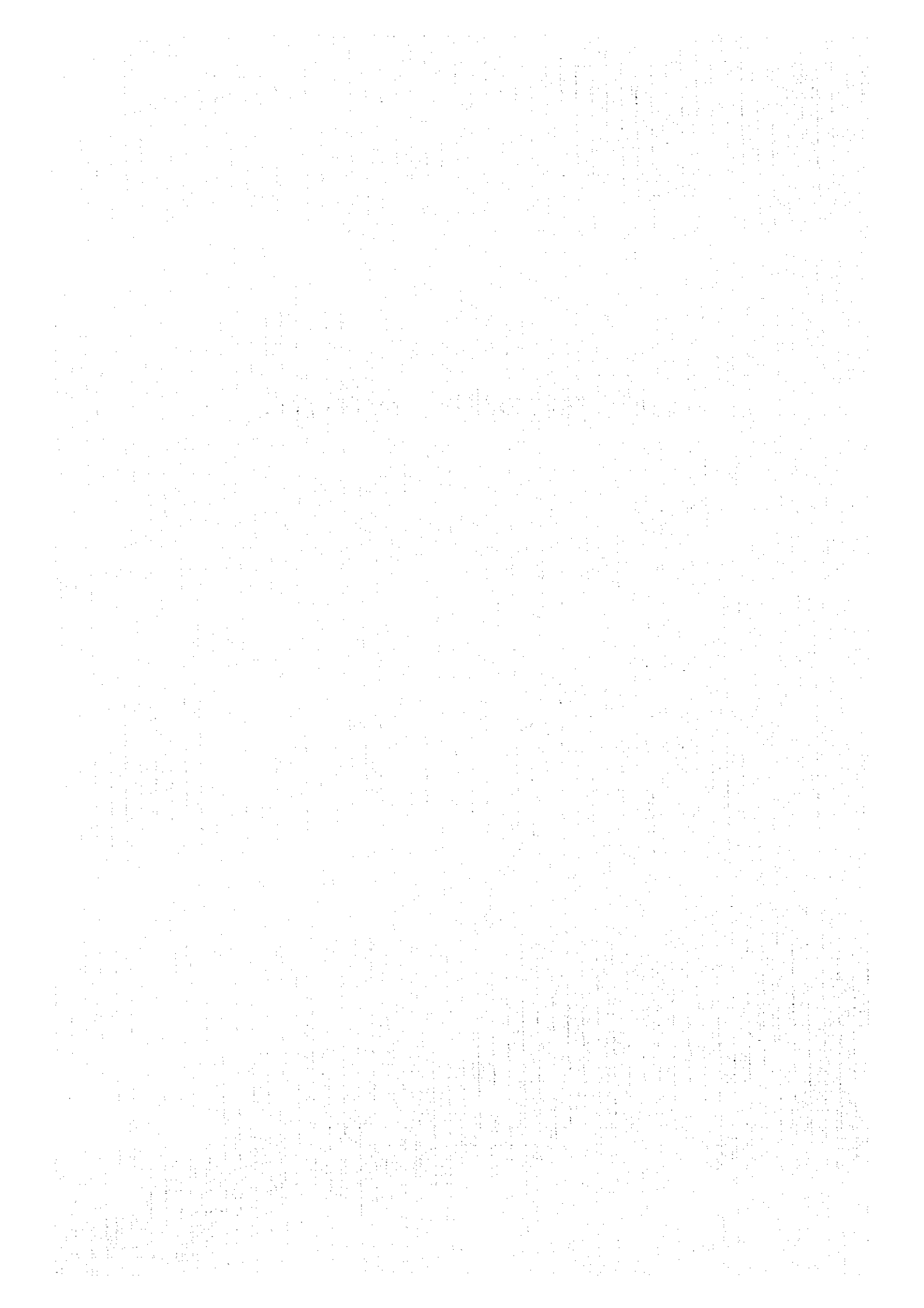
Course	Main Topic of Training	Purpose of Training
	<ul style="list-style-type: none"> - Training how to develop a full understanding and to disseminate information 	<ul style="list-style-type: none"> resources - The development of deeper understanding in the conservation of natural resources
34. Environmental Education	<ul style="list-style-type: none"> - Basic knowledge of environmental science - Basic knowledge on evaluating environment impacts - Basic knowledge on environmental management - Principles of environmental education - Environmental technology - Environmental education programmes 	<ul style="list-style-type: none"> - To enable teachers to understand the environment correctly - To be able to use the knowledge acquired to improve learning and teaching procedures in their respective units - To be able to disseminate the knowledge acquired to high density populations in their respective areas
35. Environment and Development	<ul style="list-style-type: none"> - Environmental situation in Thailand - Basic knowledge of ecology and the environment - Principles of ecology - Studies on environmental impacts and how to monitor it 	<ul style="list-style-type: none"> - To understand the present environmental situation in Thailand - To understand the principles of ecology - To understand the relationship between the environment and its development
36. Environmental Laws	<ul style="list-style-type: none"> - Government policy regarding promotion of environmental quality and pollution control - National Environmental Promotion and Conservation Act 1992 - Other relevant laws 	<ul style="list-style-type: none"> - To understand the government's policies on conservation of environmental quality and pollution control - To understand the principles of the new Environmental Promotion and Conservation Law
37. Industrial Air Pollution Quality Analysis	<ul style="list-style-type: none"> - Principles of analysis and techniques in testing polluted air from factories - Practical training in collecting samples and analyzing air from factories 	<ul style="list-style-type: none"> - To understand the principles of analyzing polluted air from factories - To be able to monitor and analyze the quality of air from factories

Course	Main Topic of Training	Purpose of Training
	<ul style="list-style-type: none"> - Tools and equipment used in preventing pollution 	
38. Heavy Metals Analysis	<ul style="list-style-type: none"> - Principles and practical training in collecting samples of heavy metals - Principles and analysis of heavy metals - Data analysis 	<ul style="list-style-type: none"> - To understand the techniques in preparing equipment and preserving samples - To obtain practice in the analysis of heavy metals

Table 5 : Shows the Present Needs of HRD in the field of
Environment in Thailand (1995).

COURSES	AGENCIES	TRAINEE
1.ENVIRONMENTAL MANAGEMENT PLAN	727	4517
2.SOLIDWASTE MANAGEMENT	637	3830
3.PUBLIC AWARENESS ON NATURAL RESOURCES AND ENVIRONMENT	574	4992
4.ENVIRONMENTAL LAWS	563	3380
5.ENVIRONMENTAL IMPACTS ASSESSMENT	541	3012
6.ENVIRONMENT AND DEVELOPMENT	525	4077
7.WASTE WATER TREATMENT TECHNOLOGY (I)	514	2604
8.MAN AND THE ENVIRONMENT	513	4283
9.ENVIRONMENTAL INFORMATION MANAGEMENT (I)	502	2937
10.WATER POLLUTION MANAGEMENT	465	2637
11.WATER RESOURCES DEVELOPMENT (I)	450	2612
12.AGRICULTURAL TOXIC SUBSTANCE MANAGEMENT (I)	446	3215
13.WATER AND WASTE WATER ANALYSIS	417	1788
14.FOREST RESOURCE DEVELOPMENT AND THE ENVIRONMENT (I)	401	2680
15.ENVIRONMENTAL EDUCATION	382	3473
16.ENVIRONMENTAL INFORMATION MANAGEMENT (II)	349	1424
17.INDUSTRIAL SAFETY AND WORKING EQUIPMENT (I)	348	1681
18.WASTE WATER TREATMENT TECHNOLOGY (II)	341	1241
19.WATER RESOURCES DEVELOPMENT (II)	322	1183

(14) 機材の利用・管理状況表



供与機材の利用/管理状況表 1

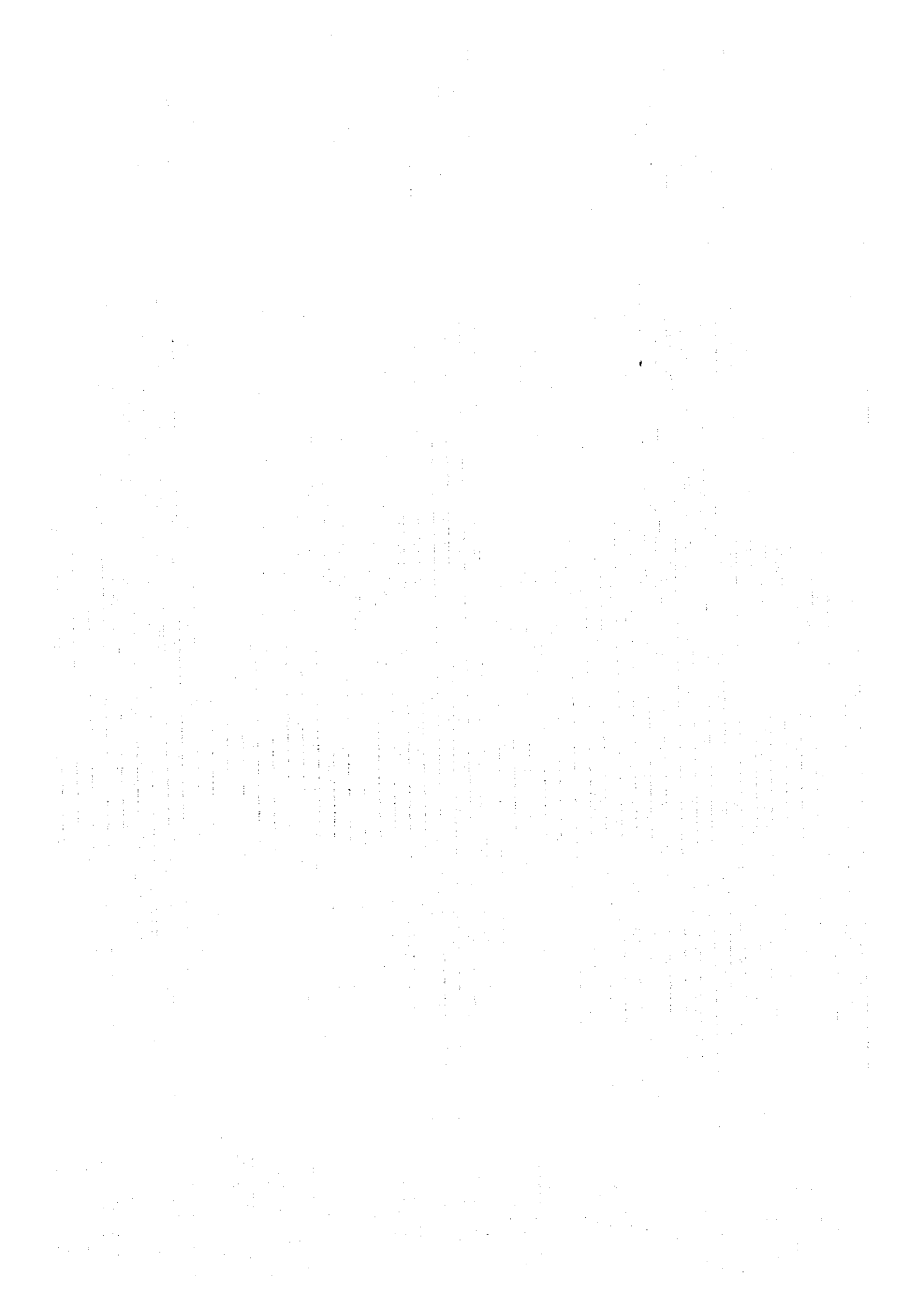
平成8年度 第3四半期現在

(1.60万円以上の機材)

供与年度	番号	機材名(メーカー名/型式)	価格	数量	利用(保管)場所	利用状況	管理状況	備考(特記事項)
平成 3	A31-供	マイクロバス	2,230	1	ERTC	A	B	ERTC管理
	A32-供	ジーブ	3,217	1	ERTC	A	A	専門系チーム管理
	A33-供	ガスクロマトグラフ	2,993	1	301	B	B	大気
	A34-供	ガスクロマトグラフ	1,956	1	301	D	B	大気
	A35-供	プラズマリアクター	4,674	1	228	C	A	水質
平成 4	A41-供	灰塵物検出器	12,821	1	ERTC以外	C	B	灰塵
	A42-供	サインノイズ発生器	4,743	1	316	B	A	騒音
	A43-供	ガルダー装置	2,281	2	1台/226,1台/304	A/E	A/A	水質(A43-KYO/2KYO)
平成 5	A51-供	ガスクロマトグラフ	4,600	1	122	A	A	有毒(現地調査)
	A52-供	ガスクロマトグラフ	2,029	1	305	D	B	大気(モバイル測定器)
	A53-供	ガスクロマトグラフ	2,553	1	305	D	B	大気(")
	A54-供	騒音/振動移動測定器	9,594	1	ERTC	A	A	騒音
	A55-供	環境騒音観測装置	2,400	1	316	B	A	騒音
平成 6	A61-供	1/3オクターブアナライザ	2,015	1	316	A	A	騒音
平成 7	A71-供	気圧ロゼット装置	1,950	2	324	A	A	大気/水質
	A72-供	ボウ・ブルガススクロメータ装置	4,344	1	307	C	A	地下水現場調査用
	A73-供	ガス試験用アローフケット	2,022	1	223	C	A	地下水

利用状況 A:頻繁に使用 D:あまり利用されていない
 B:良く利用 E:使用されていない
 C:特定の時期に使用

管理状況 A:点検整備が十分、常に使用可能な状態
 B:使用に際して問題なし、管理はおおむね良好
 C:整備すれば使用可能 D:使用不可能



JICA