

The Ninth Senior Technical Managers' Meeting
of the Acid Deposition Monitoring Network in East Asia
27-29 August 2007, Niigata, Japan

**Overview of the national monitoring plans of the participating countries
(The summary table)**

The Network Center of EANET

Country	Items	Monitoring sites	Classification	Monitoring interval	Measurement Parameters	Remarks (Start time)	Available Data(2007)
<Cambodia>	Wet deposition	Phnom Penh	Urban	Weekly	All required items		
<China>	Wet deposition	Chongqing -Guanyinqiao	Urban	daily	All required items + F ⁻	April '99	✓
		Chongqing -Jinyunshan	Rural	daily	All required items + F ⁻	January. '01	✓
		Xi'an -shizhan	Urban	daily	All required items	April '99	✓
		Xi'an-Jiwozi	Remote	daily	All required items	January. '01	✓
		Xiamen-Hongwen	Urban	daily	All required items + F ⁻	April '99	✓
		Xiamen-Xiaoping	Remote	daily	All required items + F ⁻	April '99	✓
		Zhuhai-Xiang Zhou	Urban	daily	All required items + F ⁻	May '99	✓
		Zhuhai-Zhuxiandong	Urban	daily	All required items	December '99	
	Dry deposition	Chongqing -Jinyunshan	Rural	AT	SO ₂ , NO ₂ , PM ₁₀		✓
		Xiamen-Hongwen	Urban	AT+FP	SO ₂ ,NO ₂ ,PM ₁₀ ,HNO ₃ ,HCl,NH ₃ ,PM		✓
		Zhuhai-Xiang Zhou	Urban	AT	SO ₂ ,NO ₂ , PM ₁₀		✓
	Soil and vegetation	Chongqing -Jinyunshan	Rural	Every 3 years	Tree decline, Abnormalities of leaves and branches(Ions etc.in soil)		
		Xi'an-Jiwozi	Remote	Every 3 years	Tree decline, Abnormalities of leaves and branches(Ions etc.in soil)		
		Xiamen-Xiaoping	Remote	Every 3 years	Tree decline, Abnormalities of leaves and branches(Ions etc.in soil)		
		Zhuhai-Zhuxiandong	Urban	Every 3 years	Tree decline, Abnormalities of leaves and branches(Ions etc.in soil)		
	Inland aquatic environment	Chongqing-Jinyunshan Lake	Rural	4times/years	Water quality of Jinyunshan Lake		✓
		Xi'an-Jiwozi River	Remote	4times/years	Water quality of Jiwozi River		✓
Xiamen-Xiaoping Dam		Remote	4times/years	Water quality of Xiaoping Dam		✓	
Zhuhai-Zhuxiandong Stream		Urban	4times/years.	Water quality of Zhuxiandong Stream	From 2004	✓	

Country	Items	Monitoring sites	Classification	Monitoring interval	Measurement Parameters	Remarks (Start time)	Available Data(2007)
<Indonesia>	Wet deposition	Jakarta (BMG)	Urban	weekly*	All required items	April '98	✓
		Serpong (EMC)	Rural	daily	All required items	April '98	✓
		Kototabang (BMG)	Remote	weekly*	All required items	April '98	✓
		Bandung (LAPAN)	Urban	daily	All required items	January '99	✓
	Dry deposition	Serpong (EMC)	Rural	FP (Weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		✓
	Soil and vegetation	Serpong (Bogor Research Forest)	Rural	once/3years	Decline, K etc. in leaves & ions in soil	From 2003	✓
	Inland aquatic environment	Patenggang Lake	Rural	4times/yr.	Water quality of Patenggang Lake		✓
<Japan>	Wet deposition	Rishiri	Remote	daily	All required items	April'98	✓
		Ochiishi	Remote	daily	All required items	April'03	✓
		Tappi	Remote	daily	All required items	April'98	✓
		Ogasawara	Remote	daily	All required items	May'99	✓
		Sado-seki	Remote	daily	All required items	April'99	✓
		Happo	Remote	daily	All required items	April'98	✓
		Oki	Remote	daily	All required items	April'98	✓
		Yusuhara	Remote	daily	All required items	December'99	✓
		Hedo	Remote	daily	All required items	December'99	✓
		Ijira	Rural	weekly	All required items	June'99	✓
		Banryu	Urban	weekly	All required items	May'99	✓
		Tokyo	Urban	daily	All required items	April'07	✓

Country	Items	Monitoring sites	Classification	Monitoring interval	Measurement Parameters	Remarks (Start time)	Available Data(2007)
<Japan>	Dry deposition	Rishiri	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM _{10/2.5} ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2002	✓
		Ochiishi	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM _{10/2.5} ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2008	✓
		Tappi	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Ogasawara	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Sado-seki	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Happo	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Oki	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM _{10/2.5} ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2002	✓
		Yusuhara	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Hedo	Remote	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Ijira	Rural.	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Banryu	Urban	AT+ FP(biweekly)	SO ₂ ,NO,NO _x *,O ₃ ,PM ₁₀ ,HNO ₃ , HCl,NH ₃ ,PMC	FP from 2003	✓
		Tokyo	Urban	FP(biweekly)	SO ₂ ,NO ₂ ,HNO ₃ ,NH ₃ , PMC	FP from 2007	✓
	Soil and vegetation	Ijira	Rural	Once in 5 years	All required items		✓
		Banryu	Urban	Once in 5 years	All required items		✓
	Inland aquatic environment	Ijira Lake	Rural	4times/yr.	Water quality of Ijira Lake		✓
Banryu Lake		Urban	4times/yr.	Water quality of Banryu Lake		✓	
<Lao PDR>	Wet deposition	Vientiane	Urban	daily	All required items	October '03	✓
	Inland aquatic environment	Nam Houm Lake	Urban	4times/yr.	Water quality of Nam Houm Lake		

Country	Items	Monitoring sites	Classification	Monitoring interval	Measurement Parameters	Remarks (Start time)	Available Data(2007)
<Malaysia>	Wet deposition	Petaling Jaya	Urban	weekly*	All required items+Organic acid	April '98	✓
		Tanah Rata	Remote	weekly*	All required items+Organic acid	January '99	✓
		Danum Valley	Remote	weekly*	All required items+Organic acid		
	Dry deposition	Petaling Jaya	Urban	FP (weekly)	SO ₂ ,NO ₂ ,HNO ₃ ,NH ₃ , PMC		✓
		Tanah Rata	Remote	AT+ FP (weekly)	SO ₂ ,NO,NO _x *,O ₃ ,HNO ₃ ,NH ₃ , PMC	FP from 2001	✓
		Danum Valley	Remote	FP (biweekly)	SO ₂ ,NO ₂ ,HNO ₃ ,NH ₃ , PMC	FP from 2006	✓
	Soil and	Pasoh Reserve Forest	Remote	Every 3 years		From 2001	
		Petaling Jaya	Remote	Every 3 years		From 2002	
	Inland aquatic environment	Semenyih Dam	Urban	4 times/yr.	Water quality of Semeynyih Dam	February '05	✓
Danum Valley		Remote	4 times/yr.	Water quality of Danum Valley	March '07	✓	
<Mongolia>	Wet deposition	Ulaanbaatar	Urban	daily	All required items+HCO ₃ ⁻	August '98	✓
		Terelj	Remote	daily	All required items+HCO ₃ ⁻	September '98	✓
	Dry deposition	Ulaanbaatar	Urban	FP (weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		
		Terelj	Remote	FP (weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		
	Soil and vegetation	Ulaanbaatar (Bogdkhan mountain)	Urban/Ecolog	Every 3-5 years	PH(H ₂ O),pH(KCl),Exchangeable acidity, Tree decline, description tree	From 2002	
	Inland aquatic environment	Terelj River	Remote	4 times/yr.	Water quality of Terelj River	From 2002	✓
<Myanmar>	Wet deposition	Kaha-Aya, Yangon	Urban	weekly	pH,EC	June'07	✓
<Philippines>	Wet deposition	Metro Manila	Urban	weekly	All required items	April '99	
		Los Banos	Rural	weekly	All required items	April '99	
		Mt. St. Tomas	Remote	weekly	All required items	October '06	
	Dry deposition	Metro Manila	Urban	FP (Weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		
		Los Banos	Rural	FP (Weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		
		Mt. St. Tomas	Remote	FP (Weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC	October '06	
	Soil and vegetation	Los Banos	Rural	Once in 3 years	(Tree decline, description tree & ions in soil etc.)	From 2001	
	Inland aquatic environment	Pandin Lake	Rural	4 times a year	Water quality of Pandin Lake	From 2004	
Ambulalakao River		Remote	1times/yr	Water quality of Ambulalakao River	From 2005		

Country	Items	Monitoring sites	Classification	Monitoring interval	Measurement Parameters	Remarks (Start time)	Available Data(2007)
<Republic of Korea>	Wet deposition	Kanghwa	Rural	daily	All required items	March '99	
		Cheju(Kosan)	Remote	daily	All required items	April '99	
		Imsil	Rural	daily	All required items	January '01	
	Dry deposition	Kanghwa	Rural	FP(Twice a month)	SO ₂ , O ₃ , PM ₁₀ , Ions in PM _{2.5}	From 2001	
		Cheju(Kosan)	Remote	FP(Twice a month)	SO ₂ , O ₃ , PM ₁₀ , Ions in PM _{2.5}	From 2001	
		Imsil	Rural	FP(Twice a month)	SO ₂ , O ₃ , PM ₁₀ , Ions in PM _{2.5}	From 2001	
	Soil and vegetation	Imsil (Mt.Naejang)	Rural	Every 3 years	(Tree decline, description tree & ions in soil)	From 2001	
<Russia>	Wet deposition	Mondy	Remote	daily	All required items (+NO ₂ ⁻ , Br ⁻ ,	May '99	✓
		Listvyanka	Rural	daily	All required items (+F ⁻ , NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻)	January '00	✓
		Primorskaya	Rural	daily	All required items (+NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻)	February '02	✓
		Irkutsk	Urban	daily	All required items (+F ⁻ , NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻)	January '01	✓
	Dry deposition	Mondy	Remote	AT+ FP(weekly)	SO ₂ ,O ₃ ,HNO ₃ ,HCl,NH ₃ ,PMC	From 2001	✓
		Listvyanka	Rural	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC	From 2001	✓
		Primorskaya	Rural	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC	From 2001	✓
		Irkutsk	Urban	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC	From 2001	✓
	Soil and vegetation	Mondy	Remote	Once/3-5 years	Tree decline, description tree & ions in soil	From 2001	
		Listvyanka (Bolshie Koty)	Rural	Once/3-5 years	Tree decline, description tree & ions in soil	From 2001	
		Irkutsk	Urban	Once/3-5 years	Tree decline, description tree & ions in soil	From 2001	
		Primorskaya	Rural	Once/3-5 years	Tree decline, description tree & ions in soil	From2002	
	Inland aquatic environment	Pereemnaya River	Rural	4times/yr	Water quality of Pereemnaya River	From 2004	✓
		Krestovka River	Rural	5times/yr	Water quality of Krestovka River	From 2005	✓

Country	Items	Monitoring sites	Classification	Monitoring interval	Measurement Parameters	Remarks (Start time)	Available Data(2007)
<Thailand>	Wet deposition	Bangkok	Urban	daily	All required items+Organic acid, Phosphate	April '99	
		Samutprakarn	Urban	daily	All required items+Organic acid, Phosphate	January '00	
		Patumthani	Rural	daily	All required items+Organic acid, Phosphate	March '99	
		Khanchnaburi (Vachiralongkorn Dam)	Remote	daily	All required items+Organic acid, Phosphate	April '99	
		Chiang Mai(Mae Hia)	Rural	daily	All required items+Organic acid, Phosphate	January '01	
		Nakhon Ratchasima	Remote	daily	All required items+Organic acid, Phosphate	January '06	
	Dry deposition	Bangkok	Urban	AT+ FP(weekly)	SO ₂ ,NO,NO ₂ ,NO _x ,O ₃ ,HNO ₃ ,HCl, NH ₃ ,PMC		
		Samutprakarn	Urban	AT	SO ₂ ,NO,NO ₂ ,NO _x ,O ₃		
		Patumthani	Remote	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		
		Khanchnaburi (Vachiralongkorn Dam)	Remote	AT+ FP(weekly)	SO ₂ ,NO,NO _x ,PM ₁₀ ,O ₃ ,HNO ₃ ,HCl, NH ₃ ,PMC		
		Chiang Mai(Mae Hia)	Rural	AT+ FP(weekly)	SO ₂ ,NO,NO _x ,PM ₁₀ ,O ₃ ,HNO ₃ ,HCl, NH ₃ ,PMC		
		Nakhon Ratchasima	Remote	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC	January '06	
	Soil and	Vachiralongkorn Dam	Remote	Once/3 years	Tree Decline, Ions in soil		
	Inland aquatic environment	Vachiralongkorn Dam	Remote	4 times/year	Water quality of Vachiralongkorn Dam		
<Viet nam>	Wet deposition	Hanoi	urban	weekly	All required items	August '99	✓
		Hoa Binh	rural	weekly	All required items	August '99	✓
	Dry deposition	Hanoi	urban	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		✓
		Hoa Binh	rural	FP(weekly)	SO ₂ ,HNO ₃ ,HCl,NH ₃ ,PMC		✓
	Soil and	Hoa Binh	rural	Once a year	Decline, & ions in soil		
	Inland aquatic environment	Hoa Binh Reservoir	rural	4 times/year	Water quality of Hoa Bin Reservoir		✓

Note)*: Biocides are added to precipitation samples

PMC; Particulate matter components

The monitoring situations in each participating countries for mandatory items

1. Introduction

Based on the results of the First Expert Meeting, the guidelines have been adopted at the Second Expert Meeting on Acid Precipitation Monitoring Network in East Asia, which was held in March 1995 in Tokyo.

During the preparatory-phase (April 1998-December 2000) the participating countries made effort to comply with these guidelines to the extent possible. Based on the experience gained, and the latest scientific/technical information, the guidelines were revised and adopted as a technical manual “Technical Documents for Acid Deposition Monitoring in EAST Asia “ at the Second Interim Scientific Advisory Group (ISAG) Meeting of EANET held in March 2000 in Jakarta, Indonesia.

The monitoring in the regular-phase (January 2001-present) of acid deposition consists of measurements on wet deposition, dry deposition, soil and vegetation, and inland aquatic environment has been carried out in accordance with the technical documents with some modification according to the strategy paper, “Strategy Paper for Future Direction of Soil and Vegetation Monitoring of EANET” (November 2002) and “Strategy Paper for Future Direction of Dry Deposition Monitoring of EANET” (September 2005)”, prepared by Task Force on Soil and Vegetation Monitoring and Dry Deposition Monitoring.

2. Basic matters on acid deposition monitoring

2.1. Objectives

The objectives of the Acid Deposition Monitoring Network are:

- (1) to create a common understanding of the state of the acid deposition problems in East Asia; and
- (2) to provide useful inputs for decision-making at local, national and regional levels aimed at preventing or reducing adverse impacts on human health and the environment due to acid deposition.

2.2. Outline of the manual for monitoring

In the technical documents, standard suggested items concerning, sampling methodology, analytical methods, data control and data reporting, and quality assurance and quality control (QA/QC) aspects on monitoring in EANET are described. For the majority of the methods, the necessary quality assurance is facilitated by a combination of simple and robust sampling techniques with well-described sampling equipment, and use of synthetic control samples for the chemical analyses.

3. Fundamental items concerning monitoring on acid deposition

3.1. Monitoring sites

Selection of sampling sites is a critical factor in the monitoring of wet deposition. Therefore, sampling sites should be located in areas suitable for the purpose of the survey, and should properly represent the area in question. In addition, coordination is required with dry deposition monitoring, and the closest meteorological station.

EANET monitoring sites are classified into two basic categories, namely deposition monitoring sites and ecological survey sites. Deposition monitoring sites are sampling sites to collect fundamental data on the temporal and spatial distribution of acid deposition, and are further classified into three sub-categories: remote sites, rural sites, and urban sites for the objectives of the monitoring. Ecological survey sites are those to provide basic data for assessing the effects of acidification on terrestrial ecosystems, and further classified into two sub-categories: basic survey sites, and ecosystem analysis sites. All sites in each country should be classified according to these categories. Regarding the deposition monitoring sites, at least one or more remote or rural sites should be established in a country participating in the EANET activities.

3.2 Fundamental items of each monitoring

Fundamental items of each monitoring are described below.

<Wet Deposition>

1) monitoring sites

(1) general information

- ✓ represent the area in question
- ✓ coordination with dry deposition monitoring & the closest meteorological station

- ✓ At least one or more remote or rural sites should be established

(2) siting of the sampling equipment

- ✓ to remain in almost the same conditions for several decades
- ✓ sites which don't receive local wind effect (mountain top, cols, coastal, valley basins are not suitable)
- ✓ considerations of the effects of immediate surrounding and emission within the nearest 20km

(3) minimum distance to emission and contamination sources

- ✓ Regions within 50km of large pollution source should be excluded as remote sites and ecological sites
- ✓ Regions within 20km of large pollution source should be excluded as rural
- ✓ Regions within 500m of main roads should be excluded as remote and rural sites

(4) Local criteria

- ✓ An open, flat, grassy area far enough from trees, no objects
- ✓ At least twice the objection height and less than 30 degree above the horizon
- ✓ Regions within 100 m of these emission and contamination sources should be excluded.
- ✓ The horizontal distance between collector and rain gauge should be greater than 2 meters

The rain gauge and the wet deposition collector should cross the direction of the prevailing wind.

2) Monitoring frequency and measurement parameters

(1) Monitoring frequency

- ✓ samples should be collected every 24 hours in principal
- ✓ combining daily samples for weekly (7 days) composite or sampling for a week can be acceptable
- ✓ collection can be conducted for each precipitation event.
- ✓ The starting time of a day should be at 9:00 local time as a general rule.
- ✓ If a refrigerator is not in use, biocide should be used for preserving the samples.

(2) Measurement parameters

a) Precipitation chemistry parameters

Mandatory items:

- ✓ pH, EC, SO_4^{2-} , NO_3^- , Cl^- , NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+}

Optional items:

- ✓ F, HCO_3^- , NO_2^- , Organic acid (HCOO^- , CH_3COO^-), (Br^- , PO_4^{3-})

b) Meteorological Measurements

- ✓ Wind direction/speed, temperature, humidity, precipitation amount, solar radiation

(3) Laboratory treatment of samples

- ✓ all samples should be filtered with clean membrane filters (pore size: $0.45\mu\text{m}$)
- ✓ After filtration, samples should be refrigerated at 4 degree.
- ✓ Analysis should be carried out within a week of sample arrival in the laboratory.

<Dry deposition>

Priority of the chemical species for dry deposition monitoring in EANET is as follows.

(First priority):

- ✓ SO_2 , O_3 , NO , NO_2 (urban), HNO_3 , HCl , NH_3
- ✓ Particulate component (SO_4^{2-} , NO_3^- , Cl^- , NH_4^+ , Na^+ , Mg^{2+} , K^+ , and Ca^{2+}), PM_{10}

(Second priority):

- ✓ NO_2 (rural and remote), $\text{PM}_{2.5}$

<Soil & Vegetation>

(1) Selection of basic survey site

- Survey sites should preferably be located within a radius of approximately 50 km of (Dry and Wet) deposition monitoring sites.

(2) Site selection criteria

- Two forests, whose soils have different sensitivities to acid deposition, are recommended to be selected.
- Each sites should be established in a continuous forest area of more than one hectare.
- (If the area is surrounded with a suitable shelter belt, 0.2 hectare is sufficient.)
- Site must be accessible for surveying over a long period(decades).

(3) Selection of plots for soil monitoring

- Several plots, at least two plots, occupying areas from 5m*5m to 10m*10m, should be selected randomly at each soil type

(4) Selection of subplots for soil sampling

- In the plot, five subplots, each occupying 1m*1m, are selected in principle at the center and the diagonal lines of the plot

(5) Monitoring parameters and frequency of analysis

1) Monitoring parameter for soil (Every 3-5 years)

Mandatory items:

- ✓ Moisture content/pH(H₂O) and pH(KCl)/Exchangeable Base cations (Ca, Mg, K, and Na)/Exchangeable acidity
- ✓ Effective cation exchangeable capacity (ECEC)/Carbon contents (for only calcareous soil)

Optional items:

- ✓ Exchangeable AL, H/Total Carbon content/ Total Nitrogen content/

Voluntary items:

- ✓ Available phosphate/Sulfate

2) Selection of plots for general description of the forest

- ✓ Two forest areas of more than 0.2 hectare are selected.
- ✓ A measuring plot should be subdivided to three coaxial circles of 1000, 400, and 200 square meters for the detailed survey.

3) Monitoring items and frequency of monitoring for general description of the forest.

Mandatory items: (Every 3-5 years)

- ✓ Description of trees; Name of species/ Diameter at Breast Height/ Height of tree
- ✓ Understory vegetation survey

4) Survey of tree decline

Mandatory items: (Every 3-5 years)

- ✓ Observation of tree decline

Optional items: (Every 3-5 years)

- ✓ Photographic record of tree decline/ Estimation of decline causes

<Inland aquatic environment>

Measurement parameters and frequency of monitoring

1) 4 times/year**Mandatory items:**

- ✓ W.T,pH,EC,Alkalinity, SO_4^{2-} , NO_3^- , Cl^- , NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+}

Optional Parameters:

- ✓ Phytoplankton(diatom species; for lakes), Epilithic algae (for springs,headwaters,rivers)

2)once/year

Mandatory items:

- ✓ Transparency,water color,DOC (if possible COD), NO_2^- ,and PO_4^{3-}

Optional Parameters:

- ✓ Total Al

3)once/in 3-5year

Mandatory items:

- ✓ Sediment(SO_4^{2-} , NO_3^- ,and NH_4^+ in pore water)

Optional Parameters:

- ✓ living organisms other than phytoplankton,
Sediment(Pb,Pb210,and stable isotope of S; for lake)

4. Monitoring situations in each participating countries.

The monitoring situations in each participating countries are described in Table 1-4.

Table1. Wet deposition monitoring

Country/items	City	Monitoring sites	Classification	Monitoring interval	Mandatory items:										Optional items: F ⁻ ,HCO ₃ ⁻ ,NO ₂ ⁻ , .Organic acid,Br ⁻ ,PO ₄ ³⁻	Meteorology
					pH	EC	SO ₄ ²⁻	NO ₃ ⁻	Cl ⁻	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	NH ₄ ⁺		
<Cambodia>		Phnom Penh	Urban	Weekly	x	x	x	x	x	x	x	x	x	x		
<China>	Chongqing	Guanyinqiao	Urban	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻	x
		Jinyunshan	Rural	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻	x
	Xi'an	Shizhan	Urban	Daily	x	x	x	x	x	x	x	x	x	x		x
		Jiwozi	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
	Xiamen	Hongwen	Urban	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻	x
		Xiaoping	Remote	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻	x
	Zhuhai	Xiang Zhou	Urban	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻	x
		Zhuxian Cavern	Urban	Daily	x	x	x	x	x	x	x	x	x	x		x
<Indonesia>		Jakarta(BMG)	Urban	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Serpong(EMC)	Rural	Daily	x	x	x	x	x	x	x	x	x	x		x
		Kototabang(BMG)	Remote	Weekly	x	x	x	x	x	x	x	x	x	x		
		Bandung(LAPAN)	Urban	Daily	x	x	x	x	x	x	x	x	x	x		
<Japan>		Rishiri	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Ochiishi	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Tappi	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Ogasawara	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Sado-seki	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Happo	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Okii	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Yusuhara	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Hedo	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Ijira	Rural	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Banryu	Urban	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Tokyo	Urban	Daily	x	x	x	x	x	x	x	x	x	x		
<Lao PDR>		Vientiane	Urban	Daily	x	x	x	x	x	x	x	x	x	x		
<Malaysia>		Petaling Jaya	Urban	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Tanah Rata	Remote	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Danum Valley	Remote	Weekly	x	x	x	x	x	x	x	x	x	x		
<Mongolia>		Ulaanbaatar	Urban	Daily	x	x	x	x	x	x	x	x	x	x	HCO ₃ ⁻	x
		Terej	Remote	Daily	x	x	x	x	x	x	x	x	x	x	HCO ₃ ⁻	x
<Myanmar>		Kaha-Aya, Yangon	Urban	Daily	x	x										
<Philippines>		Metro Manila	Urban	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Los Banos	Rural	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Mt. Sto. Tomas	Rural	Weekly	x	x	x	x	x	x	x	x	x	x		x
<Republic of Korea>		Kanghwa	Rural	Daily	x	x	x	x	x	x	x	x	x	x		x
		Cheju(Kosan)	Remote	Daily	x	x	x	x	x	x	x	x	x	x		x
		Imsil	Rural	Daily	x	x	x	x	x	x	x	x	x	x		x
<Russia>		Mondy	Remote	Daily	x	x	x	x	x	x	x	x	x	x	NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻	x
		Listvyanka	Rural	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻ , NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻	x
		Irkutsk	Urban	Daily	x	x	x	x	x	x	x	x	x	x	F ⁻ , NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻	x
		Primorskaja	Rural	Daily	x	x	x	x	x	x	x	x	x	x	NO ₂ ⁻ , Br ⁻ , HCO ₃ ⁻	x
<Thailand>		Bangkok	Urban	Daily	x	x	x	x	x	x	x	x	x	x	HCOOH,CH ₃ COOH,PO ₄ ³⁻	x
		Samuyprakan	Urban	Daily	x	x	x	x	x	x	x	x	x	x	HCOOH,CH ₃ COO,HPO ₄ ³⁻	x
		Patumthani	Rural	Daily	x	x	x	x	x	x	x	x	x	x	HCOOH,CH ₃ COO,HPO ₄ ³⁻	x
		Khanchanaburi (Vachralongkorn Dam)	Remote	Daily	x	x	x	x	x	x	x	x	x	x	HCOOH,CH ₃ COO,HPO ₄ ³⁻	x
		Chiang Mai(Mae-Hia)	Rural	Daily	x	x	x	x	x	x	x	x	x	x	HCOOH,CH ₃ COO,HPO ₄ ³⁻	x
		Nakhon Ratchasima	Remote	Daily	x	x	x	x	x	x	x	x	x	x	HCOOH,CH ₃ COOH,PO ₄ ³⁻	x
<Viet nam>		Hanoi	Urban	Weekly	x	x	x	x	x	x	x	x	x	x		x
		Hoa Binh	Rural	Weekly	x	x	x	x	x	x	x	x	x	x		x

Table2. Dry deposition(Air concentration) monitoring

Country/items	City	Monitoring sites	Classification	Monitoring method	Priority of the chemical species											
					SO ₂	O ₃	NO	NO ₂	PM ₁₀	HNO ₃	HCl	NH ₃	SO ₄ ²⁻	NO ₃	NH ₄ ⁺	Ca ²⁺
<China>	Chongqing	Jiayunshan	Rural	AT	x			x	x							
	Xiamen	Hongwen	Urban	AT,FP	x			x	x	x	x	x	x	x	x	x
	Zhuhai	Xiang Zhou	Urban	AT	x			x	x							
<Indonesia>		Serpong(EMC)	Rural	FP	x					x	x	x	x	x	x	x
<Japan>		Rishiri	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Ochiishi	Remote	FP	x					x	x	x	x	x	x	x
		Tappi	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Ogasawara	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Sado-seki	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Happo	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Oki	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Yusuhara	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Hedo	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Ijira	Rural	AT,FP	x	x	x	x	x	x	x	x	x	x	x	x
		Banryu	Urban	AT,FP	x	x	x		x	x	x	x	x	x	x	x
	Tokyo	Urban	FP	x					x	x	x	x	x	x	x	
<Malaysia>		Petaling Jaya	Urban	FP	x					x	x	x	x	x	x	x
		Tanah Rata	Remote	AT,FP	x	x	x	x		x	x	x	x	x	x	x
		Danum Valley	Remote	FP	x					x	x	x	x	x	x	x
<Mongolia>		Ulaanbaatar	Urban	FP	x					x	x	x	x	x	x	x
		Terelj	Remote	FP	x					x	x	x	x	x	x	x
<Philippines>		Metro Manila	Urban	FP	x					x	x	x	x	x	x	x
		Los Banos	Rural	FP	x					x	x	x	x	x	x	x
<Republic of Korea>		Kanghwa	Rural	AT,FP	x	x			x	x	x	x	x	x	x	x
		Cheju(Kosan)	Remote	AT,FP	x	x			x	x	x	x	x	x	x	x
		Imsil	Rural	AT,FP	x	x			x	x	x	x	x	x	x	x
<Russia>		Mondy	Remote	AT,FP	x	x				x	x	x	x	x	x	x
		Listvyanka	Rural	FP	x					x	x	x	x	x	x	x
		Irkutsk	Urban	FP	x					x	x	x	x	x	x	x
		Primorskaya	Rural	FP	x					x	x	x	x	x	x	x
<Thailand>		Bangkok	Urban	AT,FP	x		x	x	x	x	x	x	x	x	x	x
		Samutprakarn	Urban	AT	x	x	x	x								
		Patumthani	Rural	FP	x					x	x	x	x	x	x	x
		Khanchanaburi(Vachralo ngkorn Dam)	Remote	AT,FP	x	x	x		x	x	x	x	x	x	x	x
		Chiang Mai(Mae-Hia)	Rural	AT,FP	x	x	x		x	x	x	x	x	x	x	x
	Nakhon Ratchasima	Remote	FP	x					x	x	x	x	x	x	x	
<Viet nam>		Hanoi	Urban	FP	x					x	x	x	x	x	x	x
		Hoa Binh	Rural	FP	x					x	x	x	x	x	x	x

AT:Automatic Monitor,FP:Filter pack,

Table3. Soil & Vegetation monitoring

Country/items	City	Monitoring sites	Classification	Monitoring interval (Soil)	Monitoring interval (Forest)	Soil									
						Mandatory items:							Optional items		
						Moisture contents	pH (H ₂ O)	pH (KCl)	Exchangeable base cations (Ca,Mg,K,and Mg)	Exchangeabl e Acidity	Effective cation exchngeable capacity (ECEC)	Carbonate contents	Exchangeable acid cations (AL,H)	Total carbon content	Total nitrogen content
<China>	Chongqing	Jinyunshan	Rural	Once/3years	Once/3years	x	x	x	x	x	x	x	x	x	x
	Xi'an	Dabagou	Remote	Once/3years	Once/3years	x	x	x	x	x	x	x	x	x	x
	Xiamen	Xiaoping	Remote	Once/3years	Once/3years	x	x	x	x	x	x	x	x	x	x
	Zhuhai	Zhuxian dong	Urban	Once/3years	Once/3years	x	x	x	x	x	x	x	x	x	x
<Indonesia>		Serpong (Bogor Ewsearch Forest)	Rural	Once/3years	Once/3years		x	x	x		x	x	x	x	x
<Japan>		Ijira	Rural	Once/5years	Once/5year	x	x	x	x	x	x		x		
		Banryu	Urban	Once/5years	Once/5year	x	x	x	x	x	x		x	x	x
<Malaysia>		Pasoh Reserve Forest	Remote			x	x	x		x					
		Petaling Jaya	Remote												
<Mongolia>		Ulaanbaatar (Bogdkhan mountain)	Urban	Once/3-5years	Once/3-5years		x	x		x					
<Philippines>		Los Banos Laguna (Makiling Forest Reserve)	Rural	Once/3years	Once/3years	x	x	x	x	x			x	x	x
<Republic of Korea>		Imsil (Mt.Naejang)	Rural	Once/3years	Once/3years	x	x	x	x	x			x		
<Russia>		Mondy	Remote	Once/3-5years	Once/3-5years		x	x	x		CEC	x	AL	x	x
		Listvyanka	Rural	Once/3-5years	Once/3-5years	x	x	x	x	x	x	x	x	x	x
		Primorskaya	Rural	Once/3-5years	Once/3-5years	x	x	x	x	x	x	x	x	x	x
		Irkutsk	Urban	Once/3-5years	Once/3-5years	x	x	x	x	x	x	x	x	x	x
<Thailand>		Vachralongkorn Dam	Remote	Once/3years	Once/3years	x	x	x	x	x	x				
<Viet nam>		Hoa Binh	Rural	Once/year	Once/year		x	x	x		CEC				

x*)Monitoring plan shows.

Table3. Soil & Vegetation monitoring

Country/items	City	Monitoring sites	Forest monitoring							
			Voluntary item	mandatory item(3-5years)					Optional items	
			Available phosphate/Sulfate	Name of species	Diameter at breast height	Height of tree	Understory vegetation survey	Observation of tree decline	Photographic record of tree decline	Estimation of decline causes
<China>	Chongqing	Jinyunshan	x	x	x	x	x	x		
	Xi'an	Dabagou	x	x	x	x				
	Xiamen	Xiaoping	x	x	x	x				
	Zhuhai	Zhuxian dong	x	x	x	x	x	x		
<Indonesia>		Serpong (Bogor Ewsearch Forest)	x	x	x	x		x		
<Japan>		Ijira	Sulfate	x	x	x	x	x	x	x
		Banryu		x	x	x	x	x	x	x
<Malaysia>		Pasoh Reserve Forest								
		Petaling Jaya								
<Mongolia>		Ulaanbaatar (Bogdkhan mountain)		x	x	x	x	x		
<Philippines>		Los Banos Laguna (Makiling Forest Reserve)		x	x	x	x	x		x*
<Republic of Korea>		Imsil (Mt.Naejang)		x	x	x	x	x		x*
<Russia>		Mondy	x							
		Listvyanka	x	x	x	x		x	x	x
		Primorskaya	x	x	x	x		x	x	x
		Irkutsk	x	x	x	x	x	x	x	
<Thailand>		Vachralongkorn Dam								
<Viet nam>		Hoa Binh						x		

x*)Monitoring plan shows.

Table4. Inland aquatic environment monitoring

Country/items	City	Monitoring sites	Classification	Monitoring interval	Mandatory items(4times/year)												Mandatory items(Once/year)					
					W.T	pH	EC	Alkalinity	SO ₄ ²⁻	NO ₃ ⁻	Cl ⁻	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	NH ₄ ⁺	Transparency	water color	DOC (COD)	NO ₂ ⁻	PO ₄ ³⁻	
<China>	Chongqing	Jinyunshan Lake	Rural	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	Xi'an	Jiwozi River	Remote	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	Xiamen	Xiaoping Dam	Remote	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	Zhuhai	Zhuxiandong Stream	Urban	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<Indonesia>		Patenggang Lake	Rural	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<Japan>		Ijira Lake	Rural	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
		Banryu Lake	Urban	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<Lao-PDR>		Nam Houm Lake	Urban	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x						
<Malaysia>		Semenyih Dam	Urban	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x						
		Danum Valley	Remote	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x						
<Mongolia>		Terej River	Remote	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x				x	x	
<Philippines>		Pandin Lake	Rural	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x				x	x	
		Ambulalakao River	Remote	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x				x	x	
<Russia>		Pereemnya River	Rural	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x
		Krastovka River	Rural	5 times/year	x	x	x	x	x	x	x	x	x	x	x	x				x	x	
<Thailand>		Vachiralongkorn Dam	Remote	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
<Viet nam>		Hoa Binh Reservoir	Rural	4 times/year	x	x	x	x	x	x	x	x	x	x	x	x	x				x	x

Annex 1 Table. Summary of sampling plan/schedule in the individual monitoring sites 2006-2011

Country	Organization	Area (Name of nearest deposition monitoring site)	Name of individual monitoring site	Soil type by FAO/Unesco or ISRIC	Forest type (major species)	Monitoring records ^{*4}	Next sampling schedule and items	Interval
China	S, F) Chongqing Institute of Environmental Science	Jinyunshan (Chongqing)	Jinyunshan	(Acidic-Udic Argosols) ^{*1}	<i>Castanopsis carlesii</i> var. <i>spinulosa</i> , <i>Symplocos setchuenensis</i> , etc.	2000 (S), 2003; 2006 (S, F)	2009 (S, F)	3 years
	S, F) Xi'an Environmental Science	Jiwozi (Xi'an)	Dabagou	(Brown soil) ^{*1}	<i>Pinus armandi</i> , <i>Larix gmelini</i> , etc.	2001 (S), 2003; 2006 (S, F)	2009 (S, F)	
	S, F) Xiamen Environmental Monitoring Central Station	Xiaoping (Xiamen)	Xiaoping	(Red soil) ^{*1}	Man-made forest (<i>Michelianmacclurei dandyrar</i> , <i>Fokienia hodginsii</i> , <i>Pinus massoniana</i>)	2000; 2003; 2006 (S, F)	2009 (S, F)	
	S, F) Zhuhai Environmental Monitoring Station	Zhuxiandong (Zhuhai)	Zhuxiandong	(Ochinic Udic Ferrosols) ^{*1}	<i>Acacia auriculiformis</i> , <i>A. confusa</i> , <i>Pinus</i>	2001 (S), 2000; 2003; 2006 (S, F)	2009 (S, F)	
Indonesia	S) Soil and Agro Climate Research Development Center (Puslitanak) Environmental Management Center (EMC) F)	EMC	Bogor Research Forest (Dramaga Experimental Forest)	(Typic Dystrudepts) ^{*1}	Man-made forest (<i>Hopea mengarawan</i> , <i>Khaya anthotheca</i> etc.)	2001 (S), 2007(S)	2008 (F)?	3 years
Japan	S) Gifu Prefectural Research Institute of Health and Environmental Science F) Forest Science Research Institute, Gifu Prefecture	Ijira	Ijira	Dystric Cambisols	Man-made forest (<i>Cryptomeria japonica</i> , <i>Chamaecyparis obtuse</i> etc.)	2000; 2006 (S, F) 2003; 2004; 2005; 2007 (F) ^{*6}	2011 (S, F)	5 years ^{*8}
			Yamato	Andosols	Man-made forest (<i>Chamaecyparis obtuse</i>)	2003; 2004; 2005; 2007 (F) 2006 (S, F)	2011 (S, F)	

	S) Agricultural Experimental Station, Shimane Prefecture F) Forestry Technology Cener, Shimane Prefecture	Banryu	Banryu-2 ^{*2}	Cambisols	Secondary forest (<i>Symplocos lucida</i> , etc.)	2000; 2003; 2004; 2005 (F) 2001; 2006 (S, F)	2011 (S, F)	
		Iwami "rinku" Factory Park ^{*2}	Acrisols	Secondary forest (<i>Castanopsis cuspidate</i> , etc.)	2001; 2006 (S, F) 2003; 2004; 2005 (F)	2011 (S, F)		
Malaysia	S) Universiti Putra Malaysia F)	-	Pasoh Reserve Forest	Dystric Nitosols/ Rhodic Ferralsols	Natural forest	2000 (S) 2007 August (S) ^{*7} 2007 November (S)		3 years
		Petaling Jaya	Sungai Lalang Reserve Forest	Dystric Nitosols/ Rhodic Ferralsols	Secondary forest	2007 August (S) 2007 November (S)		
Mongolia	S) Central Laboratory for Environmental Monitoring F) National University of Mongolia (NUM).	Ulaanbaatar	Bogdkhan Mountain	Not reported	Natural forest (<i>Larix sibirica</i>)	2005 (S, F)		3-5 years
Philippines	S) University of the Philippine Los Banos (UPLB), Environmental Management Bureau F) UPLB	Los Banos	Mt. Makiling	Eutric Cambisols	Secondary forest (<i>Celtis luzonica</i> , etc.)	2000 (F) 2002 (S) 2001, 2005 ^{*5} (S, F)	2008 (S, F)	3 years
			UP Quezon, Land Grant	Dystric Nitosols	Secondary forest	(2000(s)) 2001, 2005 ^{*5} (S, F)	2008 (S, F)	
Republic of Korea	S, F) National Institute of Environmental Research	Imsil	Mt. Naejang	Not reported	Secondary forest (<i>Pinus densiflora</i> , <i>Pinus rigida</i> , <i>Styrax japonica</i> , <i>Prunus maximowiczii</i>)	2001, 2004 (S, F)		3 years
Russia	S) Laboratory of Hydrochemistry and Atmospheric Chemistry, Limnological Institute of RAS/SD (Irkutsk) F) Siberian Institute of	Irkutsk	Irkutsk	Eutric Regosols/ Calcaric Luvisols	Man-made forest (<i>Pinus sylvestris</i> , <i>Betula pendula</i>)	2001 (S, (F)) 2003 (F)	-	3-5 years
		Listvyanka	Bolshie Koty	Mollic Leptosols/ Umbric Leptosols	Natural forest (<i>Pinus sylvestris</i> , <i>Populus tremula</i> , etc.)	2000 (S) 2002 (F)	-	

	Plant Physiology and Biochemistry, RAS/SD (Irkutsk)		Pereemnaya river catchment	Gelic Podzols/ Dystric Leptosols	Natural forest (<i>Betula pendula</i> , <i>Picea obovata</i> , etc.)	2005 (S, F)	-	
		Mondy	Ilchir Lake	Gelic Podzols/ Gelic Gleysols	Not reported	1999 (S)	-	
			Okinskoe Lake	Gelic Podzols	Not reported	1999 (S)	-	
			Solar Observatory	Calcic Gleysols	Natural forest (<i>Larix sibirica</i>)	1999 (S) 2004 (F)	-	
		Primorskaya	Primorskaya	Mollic Leptosols/ Umbric Leptosols	Natural forest (<i>Quercus mongolica</i> , <i>Betula daurica</i> , etc.)	2006 (S, F)	-	
Thailand	S) Department of Agriculture, King Mongkut's University of Technology Thonburi F) Royal Forest Department	Vachiralongkorn Dam (old name: Kao Lam Dam) *3	Vachiralongkorn Dam	Ferric Acrisols	Secondary forest (<i>Xylia xylocarpa</i> , etc.)	2000 (S, F) 2001, 2002 (S) 2003; 2006 (S, F)	2009 April and August (S, F)	3 years
			Vachiralongkorn Puyea	Luvisols	Secondary forest (<i>Dipterocarpus turbinatus</i>)	2002, 2003; 2006 (S, F)	2009 April and August (S, F)	
Viet Nam	S) Institute of Meteorology and Hydrology (IMH), and National University of Hanoi	Hoa Binh	Cave of Heaven	Ferric Acrisols	Man-made forest (<i>Pinus</i> sp.)	1999 (S, F)	-	3-5 years
			Thang Ranh	Ferric Acrisols	Man-made forest (<i>Acacia auriculiformis</i>)	1999 (S, F)	-	

Note: S, Soil monitoring; F, Forest monitoring; *1. Classification by FAO/UNESCO has not been reported; *2. The sites around Banryu deposition site were relocated in 2001; *3. Kao Lam Dam was renamed to Vachiralongkorn Dam; *4. Underlined data will be published in Data Report 2007; *5. The surveys were carried out in February 2005 due to postponement of surveys in autumn 2004 in the Philippines. The data was included in the Data Report 2004; *6. Tree decline will be surveyed every year in Japan; *7. Italic letter shows the data to be submitted in the original plan.

Myanmar**Annex I****Format on information on the National Center and contact person(s)**

Date(data reporting)	12 June 2008
Country name	Myanmar
Organization name	Ministry of Transport
Department	Department of Meteorology & Hydrology (DMH)
Name of contact persons	1. Mr. Tun Lwin, Director General 2. Ms. Hrin Nei Thiam, Assistant Director
Name of national QA/QC manager (NAM)	Ms. Nyein Nyein Naing, Staff Officer
Postal address	Department of Meteorology & Hydrology, Mayangone, 11061, Kaba-Aye Pagoda Road, Yangon, Myanmar
Contact address	Tel: 095-1-665669 Fax: 95-1-665944/665704 E-mail: dg.dmh@mptmail.net.mm

Format on national monitoring plan

Date(that the plan was decided)	August 2006
Country name	Myanmar
Organization name (Responsible agency)	Ministry of Transport
Department	Department of Meteorology & Hydrology (DMH)
Name of the person in charge	Ms. Htwe Htwe Win, Staff Officer
Postal address	Department of Meteorology & Hydrology, Mayangone, 11061, Kaba-Aye Pagoda Road, Yangon, Myanmar
Contact address	Tel: 095-1-665669 Fax: 95-1-665944/665704 E-mail: dg.dmh@mptmail.net.mm

1. Outline of the national monitoring plan

1) Number of monitoring sites and the arrangement (illustrations of monitoring sites arrangement should be attached in each cases.).

Items	(number of sites)	
	formal-phase network sites (a plan)	prospective future plan (year:)
Wet deposition	1	
Dry deposition		
Soil & vegetation		
Inland aquatic environment		

2) Measurement parameters and monitoring interval

Items	Measurement parameters	Monitoring interval
Wet deposition	1.pH, 2.EC	1.Daily Remark – Weekly since 2008

3) Participating laboratories for each monitoring activities

<Wet deposition / Dry deposition (1)>

Organization name	Ministry of Transport	Code	
Department/Section	Department of Meteorology & Hydrology (DMH)		
Name of a person in charge in the laboratory(PCL)	Ms. Htwe Htwe Win, Staff Officer		
Postal address	Mayangone, 11061, Kaba-Aye Pagoda Road, Yangon, Myanmar		
Contact address	Tel: 095-1-665669 Fax: 95-1-665944/665704 E-mail: dg.dmh@mptmail.net.mm		
Note	Wet Sampler was installed on 16 June 2007 at the chosen site.		

Format on information on respective monitoring sites

Date(data reporting)	12 June 2008		
Country name	Myanmar		
Organization name	Ministry of Transport		
Department	Department of Meteorology & Hydrology (DMH)		
Name of national QA/QC manager(NAM)	Ms. Nyein Nyein Naing, Staff Officer		
Postal address	Mayangone, 11061, Kaba-Aye Pagoda Road, Yangon, Myanmar		
Contact address	Tel: 095-1-665669	Fax: 95-1-665944/665704	
	E-mail: dg.dmh@mptmail.net.mm		

1. Wet deposition (prepare for each site)

1) Outline of monitoring site

Site name	Urban (Kaba-Aye, Yangon)		Code	
Address	Department of Meteorology and Hydrology Mayangone, 11061, Kaba-Aye Pagoda Road, Yangon, Myanmar			
Site classification	1.urban			
Latitude	(north) 16.5 °	Longitude	(east) 96.11°	
Altitude	21.7 m (Above M.S.L)			
Height of sampling funnel	From the ground level: 7.62 m From the floor of collector installed: 1.0 m			

2) Sample collection

Period of sample	1.daily (during 2007)
Collection	2.daily collection and weekly composite analysis (since 2008)
System of sample	1.wet only
Collection	
Collector	Manufacturer: OGASAWARA KEIKI Co., Ltd , model: U S 3 3 0 Funnel diameter: 200 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge: 1.use (installed since 20 May,2008) Manufacturer: Local made , model: Ordinary rain gauge Height from the ground level: 7.62 m Method: 1.other (Manual)
Other parameters of observation on site	1.solar radiation
In case of using nearest meteorological station data.	Name of the station: DMH Distance from the site: 90 m Direction from the site (bearings): Eastward
	1.precipitation amount (during 2007), 2.wind direction, 3.wind velocity, 4.temperature, 5.humidity

Republic of Korea**National monitoring plan**

Date(that the plan was decided)	January, 2008
Country name	Republic of Korea
Organization name (Responsible agency)	National Institute of Environmental Research
Department	National Center
Name of the person in change	Han Jin-Seok
Postal address	ZIP CODE: 404-170, Environmental Research Complex, Kyeongseo-dong, Seo-gu, Incheon city
Contact address	Tel: +82-32-560-7330 Fax: +82-32-560-7333 E-mail : nierhan@hanmail.net

1. Outline of the national monitoring plan

1) Number of monitoring sites and the arrangement (illustrations of monitoring sites arrangement should be attached in each cases).

(number of sites)

Items	Formal-phase Network sites (a plane)	Prospective Future plan (year:)
Wet deposition	3 sites	
Dry deposition	3 sites	
Soil & vegetation	1 site	
Inland aquatic environment	-	

2) Measurement parameters and monitoring interval

Items	Measurement parameters	Monitoring interval
Wet deposition	1.pH, 2.EC, 3.NH ₄ ⁺ , 4.Na ⁺ , 5.K ⁺ , 6.Ca ²⁺ , 7.Mg ²⁺ , 8.SO ₄ ²⁻ , 9.NO ₃ ⁻ , 10.Cl ⁻ , 11.Others(, ,)	1.daily, 2.other(weekly)
Dry deposition	1.SO ₂ , 2.NO ₂ , 3.NO, 4.O ₃ , 5.Other gases(HNO ₃ , NH ₃ , HCl), 6.Particulate Matter(PM), 7.Components in PM	1.hourly, 2.other(Two times per week)
Soil	1.pH(H ₂ O), 2.pH(KCl), exchangeable (3.Na ⁺ , 4.K ⁺ , 5.Ca ²⁺ , 6.Mg ²⁺ , 7.Al ³⁺ , 8.H ⁺), 9.exchangeable acidity, 10.ECEC, 11.Carbonate, 12.T-C, 13.T-N, 14. SO ₄ ²⁻ , 15. available phosphate, 16.others(, ,)	Monitoring period (month:_____, year: <u>3 years</u>)
Vegetation	1.observation of tree decline, 2.description of trees, 3.others(, ,)	year: <u>3 years</u>
Inland aquatic environment	1.Water Temp, 2.pH, 3.EC, 4.alkalinity, 5.NH ₄ ⁺ , 6. Na ⁺ , 7.K ⁺ , 8.Ca ²⁺ , 9.Mg ²⁺ , 10.SO ₄ ²⁻ , 11.NO ₃ ⁻ , 12.Cl ⁻ , 13.Others(, ,) 14.transparency, 15.Water color, 16.DOC(COD), 17.NO ₂ ⁻ , 18.PO ₄ ³⁻ , 19.Sediment(SO ₄ ²⁻ , NO ₃ ⁻ , and NH ₄ ⁺ in pore water) 20.Others(, ,)	1.regularly (times/year) 2.irregular (month:_____, year:_____)

3) Participating laboratories for each monitoring activities

<Wet deposition/Dry deposition (1)>

Organization name	National Institute of Environmental Research	Code	
Department/Section	National Center / Wet & Dry deposition Section		
Name of a person in charge in the laboratory(PCL)	Hong You-Deog		
Postal address	ZIP CODE: 404-170, Environmental Research Complex, Gyeongseo-dong, Seo-gu, Incheon city		
Contact address	Tel: +82-32-560-7353 Fax: +82-32-56-7333 E-mail: ydhong@me.go.kr		
Note			

<Soil >

Organization name	National Institute of Environmental Research	Code	
Department/Section	National Center / Soil Section		
Name of a person in charge in the laboratory(PCL)	Soil: Park Jong-Gyeom		
Postal address	ZIP CODE: 404-170, Environmental Research Complex, Gyeongseo-dong, Seo-gu, Incheon city		
Contact address	Soil: Tel: +82-32-560-7575, Fax: +82-32-568-2042 E-mail: pj0930@me.go.kr		
Note			

<Vegetation >

Organization name	National Institute of Environmental Research	Code	
Department/Section	National Center / Vegetation Section		
Name of a person in charge in the laboratory(PCL)	Koh Kang-suk		
Postal address	ZIP CODE: 404-170, Environmental Research Complex, Gyeongseo-dong, Seo-gu, Incheon city		
Contact address	Vegetation: Tel: +82-32-560-7203, Fax: +82-32-560-7206 E-mail: kohks@me.go.kr		
Note			

Information on respective monitoring sites

Date(data reporting)	July, 2008
Country name	Republic of Korea
Organization name	National Institute of Environmental Research
Department	Air Quality Research Department
Name of national QA/QC manager(NAM)	Hong You-Deog
Postal address	ZIP CODE: 404-170, Environmental Research Complex, Gyeongseo-dong, Seo-gu, Incheon city
Contact address	Tel: +82-32-560-7353 Fax: +82-32-560-7333 E-mail: ydhong@me.go.kr

1-1.Wet deposition (prepare for each site)

1) Outline of monitoring site

Site name	Ganghwa	Code	101
Address	437-1 Seokmo-ri, Samsan-myeon, Ganghwa-gun, Gyeonggi-do		
Site classification	1.urban, 2.rural, 3.remote		
Latitude	(north) 37 ° 42 ‘	Longitude	(east) 126 ° 17 ‘
Altitude	102 M		
Height of sampling funnel	From the ground level: 1.5 m		From the floor of collector installed: 1.0 m

2) Sample collection

Period of sample Collection	1.daily, 2.every precipitation event, 3.weekly, 4.biweekly, 5.monthly 6.daily collection and weekly composite analysis 7.other()
System of sample Collection	1.wet only, 2.other()
Collector	Manufacturer: Eigenbrodt , model: NAS 181 Funnel diameter: 200 mm

3) Meteorological observation

Precipitation amount on Site	Rain gauge: 1.use, <u>2.no use</u> Manufacturer: _____, model: _____ Height from the ground level: _____ m Method: 1.tipping bucket, 2.gravimetric, 3.other(_____)
Other parameters of Observation on site	1.wind direction, 2.wind velocity, 3.temperature, 4.humidity, 5.solar radiation, 6.other(_____)
In case of using nearest meteorological station data.	Name of the station: Ganghwa Distance from the site: 15 km Direction from the site(bearings): 090 degree <u>1.precipitation amount, 2.wind direction, 3.wind velocity, 4.temperature, 5.humidity, 6.solar radiation, 7.other(_____)</u>

4) Situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. At each divided directions in the following scale. And attach a sketch map for each scale. Attach color photos of 8 azimuth directions for on-site scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

1-2.Wet deposition (prepare for each site)

1) Outline of monitoring site

Site name	Jeju	Code	102
Address	3786 Gosan-ri, Hangeong-myeon, Bukjeju-gun, Jeju-do		
Site classification	1.urban, 2.rural, <u>3.remote</u>		
Latitude	(north) 33 ° 18 ‘	Longitude	(east) 126 ° 10 ‘
Altitude	50 M		
Height of sampling funnel	From the ground level: 1.5 m From the floor of collector installed: 1.0 m		

2) Sample collection

Period of sample Collection	<u>1.daily</u> , 2.every precipitation event, 3.weekly, 4.biweekly, 5.monthly 6. daily collection and weekly composite analysis 7.other()
System of sample Collection	<u>1.wet only</u> , 2.other()
Collector	Manufacturer: AQUA , model: RM 8300 Funnel diameter: 200 mm

3) Meteorological observation

Precipitation amount on Site	Rain gauge: 1.use, <u>2.no use</u> Manufacturer: , model: Height from the ground level: m Method: 1.tipping bucket, 2.gravimetric, 3.other()
Other parameters of observation on site	1.wind direction, 2.wind velocity, 3.temperature, 4.humidity, 5.solar radiation, 6.other()
In case of using nearest meteorological station data.	Name of the station: Jejugeocheung Distance from the site: 150 m Direction from the site(bearings): 045 degree <u>1.precipitation amount, 2.wind direction, 3.wind velocity, 4.temperature, 5.humidity, 6.solar radiation, 7.other()</u>

4) Situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. At each divided directions in the following scale. And attach a sketch map for each scale. Attach color photos of 8 azimuth directions for on-site scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

1-3.Wet deposition (prepare for each site)

1) Outline of monitoring site

Site name	Imsil	Code	103
Address	201 Seongeo-ri, Unam-myeon, Imsil-gun, Jeollabuk-do		
Site classification	1.urban, 2. <u>rural</u> , 3.remote		
Latitude	(north) 35 ° 36 ‘	Longitude	(east) 127 ° 11 ‘
Altitude	M		
Height of sampling funnel	From the ground level: 1.5 m		From the floor of collector installed: 1.0 m

2) Sample collection

Period of sample Collection	1.daily, 2.every precipitation event, 3. <u>weekly</u> , 4.biweekly, 5.monthly 6.daily collection and weekly composite analysis 7.other()
System of sample Collection	1. <u>wet only</u> , 2.other()
Collector	Manufacturer: APMKOREA , model: ARS101 Funnel diameter: 200 mm

3) Meteorological observation

Precipitation amount on Site	Rain gauge: 1.use, 2. <u>no use</u> Manufacturer: , model: Height from the ground level: m Method: 1.tipping bucket, 2.gravimetric, 3.other()
Other parameters of observation on site	1.wind direction, 2.wind velocity, 3.temperature, 4.humidity, 5.solar radiation, 6.other()
In case of using nearest meteorological station data.	Name of the station: Imsil Distance from the site: 10 km Direction from the site(bearings): 085 degree 1. <u>precipitation amount</u> , 2. <u>wind direction</u> , 3. <u>wind velocity</u> , 4. <u>temperature</u> , 5. <u>humidity</u> , 6.solar radiation, 7.other()

4) Situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. At each divided directions in the following scale. And attach a sketch map for each scale. Attach color photos of 8 azimuth directions for on-site scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

2-1. Dry deposition (prepare of each site)

1) Outline of monitoring site

Site name	Ganghwa	Code	201
Address	437-1 Seokmo-ri, Samsan-myeon, Ganghwa-gun, Gyeonggi-do		
Site classification	1.urban, <u>2.rural</u> , 3.remote, 4.ecological		
Latitude	(north) 37 ° 42 ‘	Longitude	(east) 126 ° 17 ‘
Altitude	102 M		
Height of sampling	From the ground level: 3 m		
Funnel	From the floor of collector installed: 2.5 m		

2) A situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. at divided direction in the following scale. A sketch map should be attached for each scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

---→ same as the site coded 101

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

---→ same as the site coded 101

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

---→ same as the site coded 101

3) Gases

(1) Outline of monitoring

Measured parameters	<u>1.SO₂</u> , <u>2.NO₂</u> , 3.NO, <u>4.O₃</u> , 5.others(<u>HNO₃</u> , <u>NH₃</u> , <u>HCl</u>)
Sampling period of each data	1.an hour, 2.12hours, 3.a day, 4.a week, 5.two weeks, 6.a month 7.other(<u>one day in a six-day cycle</u>)
Measurement interval	<u>1.Continuous</u> , 2.hourly, 3.daily, 4.weekly, 5.biweekly, 6.monthly, 7.other()

(2) Monitoring method

Measurement parameter(1)	<u>SO₂</u> ,
Measurement method	1. automatic(method: <u>UV Fluorescence</u>) manufacturer: API(USA), model: 100A
	2. manual(method: 1. filtration(a. diffusion denuder, b. filter pack), 2. bubbling, 3. other()) sampling flow rate(liters/min)

Measurement parameter(2)	<u>NO₂</u>
Measurement method	1. automatic(method: <u>Chemiluminescence</u>) manufacturer: API(USA), model: 200A
	2. manual(method: 1. filtration(a. diffusion denuder, b. filter pack), 2. bubbling, 3. other()) sampling flow rate(liters/min)

Measurement parameter(3)	<u>O₃</u>
Measurement method	1. automatic(method: <u>UV photometric</u>) manufacturer: : API(USA), model: 400A
	2. manual(method: 1. filtration(a. diffusion denuder, b. filter pack), 2. bubbling, 3. other()) sampling flow rate(liters/min)

Measurement parameter(4)	<u>HNO₃, NH₃, HCl</u>
Measurement method	1. automatic(method:) manufacturer: , model:
	2. manual(method: 1. filtration(a. diffusion denuder, <u>b. filter pack</u>), 2. bubbling, 3. other()) sampling flow rate(<u>16.7 liters/min</u>)

4) Particulate matter

(1) Outline of monitoring

Measured & analyzed parameters	1.gravimetric method(a.TSP, <u>b.PM-2.5</u>), 2. NH_4^+ , 3. Na^+ , 4. K^+ , 5. Ca^{2+} , 6. Mg^{2+} , 7. SO_4^{2-} , 8. NO_3^- , 9. Cl^- , 10.Others(<u>PM-10</u>)
Sampling period of each data	1.an hour, 2.a day, 3.a week, 4.two weeks, 5.a month 6.other(<u>one day in a six-day cycle</u>)
Measurement interval	1. <u>continuous</u> , 2.hourly, 3.daily, 4.weekly, 5.biweekly, 6.monthly, 7.other()

(2) Measurement method

Measurement method	1.automatic(method : <u>β-ray</u>) manufacturer : MetOne(USA), model : BAM1020 2.gravimetric method(a.Hi-vol sampler, <u>b.Lo-vol sampler</u>), 3.other()
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5) Meteorological observation

Parameters of Observation	1.precipitation amount(a.tipping bucket, b.gravimetric, c.other()), 2.wind direction, 3.wind velocity, 4.temperature, 5.humidity, 6.solar radiation 7.other()
In case of using the nearest meteorological station data	Name of the station: Gwanghwa Distance from the site: 15 km Direction from the site(bearing): 090

2-2. Dry deposition (prepare of each site)

1) Outline of monitoring site

Site name	Jeju	Code	202
Address	3786 Gosan-ri, Hangeong-myeon, BukJeju-gun, Jeju-do		
Site classification	1.urban, 3.rural, <u>3.remote</u> , 4.ecological		
Latitude	(north) 33 ° 18 ‘	Longitude	(east) 126 ° 10 ‘
Altitude	50 M		
Height of sampling	From the ground level: 3 m		
Funnel	From the floor of collector installed: 2.5 m		

2) A situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. at divided direction in the following scale. A sketch map should be attached for each scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

---→ same as the site coded 102

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

---→ same as the site coded 102

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

---→ same as the site coded 102

4) Particulate matter

(1) Outline of monitoring

Measured & analyzed parameters	1.gravimetric method(a.TSP, <u>b.PM-2.5</u>) 2. NH_4^+ , 3. Na^+ , 4. K^+ , 5. Ca^{2+} , 6. Mg^{2+} , 7. SO_4^{2-} , 8. NO_3^- , 9. Cl^- , 10.Others(<u>PM-10</u>)
Sampling period of each data	1.an hour, 2.a day, 3.a week, 4.two weeks, 5.a month 6.other(<u>one day in a six-day cycle</u>)
Measurement interval	1. <u>continuous</u> , 2.hourly, 3.daily, 4.weekly, 5.biweekly, 6.monthly, 7.other()

(2) Measurement method

Measurement method	1.automatic(method: β -ray) manufacturer: : TEI(USA), model: BAM1020 2.gravimetric method(a.Hi-vol sampler, <u>b.Lo-vol sampler</u>), 3.other()
--------------------	---

5) Meteorological observation

Parameters of observation	1.precipitation amount(a.tipping bucket, b.gravimetric, c.other()), 2.wind direction, 3.wind velocity, 4.temperature, 5.humidity, 6.solar radiation 7.other()
In case of using the nearest meteorological station data	Name of the station: <u>Jejugocheung</u> Distance from the site: 150 m Direction from the site(bearing):

2-3. Dry deposition (prepare of each site)

1) Outline of monitoring site

Site name	Imsil	Code	203
Address	201 Seongeo-ri, Unam-myeon, Imsil-gun, Jeollabuk-do		
Site classification	1.urban, <u>2.rural</u> , 3.remote, 4.ecological		
Latitude	(north) 35 ° 36 ‘	Longitude	(east) 127 ° 11 ‘
Altitude	M		
Height of sampling	From the ground level: 3 m		
Funnel	From the floor of collector installed: 2.5 m		

2) A situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. at divided direction in the following scale. A sketch map should be attached for each scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

---→ same as the site coded 103

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

---→ same as the site coded 103

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

---→ same as the site coded 103

3) Gases

(1) Outline of monitoring

Measured parameters	1.SO ₂ , 2.NO ₂ , 3.NO, 4.O ₃ , 5.others(HNO ₃ , NH ₃ , HCl)
Sampling period of each data	1.an hour, 2.12hours, 3.a day, 4.a week, 5.two weeks, 6.a month 7.other(one day in a six-day cycle)
Measurement interval	1.Continuous, 2.hourly, 3.daily, 4.weekly, 5.biweekly, 6.monthly, 7.other()

(2) Monitoring method

Measurement parameter(1)	SO ₂ ,
Measurement method	1.automatic(method: <u>UV Fluorescence</u>) manufacturer: Thermal Environ Instrument(USA) , model: 43C
	2.manual(method: 1.filtration(a.diffusion denuder, b.filter pack), 2.bubbling, 3.other()) sampling flow rate(liters/min)

Measurement parameter(2)	NO ₂
Measurement method	1.automatic(method: <u>Chemiluminescence</u>) manufacturer : Thermal Environ Instrument(USA) , model: 42C
	2.manual(method: 1.filtration(a.diffusion denuder, b.filter pack), 2.bubbling, 3.other()) sampling flow rate(liters/min)

Measurement parameter(3)	O ₃
Measurement method	1.automatic(method: <u>UV photometric</u>) manufacturer: Thermal Environ Instrument(USA) , model: 49C
	2.manual(method: 1.filtration(a.diffusion denuder, b.filter pack), 2.bubbling, 3.other()) sampling flow rate(liters/min)

Measurement parameter(4)	HNO ₃ , NH ₃ , HCl
Measurement method	1.automatic(method:) manufacturer: , model:
	2.manual(method: 1.filtration(a.diffusion denuder, <u>b.filter pack</u>), 2.bubbling, 3.other()) sampling flow rate(<u>16.7 liters/min</u>)

4) Particulate matter

(1) Outline of monitoring

Measured & analyzed parameters	1.gravimetric method(a.TSP, b.PM-2.5), 2. NH_4^+ , 3. Na^+ , 4. K^+ , 5. Ca^+ , 6. Mg^{2+} , 7. SO_4^{2-} , 8. NO_3^- , 9. Cl^- , 10.Others(PM-10)
Sampling period of each data	1.an hour, 2.a day, 3.a week, 4.two weeks, 5.a month 6.other(<u>one day in a six-day cycle</u>)
Measurement interval	1.continuous, 2.hourly, 3.daily, 4.weekly, 5.biweekly, 6.monthly, 7.other()

(2) Measurement method

Measurement method	1.automatic(method: <u>β-ray</u>) manufacturer: MET ONE(USA) model: BAM1020 2.gravimetric method(a.Hi-vol sampler, b. <u>Lo-vol sampler</u>), 3.other()
--------------------	--

5) Meteorological observation

Parameters of observation	1.precipitation amount(a.tipping bucket, b.gravimetric, c.other()), 2.wind direction, 3.wind velocity, 4.temperature, 5.humidity, 6.solar radiation 7.other()
In case of using the nearest meteorological station data	Name of the station: lmsil Distance from the site: 10 k m Direction from the site(bearing): 085

3. soil and vegetation (prepare for each soil type)(For Basic survey site)

1) Permanent site

Site name(soil type)	Mt. Naejang ()	Code	301
Location	59-10 Naejang-dong, Jeongeup-si,, Jeollabuk-do		
Latitude	(north) 35 ° 30 ‘	Longitude	(east) 126 ° 54 ‘
Altitude	200 m		
Data of wet deposition	1. on site measuring data, 2. use the nearest wet deposition monitoring site data.		
In case of use the nearest wet deposition monitoring site data.	name of the site: lmsil distance from the site: 28 km direction from the site(bearings): WSW		
Site classification of the wet deposition monitoring site	1.urban, <u>2.rural</u> , 3.remote		

2) A situation around the site

Describe the situation of the topography, land use, vegetation, sources of air pollutants, etc. at each divided directions in the following scale. A sketch map should be attached for each scale.

(1) On-site scale (within 150m from sampler)

Describe in “Outline of the monitoring site (Form A)”

(2) Local scale (150m – 10km)

Describe in “Outline of the monitoring site(Form B)”

(3) Regional scale (10km – 50km)

Describe in “Outline of the monitoring site(Form C)”

3) Outline of monitoring

(1) Soil

Measurement parameters	1.pH(H ₂ O), 2.pH(KCl), exchangeable(3.Na ⁺ , 4.K ⁺ , 5.Ca ²⁺ , 6.Mg ²⁺ , 7.Al ³⁺ , 8.H ⁺), 9.exchangeable acidity, 10.ECEC, 11.Carbonate, 12.T-C, 13.T-N, 14. SO ₄ ²⁻ , 15.availabel phosphate, 16.others(,)
Monitoring interval	1.annual, 2.every 3 years 3.irregular(date of the last survey(m, d, y)

(2) Vegetation

Measurement parameters	1.observation of tree decline, 2.description of trees, 3.others(,)
Monitoring interval	1.annual, 2.every 3 years, 3.irregular(date of the last survey(m, d, y)

4) Meteorological observation

Parameters of Observation	1.precipitation amount(a.tipping bucket, b.gravimetric, c.other()), 2.wind direction, 3.wind velocity 4.temperature, 5.humidity, 6.solar radiation, 7.other()
In case of using the nearest meteorological station data	name of the station: Jeongeup distance from the site: 10 km direction from the site(bearings): 000

Outline of monitoring site A(Ganghwa)

On site scale(within 150m:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of trees, poles and buildings, and the heights of those.				
Existence of incinerators, domestic heating, parking lots, storage of fuel and agricultural products, dairy farm, and many livestock.				
Slope degree of the site.	° - °	° - °	° - °	° - °
Surface condition of the site.	(%)	(%)	(%)	(%)
Existence of a forest, river, lake, marsh, farm or fields.	NW-NE 30-150 : forest	NE-SE 30-150 : forest	SW-SE 30-200 : forest	SW-NW 30-150 : forest
Existence of roads, and their traffic densities*.				

*:Describe roads with more than 100 vehicles/day for remote sites, and roads with more than 1,000 vehicles/day for urban and rural sites.

Outline of monitoring site B(Ganghwa)

Local scale(150m - 10km:a sketch map should be attached)

(For an urban site, at least information of area within 150m - 1km from the site is expected)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Information on trunk roads, expressways, and their traffic densities (with more than <u>5,000 vehicles/day</u>).		NE-SE 1-5km : paved road, low traffic density		
Information on airports and railways.				
Information on major emission sources such as large industries, and power plants and their fuel consumptions and so on.				
Information on houses/settlements with more than 5,000 persons, and their population.				
Descriptive information around the site such as topography and meteorological condition	Ganghwa is located west of Incheon at the basin of the Han River. It is composed of 11 populated islands and 18 non-populated islands. Ganghwa monitoring site is located at the western side of Ganghwa peninsula. Ganghwa is a temperate region with strong sea winds due to being surrounded by the sea. The annual average temperature is 10.8 , and the precipitation is about 1,300mm.			

Outline of monitoring site C(Gwanghwa)

Regional scale(10km - 50km:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of main stationary air pollution sources*				
Existence of trunk roads with more than <u>10,000 vehicles/day</u> , and their traffic densities.		NE-SE 10-50km : paved road		
Existence of cities with the population more than <u>10,000 persons</u> .				

*: For rural site, description should be made on huge emission sources larger than 10,000tons/y and other major pollution sources.

Outline of monitoring site A(Jeju)

On site scale(within 150m:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of trees, poles and buildings, and the heights of those.		E 10m : Pine trees NE 150m : Meteorological observatory(10m height)		
Existence of incinerators, domestic heating, parking lots, storage of fuel and agricultural products, dairy farm, and many livestock.				
Slope degree of the site.	° - °	° - °	° - °	° - °
Surface condition of the site.	(%)	(%)	(%)	(%)
Existence of a forest, river, lake, marsh, farm or fields.	N 100m : Sea coast NW 50-100 : Sea coast		SE-SW 50-150m : Pine trees	
Existence of roads, and their traffic densities*.		E 20m : unpaved road		

*:Describe roads with more than 100 vehicles/day for remote sites, and roads with more than 1,000 vehicles/day for urban and rural sites.

Outline of monitoring site B(Jeju)

Local scale(150m - 10km:a sketch map should be attached)

(For an urban site, at least information of area within 150m - 1km from the site is expected)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Information on trunk roads, expressways, and their traffic densities (with more than <u>5,000 vehicles/day</u>).		E 100m-10 km : Paved road, low traffic density	S 100m-10km : Paved road, low traffic density	
Information on airports and railways.				
Information on major emission sources such as large industries, and power plants and their fuel consumptions and so on.				
Information on houses/ settlements with more than 5,000 persons, and their population.				
Descriptive information around the site such as topography and meteorological condition	<p>Jeju monitoring site is located at the eastern side of Jeju Island. Jeju Island total area is 1,845.60km². Jeju is situated from 126°08'43"E-126°58'20" in longitude and 33°11'27"N-33°33'50"N in latitude. Distance from the sea coast to the site is 50-100m, and elevation is about 80m. The yearly mean air temperature is about 12C and the past 30 years(1961-1990), Jeju's precipitation is 1,423.6mm.</p>			

Outline of monitoring site C (Jeju)

Regional scale(10km - 50km:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of main stationary air pollution sources*				
Existence of trunk roads with more than <u>10,000 vehicles/day</u> , and their traffic densities.	NE 1km-50km : paved road	E 1km-50km : paved road		
Existence of cities with the population more than <u>10,000 persons</u> .		NE 40km : Jeju city (271,000 persons)		

*: For rural site, description should be made on huge emission sources larger than 10,000tons/y and other major pollution sources.

Outline of monitoring site A(Imsil)

On site scale(within 150m:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of trees, poles and buildings, and the heights of those.			SW-SE 20m : Pine trees	
Existence of incinerators, domestic heating, parking lots, storage of fuel and agricultural products, dairy farm, and many Livestock				
Slope degree of the site.	° - °	° - °	° - °	° - °
Surface condition of the site.	(%)	(%)	(%)	(%)
Existence of a forest, river, lake, marsh, farm or fields.	NW-NE 20-100m : farm field		SW-SE 20-150 : forest	W 20m : small reservoir
Existence of roads, and their traffic densities*.	NW-NW 100m : unpaved road			

*:Describe roads with more than 100 vehicles/day for remote sites, and roads with more than 1,000 vehicles/day for urban and rural sites.

Outline of monitoring site B(Imsil)

Local scale(150m - 10km:a sketch map should be attached)

(For an urban site, at least information of area within 150m - 1km from the site is expected)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Information on trunk roads, expressways, and their traffic densities (with more than 5,000 vehicles/day).		NE-E 2km : paved road, low traffic density	SE-SW 3km : paved road, low traffic density	
Information on airports and railways.				
Information on major emission sources such as large industries, and power plants and their fuel consumptions and so on.				
Information on houses/settlements with more than 5,000 persons, and their population.				
Descriptive information around the site such as topography and meteorological condition				

Outline of monitoring site C (Imsil)

Regional scale(10km - 50km:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of main stationary air pollution sources*				
Existence of trunk roads with more than <u>10,000 vehicles/day</u> , and their traffic densities.	N 25km : paved road	SE 25km : paved road	S 10km : paved road	W 15km : paved road
Existence of cities with the population more than <u>10,000 persons</u> .	N 20km : Jeonju city (570,000 persons) N 35km : Iksan city (330,000 persons)			W 25km : Jeongup town (140,000 persons)

*: For rural site, description should be made on huge emission sources larger than 10,000tons/y and other major pollution sources

Outline of monitoring site A(Mt. Naejang)

On site scale(within 150m:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of trees, poles and buildings, and the heights of those.				
Existence of incinerators, domestic heating, parking lots, storage of fuel and agricultural products, dairy farm, and many livestock.				
Slope degree of the site.	° - °	° - °	° - °	° - °
Surface condition of the site.	(%)	(%)	(%)	(%)
Existence of a forest, river, lake, marsh, farm or fields.	NW-NE 30-150 : forest	NE-SE 30-150 : forest	SE-SW 30-150 : forest	SW-NW 30-150 : forest
Existence of roads, and their traffic densities*.				

*:Describe roads with more than 100 vehicles/day for remote sites, and roads with more than 1,000 vehicles/day for urban and rural sites.

Outline of monitoring site B(Mt. Naejang)

Local scale(150m - 10km:a sketch map should be attached)

(For an urban site, at least information of area within 150m - 1km from the site is expected)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Information on trunk roads, expressways, and their traffic densities (with more than 5,000 vehicles/day).	NW 10km : Honam expressway			
Information on airports and railways.				
Information on major emission sources such as large industries, and power plants and their fuel consumptions and so on.				
Information on houses/ settlements with more than 5,000 persons, and their population.				
Descriptive information around the site such as topography and meteorological condition				

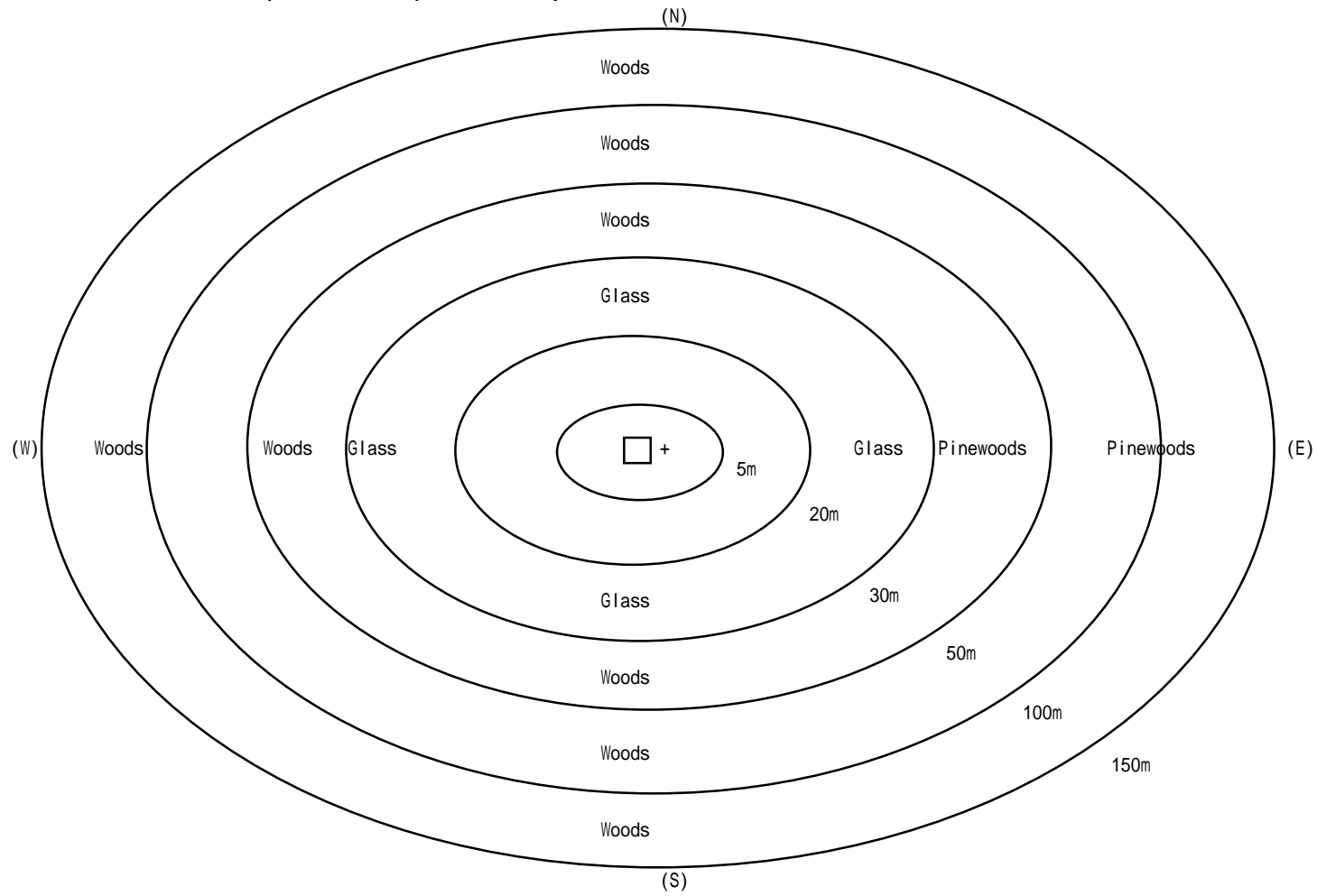
Outline of monitoring site C (Mt. Naejang)

Regional scale(10km - 50km:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of main stationary air pollution sources*				
Existence of trunk roads with more than <u>10,000 vehicles/day</u> , and their traffic densities.	NW 10km : Honam expressway			
Existence of cities with the population more than <u>10,000 persons</u> .	N 10km : Jeongup city		S 50km : Gwangju city	

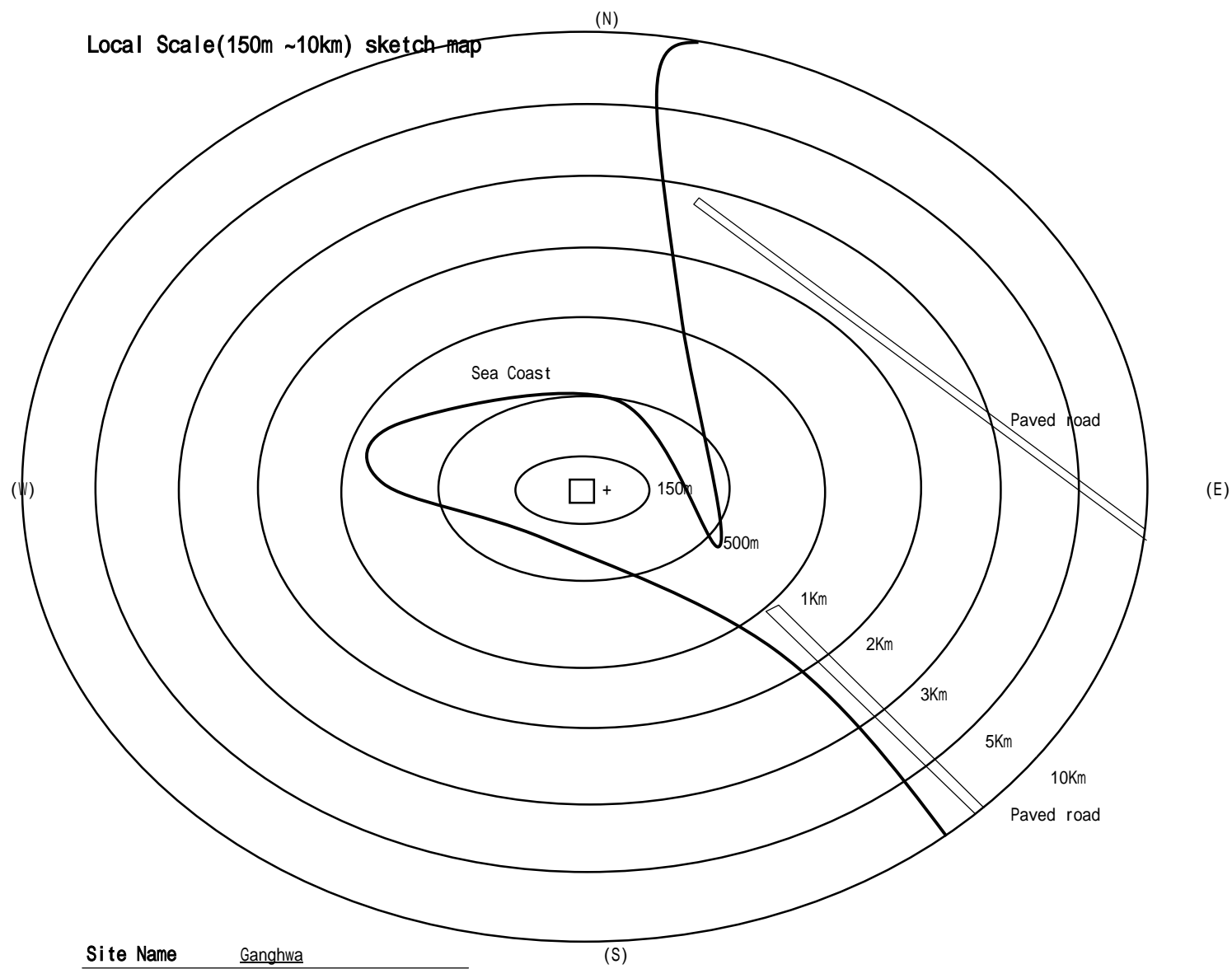
*: For rural site, description should be made on huge emission sources larger than 10,000tons/y and other major pollution sources.

On-site Scale(within 150m) sketch map



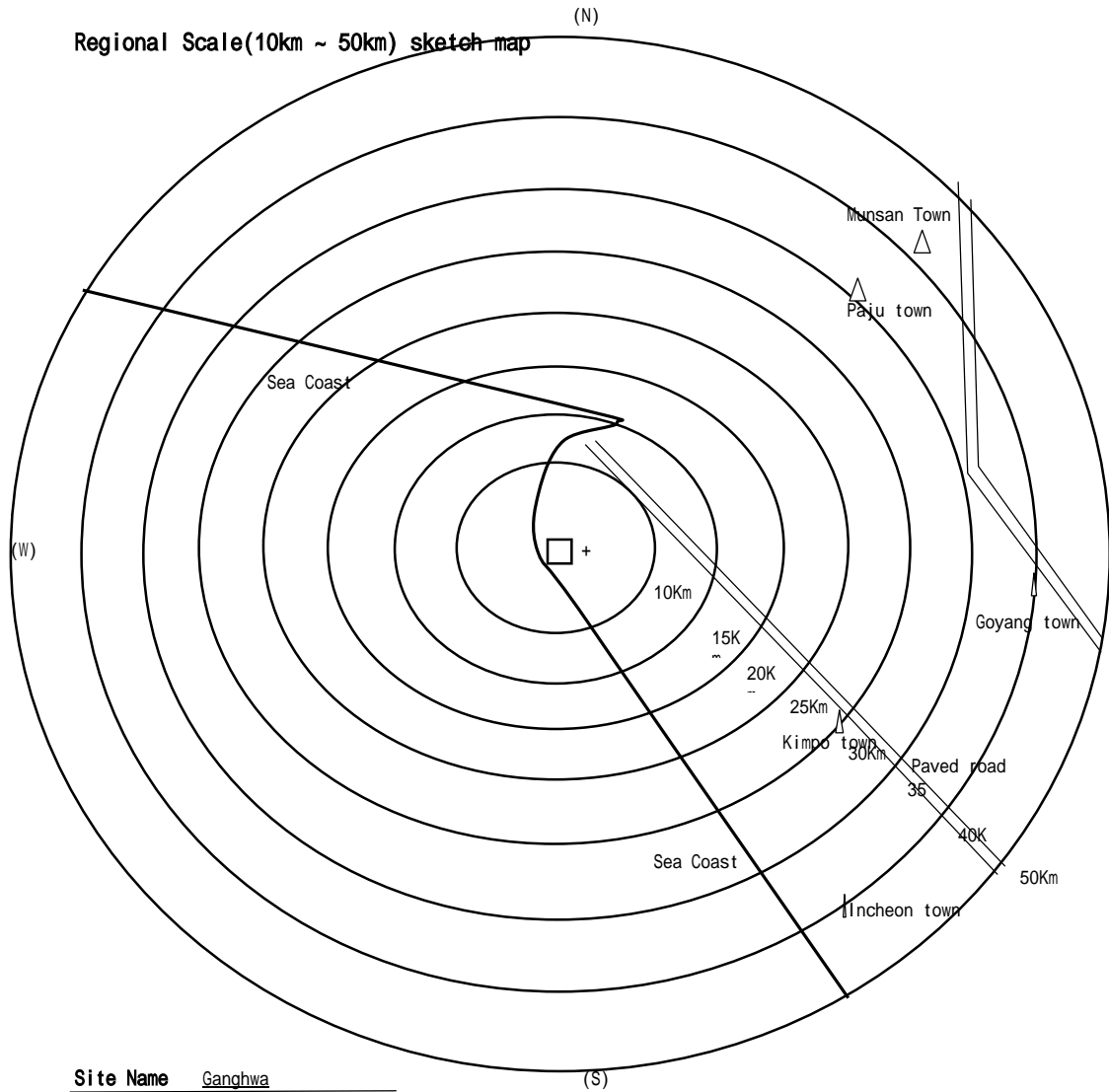
Site Name Ganghwa

Local Scale(150m ~10km) sketch map



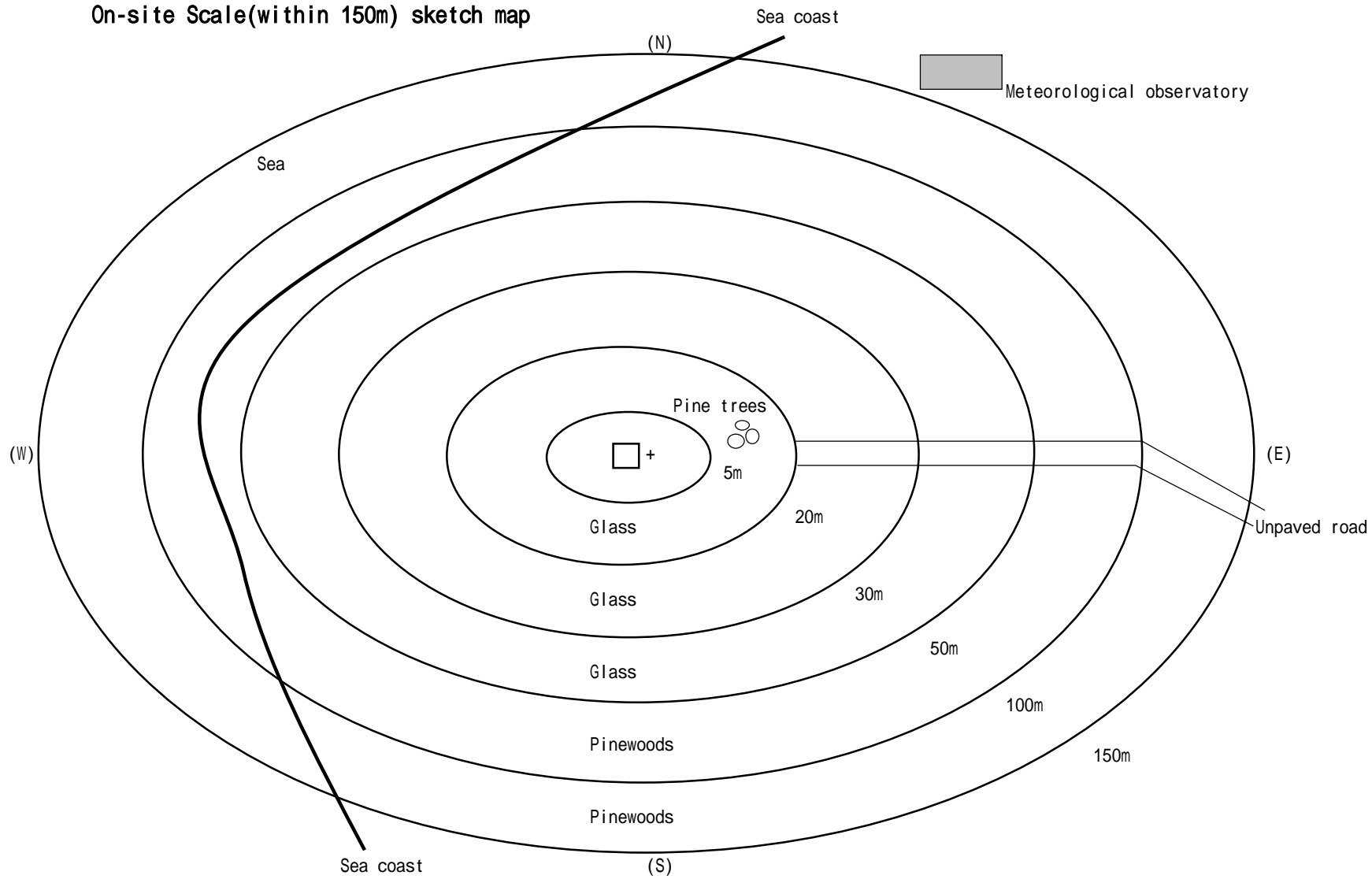
Site Name Ganghwa

Regional Scale(10km ~ 50km) sketch map



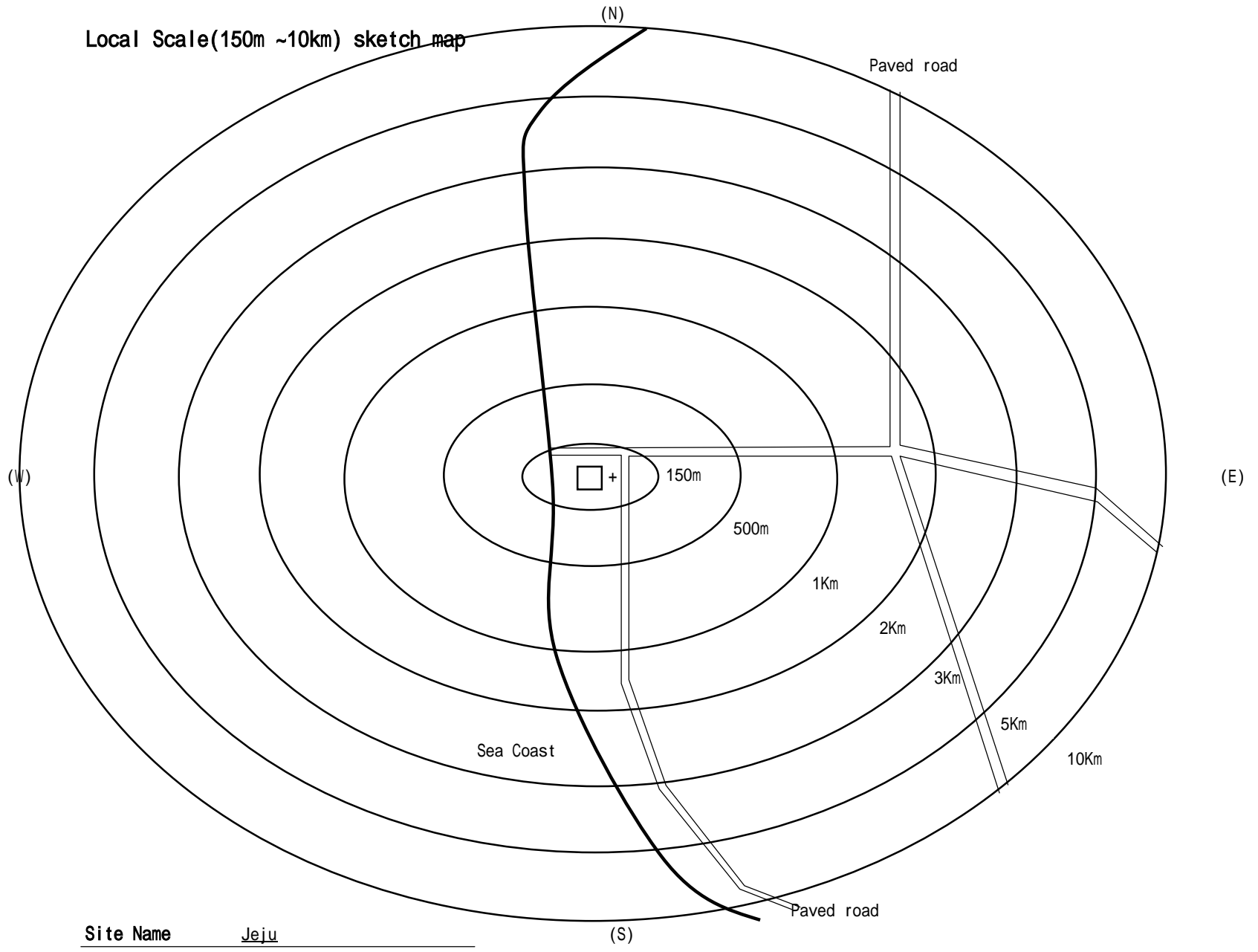
Site Name Ganghwa

On-site Scale(within 150m) sketch map

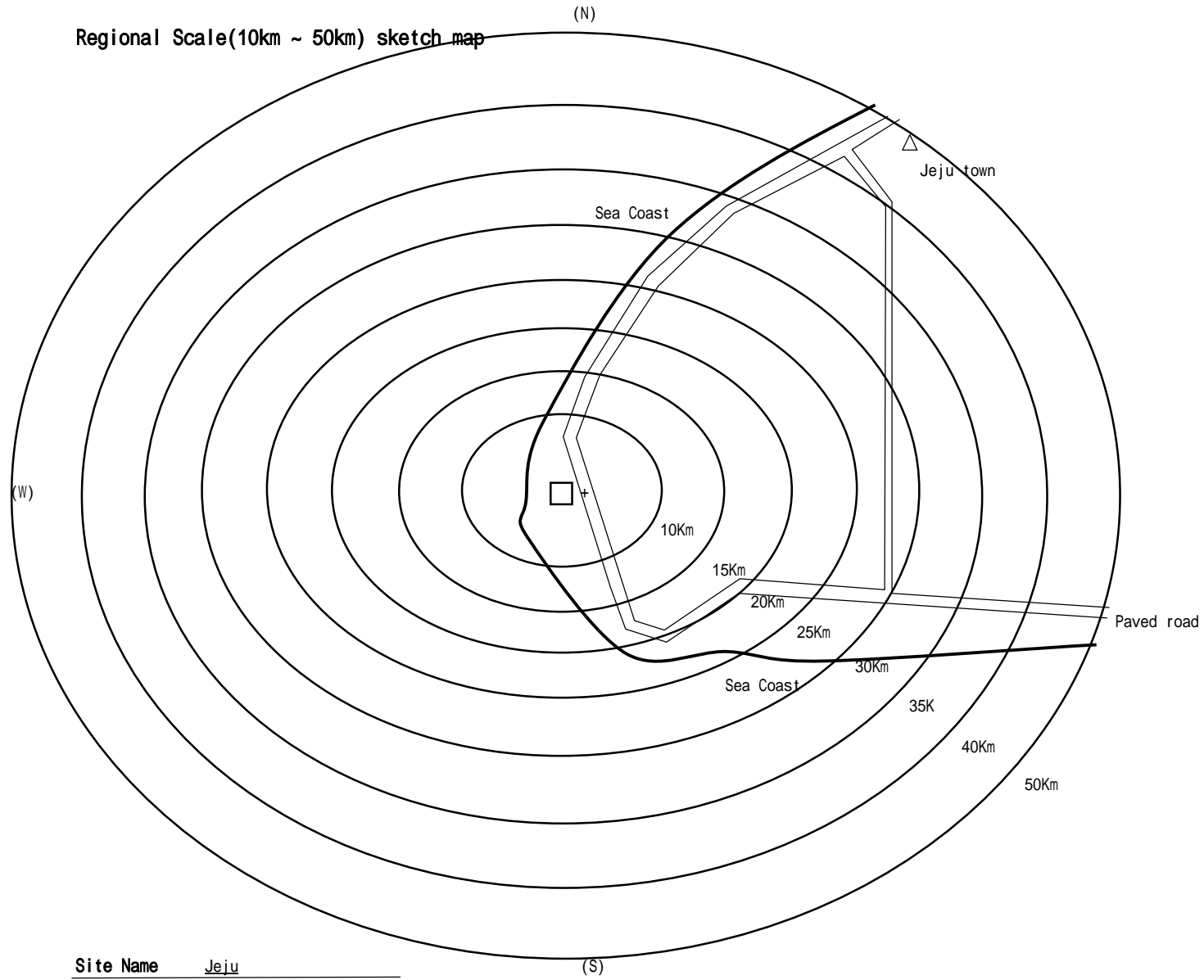


Site Name Jeju

Local Scale(150m ~10km) sketch map

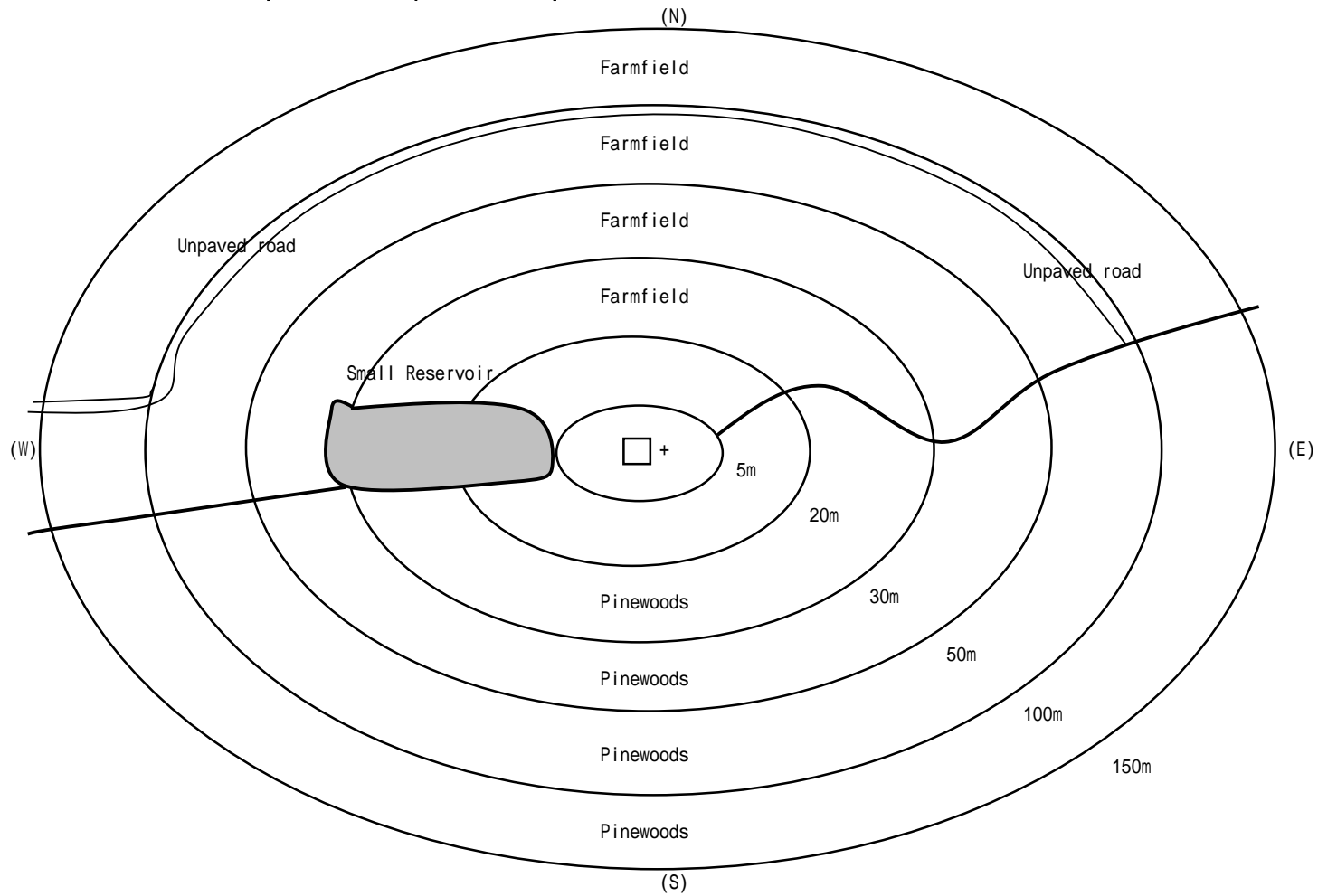


Regional Scale(10km ~ 50km) sketch map

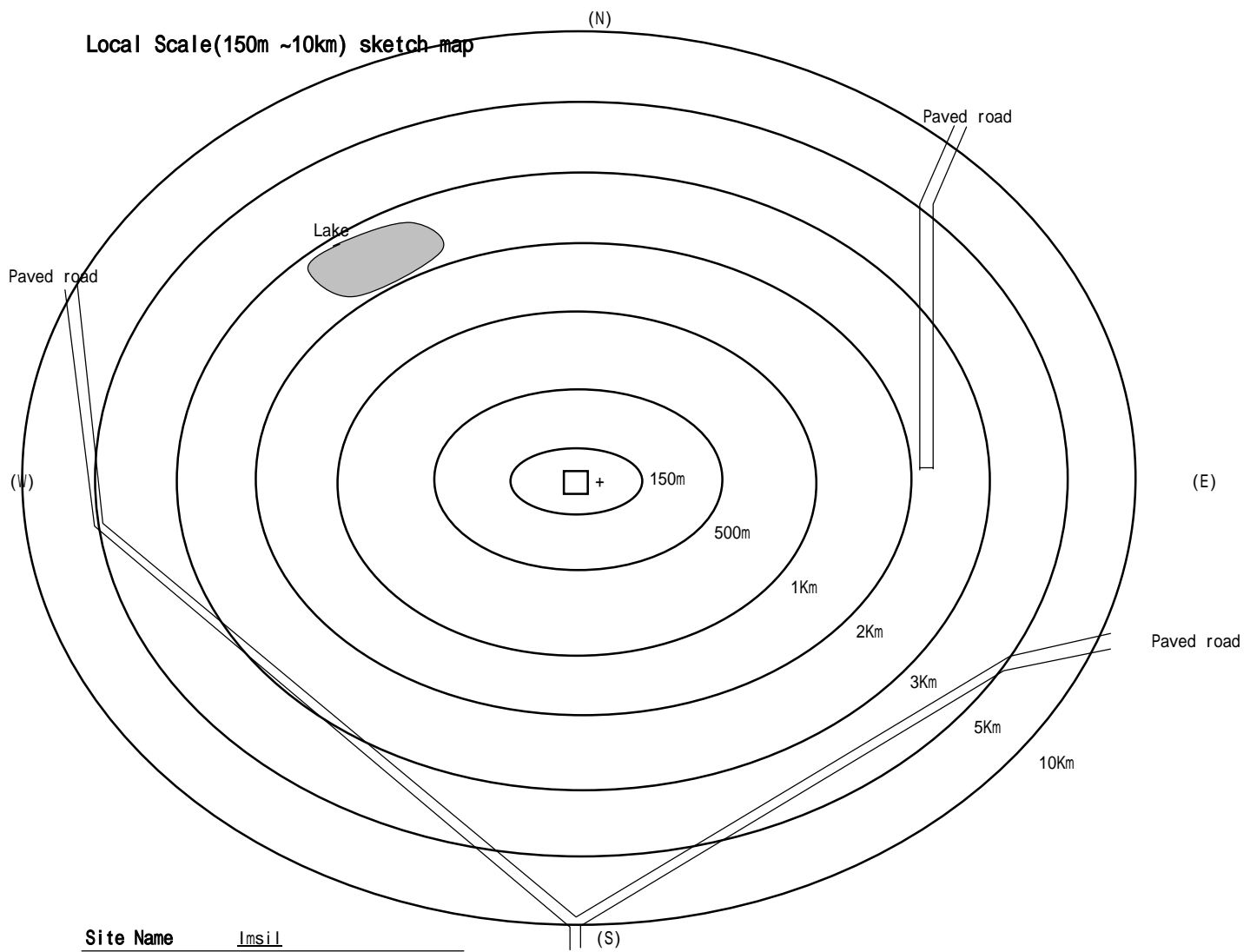


Site Name Jeju

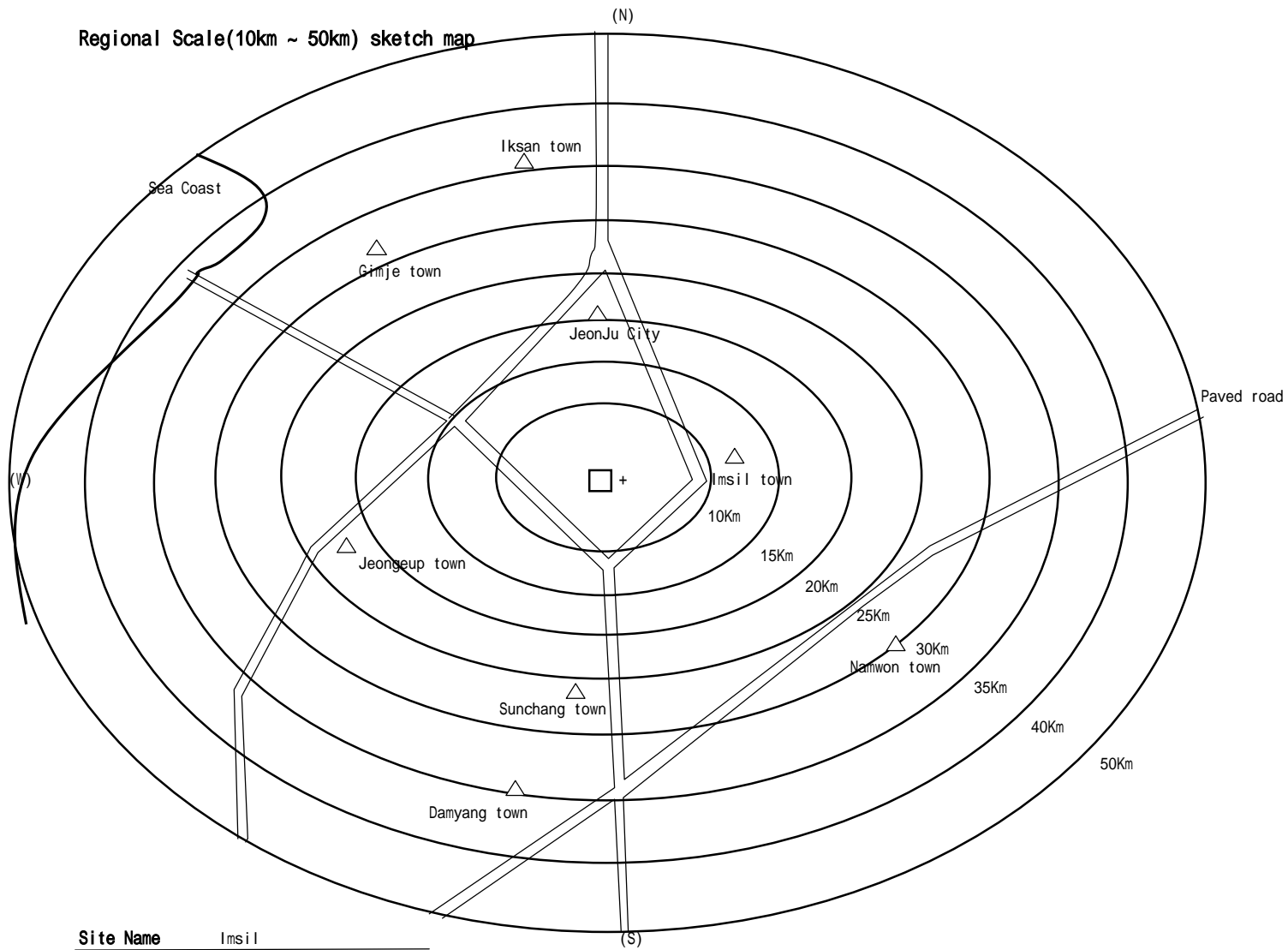
On-site Scale(within 150m) sketch map



Site Name Imsil

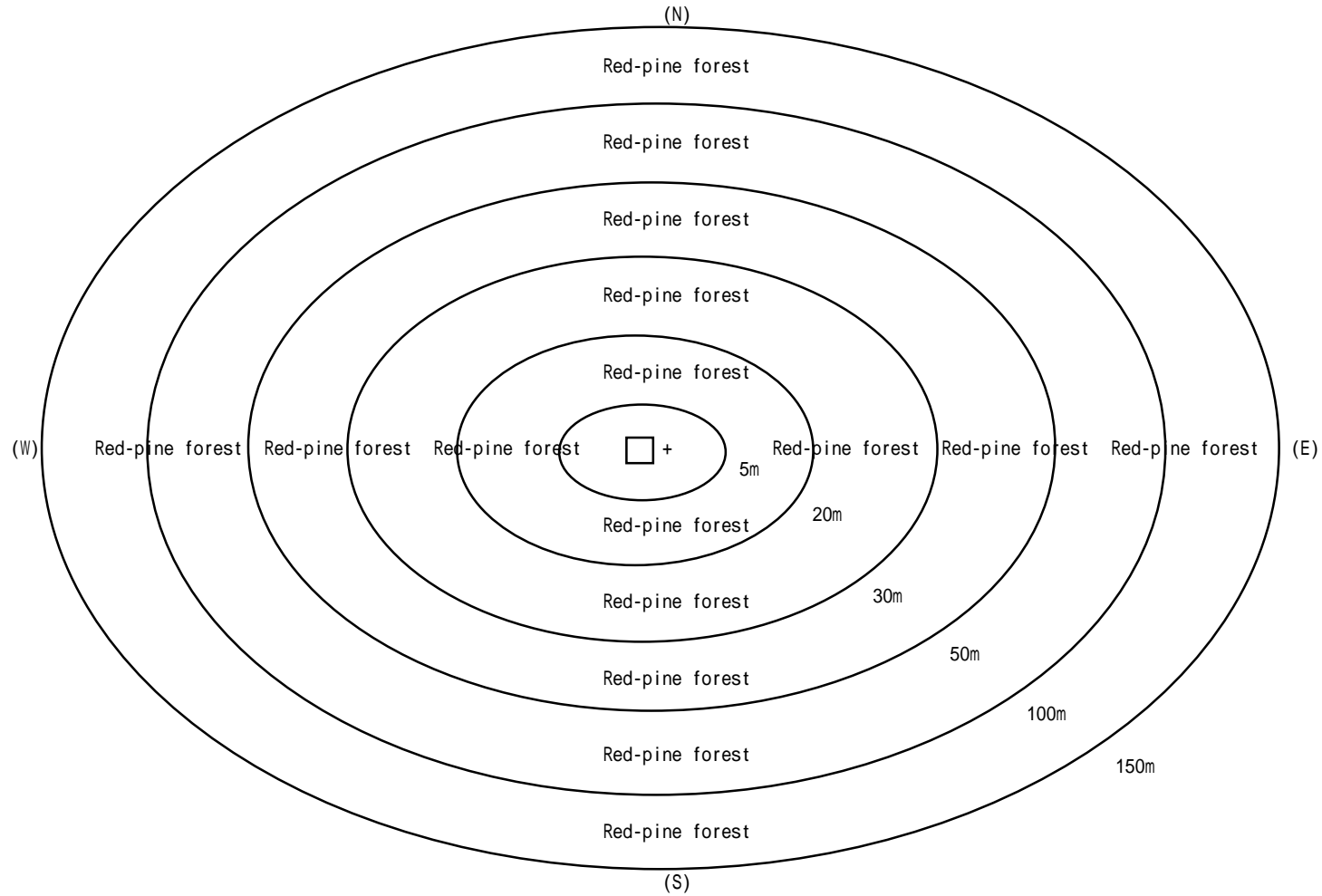


Regional Scale(10km ~ 50km) sketch map



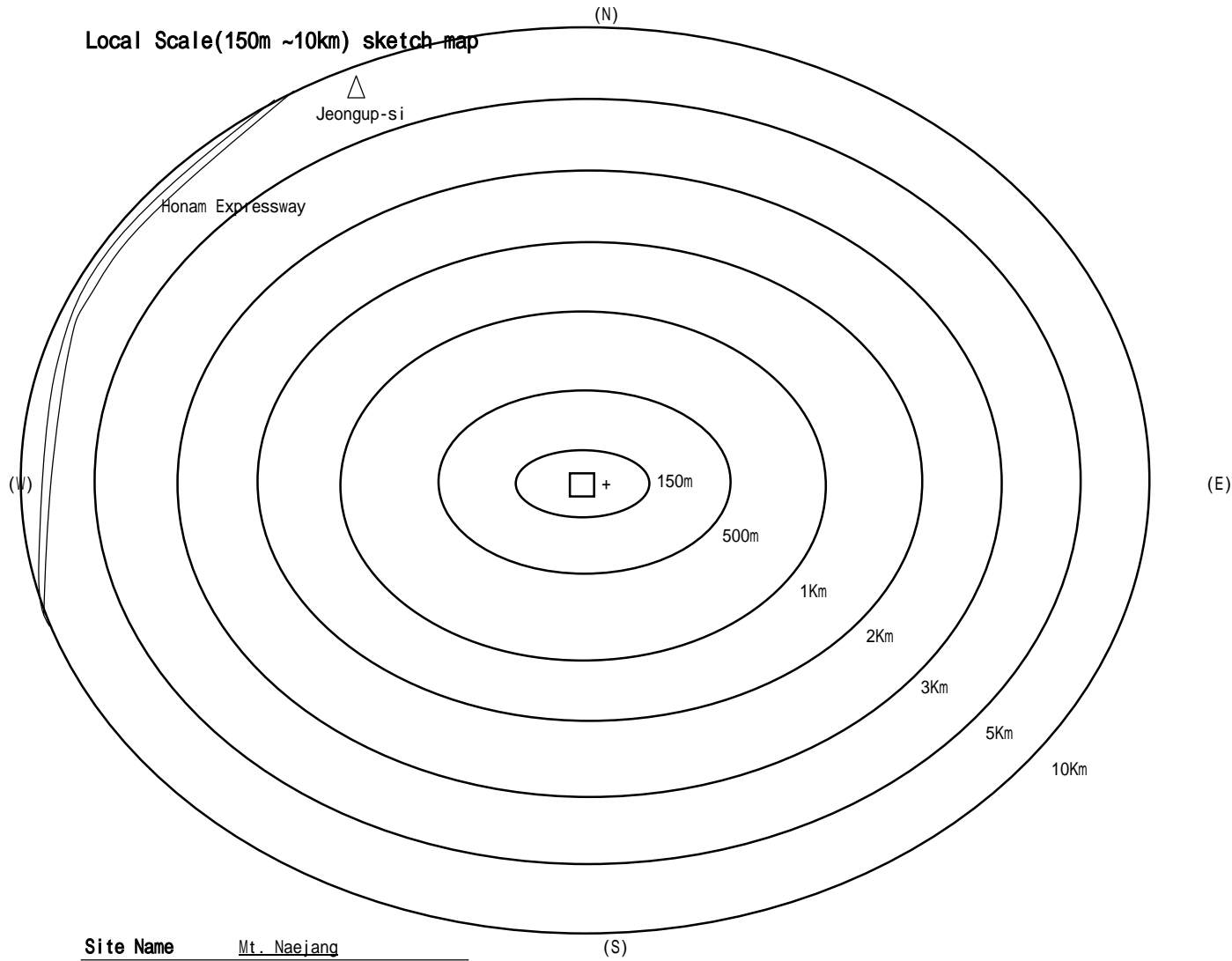
Site Name Imsil

On-site Scale(within 150m) sketch map

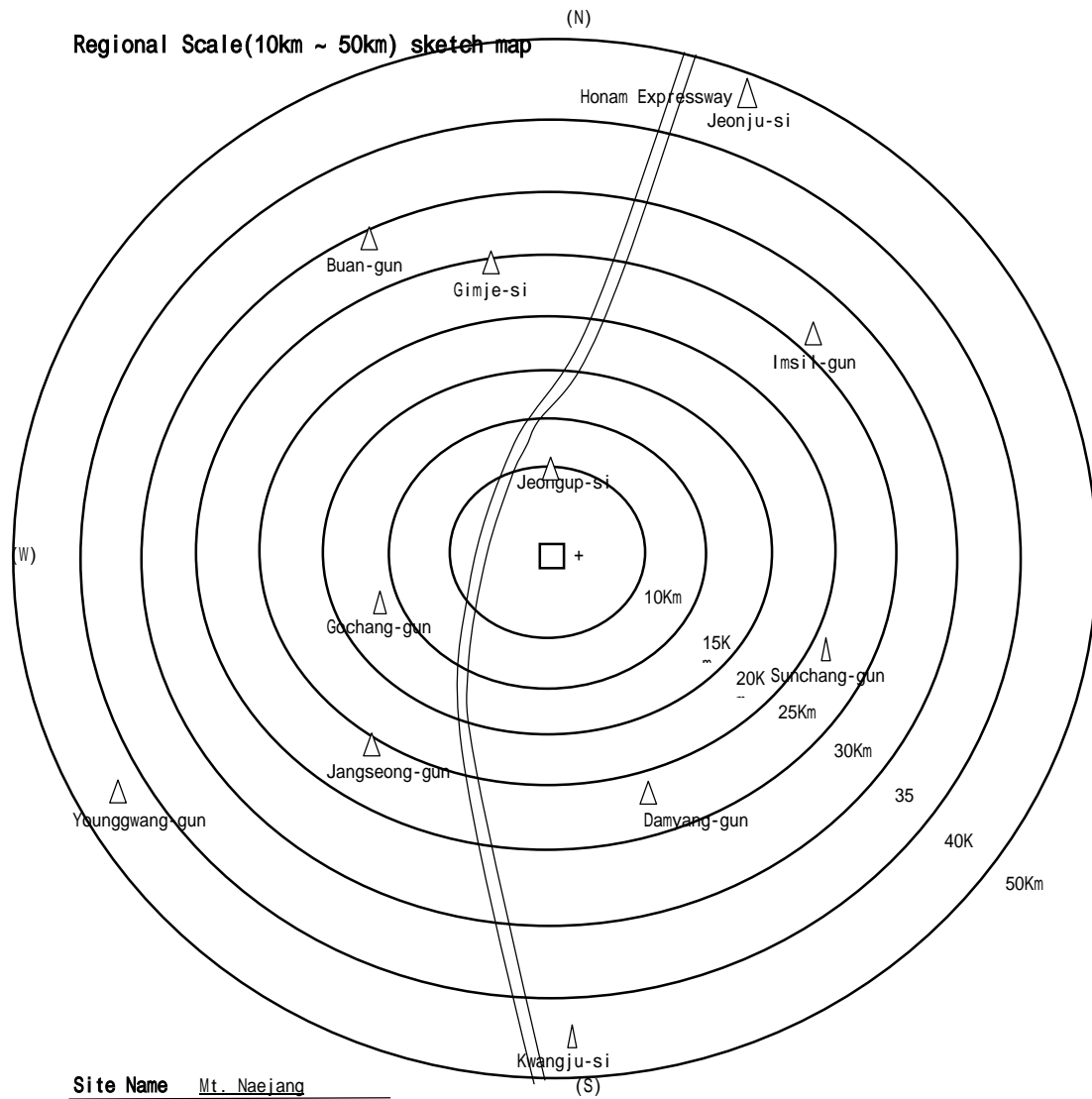


Site Name Mt. Naejang

Local Scale(150m ~10km) sketch map



Regional Scale(10km ~ 50km) sketch map



Site Name Mt. Naejang

Thailand

THAILAND NATIONAL MONITORING PLAN 2008 for EANET

1. Introduction

Thailand National Monitoring Plan for EANET in the year 2008 described below was developed by Air Quality and Noise Management Bureau, Pollution Control Department, Ministry of Natural Resources and Environment, which has been designated by the Royal Thai Government as the National Center for EANET. The details in this plan include the monitoring sites, activities and monitoring parameters which will be described below.

2. EANET Monitoring Sites in Thailand

The six monitoring sites for EANET in Thailand can be shown in Figure 1. The details of each site can be described as following.

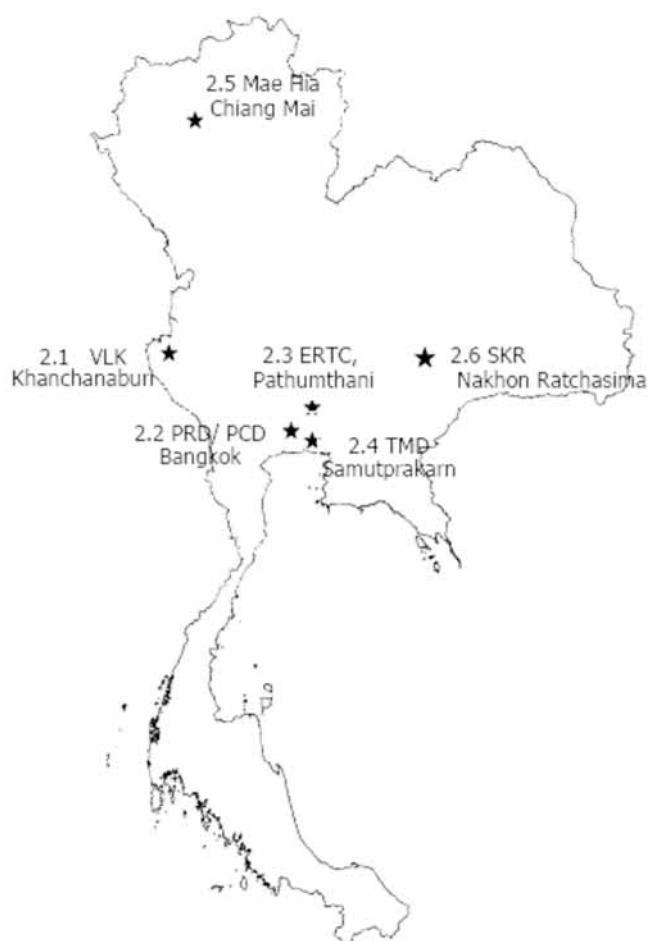


Figure 1 EANET Monitoring Sites in Thailand

- 2.1 Site name:** Vachiralongkorn Dam (VLK Dam) site in Khanchanaburi Province
(the former name: Khao Lam Dam site)
Postal Address: Tha Khanon sub-district, Thongpaphum District, Kanchanaburi Province 71180
Site Classification: Remote Site (West)
Monitoring Parameters: wet deposition, dry deposition, inland aquatic environment and soil and vegetation monitoring.
- 2.2 Site name:** Pollution Control Department (PCD)/ Public Relations Department (PRD) sites in Bangkok
(These two locations are located in the same area)
Postal Address: PCD: AQNMB 9th Fl., Pollution Control Department, 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400, PRD: Rama VI Road, Soi 30, Bangkok 10400
Site Classification: Urban Site (Central)
Monitoring Parameters: wet deposition (PCD) and dry deposition (PRD)
- 2.3 Site name:** Environmental Research and Training Center (ERTC) in Patumthani Province
Postal Address: Technopolis Klong 5 ,Klong Luang, Pathumthani 12120
Site Classification: Rural Site (Central)
Monitoring Parameters: Wet deposition and Dry deposition
- 2.4 Site name:** Thailand Meteorological Department (TMD) in Samutprakarn province or in Bangkok metropolitan area
Postal Address: 4353 Sukhumvit Rd., Bangna, Bangkok 10260
Site Classification: Urban Site (Central)
Monitoring Parameters: Wet deposition and Dry deposition
- 2.5 Site name:** Mae-Hia in Chiang Mai Province
Postal Address: 239 Huaykaew Rd., Muang District , Chiangmai
Site Classification: Rural Site (North)
Monitoring Parameters: wet deposition and dry deposition
- 2.6 Site name:** Research and Training re-afforestation, Sakaerat Silvicultural Research Station (**SKR**) in Nakhon Ratchasima Province
Postal Address: U-dom Sap Sub-District, Wang Nam Khiew District Nakhon Ratchasima Province, 30150
Site Classification: Remote Site (North East)
Monitoring Parameters: wet deposition and dry deposition

3. Monitoring Period

The monitoring period in 2008 is one year from January 1st to December 31st, 2008.

4. Monitoring Activities

The EANET monitoring plan in Thailand includes the following activities

- Wet Deposition Monitoring (Rain sampling)
- Dry Deposition Monitoring (Gases and Aerosols sampling)
- Soil and Vegetation Monitoring
- Inland Aquatic Environments Monitoring
- Meteorological Monitoring

4.1 Wet Deposition Monitoring

4.1.1 Monitoring Sites: Wet depositions are monitored at the following sites,

- Vachiralongkorn Dam, Khanchanaburi (VLK)
- Pollution Control Department, Bangkok (PCD)
- Environmental Research and Training Center, Patumthani (ERTC)
- Thailand Meteorological Department, Samutprakarn (TMD)
- Mae-Hia, Chiang Mai
- Research and Training re-afforestation, Sakaerat Silvicultural Research Station, Nakhon Ratchasima

4.1.2 Sampling, Collection, and Transport

Wet deposition samples in Thailand are done by using “Wet-Only-Sampler” to collect rain samples for quality measurement (pH, EC and concentration of ionic species) when the rain gauges are used for quantity measurement (precipitation amount). Twenty-four hours composite samples are collected and kept in polyethylene collecting bottles. Rain samples are weighted before analyzed for chemical composition. If the sample cannot be analyzed in the same day or needed to transport from the sampling site to laboratory, the samples will be refrigerated at 4 °C or kept in keeping box with freezer pack and transported to the laboratory as soon as possible. Thymol shall be used to preserve the rain samples in some monitoring sites.

4.1.3 Analysis of Rain Samples

The rain samples (wet deposition samples) are analyzed by the methods and parameters as shown in Table 1.

Table 1: Analyses of Wet Deposition Samples

EANET Suggested		Methods used in Thailand	
Parameters	Instrument Methods	Parameters	Methods
1. Electric Conductivity	- Conductivity Cell	1. Electric Conductivity	- Conductivity Cell
2. pH	- Glass electrode (preferably with the electrode of non-leak inner cell)	2. pH	- Glass electrode
3. Chloride, Nitrate, Sulfate, Nitrite, Fluoride, Phosphate	- IC (preferably with suppressor), Spectrophotometry	3. Chloride, Nitrate, Sulfate, Phosphate	- IC with suppressor
4. Sodium, Potassium, Calcium, Magnesium	- IC, -AAS / Emission Spectrometry	4. Sodium, Potassium, Calcium, Magnesium	- IC with suppressor
5. Ammonium	- IC, Spectrophotometry (indophenol blue)*	5. Ammonium	- IC with suppressor
6. Heavy Metals, Aluminium	- AAS with Graphite Furnace, ICP Emission	-	-
7. Mercury	Spectrometry, ICP / MS, Mercury Analyzer with a Gold Trap	-	-
8. Organic Acids	- IC	7. formate , acetate	- IC with suppressor

* Indophenol Blue: not recommended if biocide, thymol, is used in sample collection
Sources: Guidelines for EANET, March 2000

4.2 Dry Deposition Monitoring

4.2.1 Monitoring Sites, sampling and analysis

Dry deposition for both gases and aerosols are monitored as the following details,

- Atmospheric gases concentrations, i.e. SO₂, NO_x and O₃, are monitored by automatic analyzers at the Chiang Mai, Bangkok, Samutprakarn and Khanchanaburi. For Khanchanaburi site, SO₂, NO_x and O₃ are monitored for 2 weeks, three times a year around March, July and November. For Chiang Mai, Bangkok, and Samutprakarn site, SO₂, NO_x and O₃ are monitored continuously all year round.

- Atmospheric gases and aerosols concentrations monitoring by four stages filter pack method are monitored at Chiang Mai, Bangkok, Patumthani and Nakhon Ratchasima. The duration of sampling is 10 days/sample, continuously in 1 year. For VLK, the sampling frequency is three times a year together with the dry deposition monitored by automatic analyzers. The filter pack samples have been analyzed for SO₄²⁻, NO₃⁻, Cl⁻, NH₄⁺, Na⁺, K⁺, Mg²⁺ and Ca²⁺ in particulate (aerosol) and SO₂, HNO₃, NH₃ and HCl in gas phase.

The detail of Dry Deposition Monitoring methods and monitoring sites can be summarized in Table 2 and Table 3 respectively.

Table 2: Monitoring Methods for Dry Deposition in Thailand

EANET Suggested		Monitoring Methods in Thailand	
Parameters	Methods	Parameters	Methods
1. <u>Gases</u> SO ₂	UV Fluorescent , Filter pack, Denuder or Passive sampler	1. <u>Gases</u> SO ₂	UVF , Filter pack
O ₃	UV photometric, passive sampler	O ₃	UV photometric
NO ₂ (urban), NO	Chemiluminescence's, Passive sampler	NO ₂ (urban), NO	Chemiluminescence
HNO ₃	Filter pack, denuder, passive sampler	HNO ₃	Filter pack
NH ₃ , HCl	Filter Pack, Denuder, passive sampler	NH ₃ , HCl	Filter pack
2. <u>Aerosols</u> SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺	Filter Pack, Diffusion Denuder	2. <u>Aerosols</u> SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺	Filter Pack
3. <u>PM</u>	β ray abs, TEOM	3. PM-10	TEOM

Table 3: Details of dry deposition monitoring in Thailand EANET sites

Monitoring Sites	Measurement Parameters	Monitor and Analytical Methods
1. Vachiralongkorn Dam (VLK), Khanchanaburi	SO ₂ , NO ₂ , NO, O ₃ , PM-10	Automatic analyzer
	SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , SO ₂ , HNO ₃ , HCl, NH ₃	Filter Pack / IC
2. The Government Public Relations Department (PRD), Bangkok	SO ₂ , NO ₂ , NO, PM-10	Automatic analyzer
	SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , SO ₂ , HNO ₃ , HCl, NH ₃	Filter Pack / IC
3. Environmental Research and Training Center (ERTC), Patumthani	SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , SO ₂ , HNO ₃ , HCl, NH ₃	Filter Pack / IC
4. Thailand Meteorological Department (TMD), Samutprakarn	SO ₂ , NO ₂ , NO, O ₃	Automatic analyzer
5. Mae Hia, Chiang Mai	SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , SO ₂ , HNO ₃ , HCl, NH ₃	Filter Pack / IC

6. Research and Training in Re-afforestation Station, Sakaerat (SKR), Nakhonratchansima	SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NH ₄ ⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , SO ₂ , HNO ₃ , HCl, NH ₃	Filter Pack / IC
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4.3 Soil and Vegetation Monitoring

4.3.1 Monitoring Sites

Soil and vegetation characterization are monitored in two locations in Khanchanaburi Province, 1. Vachiralongkorn Dam location and 2. Vachiralongkorn-Puye location. The locations of both sites at Vachiralongkorn Dam area can be shown in figure 2.

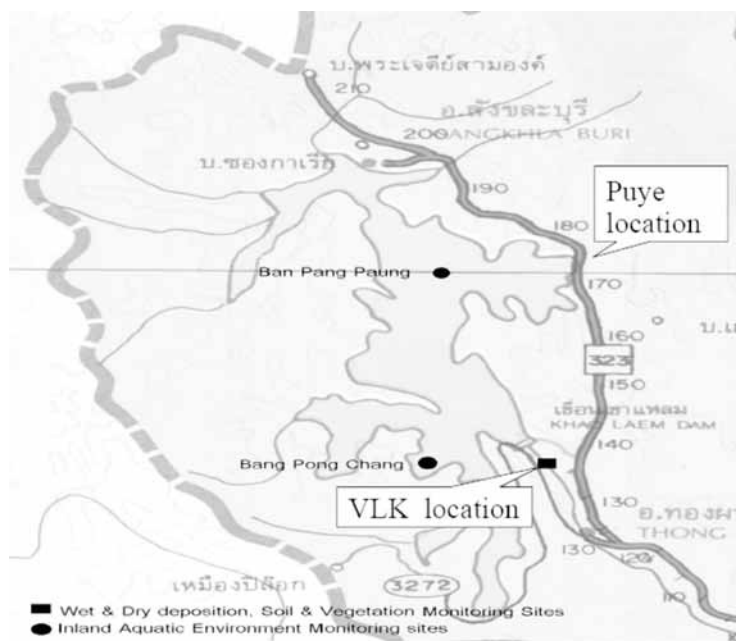


Figure 2: Soil and Vegetation monitoring locations at Vachiralongkorn Dam site

4.3.1.1 Sampling

- Soil Sampling: In each plot, soils are sampled by using horizon sequence of A (0-10 cm depth) and B (10-20 cm depth). Sampling period of soil samples are once a year or twice a year (dry and wet season). The collected soil samples will be dried by air and then passed through the 2-mm sieve to remove pebbles and plant residues before analyzing for chemical properties.

- Vegetation Sampling: One measuring plot is subdivided to three coaxial circles of 1000, 400 and 200 square meter for general description of the forest. Sampling period of vegetation is once a year or twice a year in wet and dry season. The name of species, diameter at breast height (DBH) and the height of each tree in the plot also be recorded. Fresh leaf samples are collected from the top crown or outer canopy of the selected trees. The leaf samples are dried in an oven at 80°C for two days, and then weighed and grounded to the size smaller than 0.5 mm for chemical analysis. Characteristics of vegetation are also determined for observing the forest changing that may caused by air pollution or other sources. The details of vegetation survey can be shown in Table 4.

4.3.1.2 Analysis

The method of soil and vegetation analysis can be referred to the "Technical Documents for Soil and Vegetation Monitoring in East Asia", March 2000,

adopted at the 2nd Interim Scientific Advisory Group Meeting of EANET as specified in Table 5 and 6 respectively.

Table 4: Selection of plots for general description of the forest (Measuring Plot for the survey of vegetation)

EANET Guideline		Methods Used in Thailand	
Area	Trees to be measured	Area	Trees to be measured
(200 m ²) radius 7.98 m.	Tree height above 1.3 m.	(200 m ²) radius 7.98 m.	Tree height above 1.3 m.
(400 m ²) radius 11.28 m.	DBH more than 4 cm.	(400 m ²) radius 11.28 m.	DBH more than 4 cm.
(1000 m ²) radius 17.85 m.	DBH more than 18 cm.	(1000 m ²) radius 17.85 m.	DBH more than 18 cm.
Description of trees		Description of trees	
<ul style="list-style-type: none"> - Name of species - Diameter at Breast Height - Height of tree 		<ul style="list-style-type: none"> - Name of species - Diameter at Breast Height - Height of tree 	
Understory vegetation survey		Understory vegetation survey	

Table 5: Analyses of Soil Samples

EANET Requirement		Methods used in Thailand	
Parameters	Methods	Parameters	Methods
Chemical Properties			
1. Moisture Content (M)	Drying oven, Balance	1. Moisture Content (M)	Drying oven, Balance
2. pH(H ₂ O), pH(KCl) (M)	pH meter (glass electrode)	2. pH(H ₂ O), pH(KCl) (M)	pH meter (glass electrode)
3. Exchangeable Base Cations (M) (Ca, Mg, K and Na)	CH ₃ COONH ₄ -Extraction / AAS, ICP-AES, ICP-MS	3. Exchangeable Base Cations (M) (Ca, Mg, K and Na)	CH ₃ COONH ₄ -Extraction / AAS
4. Exchangeable Acidity (M)	KCl-Extraction / Titration	4. Exchangeable Acidity (M)	KCl-Extraction / Titration
5. Effective Cation Exchangeable Capacity (ECEC) (M)	Calculation (as sum of Exchangeable cations)	5. Effective Cation Exchangeable Capacity (ECEC) (M)	Calculation (as sum of exchangeable cations)
6. Exchangeable Al, H (O)	KCl-Extraction / Titration	6. Available Phosphate (V)	Spectrophotometry (Bray-1 test)

7. Carbonate Content (for calcareous soil) (M*)	Volumetric calcimeter		
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Table 5: Analyses of Soil Samples (con't)

EANET Requirement		Methods used in Thailand	
Parameters	Methods	Parameters	Methods
<u>Chemical Properties</u>			
8. Total Carbon Content (O)	Titration (Walkley-Black method), CN-analyzer Titration (Kjeldahl method), CN-analyzer Spectrophotometry (Bray-1 test) NaHCO ₃ – Extraction / Turbidimetry, IC, ICP		
9. Total Nitrogen Content (O)			
10. Available Phosphate (V)			
11. Sulfate (V)			
<u>Physical Property</u>			
1. Fine Earth Bulk Density (O)	Metal sampling cylinder, Drying oven, Balance Pocket Penetrometer		
2. Penetration Resistance (in the fieldwork) (O)			

Remark: M = Mandatory items, O = Optional items, V = Voluntary items, M = Mandatory item only for calcareous soil*

Table 6: Analyses of Vegetation Samples

EANET Requirement		Methods used in Thailand	
Parameters	Methods	Parameters	Methods
1. Total-nitrogen	Kjeldahl / Duma method LECO Sulfur Analyzer Calorimetry	1. Total-nitrogen	Kjeldahl method
2. Total-sulfur		2. Total-sulfur	ICP-MS
3. Total-phosphorus		3. Total-phosphorus	Calorimetric (Ascorbic-Acid) Method
4. Total Ca, Mg and K	Atomic Absorption Spectrophotometry Atomic Absorption Spectrophotometry	4. Total Ca, Mg and K	ICP-MS
5. Total Na and Other Heavy metal		5. Total Na and Other Heavy metal (Na, Zn, Mn, Fe, Al, Pb, Cu)	ICP-MS
6. Fluoride and Chloride	Calcium oxide incineration method		

Remarks: The degree of decline of trees, and abnormalities of leaves and branches are also studied.

4.4 **Inland Aquatic Environments Monitoring**

4.4.1 Monitoring sites

Inland aquatic environments are monitored at Vachiralongkorn Dam, Khanchanaburi province. The surface water samples are collected from two locations in Vachiralongkorn Reservoir, namely Ban Pong Chang (BPC) and Ban Pang Pueng (BPP) station. The locations of the inland monitoring stations are also shown in figure 2.

4.4.2 Inland Aquatic Environments Sampling and Analyses

The frequency of sampling for Inland Aquatic Environment Monitoring is every 3 months, 4 times a year, around March, June, September and December 2008. The water samples are collected and analyzed for the parameters by the methods specified in Table 7.

Table 7: Sampling and Analyses for Inland Aquatic Environments Samples

EANET suggested		Analytical Methods used in Thailand		Sampling
Parameters	Analytical Methods	Parameters	Methods	
<u>Water Quality</u>				
1. pH	pH meter	1. pH	pH meter	On-site measurement
2. Electric Conductivity	Conductivity Meter	2. Electric Conductivity	Conductivity Meter	On-site measurement
3. Water Temperature	Thermometer	3. Temperature	Thermometer	On-site measurement
4. Alkalinity	Titration Technique	4. Alkalinity	Titration Technique	On-site measurement
5. NO ₃ ⁻ , NO ₂ ⁻ , PO ₄ ³⁻	IC / Spectrophotometry	5. NO ₃ ⁻ , NO ₂ ⁻ , PO ₄ ³⁻	IC	water sampler
6. NH ₄ ⁺	IC / Spectrophotometry	6. NH ₄ ⁺	IC	water sampler
7. Ca ²⁺ , Mg ²⁺ , Na ⁺ , K ⁺	IC / AAS	6. Ca ²⁺ , Mg ²⁺ , Na ⁺ , K ⁺	IC	water sampler
8. SO ₄ ²⁻	IC / Turbidimetry	7. SO ₄ ²⁻	IC	water sampler
9. Cl ⁻	IC / Titration Technique	8. Cl ⁻	IC	water sampler
<u>Plankton (optional)</u>	Distribution and Identification of diatom taxa	-----	-----	-----

4.5 Meteorological Monitoring

Meteorological parameters including wind speed, wind direction, precipitation amount, solar radiation, ambient temperature, and ambient relative humidity has been monitored on-site in the five monitoring sites.

1. Public Relation Department site, Bangkok
2. Thailand Meteorological Department site, Samutprakarn
3. Pathumthani Agro Meteorological station, Patumthani
4. Thongpaphum Meteorological station, Khanchanaburi
5. Chiang Mai City Hall, Chiang Mai

5. Responsible Agencies

The responsible agencies for acid deposition monitoring in Thailand for EANET are shown in Table 8.

6. Monitoring Schedule

The Acid deposition monitoring schedule for 2008 is shown in Table 9.

Table 8: Responsible Agencies for Acid Deposition Monitoring in Thailand for EANET

Monitoring	Sampling Site	Sample Collector	Sample Analysis
1. <u>Wet Deposition</u>	1. VLK Dam, Khanchanaburi	EGAT's staff	PCD
	2. PCD, Bangkok	PCD's staff	PCD
	3. TMD, Samutprakarn	TMD' staff	TMD
	4. ERTC, Patumthani	ERTC's staff	ERTC
	5. CMU, Chiang Mai	CMU's staff	CMU
	6. Research and Training in Re-afforestation Station, Sakaerat Silvicultural Research Station, Nakhon Ratchasima	Sakaerat Silvicultural Research Station's staff	KKU
2. <u>Dry Deposition</u>			
2.1 Gases	1. VLK Dam, Khanchanaburi 2. PRD, Bangkok 3. TMD, Samutprakarn	PCD's staff	PCD
2.2 Gases and Aerosols	1. VLK Dam , Khanchanaburi	PCD's staff	PCD
	2. PRD, Bangkok	PCD's staff	PCD
	3. ERTC, Patumthani	PCD's staff	PCD
	4. CMU, Chiang Mai	CMU's staff	CMU
	5. Research and Training in Re-afforestation Station, Sakaerat Silvicultural Research Station, Nakhon Ratchasima	Sakaerat Silvicultural Research Station's staffs	KKU
3. <u>Soil & Vegetation</u>	VLK Dam and VLK- Puye Khanchanaburi	1. Royal Forest Department's staff (vegetation) 2. Department of Agriculture's staff (soil)	PCD (Vegetation) KMUTT (soil)
4. <u>Inland Aquatic Environments</u>	VLK Reservoir, Khanchanaburi	PCD and EGAT's staff	PCD

EGAT = Electric Generation Authority of Thailand

PCD = Pollution Control Department

TMD = Thailand Meteorological Department

ERTC = Environmental Research and Training Center

CMU = Chiang Mai University

KKU = Khonekean University

KMUTT = King Mongkut's University of Technology Thonburi

Table 9: Acid Deposition Monitoring Schedule in Thailand for EANET

Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<u>Monitoring</u>												
- Wet Deposition												
- Dry Deposition (gases and aerosols)												
- Dry Deposition (gases and aerosols) at VLK			/			/	/		/		/	/
- Inland Aquatic Environments			/			/			/			
- Soil and Vegetation				/					/			
<u>Analysis & Report</u>												
Analysis												
Report to Network Center												

Data Report will be reported to Network Center in next year

Format on information on the National Center and contact person(s)

Date(data reporting)	June 30 th , 2008
Country name	THAILAND
Organization name	Ambient Air Quality Division /Air Quality and Noise Management Bureau Pollution Control Department Ministry of Natural Resources and Environment
Department	Pollution Control Department
Name of contact person	Mr. Phunsak Theramongkol
Name of QA/QC manager	Ms. Wassana Toruksa
Postal address	Pollution Control Department. 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand
Contact address	Tel: (662) 298-2373 Fax: (662) 298-2392, 298-2357 E-mail: phunsak.t@pcd.go.th , wassana.t@pcd.go.th

Format on national monitoring plan

Date(that the plan was decided)	January 1 st , 2008
Country name	THAILAND
Organization name	Ambient Air Quality Division/ Air Quality and Noise Management Bureau
Department	Pollution Control Department
Name	Mr. Phunsak Theramongkol
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand
Contact address	Tel: (662) 298-2399 Fax: (662) 298-2392,298-2357 E-mail: phunsak.t@pcd.go.th, wassana.t@pcd.go.th

1. Outline of the national monitoring plan

1) **Number of monitoring sites and the arrangement** (illustrations of monitoring sites arrangement should be attached in each cases.).

(number of sites)

Items	Prospective plan (year:2008)
Wet deposition	6
Dry deposition	6
Soil & vegetation	1
Inland aquatic environment	1

Note 1. Wet and Dry Deposition monitoring site :

- 1) Pollution Control Department/ the Government Public Relation Department, Bangkok (PCD/PRD),
 - 2) Vachiralongkorn Dam, Khanchanaburi province(VLK)
 - 3) Environmental Research and Training Center, Patumthani province(ERTC),
 - 4) Thailand Meteorological Department, Samutprakarn province(TMD),
 - 5) Mae Hia, Chiangmai province(Mae Hia),
 - 6) Research and Training Re-afforestation, Sakaerat, Nakhon Ratchasima province(SKR)
2. Soil and Vegetation: Vachiralongkorn Dam and Vachiralongkorn-Puye location , Khanchanaburi province.
 3. Inland Aquatic Environment: Vachiralongkorn Dam & Reservoir, Khanchanaburi province.

2) Measurement parameters and monitoring interval

Items	Measurement parameters	Monitoring interval
Wet deposition	1.pH, 2.EC, 3.NH ₄ ⁺ , 4.Na ⁺ , 5.K ⁺ , 6.Ca ²⁺ , 7.Mg ²⁺ , 8.SO ₄ ²⁻ , 9.NO ₃ ⁻ , 10.Cl ⁻ , 11. Amount of precipitation 12. CH ₃ COO ⁻ , 13.HCOO ⁻ , 14.PO ₄ ³⁻	daily
Dry deposition	1.SO ₂ , 2.NO ₂ , 3.NO, 4.O ₃ , 5. Particulate Matter (PM-10) 6. others (aerosol)	- hourly - daily, monthly - 10 days
Soil	1.pH (H ₂ O), 2.pH (KCl), 3.exchangeable (Na ⁺ ,K ⁺ , Ca ²⁺ ,Mg ²⁺ , 4 Exchangeable acidity, 5. ECEC, 6. Moisture content	Once- twice a year
Vegetation	1. observation of tree decline, 2. description of trees	Once- twice a year
Inland aquatic environment	1. water temperature, 2. pH, 3. EC, 4 alkalinity, 5 NH ₄ ⁺ , 6. Na ⁺ , 7. K ⁺ , 8. Ca ²⁺ , 9. Mg ²⁺ , 10. SO ₄ ²⁻ , 11 NO ₃ ⁻ , 12. Cl ⁻ , 13. NO ₂ ⁻ , PO ₄ ³⁻ , COD, transparency	4 times/year

3) Participating laboratories for each monitoring activities**Environmental Research and Training Center (ERTC) <Wet deposition>**

Organization name	Ministry of Natural Resources and Environment (MNRE)	Code	TH01
Department/Section	Environmental Research and Training Center (ERTC) Department of Environmental Quality Promotion (DEQP)		
Name of a person in charge in the laboratory (PCL)	Dr. Hathairatana Garivait		
Postal address	Technopolis Klong 5 ,Klong Luang, Patumthani 12120 Thailand		
Contact address	Tel: (662) 577-4182-9 Fax: (662) 577-1138 E-mail: garivah@deqp.go.th, hathairatana@yahoo.com		
Note			

Pollution Control Department (PCD) <Wet Deposition / Dry Deposition>

Organization name	Ministry of Natural Resources and Environment(MNRE)	Code	TH02
Department/Section	Environmental Quality and Laboratory Section Pollution Control Department (PCD)		
Name of a person in Charge in the laboratory (PCL)	Dr. Pornsri Sutthanarak, Head of laboratory (Ms. Pannipa Teerajindachon QA/QC Manager Ms. Siwaporn Phanthong, Scientist)		
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand		
Contact address	Tel: (662) 298-2545(office), 298-2804-5 (lab) Fax: (662) 298-2580 E-mail: pornsri.s@pcd.go.th		
Note	Rain samples from Pollution Control Department site and Vachiralongkorn Dam site were analyzed by PCD laboratory		

Thailand Meteorological Department (TMD) <Wet deposition>

Organization name	Ministry of Information and Communication Technology	Code	TH04
Department/Section	Meteorological Observations Division Thailand Meteorological Department (TMD)		
Name of a person in Charge in the laboratory (PCL)	Mr. Jessada Koongammak		
Postal address	4353 Sukhumvit Rd., Bangna, Bangkok 10260 Thailand		
Contact address	Tel: (662) 399-4566-9 ext 182 Fax: (662) 399-4548		
Note	The location of this site is in Samutprakarn area but the postal address is Bangkok		

Chiangmai University (CMU) < Wet Deposition / Dry Deposition >

Organization name	Chiangmai University	Code	TH05
Department/Section	Department of Chemistry, Faculty of Science		
Name of a person in Charge in the laboratory (PCL)	Dr. Somporn Jantara		
Postal address	239, Huaykaew Rd., Muang District, Chiangmai Province. Thailand		
Contact address	Tel: (66)053 943396 ext 323 Fax: (66) 053 892277 E-mail: sp_chan@chiangmai.ac.th		
Note			

Khon Kaen University (KKU) < Wet Deposition / Dry Deposition >

Organization name	Khon Kaen University	Code	TH06
Department/Section	Department of Environmental Engineering, Faculty of Engineering		
Name of a person in Charge in the laboratory (PCL)	Mrs. Paisri Wannasangthong		
Postal address	123, Thanon Friendship Highway, Muang District, Khon Kaen Province, 40002 Thailand		
Contact address	Tel: (66) 043 202571 ext. 118 Fax: (66) 043 239163 E-mail: envmc@kku.ac.th		
Note			

< Soil > (analyze Soil sample from Vachiralongkorn Dam)

Organization name	King Mongkut's University of Technology Thonburi	Code	TH03
Department/Section	Environmental Technology Division, School of Energy and Material		
Name of a person in Charge in the laboratory (PCL)	Dr. Pojanie Khummongkol		
Postal address	91 Pracha-uthit Rd., Bangmod, Tung-kru, Bangkok 10140 Thailand		
Contact address	Tel: (662) 470-8651 Fax: (662) 470-8660 E-mail: pojanie.khu@kmutt.ac.th		
Note			

< Vegetation > (analyze Vegetation sample from Vachiralongkorn Dam)

Organization name	Ministry of Natural Resources and Environment(MONRE)	Code	TH02
Department/Section	Environmental Quality and Laboratory Section Pollution Control Department (PCD)		
Name of a person in Charge in the laboratory (PCL)	Dr. Pornsri Sutthanarak, Head of Laboratory		
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand		
Contact address	Tel: (662) 298-2545 Fax: (662) 298-2580 E-mail: pornsri.s@pcd.go.th		
Note			

< Inland aquatic environment > (analyze surface water sample from Vachiralongkorn Dam)

Organization name	Ministry of Natural Resources and Environment(MONRE)	Code	TH02
Department/ Section	Environmental Quality and Laboratory Section Pollution Control Department (PCD)		
Name of a person in Charge in the laboratory (PCL)	Dr. Pornsri Sutthanarak, Head of Laboratory Ms. Monthicha Ketrikorn, Scientist		
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand		
Contact address	Tel: (662) 298-2545 Fax: (662) 298-2580 E-mail: pornsri.s@pcd.go.th		
Note			

Format on information on respective monitoring sites

Date (data reporting)	June 30 th , 2008
Country name	THAILAND
Organization name	Ministry of Natural Resources and Environment
Department	Air Quality and Noise Management Bureau / Pollution Control Department
Name	Mr. Phunsak Theramongkol
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400, Thailand
Contact address	Tel: (662) 298-2373 Fax: (662) 298-2392 E-mail: phunsak.t@pcd.go.th, wassana.t@pcd.go.th

1. Wet deposition (prepare for each site)

1.1 Pollution Control Department, Bangkok

1) Outline of monitoring site

Site name	Pollution Control Department, Bangkok	Code	TH11042
Address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand		
Site classification	urban		
Latitude	(north) 13 °47 '	Longitude	(east) 100 °32 '
Altitude	75 M MSL		
Height of sampling funnel	from the ground level: 60 m from the floor of sampler installed: 1.5 m		

2) Sample collection

Period of sample Collection	daily
System of sample Collection	wet only sampler
Collector	Manufacturer : Aerochem Metrics Inc. , model : 301 Funnel diameter : 288 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge : Use Manufacturer : - , model : - (rain gauge of collector set : Aerochem Metrics Inc. , model : 301) Height from the ground level : 60 m Method : Gravimetric
Other parameters of observation on site	-
In case of using nearest meteorological station data.	Name of the station : PRD station Distance from the site : 150 m Direction from the site (bearings) : East
Parameters at nearest Met station	- Gas: NO-NO _x , SO ₂ , PM10 - Met: ambient temperature, relative humidity, solar radiation, wind speed, wind direction

- 2) Situation around the site are attached in the file "Bangkok site scale.xls" which include,
- (1) On-site scale (within 150m from sampler)
 - (2) Local scale (150m - 10km)
 - (3) Regional scale(10km - 50km)

1.2 Thailand Meteorological Department, Samutprakarn province

1) Outline of monitoring site

Site name	Thailand Meteorological Department (TMD), Samutprakarn	Code	TH11043
Address	Thailand Meteorological Department (TMD), 4353 Sukhumvit Rd., Bangna. Bangkok (Samutprakarn)		
Site classification	urban		
Latitude	(north) 13 °44 '	Longitude	(east) 100 °34 '
Altitude	2 M MSL		
Height of sampling funnel	From the ground level: 1.5 m From the floor of sampler installed: 1.5 m		

2) Sample collection

Period of sample Collection	daily
System of sample Collection	wet only sampler
Collector	Manufacturer : Aerochem Metrics Inc. , model : 301 Funnel diameter : 288 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge : Use Manufacturer : - model : - (the set of Aerochem Metrics Inc. , model : 301) Height from the ground level : 1.5 m Method : Gravimetric
Other parameters of observation on site	-
In case of using nearest meteorological station data.	name of the station: ambient air monitoring station at TMD site (TMD05t gas and met daily and monthly by PCD.xls) distance from the site: 0.1 km direction from the site (bearings): East
Parameters	NO-NOx , SO ₂ , O ₃ , RH, Rain, wind speed, wind direction, ambient temperature, relative humidity

- 2) Situation around the site are attached in "Samutprakarn site scale.xls" which include
- (1) On-site scale (within 150m from sampler)
 - (2) Local scale (150m - 10km)
 - (3) Regional scale(10km - 50km)

1.3 Environmental Research and Training Center (ERTC), Patumthani

1) Outline of monitoring site

Site name	Environmental Research and Training Center (ERTC), Patumthani	Code	TH11044
Address	Technopolis , Klong 5 , Klong Luang, Pathumthani 12120		
Site classification	rural		
Latitude	(north) 14 ° 02 '	Longitude	(east) 100 ° 46 '
Altitude	2 M MSL		
Height of sampling funnel	from the ground level: 1.5 m from the floor of sampler installed: 1.5 m		

2) Sample collection

Period of sample Collection	daily
System of sample Collection	wet only sampler
Collector	Manufacturer : Graseby model : T87-100 Funnel diameter : 288 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge : Use Manufacturer : , model : (standard rain gauge from Thailand Meteorological Department) Height from the ground level : 1.5 m Method : Gravimetric
Other parameters of observation on site	Gas and aerosol by filter pack method
In case of using nearest meteorological station data.	Name of the station : Patumthani Agro Met Station (TMD's station) (Pathumtani monthly Metdata by TMD (from 3hrdata).xls) & (Pathumtani_monthlyMetData by TMD.xls) Distance from the site : 17.5 km Direction from the site (bearings) : North-west
Parameters	precipitation amount, wind direction, wind speed , ambient temperature, relative humidity , barometric pressure

2) Situation around the site are attached in "Patumthani site scale.xls" which include

- (1) On-site scale (within 150m from sampler)
- (2) Local scale (150m - 10km)
- (3) Regional scale(10km - 50km)

1.4 Vachiralongkorn Dam (Khao Lam Dam), Khanchanaburi province

1) Outline of monitoring site

Site name	Vachiralongkorn Dam , Khanchanaburi	Code	TH11045
Address	Vachiralongkorn Dam, Tha-Khanoon Sub-district, Thongpaphum District, Khanchanaburi Province 71180		
Site classification	remote		
Latitude	(north) 14 ° 46 '	Longitude	(east) 98 ° 35 '
Altitude	170 M		
Height of sampling funnel	from the ground level: 1.5 m from the floor of sampler installed: 1.5 m		

2) Sample collection

Period of sample Collection	daily
System of sample Collection	wet only
Collector	Manufacturer : Aerochem Metrics Inc. , model : 301 Funnel diameter : 288 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge : Use Manufacturer : - model : - (standard rain gauge from Thailand Meteorological Department) Height from the ground level : 1.5 m Method : Gravimetric
Other parameters of observation on site	1. NO-NO _x , SO ₂ , O ₃ , rain amount , wind speed , wind direction, PM-10, ambient temperature (by PCD's mobile unit, 3 times a year in April, August, November 2007) 2. gases and aerosols by filter pack method (3 times a year)
In case of using nearest meteorological station data.	Name of the station : Thongpaphum observation met station (Khanchanaburi monthly Metdata by TMD (from 3hrdata).xls) & (Khanchanaburi_monthlyMetdata by TMD.xls) Distance from the site : 6 km Direction from the site (bearings) : South-east
Parameters	precipitation amount, wind direction, wind speed, relative humidity, ambient temperature

2) Situation around the site are attached in "Khanchanaburi site scale.xls" which include

- (1) On-site scale (within 150m from sampler)
- (2) Local scale (150m - 10km)
- (3) Regional scale(10km - 50km)

1.5 Mae-Hia, ChiangMai Province

1) Outline of monitoring site

Site name	Mae-Hia , Chiang Mai	Code	TH11046
Address	Chiang Mai University , Chiang Mai, Thailand		
Site classification	rural		
Latitude	(north) 18 ° 46 '	Longitude	(east) 98 ° 56 '
Altitude	350 M MSL		
Height of sampling funnel	from the ground level: 1.5 m from the floor of sampler installed: 1.5 m		

2) Sample collection

Period of sample Collection	daily
System of sample Collection	wet only sampler
Collector	Manufacturer : Aerochem Metrics Inc. , model : 301 Funnel diameter : 288 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge : Use Manufacturer : - model : - (Aerochem Metrics Inc. , model : 301) Height from the ground level : 1.5 m Method : Gravimetric
Other parameters of observation on site	Gases and aerosol by filter pack method
In case of using nearest meteorological station data.	Name of the station : Chiang Mai city hall (Salaklang) station (Chiangmaicityhall gas and met daily and monthly by PCD.xls) Distance from the site : 3 km Direction from the site (bearings) : North-east
Parameters	1. SO ₂ , NO-NOx, O ₃ , PM-10, 2. relative humidity, rain amount, wind direction, ambient temperature, solar Radiation

- 2) Situation around the site are attached in "Chiang Mai site scale.xls" and "Chiang Mai site scale topo.pdf" which include
- (1) On-site scale (within 150m from sampler)
 - (2) Local scale (150m - 10km)
 - (3) Regional scale(10km - 50km)

1.6 Sakaerat Silvicultural Research Station, Nakhon Ratchasima Province

1) Outline of monitoring site

Site name	Sakaerat Silvicultural Research Station	Code	TH11054
Address	U-dom Sap Sub-District , Wang Nam Khiew District, Nakhon Ratchasima Province, Thailand 30150		
Site classification	Remote		
Latitude	(north) 14 ° 27 ' - 14 ° 33 '	Longitude	(east) 101 ° 53 ' - 101 ° 56 '
Altitude	418 M MSL		
Height of sampling funnel	from the ground level: 1.5 m from the floor of sampler installed: 1.5 m		

2) Sample collection

Period of sample Collection	daily
System of sample Collection	wet only sampler
Collector	Manufacturer : Aerochem Metrics Inc. , model : 301 Funnel diameter : 288 mm

3) Meteorological observation

Precipitation amount on site	Rain gauge : Use Manufacturer : - model : - (Aerochem Metrics Inc. , model : 301) Height from the ground level : 1.5 m Method : Gravimetric
Other parameters of observation on site	Gases and aerosols by filter pack method
In case of using nearest meteorological station data.	Name of the station : Sakaerat Silvicultural Research Meteorological Station Distance from the site : 0.1 km Direction from the site (bearings) : North
Parameters	precipitation amount

2) Situation around the site are attached in "Nakhon Ratchasima site scale topo.xls" and "Nakhon Ratchansima Site pictures.pdf" which include

- (1) On-site scale (within 150m from sampler)
- (2) Local scale (150m - 10km)
- (3) Regional scale(10km - 50km)

Format on information on respective monitoring sites

Date (data reporting)	June 30 th , 2007
Country name	THAILAND
Organization name	Ministry of Natural Resources and Environment
Department	Air Quality and Noise Management Bureau/ Pollution Control Department
Name	Mr. Phunsak Theramongkol
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400, Thailand
Contact address	Tel: (662) 298-2373 Fax: (662) 298-2392 E-mail: phunsak.t@pcd.go.th, wassana.t@pcd.go.th

2. Dry deposition (prepare for each site)

2.1 The Government Public Relations Department (PRD)

1) Outline of monitoring site

Site name	The Government Public Relations Department (PRD), Pollution Control Department (PCD), Bangkok	Code	TH11042
Address	The Government Public Relations Department, Rama VI Road, Soi 30, Bangkok 10400		
Site classification	urban		
Latitude	(north) 13 °46 '	Longitude	(east) 100 °32 '
Altitude	11 M MSL		
Height of sampling funnel	From the ground level: 4 m From the floor of sampler installed: 1.5 m		

2) A situation around the site (File : Bangkok site scale.xls)

3) Gases

Public Relation Department, Bangkok
- automatic

(1) Outline of monitoring

Measured parameters	1. SO ₂ , 2. NO _x (NO+NO ₂) 3. PM-10
Sampling period of each data	Hourly, continuous
Measurement interval	January 1 st – December 31 st , 2007

(2) Monitoring method

Measurement parameter (1)	SO ₂
Measurement method	Automatic (method: UV - Fluorescence)
	Manufacturer : Monitor Labs , model : ML-9850
Measurement Interval	Continuous sampling, hourly data recorded

Measurement parameter (2)	NO ₂ , NO, NOx
Measurement method	automatic (method : Chemiluminescence)
	Manufacturer : Monitor Labs , model : 9841 A
Measurement Interval	Continuous sampling, hourly recorded data

Measurement parameter (3)	PM-10
Measurement method	Automatic (method : TEOM)
	Manufacturer : Rupprecht & Patashnick , model : 1400ab
Measurement Interval	Continuous sampling, hourly data recorded

- Filter pack

Measured parameters	Gas : SO ₂ ,HNO ₃ ,HCl,NH ₃ Aerosol : SO ₄ ²⁻ NO ₃ ⁻ Cl ⁻ Na ⁺ NH ₄ ⁺ K ⁺ Mg ²⁺ Ca ²⁺
Sampling period of each data	10 days, continuously
Measurement interval	January 1 st – December 31 st , 2007

(2) Monitoring method

Measurement parameter (1)	Gas : SO ₂ ,HNO ₃ ,HCl,NH ₃ Aerosol : SO ₄ ²⁻ NO ₃ ⁻ Cl ⁻ Na ⁺ NH ₄ ⁺ K ⁺ Mg ²⁺ Ca ²⁺
Measurement method	manual method: filter pack sampling flow rate 1 liter/min
Measurement Interval	10 days

4) Meteorological observation

Parameters of observation	Precipitation amount, ambient temperature, relative humidity, solar radiation, wind speed, wind direction, ambient pressure
In case of using the nearest meteorological station data	name of the station: PRD distance from the site: on site direction from the site (bearings): East

2.2 Thailand Meteorological Department (TMD), Samutprakarn

1) Outline of monitoring site

Site name	Thailand Meteorological Department (TMD), Samutprakarn	Code	TH11043
Address	Thailand Meteorological Department (TMD), 4353 Sukhumvit Rd., Bangna. Bangkok (Bangkok Metropolitan/Samutprakarn province)		
Site classification	urban		
Latitude	(north) 13 °44 '	Longitude	(east) 100 °34 '
Altitude	2 M MSL		
Height of sampling funnel	From the ground level: 3.5 m From the floor of sampler installed: 3.5 m		

2) A situation around the site (File : Samutprakarn site scale.xls)

3) Gases

(1) Outline of monitoring

Measured parameters	SO ₂ , NO ₂ , NO, O ₃
Sampling period of each data	Hourly, continuous
Measurement interval	January 1 st – December 31 st , 2007

(2) Monitoring method

Measurement parameter (1)	SO ₂
Measurement method	Automatic (method: UV - Fluorescence) Manufacturer : Dasibi , model: 4108

Measurement parameter (2)	NO ₂ , NO
Measurement method	automatic (method : Chemiluminescence) Manufacturer : API , model : 200 A

Measurement parameter (3)	O ₃
Measurement method	automatic (method : UV-Absorption) manufacturer: Dasibi , model: 1008PC

4) Meteorological observation

Parameters of observation	precipitation amount , wind direction, wind velocity, temperature, humidity
In case of using the nearest meteorological station data	name of the station: ambient air monitoring station at TMD distance from the site: on site direction from the site (bearings): East

2.3 Environmental Research and Training Center (ERTC), Patumthani

1) Outline of monitoring site

Site name	Environmental Research and Training Center (ERTC), Patumthani	Code	TH11044
Address	Technopolis , Klong 5 , Klong Luang, Pathumthani 12120		
Site classification	rural		
Latitude	(north) 14 ° 02 '	Longitude	(east) 100 ° 46 '
Altitude	2 M		
Height of sampling funnel	from the ground level: 1.5 m from the floor of sampler installed: 1.5 m		

2) A situation around the site (File : Patumthani site scale.xls)

3) Gases

(1) Outline of monitoring

Measured parameters	Gas : SO ₂ ,HNO ₃ ,HCl,NH ₃ Aerosol : SO ₄ ²⁻ NO ₃ ⁻ Cl ⁻ Na ⁺ NH ₄ ⁺ K ⁺ Mg ²⁺ Ca ²⁺
Sampling period of each data	10 days, continuously
Measurement interval	January 1 st – December 31 st , 2007

(2) Monitoring method

Measurement parameter (1)	Gas : SO ₂ ,HNO ₃ ,HCl,NH ₃ Aerosol : SO ₄ ²⁻ NO ₃ ⁻ Cl ⁻ Na ⁺ NH ₄ ⁺ K ⁺ Mg ²⁺ Ca ²⁺
Measurement method	manual method: filter pack sampling flow rate 1 liter/min
Measurement Interval	10 days

4) Meteorological observation

Parameters of observation	precipitation amount , wind direction, wind speed, ambient temperature, relativehumidity
In case of using the nearest meteorological station data	name of the station: Pathumtani Agro Meteorological Station (TMD's station) distance from the site: 17.5 km direction from the site (bearings): North-west

2.4 Vachiralongkorn Dam (Khao Lam Dam), Khanchanaburi

1) Outline of monitoring site

Site name	Vachiralongkorn Dam (Khao Lam Dam), Khanchanaburi	Code	TH11045
Address	Vachiralongkorn Dam (Khao Lam Dam), Kanchanaburi		
Site classification	remote		
Latitude	(north south) 14 °46 '	Longitude	(east) 98 °35 '
Altitude	170 M MSL		
Height of sampling funnel	From the ground level: 3.5 m From the floor of sampler installed: 3.5 m (automatic) , 1.5 m (filter pack)		

2) A situation around the site (File : Khanchanaburi site scale.xls)

3) Gases

(1) Outline of monitoring

Measured parameters	SO ₂ , NO-NO _x , O ₃ , PM-10 , Gas+Aerosol by filter pack Gas : SO ₂ , HNO ₃ , HCl, NH ₃ Aerosol : SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , Na ⁺ , NH ₄ ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺
Sampling period of each data	Gas: Hourly Gas+Aerosol : 15 days
Measurement interval	Gas : continuous , periodic (3 times/year, 15 days/time) Gas+ Aerosol : continuous, periodic (3 times/year, 15 days/time)

(2) Monitoring method

Measurement parameter (1)	SO ₂
Measurement method	1. Automatic (method: UV - Fluorescence) Manufacturer : API , model : 100 A

Measurement parameter (2)	NO ₂ , NO
Measurement method	automatic (method : Chemiluminescence) Manufacturer : API , model : 200 A

Measurement parameter (3)	O ₃
Measurement method	Automatic (method : UV-Absorption) Manufacturer : API , model : 400 A

Measurement parameter (4)	PM-10
Measurement method	Automatic (method : Beta-Gauge) Manufacturer : Graseby Anderson model : GBAM-1020
Measurement Interval	Hourly , continuous

Measurement parameter (5)	Aerosol + SO ₂ , HNO ₃ , HCl, NH ₃
Measurement method	manual method: filter pack ; sampling flow rate 1 liter/min
Measurement Interval	15 days , continuous

4) Meteorological observation

Parameters of observation	precipitation amount , wind direction, wind velocity, temperature, Humidity
In case of using the nearest meteorological station data	name of the station : Thongpaphum observing Station distance from the site : 6 km direction from the site (bearings) : South-East

2.5 Mae-Hia, Chiang Mai

1) Outline of monitoring site

Site name	Mae-Hia, Chiang Mai	Code	TH11046
Address	Chiang Mai University ,Chiang Mai Province		
Site classification	rural		
Latitude	(north south) 18 °46 '	Longitude	(east) 98 °56 '
Altitude	350 M MSL		
Height of sampling funnel	From the ground level: 2.5 m From the floor of sampler installed: 2.5 m		

2) A situation around the site (File : Chiang Mai site scale.xls, Chiang Mai site scale topo.pdf)

3) Gases

(1) Outline of monitoring

- Automatic

Measurement parameter (1)	SO ₂
Measurement method	Automatic (method: UV - Fluorescence) Manufacturer : Monitor Labs , model : ML-9850
Measurement Interval	Continuous sampling, hourly data recorded

Measurement parameter (2)	NO ₂ , NO, NOx
Measurement method	automatic (method : Chemiluminescence) Manufacturer : Monitor Labs , model : 9841 A
Measurement Interval	Continuous sampling, hourly recorded data

Measurement parameter (3)	PM-10
Measurement method	Automatic (method : TEOM) Manufacturer : Rupprecht & Patashnick , model : 1400ab
Measurement Interval	Continuous sampling, hourly data recorded

-Filter pack

(1) Outline of monitoring

Measured parameters	Gas : SO ₂ ,HNO ₃ ,HCl,NH ₃ Aerosol : SO ₄ ²⁻ NO ₃ ⁻ Cl ⁻ Na ⁺ NH ₄ ⁺ K ⁺ Mg ²⁺ Ca ²⁺
Sampling period of each data	10 days, continuously
Measurement interval	January 1 st – December 31 st , 2007

(2) Monitoring method

Measurement parameter (1)	Gas : SO ₂ ,HNO ₃ ,HCl,NH ₃ Aerosol : SO ₄ ²⁻ NO ₃ ⁻ Cl ⁻ Na ⁺ NH ₄ ⁺ K ⁺ Mg ²⁺ Ca ²⁺
Measurement method	manual method: filter pack sampling flow rate 1 liter/min
Measurement Interval	10 days

4) Meteorological observation

Parameters of observation	precipitation amount, wind direction, wind speed, ambient temperature, relative humidity, solar radiation
In case of using the nearest meteorological station data	name of the station : Chiang Mai City hall Station distance from the site : ~ 3 km direction from the site (bearings) : North-East

2.6 Sakaerat Silvicultural Research Station, Nakhon Ratchasima

1) Outline of monitoring site

Site name	Sakaerat Silvicultural Research Station, Nakhon Ratchasima	Code	TH11054
Address	U-dom Sap Sub-District, Wang Nam Khiew District, Nakhon Ratchasima Province, 30150		
Site classification	Remote		
Latitude	(north) 14 ° 27' - 14 ° 33'	Longitude	(east) 101 ° 53' - 101 ° 56'
Altitude	418 M MSL		
Height of sampling funnel	from the ground level: 1.5 m from the floor of sampler installed: 1.5 m		

2) A situation around the site (File : Nakhon Ratchasima site scale topo.pdf)

3) Gases

(1) Outline of monitoring

-Filter pack

Measured parameters	Gas : SO ₂ , HNO ₃ , HCl, NH ₃ Aerosol : SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , Na ⁺ , NH ₄ ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺
Sampling period of each data	10 days, continuously
Measurement interval	January 1 st – December 31 st , 2007

(2) Monitoring method

Measurement parameter (1)	Gas : SO ₂ , HNO ₃ , HCl, NH ₃ Aerosol : SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , Na ⁺ , NH ₄ ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺
Measurement method	manual method: filter pack sampling flow rate 1 liter/min
Measurement Interval	10 days

4) Meteorological observation

Parameters of observation	precipitation amount (gravimetric)
In case of using the nearest meteorological station data	name of the station: Sakaerat Silvicultural Research Meteorological Station distance from the site: 0.1 km direction from the site (bearings): North

Format on information on respective monitoring sites

Date (data reporting)	June 30 th , 2007
Country name	THAILAND
Organization name	Ministry of Natural Resources and Environment
Department	Pollution Control Department /Air Quality and Noise Management Bureau
Name	Mr. Phunsak Theramongkol
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400, Thailand
Contact address	Tel: (662) 298-2399 Fax: (662) 298-2392 E-mail: phunsak.t@pcd.go.th, wassana.t@pcd.go.th

Note: There is no soil and vegetation monitoring in 2007

3. Soil and vegetation (prepare for each soil type) (For basic survey site) (2003, 2006, 2009)

1) Permanent site

Site name (soil type)	Khanchanaburi ❶. Vachiralongkorn Dam : Ferric Acrisols ❷. Vachiralongkorn - Puye : Luvisols (FAO): Hapluf Talff(US Taxonomy)		
Location	Vachiralongkorn Dam, Tha Khanoon sub-district, Thongpaphum District, Khanchanaburi Province 71180		
Latitude	(north) 14 ° 46 '	Longitude	(east) 98 ° 35'
Altitude	170 M MSL		
Data of wet deposition	use the nearest wet deposition monitoring site data.		
In case of use the nearest wet deposition monitoring site data.	name of the site : Khanchanaburi- Thongpaphum Meteorological station distance from the site : 1 km from wet deposition sampling site and 30 km from Vachiralongkorn Puye site direction from the site (bearings) : west from Vachiralongkorn Dam site and north from Vachiralongkorn-Puye site		
Site classification of the wet deposition monitoring site	remote		

2) A situation around the site

Please see the attached file "Khanchanaburi site scale.xls"

3) Outline of monitoring

(1) Soil

Measurement parameters	(no data for 2007)
Monitoring interval	

(2) Vegetation

Measurement parameters	(no data for 2007)
Monitoring interval	

3) Meteorological observation

Parameters of observation	precipitation amount (gravimetric) wind direction, wind speed. ambient temperature, relative humidity
In case of using the nearest meteorological station data	name of the station: Thongpaphum Observing Meteorological Station distance from the site: 6 km direction from the site (bearings): South-East

Format on information on respective monitoring sites

Date (data reporting)	June 30 th , 2007
Country name	THAILAND
Organization name	Ministry of Natural Resources and Environment
Department	Pollution Control Department /Air Quality and Noise Management Bureau
Name	Mr. Phunsak Theramongkol
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400, Thailand
Contact address	Tel: (662) 298-2399, 298-2399 Fax: (662) 298-2392 E-mail: phunsak.t@pcd.go.th, wassana.t@pcd.go.th

4. Inland aquatic environment

1) Outline of monitoring site

Type of inland aquatic system	Reservoir (Man made)		
Site name	Vachiralongkorn Dam, Khanchanaburi ● Ban Pong Chang ● Ban Pang Pueng Station		
Location	Vachiralongkorn Dam, Tha Khanon sub-district, Thongpaphum District, Khanchanaburi Province 71180		
Latitude	(north) 14 ° 46'	Longitude	(east) 98° 35 '
Altitude	170 M MSL		
Origin of the inland aquatic system	Artificial (Lake by Dam Reservoir area)		
Data of wet deposition	on site monitoring data		
In case of using the nearest wet deposition monitoring site data.	name of the site: Vachiralongkorn Dam distance from the site : - km direction from the site (bearings) : -		
Site classification of the wet deposition monitoring site	remote		

2) Outline of monitoring

Analytical parameters	pH, EC, alkalinity, NH ₄ ⁺ , Na ⁺ , K ⁺ , Ca ²⁺ , Mg ²⁺ , SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻ , NO ₂ ⁻ , others (NH ₃ -N, PO ₄ ³⁻ , water temperature)
Monitoring interval	...4.... times a year

3) Characteristics of the Lake (data of 2007)

Area	3,720 km ²	Shape*	Multi-shape
Shore line length	- m		
Hydrological type			
Water depth	mean: 145.36 m-MSL, maximum : 153.31 m-MSL, minimum : 137.40 m-MSL		
Water volume	mean: 5,865.4 x 10 ⁶ m ³ , maximum : 8,217.0 x 10 ⁶ m ³ , minimum : 3,513.4 x 10 ⁶ m ³		
Annual deviation of water depth	0 - 15.91 m (mean : 7.95 m)		
Mean retention time of water	489 days (average effluent flow = 12 x 10 ⁶ m ³)		
Utilization	irrigation, electric power, fish culture, sightseeing		

4) Outline of watershed

Area	3,720 km ²		
Altitude	m - m		
Surface geology			
Soil Types			
Vegetation (dominant plants)	Banana, rambutan, rice, corn, cassava, mango		
Land uses(covered percentage %)	Agriculture area	(%)
	Residential area	(%)
	Others	(%)
Population	22,215		
Number of inlet streams	annual: 6,026.4 x 10 ⁶ m ³ /year		
Amount of inlet water	daily: m ³ /day(month:) - m ³ /day(month:)		
Number of outlet streams	annual: 3,906.2 X 10 ⁶ m ³ /year		
Amount of outlet water	daily: m ³ /day(month:) - m ³ /day(month:)		
Number of springs	-		
Amount of the water	annual: m ³ /year	daily: m ³ /day(month:) -	m ³ /day(month:)

5) Meteorological observation

Parameters of observation	precipitation amount (gravimetric), wind direction, speed, temperature, humidity,
In case of using the nearest meteorological station data	name of the station: Thongpaphum Meteorological Observing Station distance from the site: 6 km direction from the site (bearings) : South- East

Format on monitoring data for each calendar year

Date(data reporting)	June 30 th , 2008
Country name	THAILAND
Organization name	Ministry of Natural Resources and Environment
Department	Ambient Air Quality Division / Air Quality and Noise Management Bureau/ Pollution Control Department
Name of national QA/QC manager (NAM)	Ms. Wassana Toruksa
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand
Contact address	Tel: (662) 298-2373 Fax: (662) 298-2392 E-mail: Wassana.t@pcd.go.th

1. Wet deposition (prepare for each site)

1.1 Pollution Control Department - Bangkok

1) Site

Site name	Pollution Control Department (PCD)	Code	TH11042
Postal address	Pollution Control Department, 92 Soi Phahonyothin 7, Sam Sen Nai, Phayathai, Bangkok		
Site classification	urban		

2) Sampling and shipping

Sampling	sample bottle : polyethylene	
	sample temperature : uncontrolled	
Shipping	sample temperature : (no shipping)	
	note* (the laboratory is near the sampling site)	
	packing procedure : -	
	shipping frequency : -	
Mean time from sampling to analysis	around7-14..days	
Use of biocides, kind of biocide and added quantity	Use : Thymol Filtrate sample before ions analysis	
Name of sampling organization and reporter	Ms. Wassana Toruksa Ambient Air Quality Division Air Quality and Noise Management Bureau Pollution Control Department	

*describe any treatments which don't meet the manual such as filtration of samples

3) Measurement/analytical condition

Parameter	Measurement / analytical method	Manufacturer / Type of equipment	Detection limit* (µmol/l)	Determination Limit * (µmol/l)	Note
pH	Glass electrode	Orion 710A digital	-	-	
EC	Conductivity cell	Cyberscan CON500 digital	-	-	
SO ₄ ²⁻	Ion Chromatography	Dionex DX600	0.05	0.16	
NO ₃ ⁻	Ion Chromatography	Dionex DX600	0.06	0.21	
Cl ⁻	Ion Chromatography	Dionex DX600	0.10	0.35	
NH ₄ ⁺	Ion Chromatography	Dionex DX600	0.57	1.00	
Na ⁺	Ion Chromatography	Dionex DX600	0.03	0.09	
K ⁺	Ion Chromatography	Dionex DX600	0.06	0.21	
Ca ²⁺	Ion Chromatography	Dionex DX600	0.13	0.43	
Mg ²⁺	Ion Chromatography	Dionex DX600	0.08	0.25	
()					

* data from interlaboratory comparison project 2007, for laboratory report the reporting limits were 0.01 mg/L for all parameters

4) Results of analysis

Please see the attached file: 1 Wet PCD Bangkok 07.xls

5) Meteorological condition (reported year 2007) : PCD/ Bangkok

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	25.9	28.0	30.7	30.1	30.2	30.2	28.2	28.9	28.8	28.4	27.1	28.4
Humidity(%)	monthly mean*	63.6	70.0	73.2	77.5	78.3	78.4	79.9	77.6	79.6	77.6	65.7	64.6
Mean wind speed (m/s)*		0.6	1.3	1.7	0.9	1.1	0.8	0.8	1.0	0.7	0.7	0.6	0.6
Most appearance wind* direction (bearings)		N, NE	SW	SW	SW	SW	SW	SW	SW	SW	NE	NE	NE
Precipitation amount : at sampling site (mm/month)	** (rain gauge)	9.0	0.0	16.1	148.1	275.8	174.2	275.6	163.7	322.1	190.3	0.0	0.0
	*** (tipping bucket)	14.2	0.0	10.5	90.5	342.3	228.0	272.8	176.0	282.0	158.5	16.5	1.0
Solar radiation** (W/m ² /month)		140.7	155.8	177.2	159.4	154.0	128.9	114.1	125.2	127.8	105.8	136.3	139.8

* Data from gas and met monitoring station at PRD (PCD's air monitoring station)

Please see the attached file : BangkokPRD gas data daily and monthly by PCD.xls: for more detail

** Data from PCD's wet deposition sampling station (200m from PRD station) → use this data for reference data of rain amount

Please see the attached file: 1 Wet PCD Bangkok 07.xls

*** Data from Dindang air monitoring station (1.5 km from wet deposition station)

Please see the attached file : BangkokDindang gas and met daily and monthly by PCD.xls for more detail

(Note: The data of rain amount at PRD station in 2007 were fault; the data are not used for reference)

1.2 Thailand Meteorological Department -Bangkok

1) Site

Site name	Thailand Meteorological Department (TMD)	Code	TH11043
Postal address	4353 Sukhumvith Road., Bangna, Bangkok		
Site classification	urban		

2) Sampling and shipping

Sampling	sample bottle : polyethylene
	sample temperature : uncontrolled
	note*(the sampling site is nearby the laboratory)
Shipping	sample temperature : uncontrolled
	note*(The sampling site is nearby the laboratory)
Mean time from sampling to analysis	around <u>14 days - 1 month</u>
Use of biocides, kind of biocide and added quantity	no use
Name of sampling organization and reporter	Mr. Jeasada Koo-ngammak

*describe any treatments which don't meet the manual such as filtration of samples

3) Measurement/analytical condition (TMD's laboratory)

Parameter	Measurement / analytical method	Manufacturer / Type of equipment	Detection limit* (µmol/l)	Determination Limit* (µmol/l)	Note
pH	Glass electrode	Horiba D-24 digital	-	-	
EC	Conductivity cell	Horiba D-24 digital	-	-	
SO ₄ ²⁻	Ion Chromatography	Dionex Dx-120			No data
NO ₃ ⁻	Ion Chromatography	Dionex Dx-120			No data
Cl ⁻	Ion Chromatography	Dionex Dx-120			No data
NH ₄ ⁺	Ion Chromatography	Dionex Dx-120	0.21	0.69	
Na ⁺	Ion Chromatography	Dionex Dx-120	1.07	3.55	
K ⁺	Ion Chromatography	Dionex Dx-120	0.23	0.76	
Ca ²⁺	Ion Chromatography	Dionex Dx-120	1.01	3.36	
Mg ²⁺	Ion Chromatography	Dionex Dx-120	0.19	0.65	

* data from interlaboratory comparison project 2007

4) Results of analysis

Please see the attached file : 2 Wet TMD Samutprakarn07.xls

5) Meteorological condition

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	27.2	27.7	30.5	30.7	29.6	31.2	29.4	29.8	29.9	29.2	27.8	29.0
Humidity (%)	monthly mean*	67.3	78.9	79.5	78.0	80.7	73.3	75.8	72.8	74.0	71.1	59.3	63.0
Mean wind speed (m/s)*		1.5	2.1	2.4	1.6	1.5	1.4	1.6	1.9	1.5	1.7	1.9	1.7
Mean wind speed (knots)**		1.7	2.5	3.7	2.4	1.8	1.9	1.6	2.5	1.8	1.6	1.9	1.6
Most appearance wind direction (bearings)*		NE	SW	SW	SW	SW	SW	SW	W	S	NE	NE	NE
Precipitation amount* (mm/month) tipping bucket		1.2	0.2	36.2	161.6	192.9	333.7	306.5	132.9	173.4	178.5	36.5	0.0
Precipitation amount** (mm/month) rain gauge		1.8	0.0	34.3	164.8	257.4	358.9	334.7	142.0	245.8	302.3	35.0	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

*Data from Gas and Met monitoring station at TMD (by PCD's air monitoring station)

Please see the attached file : Samutprakarn gas and met daily and monthly by PCD.xls for more details.

** Data from TMD (TMD's data) → use this data for reference data of rain amount

Please see the attached file: Samutprakarn monthly Metdata by TMD (from 3hrdata).xls

1.3 ERTC - Patumthani

1) Site

Site name	Environmental Research and Training Center (ERTC)	Code	TH11044
Postal address	Technopolis, Klong 5, Klong Luang, Pathumthani 12120		
Site classification	rural		

2) Sampling and shipping

Sampling	sample bottle : polyethylene sample temperature : uncontrolled Note (The laboratory is near the sampling site)
Shipping	sample temperature : uncontrolled note*(the sampling site is nearby the laboratory) shipping frequency : other (daily)
Mean time from sampling to analysis	around <u>1-7 days</u>
Use of biocides, kind of biocide and added quantity	No use
Name of sampling organization and reporter	Environmental Research and Training Center (ERTC) / DEQP Dr. Hathairatana Garivait

*describe any treatments which don't meet the manual such as filtration of samples

3) Measurement/analytical condition

Parameter	Measurement/ analytical method	Manufacturer / Type of equipment	Detection limit* ($\mu\text{mol/l}$)	Determination Limit* ($\mu\text{mol/l}$)	Note
pH	Glass electrode	TOA model HM30V/ Desk top	-	-	
EC	Conductivity cell	TOA model CM40S/ Desk top	-	-	
SO ₄ ²⁻	Ion Chromatography	Dionex/ DX100	0.01	0.02	
NO ₃ ⁻	Ion Chromatography	Dionex/ DX100	0.01	0.03	
Cl ⁻	Ion Chromatography	Dionex/ DX100	0.02	0.08	
NH ₄ ⁺	Ion Chromatography	Dionex/ DX100	0.14	0.48	
Na ⁺	Ion Chromatography	Dionex/ DX100	0.04	0.13	
K ⁺	Ion Chromatography	Dionex/ DX100	0.07	0.22	
Ca ²⁺	Ion Chromatography	Dionex/ DX100	0.09	0.32	
Mg ²⁺	Ion Chromatography	Dionex/ DX100	0.02	0.06	

* data from interlaboratory comparison project 2007

4) Results of analysis

Please see the attached file: 3Wet ERTC Pathumtani2007.xls

5) Meteorological condition (reported year 2007) ERTC

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean *	27.0	27.9	30.4	30.1	29.2	30.0	29.0	29.2	29.1	28.2	26.5	28.1
Humidity (%)*	monthly mean *	66	70	71	75	80	78	77	77	79	78	68	67
Mean wind speed* (knots)		2.5	2.9	3.5	3.2	3.5	3.5	4	4.5	3.8	3	3	2.3
Most appearance wind * direction (bearings)		N	S	S	S	SW	S	SW	SW	SW	NE	NE	N
Precipitation amount (mm/month)*		0.4	0	0.1	211.2	252.5	168.1	143.6	105.9	302.1	118.7	6	0
Precipitation amount (mm/month)**		3.0	0.0	1.2	216.7	236.4	154.7	182.9	114.03	353.11	104.32	11.1	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

* Data from Pathumthani Agro Meteorological Station (TMD's meteorological station)

Please see the attached file: Pathumtani monthly Metdata by TMD (from 3hrdata).xls

** Data of recorded at sampling site by ERTC's staff

Please see the attached file: 3Wet ERTC Pathumtani2007.xls

1.4 Vachiralongkorn Dam- Khanchanaburi

1) Site

Site name	Vachiralongkorn Dam (Khao Lam Dam), Khanchanaburi	Code	TH11045
Postal address	Vachiralongkorn Dam. Tha Khanun Sub-district, Thongpaphum District, Khanchanaburi Province 71180		
Site classification	remote		

2) Sampling and shipping

Sampling	sample bottle : .polyethylene
	sample temperature : uncontrolled note*()
Shipping	sample temperature : cooling (4 °C) note*(using freezer pack) packing procedure : cooler box shipping frequency : weekly
	Mean time from sampling to analysis
Use of biocides, kind of biocide and added quantity	no use
Name of sampling organization and reporter	Electricity Generating Authority of Thailand (EGAT)/ PCD Mr. Yongyut Pacha (sampling) / Ms. Siwaporn Phangthong (analysis)/ Ms Wassana Toruksa (reporter)

*describe any treatments which don't meet the manual such as filtration of samples

3) Measurement/analytical condition (PCD's laboratory)

Parameter	Measurement / analytical method	Manufacturer / Type of equipment	Detection limit (μmol/l)	Determination Limit(μmol/l)	Note
pH	Glass electrode	Orion 710A digital	-	-	
EC	Conductivity cell	Cyberscan CON500 digital	-	-	
SO ₄ ²⁻	Ion Chromatography	Dionex DX600	0.05	0.16	
NO ₃ ⁻	Ion Chromatography	Dionex DX600	0.06	0.21	
Cl ⁻	Ion Chromatography	Dionex DX600	0.10	0.35	
NH ₄ ⁺	Ion Chromatography	Dionex DX600	0.57	1.00	
Na ⁺	Ion Chromatography	Dionex DX600	0.03	0.09	
K ⁺	Ion Chromatography	Dionex DX600	0.06	0.21	
Ca ²⁺	Ion Chromatography	Dionex DX600	0.13	0.43	
Mg ²⁺	Ion Chromatography	Dionex DX600	0.08	0.25	

* data from interlaboratory comparison project 2007, for laboratory report the reporting limits were 0.01 mg/L for all parameters

4) Results of analysis

Please see the attached file: 4WetVLK Khanchanaburi07.xls

5) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	25.0	26.7	28.9	29.8	27.1	28.5	26.7	26.9	26.8	26.3	24.5	25.1
Humidity (%)	monthly mean*	69.1	60.8	58.3	69.5	86.8	81.3	85.8	86.3	87.0	85.1	78.6	74.4
Max. wind speed * (knots)		0.4	0.5	0.9	0.6	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.4
Most appearance wind direction (bearings)*		SE	NW	NW	NW	Vary	NW	NW	NW	Calm	SE	SE	SE
Precipitation amount* (mm/month)		0	0.4	54.8	116.3	292.1	236.4	333.9	366.4	227.9	225.5	0.8	0
Precipitation amount** (mm/month)		0.0	0.0	44.4	48.9	256.9	229.4	326.9	344.7	230.6	222.4	0.0	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

* Data from Thongpaphum Meteorological station (TMD's station) the nearest met station

Please see attached file : *Khanchanaburi monthly Metdata by TMD (from 3hrdata).xls*

** Data from Vachiralongkorn Dam recorded by EGAT's staff (more close to the wet deposition sampling site) → ref data

Please see attached file : *Khanchanaburi rain amount at VLK2007 by EGAT.xls*

1.5 Chiang Mai University – ChiangMai

1) Site

Site name	Mae-Hia Campus, Chiang Mai University	Code	TH11046
Postal address	Chiang Mai University. Huay Kaew Rd., Amphur Muang, Chiang Mai, 50200		
Site classification	rural		

2) Sampling and shipping

Sampling	sample bottle : polyethylene sample temperature : Uncontrolled
Shipping	sample temperature : cooling (4 °C) packing procedure : cooler box shipping frequency : Weekly note*()
Mean time from sampling to analysis	around...1-4....week(s)
Use of biocides, kind of biocide and added quantity	Use (kind of biocide : Thymol)
Name of sampling organization and reporter	Dr. Somporn Jantara, Ms. Nattahporn Jirasathaworn Chemistry Department , Faculty of Science, Chiangmai University

*describe any treatments which don't meet the manual such as filtration of samples

3) Measurement/analytical condition

Parameter	Measurement / analytical method	Manufacturer / Type of equipment	Detection limit (µmol/l)	Determination Limit(µmol/l)	Note
pH	Glass electrode	Methohm 744 pH meter	-	-	
EC	Conductivity cell	Inolab Tetra Con 325	-	-	
SO ₄ ²⁻	Ion Chromatography	Dionex DX 300	0.03	0.09	
NO ₃ ⁻	Ion Chromatography	Dionex DX 300	0.03	0.10	
Cl ⁻	Ion Chromatography	Dionex DX 300	0.19	0.63	
NH ₄ ⁺	Ion Chromatography	Dionex DX 300	0.30	1.00	
Na ⁺	Ion Chromatography	Dionex DX 300	0.36	1.20	
K ⁺	Ion Chromatography	Dionex DX 300	0.16	0.53	
Ca ²⁺	Ion Chromatography	Dionex DX 300	0.23	0.75	
Mg ²⁺	Ion Chromatography	Dionex DX 300	0.57	1.91	

* data from interlaboratory comparison project 2007

4) Results of analysis

Please see the attached file ; 5WetCMU Chiangmai07.xls

5) Meteorological condition (reported year 2007)

Month	1	2	3	4	5	6	7	8	9	10	11	12	
Items													
Temperature (°C)	monthly mean*	22.1	24.5	27.2	29.7	27.0	27.8	26.9	26.9	26.9	25.8	23.7	22.0
	monthly mean**	23.1	25.8	29.0	32.1	28.5	28.8	27.6	27.5	27.5	26.5	23.9	23.2
Humidity(%)	monthly mean*	61.2	50.4	45.3	52.9	74.8	74.0	75.7	76.6	76.4	74.1	71.0	68.9
	monthly mean**	57.5	46.5	41.8	49.5	74.0	66.6	67.9	69.4	69.4	68.1	65.7	60.8
Average daily max. wind speed (m/s) *													
Most appearance wind direction (bearings)*	NW	NW	NW	NW, SE	SW	NW	S	S	vary	NE	NE	NW	
Most appearance wind direction (bearings)**	NE	NE	NE	NE, SW	SW	SW	SW	SW	vary	NW	NW	NE	
Precipitation amount* (mm/month) tipping bucket	1.3	0.5	15.2	58.7	301.3	127.5	65.5	130.0	124.3	55.2	106.8	3.8	
Precipitation amount** (mm/month) tipping bucket	0.0	1.0	2.0	52.5	262.2	172.1	110.4	189.8	181.1	64.6	53.8	3.5	
Precipitation amount*** (mm/month) rain gauge	0	0	0	0	603.8	248	201.5	210.4	268.8	108.8	95.7	0	
Precipitation amount**** (mm/month) rain gauge	0	0	0	44.6	229.8	156.8	76.2	135.7	158.5	72.2	63.7	0	
Sunshine duration (hours/month)*													
Solar radiation ** (W/m ² /month)													

*Data from PCD air monitoring station at Chiangmai City Hall (Salaklang)

Please see the attached file: Chiangmaicityhall gas and met daily and monthly by PCD.xls

** Data from PCD air monitoring station at Yupparaj Wittayalai School

Please see the attached file: Chiangmai Yupparaj gas and met daily and monthly by PCD

*** Data from MaeHia Met station data (Chiangmai rain amount2007.xls)

**** Data from CMU's report → use for reference data of rain amount

Please see the attached file ; 5WetCMU Chiangmai07.xls

1.6 Sakaerat Silvicultural Research Station – Nakhon Ratchasima

3) Site

Site name	Sakaerat Silvicultural Research Station	Code	TH11054
Postal address	U-dom Sap Sub-District, Wang Nam Khiew District, Nakhon Ratchasima Province, Thailand 30150		
Site classification	remote		

4) Sampling and shipping

Sampling	sample bottle : polyethylene sample temperature : Uncontrolled		
Shipping	sample temperature : cooling (4 °C) packing procedure : cooler box shipping frequency : Weekly note*()		
Mean time from sampling to analysis	around__1-4__week(s)		
Use of biocides, kind of biocide and added quantity	Use (kind of biocide : Thymol)		
Name of sampling organization and reporter	Mrs. Paisri Wannasangthong Environmental Engineering Department , Faculty of Engineering, Khon Kaen University		

*describe any treatments which don't meet the manual such as filtration of samples

3) Measurement/analytical condition

Parameter	Measurement / analytical method	Manufacturer / Type of equipment	Detection limit (µmol/l)	Determination Limit(µmol/l)	Note
pH	Glass electrode	Mettler Toledo/ seven easy	-	-	
EC	Conductivity cell	Mettler Toledo/ seven easy	-	-	
SO ₄ ²⁻	Ion Chromatography	Dionex-ICS 1000	0.88	2.92	
NO ₃ ⁻	Ion Chromatography	Dionex-ICS 1000	0.36	1.20	
Cl ⁻	Ion Chromatography	Dionex-ICS 1000	0.37	1.22	
NH ₄ ⁺	Ion Chromatography	Dionex-DX100	0.08	0.27	
Na ⁺	Ion Chromatography	Dionex-DX100	0.21	0.71	
K ⁺	Ion Chromatography	Dionex-DX100	0.07	0.22	
Ca ²⁺	Ion Chromatography	Dionex-DX100	0.14	0.47	
Mg ²⁺	Ion Chromatography	Dionex-DX100	0.21	0.72	

* data from interlaboratory comparison project 2007

4) Results of analysis

Please see the attaché file : 6WetKKU Nakornratchasima07.xls

5) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature (°C)	monthly mean*	17	19.9	24.2	25.1	24.8	25.3	24.7	24.4	24.0	23.1	19.4	18.8
	monthly mean												
Humidity(%)	monthly mean*	90	85	87	88	95	94	92	93	96	95	88	87
	monthly mean												
Average daily max. wind speed (m/s)													
Most appearance wind direction (bearings)													
Most appearance wind direction (bearings)													
Precipitation amount* (mm/month)		0.0	12.2	77.3	46.4	310.8	130.2	66.8	129.1	197.3	354.4	60.8	0.5
Sunshine duration (hours/month)													
Solar radiation (W/m ² /month)													

*Data from Sakaerat Silvicultural Research Station

Please see the attached file: NakhonratchasimaSakaerat rain data daily.xls

Format on monitoring data for each calendar year

Date(data reporting)	June 30 th , 2008
Country name	THAILAND
Organization name	Ministry of Natural Resources and Environment/
Department	Ambient Air Quality Division / Air Quality and Noise Management Bureau/ Pollution Control Department
Name of national QA/QC manager (NAM)	Ms. Wassana Toruksa
Postal address	Pollution Control Department 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok 10400 Thailand
Contact address	Tel: (662) 298-2373 Fax: (662) 298-2392 E-mail: wassana.t@pcd.go.th

2. Dry deposition (prepare for each site)

2.1 Public Relation Department (Bangkok)

1) Site

Site name	The Government Public Relations Department (PRD)
Postal address	Rama VI Road, Soi 30, Bangkok 10400
Site classification	urban

2) Monitoring methods

(1) In case of automatic measurement

Measurement parameter	SO ₂	NO _x , NO ₂ , NO	PM10
Calculating method of each data	UV-Fluorescence	Chemiluminescence	TEOM

3) Measurement results

(1) Gases

a. Measurement results

Please see the attached file: BangkokPRD gas data daily and monthly by PCD.xls

(2) In case of manual measurement

a. Sampling

Sampling method	Filter pack
Mean time from sampling to analysis	2- 4 weeks
Sample handling during shipping	Keep in refrigerator , sample vessel: plastic bag

Measurement results

Please see the attached file: Filter Pack 2007.xls

4) Meteorological condition (reported year 2007) : PRD/ Bangkok

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	25.9	28.0	30.7	30.1	30.2	30.2	28.2	28.9	28.8	28.4	27.1	28.4
Humidity(%)	monthly mean*	63.6	70.0	73.2	77.5	78.3	78.4	79.9	77.6	79.6	77.6	65.7	64.6
Mean wind speed (m/s)*		0.6	1.3	1.7	0.9	1.1	0.8	0.8	1.0	0.7	0.7	0.6	0.6
Most appearance wind* direction (bearings)		N, NE	SW	SW	SW	SW	SW	SW	SW	SW	NE	NE	NE
Precipitation amount : at sampling site (mm/month)	** (rain gauge)	9.0	0.0	16.1	148.1	275.8	174.2	275.6	163.7	322.1	190.3	0.0	0.0
	*** (tipping bucket)	14.2	0.0	10.5	90.5	342.3	228.0	272.8	176.0	282.0	158.5	16.5	1.0
Solar radiation** (W/m ² /month)		140.7	155.8	177.2	159.4	154.0	128.9	114.1	125.2	127.8	105.8	136.3	139.8

* Data from gas and met monitoring station at PRD (PCD's air monitoring station)

Please see the attached file : BangkokPRD gas data daily and monthly by PCD.xls: for more detail

** Data from PCD's wet deposition sampling station (200m from PRD station) → use this data for reference data of rain amount

Please see the attached file: 1 Wet PCD Bangkok 07.xls

*** Data from Dindang air monitoring station (1.5 km from wet deposition station)

Please see the attached file : BangkokDindang gas and met daily and monthly by PCD.xls for more detail

(Note: The data of rain amount at PRD station in 2007 were fault; the data are not used for reference)

2.2 Thailand Meteorological Department -Bangkok

1) Site

Site name	Thailand Meteorological Department (TMD)
Postal address	4353 Sukumvit Road, Bangna, Bangkok 10260
Site classification	urban

2) Monitoring methods

(1) In case of automatic measurement

Measurement parameter	SO ₂	NO, NO ₂ , NO _x	O ₃
Calculating method of each data	UV-Fluorescence	Chemiluminescence	UV-absorption

3) Measurement results

Please see the attached file: *Samutprakarn gas and met daily and monthly by PCD.xls*

4) Meteorological condition

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	27.2	27.7	30.5	30.7	29.6	31.2	29.4	29.8	29.9	29.2	27.8	29.0
Humidity (%)	monthly mean*	67.3	78.9	79.5	78.0	80.7	73.3	75.8	72.8	74.0	71.1	59.3	63.0
Mean wind speed (m/s)*		1.5	2.1	2.4	1.6	1.5	1.4	1.6	1.9	1.5	1.7	1.9	1.7
Mean wind speed (knots)**		1.7	2.5	3.7	2.4	1.8	1.9	1.6	2.5	1.8	1.6	1.9	1.6
Most appearance wind direction (bearings)*		NE	SW	SW	SW	SW	SW	SW	W	S	NE	NE	NE
Precipitation amount* (mm/month) tipping bucket		1.2	0.2	36.2	161.6	192.9	333.7	306.5	132.9	173.4	178.5	36.5	0.0
Precipitation amount** (mm/month) rain gauge		1.8	0.0	34.3	164.8	257.4	358.9	334.7	142.0	245.8	302.3	35.0	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

*Data from Gas and Met monitoring station at TMD (by PCD's air monitoring station)

Please see the attached file : *Samutprakarn gas and met daily and monthly by PCD.xls* for more details.

** Data from TMD (TMD's data) → use this data for reference data of rain amount

Please see the attached file: *Samutprakarn monthly Metdata by TMD (from 3hrdata).xls*

2.3 ERTC - Patumthani

1) Site

Site name	Environmental Research and Training Center (ERTC)	Code	TH11044
Postal address	Technopolis, Klong 5, Klong Luang, Pathumthani 12120		
Site classification	rural		

2) Monitoring methods

(2) In case of manual measurement

a. Sampling

Sampling method	Filter pack
Mean time from sampling to analysis	Around 4 weeks
Sample handling during shipping	Keep in Refrigerator, sample vessel: plastic bag

3) Measurement results

(1) Gases

a. Measurement results

In case of manual sampling and chemical analysis by filter packs,, the data should be reported in the Form (Dry B and C).

Please see the attached file: *Filter Pack 2007.xls*

4) Meteorological condition (reported year 2007) ERTC

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean *	27.0	27.9	30.4	30.1	29.2	30.0	29.0	29.2	29.1	28.2	26.5	28.1
Humidity (%)*	monthly mean *	66	70	71	75	80	78	77	77	79	78	68	67
Mean wind speed* (knots)		2.5	2.9	3.5	3.2	3.5	3.5	4	4.5	3.8	3	3	2.3
Most appearance wind * direction (bearings)		N	S	S	S	SW	S	SW	SW	SW	NE	NE	N
Precipitation amount (mm/month)*		0.4	0	0.1	211.2	252.5	168.1	143.6	105.9	302.1	118.7	6	0
Precipitation amount (mm/month)**		3.0	0.0	1.2	216.7	236.4	154.7	182.9	114.03	353.11	104.32	11.1	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

* Data from Pathumthani Agro Meteorological Station (TMD's meteorological station)

Please see the attached file: Pathumtani monthly Metdata by TMD (from 3hrdata).xls

** Data of recorded at sampling site by ERTC's staff

Please see the attached file: 3Wet ERTC Pathumtani2007.xls

2.4 Vachiralongkorn Dam- Khanchanaburi

1) Site

Site name	Vachiralongkorn Dam (Khao Lam Dam) , Kanchanaburi
Postal address	Tha Khanun Sub-district, Thongpaphum District, Kanchanaburi Province 71180
Site classification	remote

2) Monitoring methods

① In case of automatic measurement

Measurement parameter	SO ₂	NO, NO ₂ , NO _x	O ₃	PM-10
Calculating method of each data	UV-Fluorescence	Chemiluminescence	UV-absorption	Beta ray Gauge

② In case of manual measurement

a. Sampling

Sampling method	Filter pack
Mean time from sampling to analysis	around 4 weeks
Sample handling during shipping	Keep in Refrigerator , sample vessel: plastic bag

3) Measurement results

Please see the attached file: Filter Pack 2007.xls

Please see the attached file: VLKgas and met periodic data 2007 by PCD mobile unit.xls

4) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	25.0	26.7	28.9	29.8	27.1	28.5	26.7	26.9	26.8	26.3	24.5	25.1
Humidity (%)	monthly mean*	69.1	60.8	58.3	69.5	86.8	81.3	85.8	86.3	87.0	85.1	78.6	74.4
Max. wind speed * (knots)		0.4	0.5	0.9	0.6	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.4
Most appearance wind direction (bearings)*		SE	NW	NW	NW	Vary	NW	NW	NW	Calm	SE	SE	SE
Precipitation amount* (mm/month)		0	0.4	54.8	116.3	292.1	236.4	333.9	366.4	227.9	225.5	0.8	0
Precipitation amount** (mm/month)		0.0	0.0	44.4	48.9	256.9	229.4	326.9	344.7	230.6	222.4	0.0	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

* Data from Thongpaphum Meteorological station (TMD's station) the nearest met station

Please see attached file : Khanchanaburi monthly Metdata by TMD (from 3hrdata).xls

** Data from Vachiralongkorn Dam recorded by EGAT's staff (more close to the wet deposition sampling site) → ref data

Please see attached file : Khanchanaburi rain amount at VLK2007 by EGAT.xls

2.5 Chiang Mai University – ChiangMai

1) Site

Site name	Mae-Hia Campus, Chiang Mai University
Postal address	Chiang Mai University, Huay Kaew Rd., Amphur Muang, Chiang Mai, 50200
Site classification	rural

2) Monitoring methods

(1) In case of automatic measurement

Measurement parameter	SO2	NO, NO ₂ , NO _x	O3	PM10
Calculating method of each data	UV fluorescence	chemilumenscense	UV absorption	Beta ray gauge

② In case of manual measurement

a. Sampling

Sampling method	Filter Pack
-----------------	-------------

Mean time from sampling to analysis	around 4 week (s)
Sample handling during shipping	Keep in Refrigerator , sample vessel: plastic bag

3) Measurement results

Please see the attached file: Filter Pack 2007.xls

Please see the attached file: Chiangmaicityhall gas and met daily and monthly by PCD.xls

5) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature (°C)	monthly mean*	22.1	24.5	27.2	29.7	27.0	27.8	26.9	26.9	26.9	25.8	23.7	22.0
	monthly mean**	23.1	25.8	29.0	32.1	28.5	28.8	27.6	27.5	27.5	26.5	23.9	23.2
Humidity(%)	monthly mean*	61.2	50.4	45.3	52.9	74.8	74.0	75.7	76.6	76.4	74.1	71.0	68.9
	monthly mean**	57.5	46.5	41.8	49.5	74.0	66.6	67.9	69.4	69.4	68.1	65.7	60.8
Average daily max. wind speed (m/s) *													
Most appearance wind direction (bearings)*		NW	NW	NW	NW, SE	SW	NW	S	S	vary	NE	NE	NW
Most appearance wind direction (bearings)**		NE	NE	NE	NE, SW	SW	SW	SW	SW	vary	NW	NW	NE
Precipitation amount* (mm/month) tipping bucket		1.3	0.5	15.2	58.7	301.3	127.5	65.5	130.0	124.3	55.2	106.8	3.8
Precipitation amount** (mm/month) tipping bucket		0.0	1.0	2.0	52.5	262.2	172.1	110.4	189.8	181.1	64.6	53.8	3.5
Precipitation amount*** (mm/month) rain gauge		0	0	0	0	603.8	248	201.5	210.4	268.8	108.8	95.7	0
Precipitation amount**** (mm/month) rain gauge		0	0	0	44.6	229.8	156.8	76.2	135.7	158.5	72.2	63.7	0
Sunshine duration (hours/month)*													
Solar radiation ** (W/m ² /month)													

*Data from PCD air monitoring station at Chiangmai City Hall (Salaklang)

Please see the attached file: Chiangmaicityhall gas and met daily and monthly by PCD.xls

** Data from PCD air monitoring station at Yupparaj Wittayalai School

Please see the attached file: Chiangmai Yupparaj gas and met daily and monthly by PCD

*** Data from MaeHia Met station data (Chiangmai rain amount2007.xls)

**** Data from CMU's report → use for reference data of rain amount

Please see the attached file ; 5WetCMU Chiangmai07.xls

2.6 Sakaerat Silvicultural Research Station – Nakhon Ratchasima

1) Site

Site name	Sakaerat Silvicultural Research Station
Postal address	U-dom Sap Sub-District, Wang Nam Khiew District, Nakhon Ratchasima Province, Thailand 30150
Site classification	remote

2) Monitoring methods

(1) In case of automatic measurement

Measurement parameter				
Calculating method of each data				

② In case of manual measurement

a. Sampling

Sampling method	Filter Pack
Mean time from sampling to analysis	around 4 week (s)
Sample handling during shipping	Keep in Refrigerator , sample vessel: plastic bag

3) Measurement results

Please see the attached file: Filter Pack 2007.xls

5) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature (°C)	monthly mean*	17	19.9	24.2	25.1	24.8	25.3	24.7	24.4	24.0	23.1	19.4	18.8
	monthly mean												
Humidity(%)	monthly mean*	90	85	87	88	95	94	92	93	96	95	88	87
	monthly mean												
Average daily max. wind speed (m/s)													
Most appearance wind direction (bearings)													
Most appearance wind direction (bearings)													
Precipitation amount* (mm/month)		0.0	12.2	77.3	46.4	310.8	130.2	66.8	129.1	197.3	354.4	60.8	0.5
Sunshine duration (hours/month)													
Solar radiation (W/m ² /month)													

*Data from Sakaerat Silvicultural Research Station

Please see the attached file: NakhonratchasimaSakaerat rain data daily.xls

4. Inland Aquatic Environments (prepare for every survey)

4.1 Ban Pong Chang

1) Site

Site type	Reservoir/ remote area
Site name	Ban Pong Chang (BPC)
Location	Vachiralongkorn Dam (Khao Lam Dam), Khanchanaburi Province

2) Sampling method

Water sampling method and sampling device	method: Grab sampling device/manufacture: Water Sampler model: Kemmeur
On site filtration	1. do (material of filter: cellulose acetate 0.45 micron)
Temperature at the shipping	cooling(4°C)
Mean time from sampling to analysis	3 day(s)
Name of sampling organization and reporter	Inland Water Division, Water Quality Management Bureau, Pollution Control Department

3) Results of analysis(surface water at the center of aquatic system)

Describe in analytical results(Inland aquatic environment) : Inland_VLK2007

Natural condition with exceptionally good water quality for remote site and use as a compared natural condition in Kanchanaburi with those in other provinces.

The sulfate concentration was between 1.0 - 1.5 mg/l (averaging 1.2 mg/l).

The cation (Ca²⁺) concentration was between 15.0 - 18.5 mg/l (averaging 16.5 mg/l)

In general, the water quality in the Bang Pong Chang was good.

5) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	25.0	26.7	28.9	29.8	27.1	28.5	26.7	26.9	26.8	26.3	24.5	25.1
Humidity (%)	monthly mean*	69.1	60.8	58.3	69.5	86.8	81.3	85.8	86.3	87.0	85.1	78.6	74.4
Max. wind speed * (knots)		0.4	0.5	0.9	0.6	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.4
Most appearance wind direction (bearings)*		SE	NW	NW	NW	Vary	NW	NW	NW	Calm	SE	SE	SE
Precipitation amount* (mm/month)		0	0.4	54.8	116.3	292.1	236.4	333.9	366.4	227.9	225.5	0.8	0
Precipitation amount** (mm/month)		0.0	0.0	44.4	48.9	256.9	229.4	326.9	344.7	230.6	222.4	0.0	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

* Data from Thongpaphum Meteorological station (TMD's station) the nearest met station

Please see attached file : Khanchanaburi monthly Metdata by TMD (from 3hrdata).xls

** Data from Vachiralongkorn Dam recorded by EGAT's staff (more close to the wet deposition sampling site) → ref data

Please see attached file : Khanchanaburi rain amount at VLK2007 by EGAT.xls

4.2 Ban Pa Pueng

1) Site

Site type	reservoir / remote area
Site name	Ban Pa Pueng (BPP)
Location	Vachiralongkorn Dam (Khao Lam Dam), Khanchanaburi Province

2) Sampling method

Water sampling method and sampling device	method: Grab sampling device/manufacture: Water Sampler model: Kemmeur
On site filtration	1.do(material of filter: cellulose acetate)
Temperature at the shipping	Cooling (4°C)
Mean time from sampling to analysis	3 day (s)
Name of sampling organization and reporter	Inland Water division, Water Quality Management Bureau, Pollution Control Department

3) Results of analysis(surface water at the center of aquatic system)

Describe in analytical results(Inland aquatic environment) : Inland_VLK2007.xls

Natural condition with exceptionally good water quality for remote site and use as a compared natural condition in Kanchanaburi with those in other provinces.

The sulfate concentration was between 1.0 - 1.4 mg/l (averaging 1.2 mg/l).

The cation (Ca²⁺) concentration was between 15.7 - 19.2 mg/l (averaging 16.8 mg/l)

In general, the water quality in the Bang Pong Chang was good.

5) Meteorological condition (reported year 2007)

Month		1	2	3	4	5	6	7	8	9	10	11	12
Items													
Temperature(°C)	monthly mean*	25.0	26.7	28.9	29.8	27.1	28.5	26.7	26.9	26.8	26.3	24.5	25.1
Humidity (%)	monthly mean*	69.1	60.8	58.3	69.5	86.8	81.3	85.8	86.3	87.0	85.1	78.6	74.4
Max. wind speed * (knots)		0.4	0.5	0.9	0.6	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.4
Most appearance wind direction (bearings)*		SE	NW	NW	NW	Vary	NW	NW	NW	Calm	SE	SE	SE
Precipitation amount* (mm/month)		0	0.4	54.8	116.3	292.1	236.4	333.9	366.4	227.9	225.5	0.8	0
Precipitation amount** (mm/month)		0.0	0.0	44.4	48.9	256.9	229.4	326.9	344.7	230.6	222.4	0.0	0.0
Sunshine duration (hours/month)													
Solar radiation (MJ/m ² /month)													

* Data from Thongpaphum Meteorological station (TMD's station) the nearest met station

Please see attached file : Khanchanaburi monthly Metdata by TMD (from 3hrdata).xls

** Data from Vachiralongkorn Dam recorded by EGAT's staff (more close to the wet deposition sampling site) → ref data

Please see attached file : Khanchanaburi rain amount at VLK2007 by EGAT.xls

Format on information on the National Center and contact person(s)

Date(data reporting)	2 May 2008
Country name	Vietnam
Organization name	Ministry of Natural Resources and Environment (MoNRE)
Department	National Institute of Meteorology, Hydrology and Environment (NIMHE)
Name of contact person	Dr. Duong Hong Son
Name of national QA/QC manager (NAM)	Mr. Tran Son
Postal address	5/62 Nguyen Chi Thanh, Dong Da, Ha Noi - Vietnam
Contact address	Tel: 84 4. 7733159 Fax: 84 4 83 55 993 E-mail: dhson@vkttv.edu.vn

Format on national monitoring plan

Date (that the plan was decided)	2 May 2008
Country name	Vietnam
Organization name (responsible agency)	Ministry of Natural Resources and Environment (MoNRE)
Department	National Institute of Meteorology, Hydrology and Environment (NIMHE)
Name of the person in charge	Dr. Duong Hong Son
Postal address	5/62 Nguyen Chi Thanh, Dong Da, Ha Noi - Vietnam
Contact address	Tel: 84 4. 7733159 Fax: 84 4 83 55 993 E-mail: dhson@vkttv.edu.vn

1. Outline of the national monitoring plan

1) Number of monitoring sites and the arrangement (illustrations of monitoring sites arrangement should be attached in each cases.).

2 sites (number of sites)

Items	formal-phase network sites (a plan)	prospective future plan (year:)
Wet deposition	2	
Dry deposition	2	
Soil & vegetation	1	
Inland aquatic environment	1	

2) Measurement parameters and monitoring interval

Items	Measurement parameters	Monitoring interval
Wet deposition	1.pH, 2.EC, 3.NH₄⁺, 4.Na⁺, 5.K⁺, 6.Ca²⁺, 7.Mg²⁺, 8.SO₄²⁻, 9.NO₃⁻, 10.Cl⁻, 11.others (F⁻)	1.daily, 2.others()
Dry deposition	1.SO₂, 2.NO₂, 3.NO, 4.O₃, 5.other gases (HNO₃, NH₃, HCl), 6.Particulate Matter(PM), 7.Components in PM Aerosol: Ca²⁺, Mg²⁺, SO₄²⁻, NO₃⁻, Cl⁻, NH₄⁺, Na⁺, K⁺	1.hourly, 2.others() (weekly)
Soil	1.pH(H ₂ O), 2.pH(KCl), 3.CEC, exchangeable (4.Na ⁺ , 5.K ⁺ , 6.Ca ²⁺ , 7.Mg ²⁺ , 8.Al ³⁺), 9.SO ₄ ²⁻ , 10.available phosphate, 11.others()	monitoring period
Vegetation	1.abnormalities of leaves and branches, 2.complete enumeration of trees, 3.decline of trees, chemical contents of fresh leaves(4.S, 5.K, 6.Ca, 7.Mg, 8.others()), 9.others()	1 time/year:
Inland aquatic environment	1.pH, 2.EC, 3.alkalinity, 4.NH₄⁺, 5.Na⁺, 6.K⁺, 7.Ca²⁺, 8.Mg²⁺, 9.SO₄²⁻, 10.NO₃⁻, 11.Cl⁻, 12. Water Temp. 13.others()	1.regularly (4 times/year) 2.irregular (month: year:)

NOTES:

- The bold values are in active during the year 2007
- For soil and vegetation: No data in the year 2007

3) Participating laboratories for each monitoring activities

<Wet deposition / Dry deposition >

Organization name	Ministry of Natural Resources and Environment (MoNRE)
Department / Section	National Institute of Meteorology, Hydrology and Environment (NIMHE)
Name of a person in charge in the laboratory (PCL)	Mr. Tran Son
Postal address	5/62 Nguyen Chi Thanh, Dong Da, Ha Noi - Vietnam
Contact address	Tel: 84 4 7733090/509 Fax: 84 4 83 55 993 E-mail: transon@vkttv.edu.vn
Note	

<Soil and Vegetation >

Organization name	Ministry of Natural Resources and Environment (MoNRE)
Department / Section	National Institute of Meteorology, Hydrology and Environment (NIMHE)
Name of a person in charge in the laboratory (PCL)	Mr. Tran Son
Postal address	5/62 Nguyen Chi Thanh, Dong Da, Ha Noi - Vietnam
Contact address	Tel: 84 4 7733090/509 Fax: 84 4 83 55 993 E-mail: transon@vkttv.edu.vn
Note	

<Inland Aquatic Environment >

Organization name	Ministry of Natural Resources and Environment (MoNRE)
Department / Section	National Institute of Meteorology, Hydrology and Environment (NIMHE)
Name of a person in charge in the laboratory (PCL)	Mr. Tran Son
Postal address	5/62 Nguyen Chi Thanh, Dong Da, Ha Noi - Vietnam
Contact address	Tel: 84 4 7733090/509 Fax: 84 4 83 55 993 E-mail: transon@vkttv.edu.vn
Note	

Format on information on respective monitoring sites

In this report including all the information of Hoa Binh and Ha Noi sites (for dry and wet deposition monitoring sites), as well as the site for inland aquatic environment.

The cover arm of the wet only sampler in Hoa Binh site was broken in end of 2007.

In Ha Noi station, there were:

- A New building, about 300 m from to Ha Noi station in SE direction, has been construction since January 2006.
- A New building, about 250 m from to Ha Noi station in NE direction, has been construction since February 2007.

Outline of monitoring site A (Hanoi)

On site scale(within 150m:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of trees, poles and buildings, and the heights of those.	Building(10m heights) Residence house (3-4m heights)		Building with 7 m heights	Building with 10 m heights
Existence of incinerators,domestic heating, parking lots, storage of fuel and agricultural products, dairy farm, and many livestocks.	Domestic heating	Domestic heating		
Slope degree of the site.	0° - 1°	0° - 1°	0° - 1°	0° - 1°
Surface condition of the site.	Grass and small tree	Grass and small tree	Grass and small tree	Grass and small tree and surface water
Existence of a forest, river, lake, marsh, farm or fields.				
Existence of roads, and their traffic densities*.				Road with 1000 vehicles/day

*:Describe roads with more than 100 vehicles/day for remote sites, and roads with more than 1,000 vehicles/day for urban and rural sites.

Outline of monitoring site B (Hanoi)

Local scale(150m - 10km:a sketch map should be attached)

(For an urban site, at least information of area within 150m - 1km from the site is expected)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Information on trunk roads, expressways, and their traffic densities (with more than 5,000 vehicles/day).	1 road	3 roads	1 road	1 road
Information on airports and railways.				
Information on major emission sources such as large industries, and power plants and their fuel consumptions and so on.		A new building is built from January 2006 (^) A new building is built from February 2007(**)		
Information on houses/ settlements with more than 5,000 persons, and their population.	Hanoi City	Hanoi City	Hanoi City	Hanoi City
Descriptive information around the site such as topography and meteorological condition				

(^): this building is built from January 2006. it is far from to Lang station about 300 m

(**): this building is built from February 2007. it is far from to Lang station about 250 m

Outline of monitoring site A (Hoa Binh)

On site scale(within 150m:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of trees, poles and buildings, and the heights of those.	Building(10m heights) Residence house (3-4m heights)		Building with 7 m heights Building with 10m heights**	Building with 10 m heights
Existence of incinerators,domestic heating, parking lots, storage of fuel and agricultural products, dairy farm, and many livestock.	Domestic heating	Domestic heating		
Slope degree of the site.	0° - 1°	0° - 1°	0° -1°	0° -1°
Surface condition of the site.	Grass and small tree and surface water	Grass and small tree and surface water	Grass and small tree and surface water	Grass and small tree and surface water
Existence of a forest, river, lake, marsh, farm or fields.	Pond			
Existence of roads, and their traffic densities*.				Road with 100 vehicles/day

*:Describe roads with more than 100 vehicles/day for remote sites, and roads with more than 1,000 vehicles/day for urban and rural sites.

Outline of monitoring site B (Hoa Binh)

Local scale(150m - 10km:a sketch map should be attached)

(For an urban site, at least information of area within 150m - 1km from the site is expected)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Information on trunk roads, expressways, and their traffic densities (with more than 5,000 vehicles/day).	Road No.6 (1000 vehicles /day)	Road No.6 (1000 vehicles /day)	Road No.6 (1000 vehicles /day)	
Information on airports and railways.		Ship route	Ship route	
Information on major emission sources such as large industries, and power plants and their fuel consumptions and so on.	Rice paddies Cement factory	Rice paddies	Rice paddies Sugar factory	
Information on houses/ settlements with more than 5,000 persons, and their population.		Hoa Binh Town (about 10,000 persons)	Hoa Binh Town (about 10,000 persons)	
Descriptive information around the site such as topography and meteorological condition				

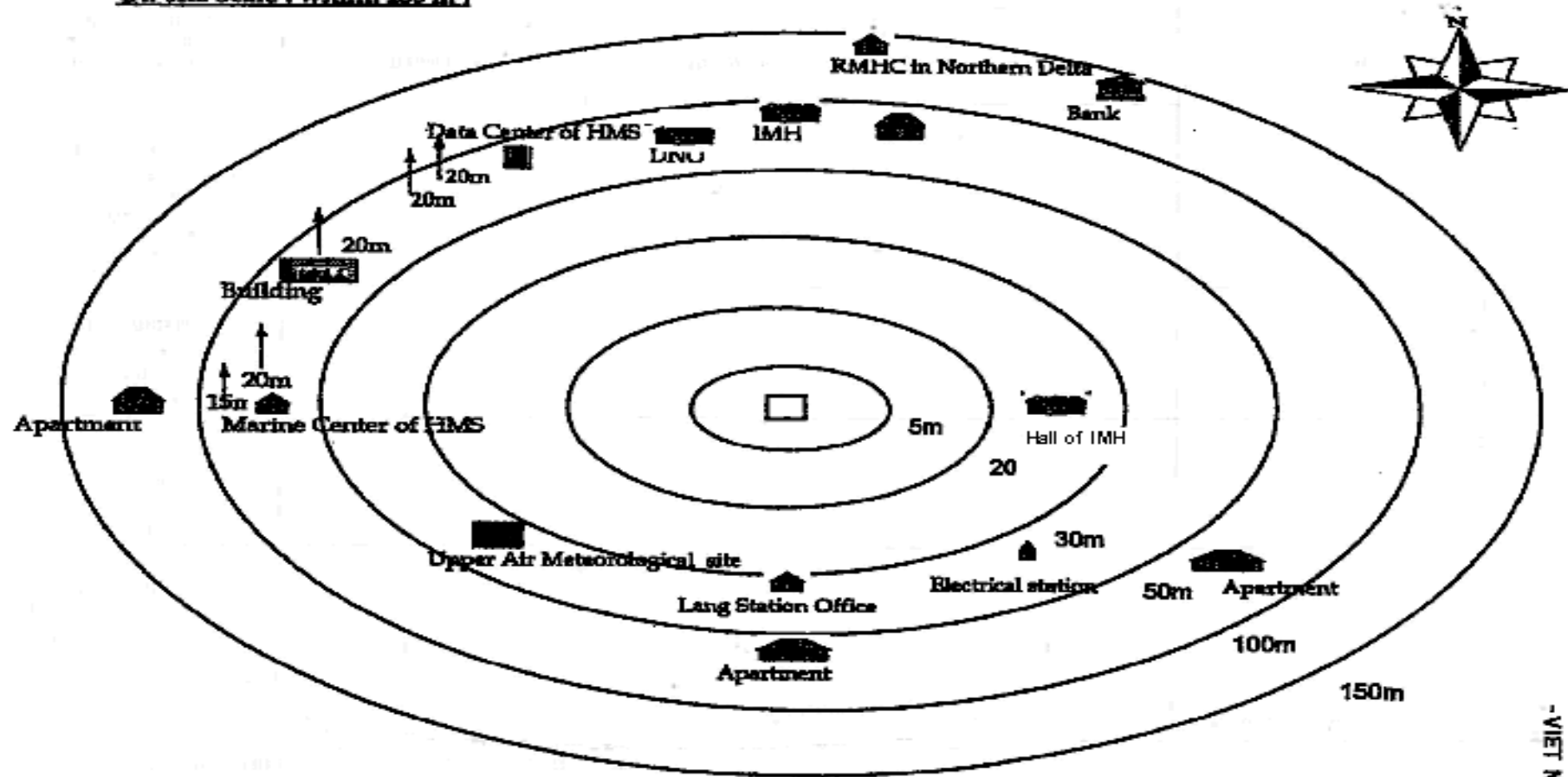
Outline of monitoring site C for remote sites*

Regional scale(10km - 50km:a sketch map should be attached)

Items	north direction(NW-NE)	east direction(NE-SE)	south direction(SE-SW)	west direction(SW-NW)
Existence of main stationary air pollution sources*	Viet Tri Industrial area	Ha Noi (Thuong Dinh Industrial)		
Existence of trunk roads with more than <u>10,000 vehicles/day</u> , and their traffic densities.		Road No.1		
Existence of cities with the population more than <u>10,000 persons</u> .	Viet Tri Cities	Ha Noi		

*: For rural site, description should be made on huge emission sources larger than 10,000tons/y and other major pollution sources.

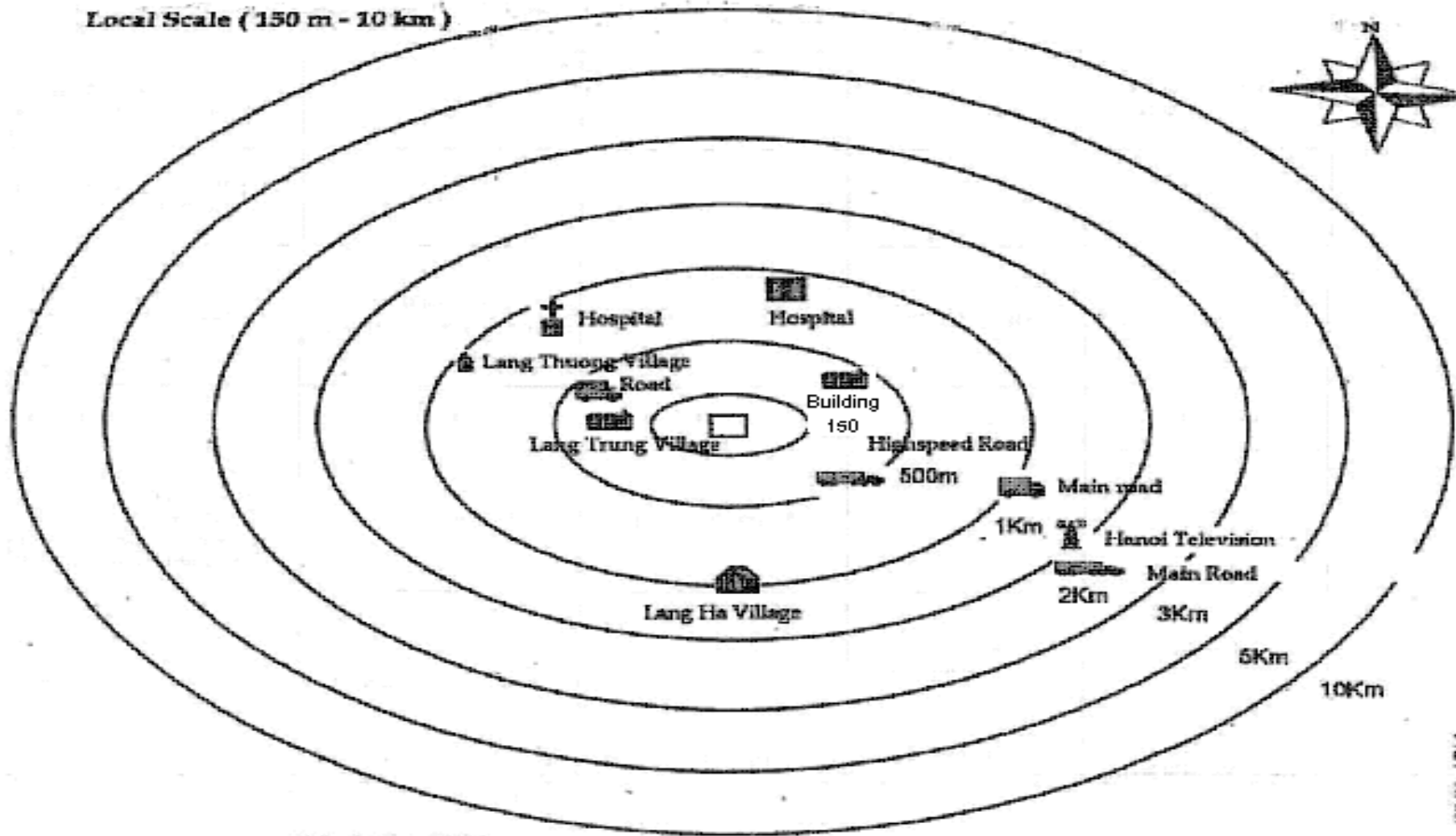
On-site Scale (within 150 m)



Site Name: HANOI STATION

-VIET NAM-

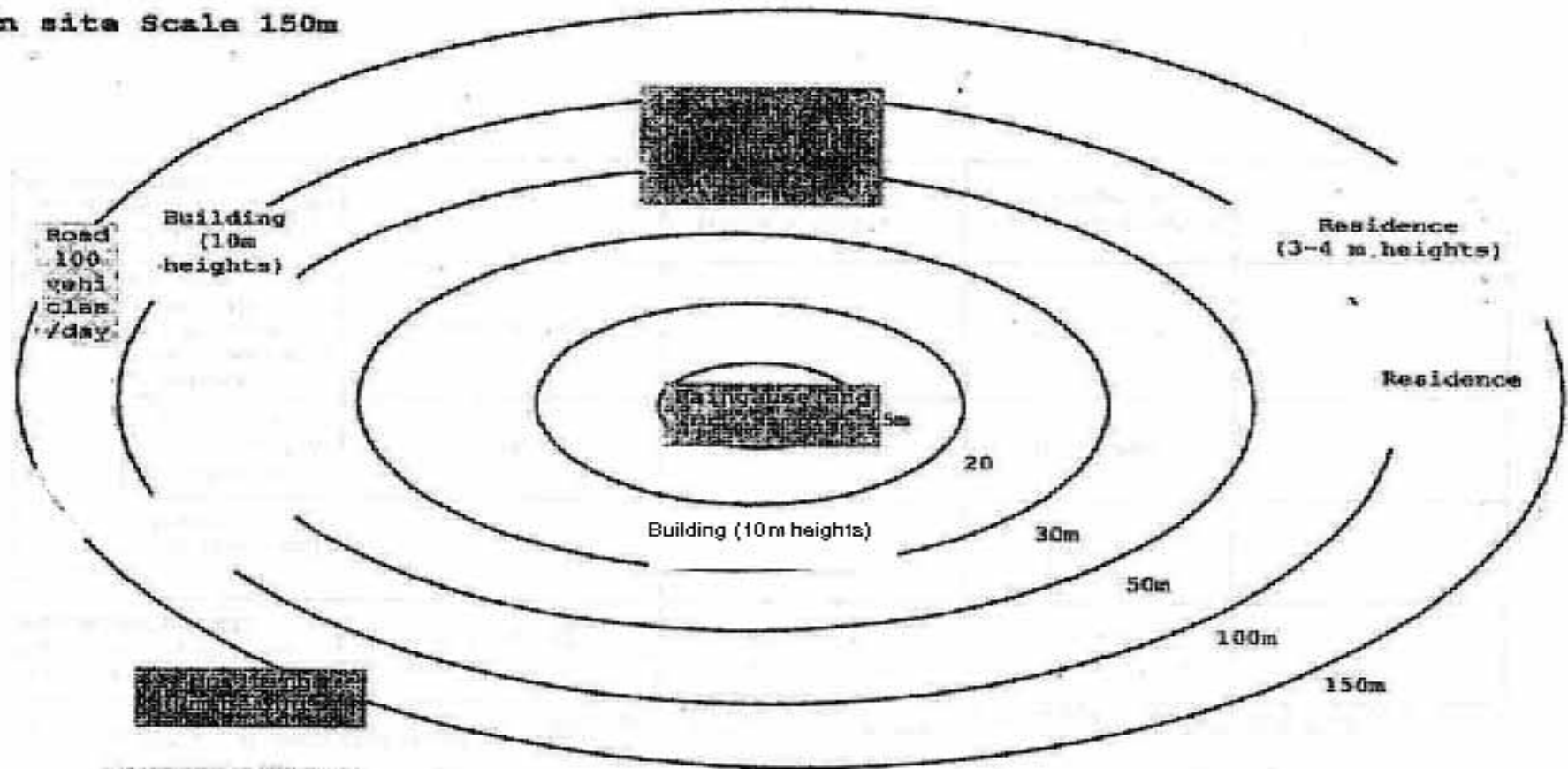
Local Scale (150 m - 10 km)



Site Name: **HANOI STATION**

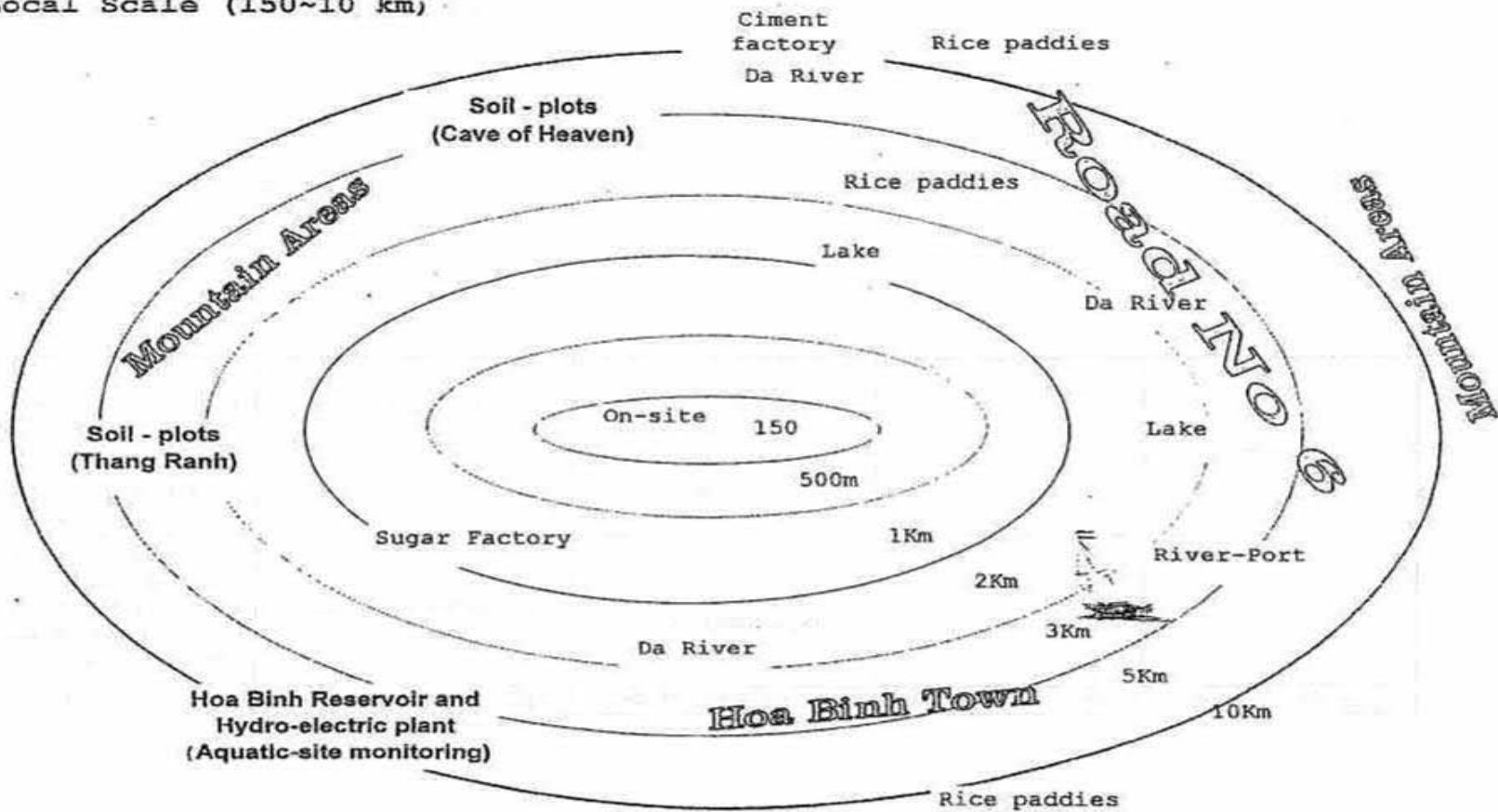
- VIET NAM -

On site Scale 150m



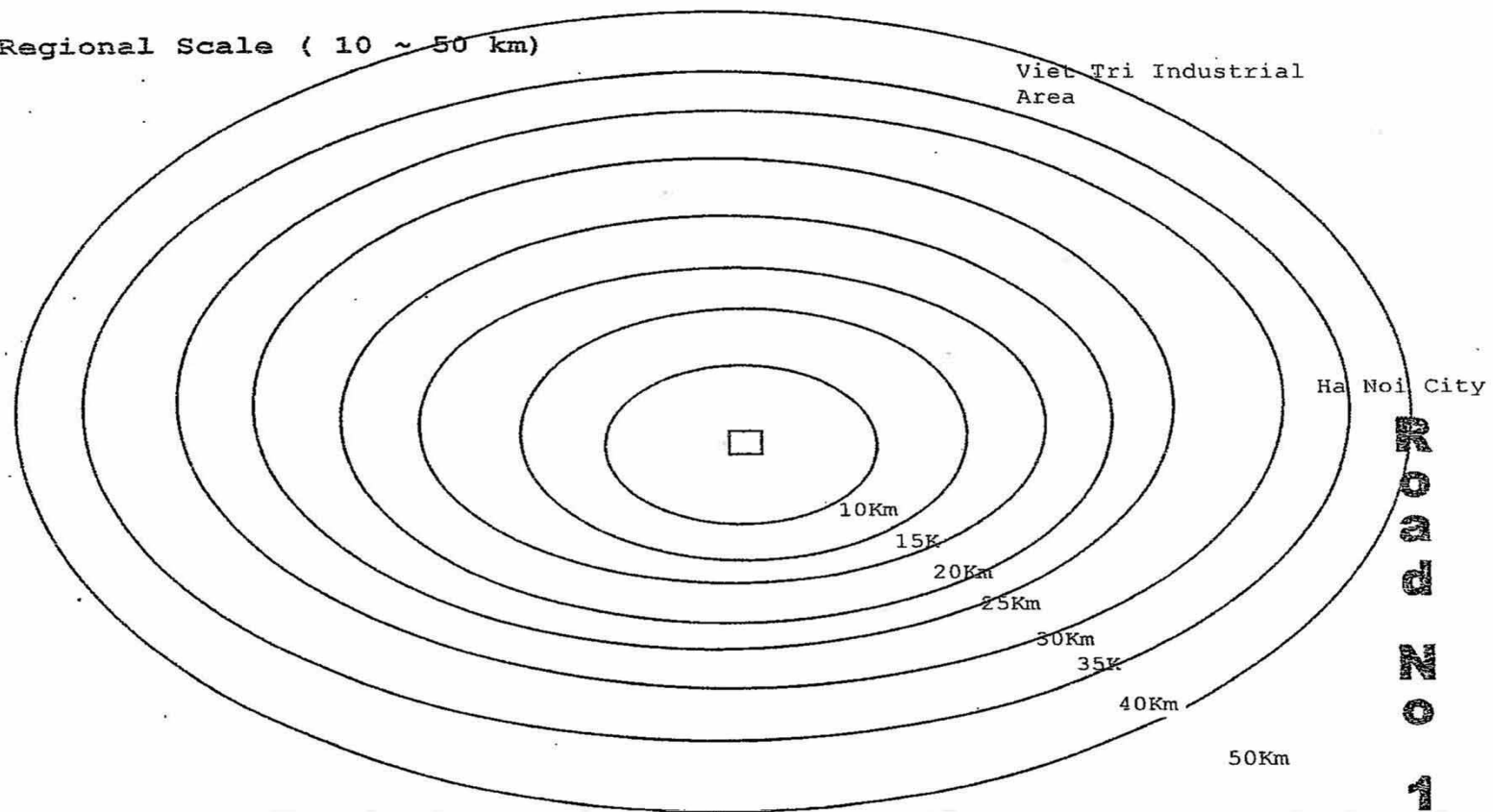
Site name: Hoa Binh

Local Scale (150~10 km)



Site Name: Hoa Binh

Regional Scale (10 ~ 50 km)



Site Name: Hoa Binh