

The Second Session
of the Scientific Advisory Committee
on the Acid Deposition Monitoring Network
in East Asia
25-27 November 2002, Bangkok, Thailand

**Strategy Paper for
Future Direction of Soil and Vegetation Monitoring of EANET
(Revised Draft)**

1. Introduction

- The East Asian Region, as a result of rapid industrialization, faces increasing risks of problems related to excess deposition of acidic substances. The adverse effects of acid deposition in East Asia may become a critical problem in the near future. With this background, based on the discussions at the expert meetings from 1993, Acid Deposition Monitoring Network in East Asia (EANET) carried out its preparatory-phase activities from 1998 to 2000, and started its regular-phase activities from January 2001.
- Objectives of EANET for regular-phase activities were decided as follows:
 - To create a common understanding of the state of the acid deposition problems in East Asia
 - To provide useful inputs for decision-making at local, national and regional levels aimed at preventing or reducing adverse impacts on the environment caused by acid deposition
 - To contribute to cooperation on the issues related to acid deposition among the participating countries
- Based on the objectives, not only deposition monitoring, but also ecological impact monitoring such as monitoring on soil, vegetation and inland aquatic environment has been promoted in EANET. Soil and vegetation monitoring has been carried out to understand effect of acid deposition especially on soil and vegetation of forests.
- Acid deposition due to acid precipitation and acidic gases may cause soil acidification, nutrient imbalance, and/or direct damage to plant body, and may become a cause of forest decline. Since the forest/tree declining process is relatively slow and complicated, it is important to monitor soil and vegetation for a long-term evaluation for description of the acidification and declining processes. However, experience in this field was limited in the EANET participating countries, and methodologies should also be elaborated to become suitable for the East Asian Region.
- The workshop on ecological impact monitoring of acid deposition in East Asia (the 2nd Training Workshop on EANET) was held in Beijing from 31 August to 3 September in 1999. Technical issues on soil and vegetation monitoring were discussed among experts from all the EANET participating countries and international organizations. The workshop clarified objectives of soil and vegetation monitoring in EANET and provided guidance on the technical issues in the East Asian Region.
- The present technical manual entitled “Technical Manual for Soil and Vegetation in East Asia” was drafted based on the discussion at the Beijing workshop, and adopted in the 2nd Interim Scientific Advisory Group (ISAG) Meeting in Jakarta, in March 2000. The current objectives on soil and vegetation monitoring were clarified into two: ultimate objective and initial objectives, in the technical manual.

1.1. Ultimate objective of soil and vegetation monitoring on EANET

- The ultimate objective of the soil and vegetation monitoring that is described in the technical manual is **“to assess the impacts of acid deposition on terrestrial ecosystems in a comprehensive and systematic manner through establishment and maintenance of good quality database”**. To achieve this ultimate objective, step-wise approach should be adopted. The initial objectives of the soil and vegetation monitoring could be **“establishment of baseline data, and also early detection of possible impacts of acid deposition, particularly on plants and forest ecosystems”**.
- In the technical manual, according to the concept of step-wise approach, surveys were classified into basic survey for the initial objectives and terrestrial ecosystem analysis for the ultimate objectives.

1.2. Development of the strategy paper for the step-wise approach

- To implement the ultimate objective, more detailed strategy should be developed. Needs for development of the future strategy and establishment of experts network were also recommended in the workshop in Beijing. Based on the discussion, establishment of Task Force of Soil and Vegetation Monitoring and Network of Soil and Vegetation Monitoring Specialists were decided at the 4th WG Meeting. As one of the main tasks of the Task Force, development of the strategy paper of soil and vegetation was decided.
- Preliminary draft outline of the strategy paper was developed based on the previous discussion and experience in the East Asian Region, and circulated among the Task Force members in July 2001. For the preliminary draft outline, the following comments were suggested by the Task Force members:
 - Accumulation of information on bio-indicator in soil and plant
 - Effect on fauna, not only on flora
 - Use of remote sensing technology
 - Grand vision on accumulation of data in East Asia
 - Development of simulation models including evaluation of direct effect on plants
 - Clarification of steps for each objective

Taking account of the above comments, draft outline was revised and has been circulated with the preliminary draft in July 2002. The preliminary draft strategy paper was drafted for further discussion at the Task Force. A part of items, which was suggested by Task Force members, could not be enough reflected on this paper because of limited information and experience in East Asia. These items (e.g. Effect on fauna) would be discussed in the next revision of the strategy paper probably a few years later.

- For the draft outline, no comment was suggested, and for the preliminary draft strategy paper, some editorial clarifications and the following comments were suggested:
 - Addition of theoretical description on acid deposition impact in the introduction
 - Addition of “temporal” evaluation in the ultimate objective
 - Importance of fauna and soil organisms as a component of terrestrial ecosystem
 - Description of selection criteria for reference areas; area to be secure from any land development activities

- Idea of newsletter by Network Center for exchange of information on acid deposition
- Importance of epiphytic plant such as mosses and lichens as indicators of acid deposition

Based on the above comments, the draft strategy paper was developed and has been circulated in the Task Force Members.

- A few points were suggested for the draft strategy as follows:
 - Importance of collection of information on fauna
 - Importance of Sub-manual on forest monitoring
 - Clarification of modeling on soil acidification

The draft strategy paper was slightly modified based on the suggestions above, and the revised draft *is expected to be* endorsed at the Second Session of Scientific Advisory Committee (SAC2) as the final draft.

- In the (revised draft) strategy paper, objectives are described in more detail, and issues to be implemented are clarified to achieve these objectives. A work plan for the coming five years is described as a part of strategy.
- This (revised draft) strategy paper will be reviewed and revised with experiences of the participating countries in EANET.

2. Objectives of soil and vegetation monitoring of EANET

2.1. Initial objectives of soil and vegetation monitoring

- The initial objectives, “establishment of baseline data” and “early detection of possible impacts” are as follows.
- **Establishment of baseline data is to describe the present status on soil and vegetation** by basic survey, which is described in chapter 2 of the Technical Manual. As baseline data, the following data should be accumulated:
 - Chemical properties of soil
 - Growth of trees (by description of trees)
 - Species composition of understory vegetation

Basic survey should consider climatic zones in the participating countries.

- **Early detection of possible impacts requires establishing the methodologies for detecting decline symptoms on plants in early stage.** To avoid heavy damage on terrestrial ecosystem and recover the problem, the symptoms should be detected in early stage. In the East Asian Region, information on forest decline, plant sensitivities, and their implication of air pollution have not been sufficiently accumulated. Accumulating information on the plant sensitivity and dose-response implication on plant activity, guideline/manual for the early detection should be established.

2.2. The ultimate objectives of soil and vegetation monitoring

- The ultimate objective, “To assess impact of acid deposition on terrestrial ecosystem with comprehensive and systematic manner through maintenance of good quality database”, will be clarified as follows:
- **The ultimate objective of soil and vegetation monitoring is achieved by evaluating spatially and temporally impacts of acid deposition on terrestrial ecosystem in the East Asian Region** with understanding the ecosystem mechanism related to acid deposition. For quantitative evaluation of acid deposition impacts, as the first step, present status of ecosystem should be described by input-output budget analysis and ecosystem modeling in the respective monitoring sites (e.g. catchment areas). Taking account of the above budget analysis and also the present status of soil and vegetation by basic survey, spatial and temporal evaluation should be promoted by appropriate methods for up scaling of monitoring data.

3. Present status of soil and vegetation monitoring

3.1. The technical manual of soil and vegetation monitoring.

- “Technical Manual for Soil and Vegetation in East Asia” focuses mainly on forest areas as monitoring sites, and vegetation currently means trees and understory vegetation in forest areas. At present, grassland is not considered as the monitoring sites.
- In the chapter 2 of the technical manual, basic survey for soil and forest is described. Items for basic survey are shown in Table 2.1.

Table 2.1. Items for basic survey of soil and forest

Item	Parameters	
Soil monitoring		
Before establishment of monitoring plots, soil profile should be described.		
Soil chemical properties	Mandatory	Moisture Content, pH (H ₂ O) and pH (KCl), Exchangeable Base Cations (Ca, Mg, K and Na), Exchangeable Acidity, Effective Cation Exchangeable Capacity (ECEC), Carbonate Content (for calcareous soil)
	Optional	Exchangeable Al and H, Total C, Total N
	Voluntary	Available Phosphate, Sulfate
Soil physical properties	Optional	Fine Earth Bulk Density, Penetration Resistance (in the fieldwork)
Forest monitoring		
General description of forest	Mandatory	Description of trees (Name of species Diameter at Breast Height, Height of tree), Understory vegetation survey
Survey of tree decline	Mandatory	Observation of tree decline,
	Optional	Photographic Record of tree decline, Estimation of decline causes

Frequency of monitoring is every 3-5 years for all the items.

- For soil monitoring, as one of the Quality Assurance/Quality Control (QA/QC) system, the multi-stage sampling was proposed (see Figure 1). In the multi-stage sampling system, soil type and sensitivity are focused, and two types of soil with different sensitivities to acid deposition are recommended to be selected in one limited area (within 40-50 km). In each soil type, two plots should be established, and then five subplots should be established in each plot. According to the multi-stage sampling, 20 subplots can be established in one area. By using this system, quality/variation in each sampling stage (area, soil type, plot, and subplot) can be estimated.

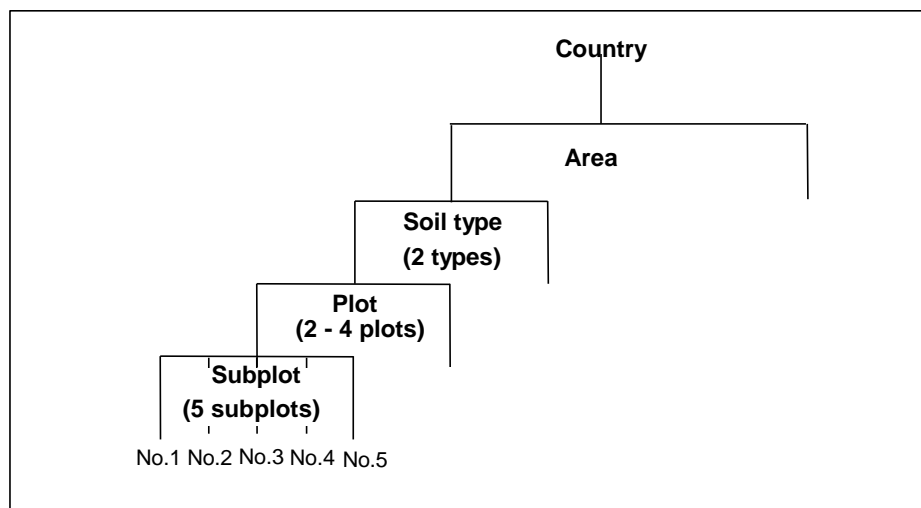


Figure 1. Image of the multi-stage sampling for soil monitoring

(the numbered sample should consist of two parts taken from different layers)

- For further discussions toward the ultimate objectives, terrestrial ecosystem analysis is also proposed in the chapter 3 of the technical manual. In this (preliminary draft) strategy paper, the step-wise approach is clarified in more detail.

3.2. The present status of basic survey in the participating countries

3.2.1. Preparatory-phase activities from 1998 to 2000

- In the preparatory-phase activities of EANET from 1998 to 2000, data on soil and vegetation monitoring was submitted to the Interim Network Center from 7 countries. The monitoring sites are shown in Table 2.2.

Table 2.2. Monitoring site for basic survey of soil and forest from 1998 to 2000

Country	Area (Nearest deposition monitoring site)	Name of individual monitoring site	Soil type (by FAO/UNESCO)	Forest type	Monitoring items* (year)
China	Chongqing	Chongqing	Not reported	Not reported	S (2000)
	Xiamen	Xiamen -xiaping	Not reported	Man-made forest (<i>Michelianmacclurei dandyar</i> , <i>Fokienia hodginsii</i> , <i>Pinus massoniana</i>)	S, F (2000)
	Zhuhai	Zhuhai - Zhuxiandong	Not reported	Not reported	S (2000)
Japan	Ijira	Lake Ijira	Dystric Cambisol	Man-made forest (<i>Cryptomeria japonica</i> , <i>Chamaecyparis obtuse</i> etc.)	S, F (2000)
	Banryu	Lake Banryu	Ferralic Cambisol/ Arenosols	Natural forest (<i>Pinus sp.</i> and broadleaf trees)	S, F (1998, 2000)
Malaysia	-	Pasoh	Dystric Nitosols/ Rhodic Ferralsol	Not reported	S (2000)
Philippines	Los Banos	Mt. Makilling	Eutric Cambisol	Secondary forest (<i>Celtis luzonica</i> Warb, etc.)	S (1999), F (2000)
		UP Quezon, Land Grant	Dystric Nitosol	Secondary forest	S (2000)
		Agromet Station**	Eutric Nitosol	Grassland	S (1999)
Russia	Listvyanka	Bolshie Koty	Mollic Leptosol/ Umbric Leptosol	Natural forest (<i>Pinus sylvestris</i> / <i>Populus tremula</i> , etc.)	S (2000)
	Monday	Ilchir Lake	Helic Podzol	Not reported	S (1999)
			Helic Gleysol	Not reported	
		Okinskoe Lake	Helic Podzol	Not reported	
	Solar Observatory	Rendzina	Not reported		
Thailand	Kao Laem Dam	Khao Laem Dam	Ferric Acrisol	Secondary forest (<i>Xylia xylocarpa</i> ,)	S, F (1999, 2000)
Viet Nam	Hoa Binh	Cave of Heaven	Ferric Acrisol	Man-made forest (<i>Pinus sp.</i>)	S, F (1999)
		Thang Ranh	Ferric Acrisol	Man-made forest (<i>Acacia auriculiformis</i>)	

*S, Soil monitoring; F, Forest monitoring; **Agromet station in the Philippines is not included in the National Monitoring Plan for the regular phase.

- In most areas, more than two types of soil were collected in areas around one deposition monitoring site based on the multi-stage sampling approach; e.g. in the area around Banryu deposition monitoring site in Japan, two soil types, namely Ferralic Cambisol and Arenosols, have been selected; in the area around Los Banos deposition monitoring site in the Philippines, three soil types, namely Eutric Cambisol (Mt. Makilling), Dystric Nitosol (UP Quezon Land Grant), Eutric Nitosol (Agromet station), have been selected.
- The East Asian Region is latitudinally wide area, and varied soil types were selected as soil for monitoring: e.g. acidic soils such as Dystric Nitosol with relatively low pH (lower than 4.5), and alkaline soils such as Rendzina with high pH (higher than 7.5).
- Tree decline was reported only in Japan. It was reported that the causes of the decline seemed to be natural factors, such as insect attack.
- Since the frequency is every 3-5 years, the monitoring was carried out once in these sites during the period from 1998 to 2000.

3.2.2. National Monitoring Plans for the regular-phase from 2001

- EANET started its regular-phase activities from January 2001. For the regular-phase activities, the participating countries reviewed and revised their National Monitoring Plans. In most of the participating countries, the plans on soil and vegetation monitoring have not been changed fundamentally.
- Indonesia, Republic of Korea and Mongolia have newly started the soil and vegetation monitoring. Indonesia started soil monitoring and forest monitoring at Serpong and Bogor, and the nearest deposition-monitoring site is the “EMC” station. Korea started soil monitoring and forest monitoring at Mt. Naejang near the “Imsil” deposition-monitoring site in southern part of Korea. Mongolia started soil monitoring at Mt. Bogdkhan in Ulaanbaatar, and the nearest deposition-monitoring site is the “Ulaanbaatar” station.
- The second new plot was established in Thailand in 2002 within the same area under the changed name as Vachiralongkorn Dam.

4. Issues to be implemented to achieve the objectives

- To achieve the objectives described in chapter 2 in this paper, issues to be implemented should be clarified considering the present status of soil and vegetation monitoring on EANET. As the first step toward the initial and ultimate objectives, the following issues could be identified. Next steps will be discussed in consideration of progress of these issues. These issues will be reflected to the specific work plan for the next five years.

4.1. Issues for the achievement of initial objectives

4.1.1. Issues for the establishment of baseline data

- **Promotion of continuous monitoring according to the Technical Manual**

At present, in most countries, only one or two monitoring sites have been selected, and monitoring has just been carried out once. Accumulation of basic data on soil and forest is the first step for establishment of the baseline data, and the monitoring in these sites should be carried out continuously in every 3-5 years. Protection/conservation of the monitoring site should also be discussed. The monitoring sites should be established in areas, which should be protected/conserved for decades. If the present sites do not meet the above criteria, other appropriate sites should be found.

- **Improvement of monitoring system**

For the stable monitoring, the following items on the monitoring system should be elaborated.

- **Number and location of monitoring sites should be reviewed considering climatic zones and the concept of the multi-stage sampling.** Monitoring sites should be established systematically even though the numerous monitoring sites could not be established on small grids. At present, only one or two areas have been selected in most countries for soil and vegetation monitoring. East Asian Region is latitudinally wide area and consists of varied climatic zones, and representative climatic zones in each country should be covered. At least, for representative climatic zones in the respective countries one area should be selected. For each area, two types of soil should be selected, and plots and subplots should be established according to the multi-stage sampling system. Discussion should start to increase the monitoring sites taking account of experience in the respective countries.
- **For soil and vegetation monitoring, support by the relevant experts is necessary, and such experts should be involved continuously.** In the most participating countries for EANET, National Centers do not have soil and vegetation experts in their institution, and cooperated with the relevant researchers in other institutions (e.g. universities). For their continuous involvement for the monitoring, appropriate system such as a national committee of relevant agencies for EANET should be considered.

4.1.2. Issues for the early detection of possible impacts

- **Development/improvement of methodologies for forest monitoring**

In the present Technical Manual, only the observation guideline of declining trees is described for the early detection. The present methods for forest monitoring in the Technical Manual may not be able to applicable for the entire region in East Asia. Discussion on possibility of improvement/development of the methodologies should be promoted, and **sub-manual for forest monitoring** should be prepared using available materials developed by EMEP or other related programs/agencies outside EANET. The methodologies for identifying symptoms of acid deposition impact should be discussed in this sub-manual. As described below the Joint Workshop by ICP Forests which has already developed a manual for forest monitoring across the ECE region, and EANET would be the appropriate opportunity for starting the discussion.

- **Compilation of basic information on the early detection**
Based on the discussion on improvement of methodologies, accumulation of the basic information on the early detection should be discussed. The procedures to collect information such as plant sensitivities and dose-response implication should be discussed. Concerning the plant sensitivities, information on epiphytic plant species, such as mosses and lichens, also should be collected since they have been used as indicators of air pollution including acid deposition. It should be discussed to collect basic information on fauna (e.g. forest insects).
- **Monitoring manual on early detection**
Based on experience by using the above sub-manual and the latest scientific information, monitoring manual on early detection should be established step by step.
- **Description of present status of soil and vegetation**
Based on the basic survey, present status of soil and vegetation should be described. The report should be published. The report should be reviewed and revised periodically (e.g. every 5 years) with the latest monitoring data.

4.2. Issues to achieve the ultimate objective

- **Promotion of case study in reference catchment areas**
A few catchment areas should be selected as the reference sites, where case study would be carried out to develop the monitoring methodologies. The area, where land use patterns do not change in the future, should be selected. In the case study, methodologies of ecosystem analysis should be considered:
 - Design of the case study and selection of reference catchments
 - Estimation of inputs (deposition) and outputs (e.g. stream water) amounts
 - Studies on element dynamics in soil and plant system
 - Standardization of the methodologies
 - Establishment of monitoring guideline/manual on ecosystem analysis
- **Catchment analysis and simulation modeling on soil and surface water acidification**
Based on the monitoring guideline/manual on ecosystem analysis, catchment monitoring should be promoted in the respective areas in the participating countries. At the same time, simulation model on soil/surface water acidification should be developed. Changes in chemical properties should be clarified in the acidification process, and simulated in the model. Trends of soil acidification and/or surface water quality should be estimated. In the future simulation model, direct effects of acid deposition on plants and effect on fauna should be taken into account.
- **Description of present status of ecosystem**
Based on the catchment analysis, present status of ecosystem should be described such as elemental budget. The report should be reviewed and revised periodically with the latest monitoring data.

- **Up-scaling of monitoring data**

For application of the monitoring data to the ultimate objectives, up scaling of monitoring data should be discussed as the next step. Use of the following methodologies should be discussed to evaluate spatially in the East Asia

- **Spatial modeling and mapping**

Based on the data in the basic survey and the catchment analysis, condition of the region should be estimated by the appropriate spatial modeling, and then described on map of the region.

- **Remote sensing technology**

Taking account of the data mainly in the basic survey, remote sensing technology should be used especially for description of the present condition on forest decline.

4.3. General matters to be elaborated

4.3.1. Capacity building and training

- In order to obtain comparable data in the participating countries, standardization of the methods and skills should be promoted. Individual training by the Network Center mainly could be utilized for skill up. For specific fields such as vegetation monitoring, sub-regional training course for tropical zone may be considered.
- For the common understanding of the relevant technical and scientific information, the Network on soil and vegetation specialists for EANET should be used. The information can be available through the Network activities. It should be discussed that Network Center would regularly publish a newsletter for the exchange of the relevant information. In the respective countries also, the information should be disseminated to the researchers, scientists, and technicians in the relevant study fields.
- For development of methodologies based on experience in the East Asian Region, opportunity to share the experiences, such as a technical workshop, should be planned. Especially in order to develop methodologies for forest monitoring in the basic survey, a workshop should be undertaken.

4.3.2. Compilation of monitoring data in East Asian Region

- Monitoring activities in the East Asian Region have been carried out at national/international levels by various manners. The data with different quality could not be compared directly, and therefore, EANET activities have accumulated data with common methodologies and QA/QC. Taking account of the data quality, data obtained in EANET and other relevant national/international activities in the East Asian Region should be collected and compiled in a systematic manner at an organization authorized by the participating countries in EANET; Network Center may be one of the candidate for data compilation utilizing the collaboration with other international organizations. Condition in the East Asian Region should be evaluated with referring the relevant compiled data.

4.3.3. Collaboration with relevant networks/organizations

- In the Asian Region, some other activities have been progressed on air pollution/acid deposition issues; e.g. LTP, Male Declaration, RAINS ASIA etc. In the relevant fields such as forest science, network on Teak forests have been established. In China, collaboration research project between Norway and China, called, “Integrated Monitoring Program on Acidification of Chinese Terrestrial Systems (IMPACT)”, has been promoted. In IMPACT, catchment studies have been focused on especially.
- In Europe and the North America, much experience has been accumulated. Especially **Working Group on Effects (WGE)** and its **International Co-operative Programmes** (e.g. **ICP Forests**, **ICP Vegetation**, **ICP Integrated Monitoring**, etc.) on CLRTAP (Convention on Long-range Transboundary Air Pollution) in Europe will provide much available information for the East Asian activities including existing monitoring manual for ECE region.
- In research field, **International Union of Forest Research Organization (IUFRO)** may have the latest scientific information on forest science. In IUFRO, studies on “Impacts of air pollution on forest ecosystems” are promoted in the Unit 7.04.00 under the Division 7 “Forest Health”. Especially in the Unit 7.04.01 “Diagnosis, monitoring and evaluation”, issues on monitoring are studied. In the Unit 7.04.00, International Meeting for Specialists in Air Pollution Effects on Forest Ecosystem is held regularly.
- Collaboration with these relevant networks/organizations should be promoted for EANET monitoring activities.

4.4. Overall strategy and milestones

- Overall strategy to achieve the initial and ultimate objective described above could be imaged as shown in Figure 2.1. The initial objective would be description of the Present status on soil and vegetation in East Asia, and it would also be one of steps toward the ultimate objective. For the ultimate objective, the other approach should also be promoted, especially for description of present status on ecosystem. To achieve these steps, some issues, such as establishment of monitoring system and manuals, should be implemented. Then, up scaling of these data should be discussed for spatial evaluation of impacts of acid deposition in the East Asian Region.
- To confirm the progress of the strategy, the appropriate **milestones** should be selected for the respective objectives. At present, the following milestones could be considered in the coming five years as described in Figure 2.2:
 - **Joint Workshop by ICP Forests and EANET: 2002**
As one of the collaboration with the relevant networks/organizations, ICP Forests and EANET are planning to hold jointly the Workshop on elaboration and development of forest monitoring in East Asia in winter 2002/2003.
 - **Implementation of the next monitoring: 2002-2005**
As the first step on continuous monitoring, the next monitoring should surely be carried out according to the Technical Manual. The next monitoring time will come to most monitoring site from 2002 to 2005 since the previous monitoring was carried out in 1999 and 2000 with frequency of every 3 – 5 years.

- **Start of case studies in selected reference catchments: 2006**
Design of case studies will be finalized based on the latest scientific information. According to the design, appropriate reference catchments will be selected, and case studies will be started step by step in these sites.
- **Preparation of sub-manual on forest monitoring: 2005**
Discussion on improvement of forest monitoring should be promoted based on the result from the Joint Workshop in the coming years. Based on the discussion, sub-manual for forest monitoring should be prepared by the Task Force. In the sub-manual, some issues, such as accumulation on information of bio-indicator, may be discussed for the future development of monitoring manual on early detection.

5. Specific work plans

- For coming five years, from 2003 to 2007, specific work plans should be implemented or started at least for the following major issues.
 - **Conveying of the Joint Workshop by ICP Forests and EANET for improvement of the monitoring methodologies on forests (in 2002)**
 - **Promotion of continuous monitoring**
 - **Discussion on improvement of forest monitoring methodologies**
 - **Compilation of information on plant sensitivities**
 - **Design of case study and selection of reference catchment area**
 - **Evaluation of monitoring data from 2001 to 2005**
 - As one of collaborations with the relevant network, **Joint Workshop by EANET and ICP Forests will be held in winter 2002/2003**. It may also be useful for development of methodologies for vegetation monitoring in East Asia. In the Joint Workshop, not only the method, but also know-how to develop the methodologies should be informed based on the experience in Europe. Discussion with field study in forest areas should be promoted.
 - For continuous monitoring, **detailed next sampling plan** for the respective monitoring sites should be clarified based on the National Monitoring Plans. In the detailed plan, the following items should be described:
 - **Monitoring sites:** locations, soil types, and vegetation types
 - **Monitoring items:** soil and/or forest
 - **Parameters:** pH, exchangeable cations, exchangeable acidity, etc. for soil; general description of forests, survey of tree decline, etc.
 - **Monitoring year:** 2003, 2004, 2005, 2006, and/or 2007
 - **Monitoring seasons and/or months:** spring, summer, autumn, and/or winter; rainy season or dry season; month
 - **Organizations in charge of the sampling and analysis:**
- The above plan should be reported to the Task Force and SAC3. **In the participating countries, effort should be made to implement the described plan in the coming five years.** The same procedures should be promoted with gradually increasing number of the sites.

- To start discussion on possibility of **improving forest monitoring methodologies**. Based on the discussion in the Joint Workshop with ICP Forests, methods suitable for East Asian Region should be developed for forest monitoring. Preparation of sub-manual for the Technical Manual would be discussed for application of the new methods. Accumulation of the relevant basic information such as plant sensitivity should also be discussed in this connection. Preferably, sub-manual will be prepared and submitted to SAC5, in 2005.
- For the ultimate objectives, case studies for terrestrial ecosystem survey should be promoted. As the first step, **design of case study and selection of reference catchment area** should be progressed. Information on the previous and present research studies should be compiled. Based on these experiences, design of case study would be clarified by the TF by 2004.
 - Criteria for site selection
 - Monitoring item
 - Frequency
 - Method for data evaluation
 - Budget plan

According to the design of case study, the appropriate reference catchment area should be selected. Areas with research histories might be considered as the candidate reference site.
- Monitoring according to the present Technical Manual is expected to be carried out by 2005. After adoption of the sub-manual for forest monitoring, monitoring item will be slightly changed. Therefore, **evaluation of monitoring data from 2001 to 2005 should be discussed in 2006**, and review and revision of the strategy paper should be discussed based on experiences.
- **Schedules**
 - 2001
 - ◇ (EANET started the regular-phase activities.)
 - **2002**
 - ◇ Final draft will be submitted to SAC2.
 - ◇ Joint Workshop by EANET and ICP Forests will be held in winter 2002/2003.
 - **2003**
 - ◇ The participating countries will report the next sampling plans of the participating countries to the Task Force.
 - ◇ The Task Force will start discussion on improvement of forest monitoring.
 - ◇ The Task Force will discuss design of case study.
 - ◇ Monitoring will be carried out in some countries.
 - **2004**
 - ◇ The Task Force will draft sub-manual for forest monitoring.
 - ◇ Design of case study will be established.
 - ◇ Monitoring will be carried out in some countries.

- **2005**
 - ✧ The Task Force will submit the draft sub-manual for forest monitoring to SAC5, where the sub-manual is expected to be adopted.
 - ✧ The reference sites for case studies will be selected.
 - ✧ Monitoring will be carried out in some countries.
- **2006**
 - ✧ Monitoring will be carried out in some countries. Forest monitoring will be carried out according to the sub-manual.
 - ✧ Case study will start at least in one reference site.
 - ✧ Evaluation of monitoring data from 2001 to 2005 should be discussed.
 - ✧ The strategy paper will be reviewed and revised, and specific work plan for the next five years should be discussed taking account of experience.
- **2007**
 - ✧ Monitoring will be carried out in some countries. Forest monitoring will be carried out according to the sub-manual.
 - ✧ Improvement of monitoring system will be discussed.
 - ✧ Steps for accumulation on bio-indicator will be discussed.
 - ✧ Case study in other reference sites will start step by step.

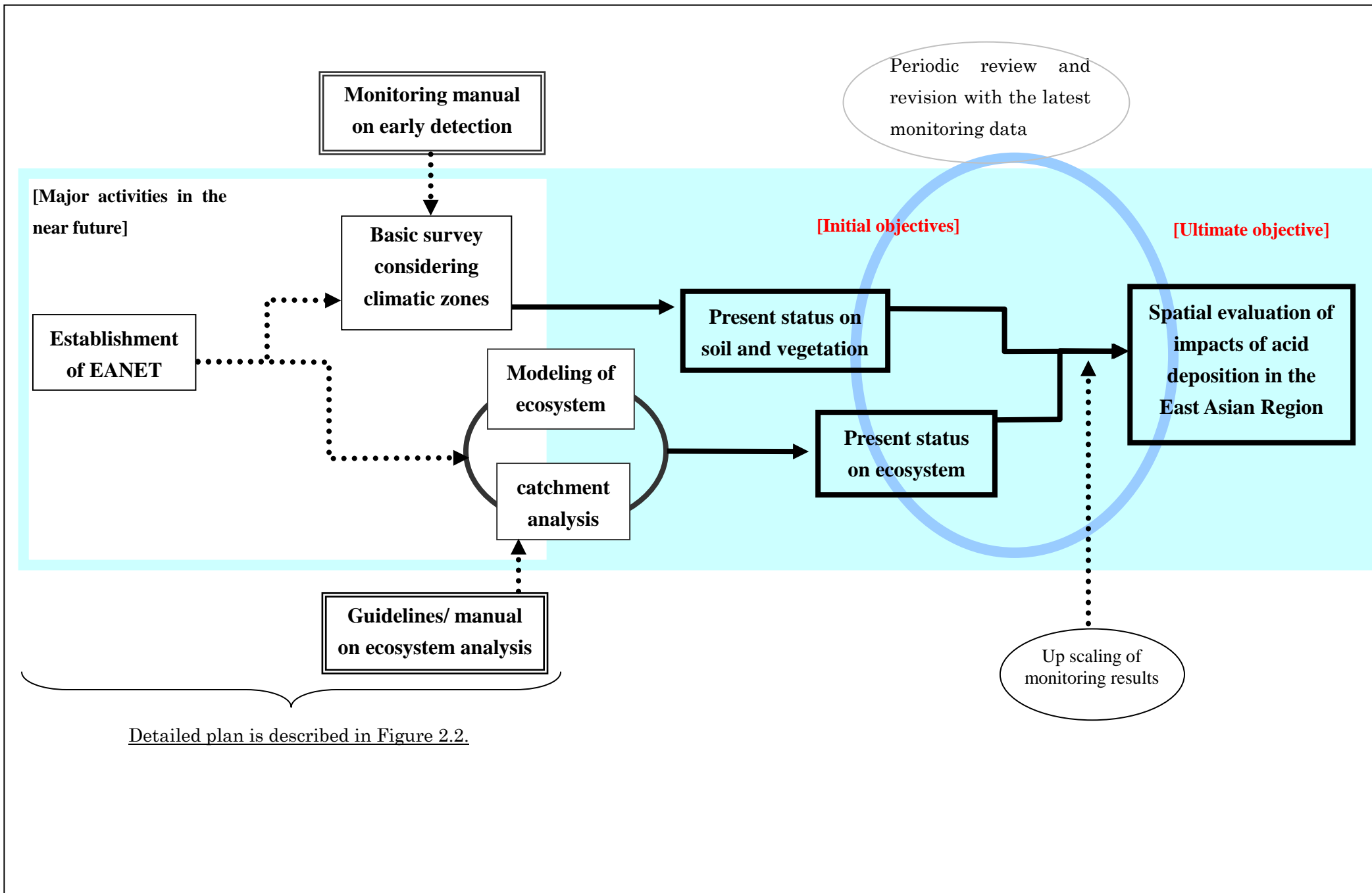


Figure 2.1. Overall strategy for Future Direction of Soil and Vegetation Monitoring of EANET

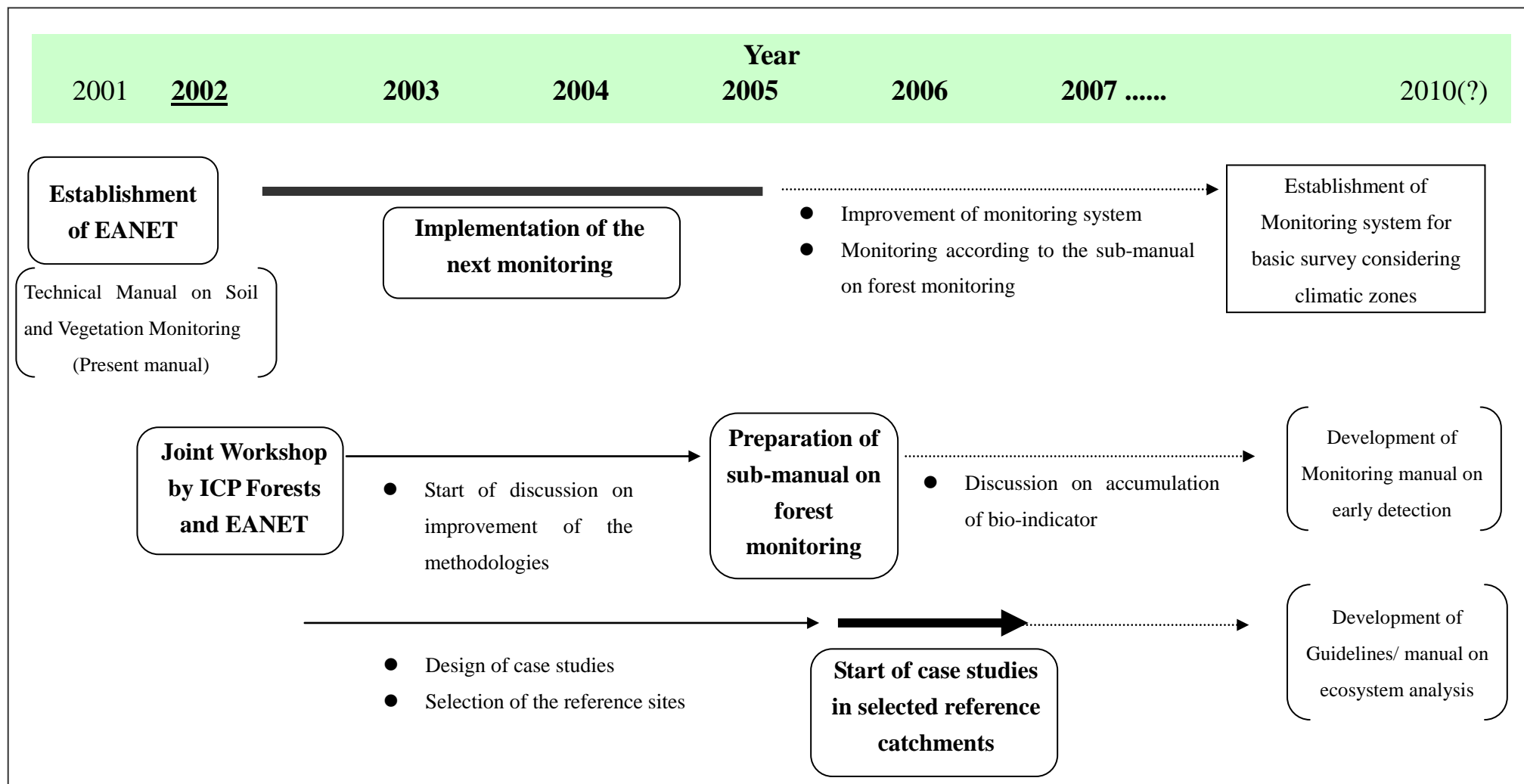


Figure 2.2. Milestones of activities in the coming five years