



Implementation Plan for the First Phase (FY2002-2004) of Asia-Pacific Environmental Innovation Strategy Project

Developed by the Research Coordination Committee of APEIS

Endorsed by the ECO ASIA Panel on 29 July, 2002

1. OBJECTIVES

The major objectives of the Asia-Pacific Environmental Innovation Strategy Project (APEIS) are as follows:

- To develop scientific knowledge-based tools and innovative strategy options to promote informed decision-making for sustainable development, for the use of policy makers in the Asia-Pacific region as a common asset in the region
- To promote regional cooperation and capacity building, so as to enable Asia-Pacific countries to formulate and implement their own policies for environmental management and protection that take into account their national circumstances, making use of the scientific tools and options developed, through participation and collaboration in the Project

APEIS is a concrete regional initiative to realize the following part of the Plan of Implementation for the World Summit on Sustainable Development (Draft):

94. Assist developing countries, through international cooperation, to enhance their capacity in their efforts to address issues pertaining to environmental protection including in their formulation and implementation of policies for environmental management and protection, [including actions at all levels to] [with action to]:

(a) [Agreed] Improve their use of science and technology for environmental monitoring, assessment models, accurate database and integrated information systems;

(b) [Agreed] Promote and, where appropriate, improve their use of satellite technologies for quality data collection, verification and updating and further improvement of

aerial and ground-based observations, in support of their efforts to collect quality, accurate, long-term, consistent and reliable data;

2. SCOPE AND RESEARCH OUTLINE

APEIS is composed of three sub-projects, namely the Integrated Environmental Monitoring (IEM), Integrated Environmental Assessment (IEA) and Research on Innovative and Strategic Policy Options (RISPO) sub-projects, and support functions including networking and capacity building, and information sharing and outreach. These activities are mutually inter-linked and collectively provide a range of information assisting formulation and implementation of policies for environmental management and protection. Synergies are expected to arise between these sub-projects; monitoring data produced by IEM will be used for model verification and simulation of IEA; integrated models developed by IEA will be used to quantitatively assess the effects of innovative strategy options proposed by RISPO.

The aim of the IEM sub-project is to develop an integrated environmental monitoring system, that can cover the entire Asia-Pacific region, mainly by using the MODIS (Moderate Resolution Imaging Spectrometer) sensor mounted on the EOS (Earth Observation System)-Terra satellite, and through cooperative research with countries in the region. The sub-project consists of the following components:

- Establishment of a network of satellite data receiving stations and analytical systems for MODIS data that covers the Asia-Pacific region.
- Development of a ground-truth observation network for various ecosystem types to validate satellite remote sensing data in the Asia-Pacific region
- Integrated monitoring of environmental disasters such as dust storms, transboundary air pollution, floods, marine pollution and oil spills, forest fires, and so forth
- Integrated monitoring of environmental indices and degradation such as desertification, salinization and deforestation as well as land use and land cover changes
- Study of land-atmosphere processes and ecological functions at the watershed scale, and eventually modeling of water resources and agricultural productivity

The aims of the IEA sub-project are to provide integrated models of the environment and economy, as well as a strategic database to assess the current and future interactions

between economic development and environmental changes, and to predict the effects of strategic policy options. This sub-project consists of the following components:

- Development of a set of integrated assessment models including environment-economy models (AIM/Trend and AIM/CGE), ecosystem/health impact models (AIM/Ecosystem and AIM/Water), a material/recycle-economy model (AIM/Material) and a energy technology model (AIM/Energy) based on the achievements of an existing computer simulation model development project, the Asia-Pacific Integrated Model (AIM) project
- Development of indicators and a strategic database comprised of the fundamental database, index base, model base and strategy option base, which will be systematically linked to each other and readily available for policy making
- Assessment of the current conditions and possible future changes of the environment and economy, and the quantitative effects and implications of proposed innovative strategy options

The aims of the RISPO sub-project are to propose innovative and strategic policy options, and to provide policy inventories as knowledge-based tools for informed decision making by examining information about successful or unsuccessful practices collected through field-based case studies. This sub-project consists of the following components:

- Conduction of field-based case studies in selected countries to formulate policy inventories and possible strategic policy options in such categories of innovation as creation of eco-markets and eco-industry, introduction of advanced technology, development of innovative urban systems, appropriate use of community resources, and networking of small-scale innovations.
- Development of policy inventories, which consist of a good practices inventory and an innovative instruments inventory, from the data obtained from case studies mentioned above and from other existing projects such as Global Environment Facility (GEF) projects
- Proposal of strategic policy options based on the analysis of practices and instruments compiled in the policy inventories
- Implementation of pilot projects on selected issues and sites, in order to examine the effects, feasibility and applicability of the strategic policy options.

3. PARTICIPATING ORGANIZATIONS

The following research institutes in the region are currently working on various aspects of the APEIS sub-projects. The process of involving other research institutes is ongoing.

- IEM National Institute for Environmental Studies (NIES) (Japan); Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Science (CAS) (China); Chinese Ecosystem Research Network, CAS (China); Xinjiang Institute of Ecology and Geography, CAS (China); National University of Singapore (Singapore)
- IEA NIES (Japan); Kyoto University (Japan); Energy Research Institute, State Development Planning Commission (China); Institute of Geographical Sciences and Natural Resources Research, CAS (China); Indian Institute of Management, Ahmedabad (India); Asian Institute of Technology (Thailand); Korea Environment Institute (Korea); Sangmyung University (Korea); Universiti Putra Malaysia (Malaysia)
- RISPO Institute for Global Environmental Strategies (IGES) (Japan); Tata Energy Research Institute (TERI) (India); Thailand Environmental Institute (TEI) (Thailand)

Environmental ministers and senior officials in the region, as well as representatives from international organizations have been participating in the supervisory bodies of APEIS, including the Environment Congress for Asia and the Pacific (ECO ASIA) and the ECO ASIA Panel. International research networks and institutions including the Asia-Pacific Network for Global Change Research (APN) and the Institute of Advanced Studies of the United Nations University (UNU/IAS), are strong partners working with APEIS.

4. EXPECTED OUTCOMES OF THE FIRST PHASE

APEIS intends to produce two types of products; “knowledge-based tools for decision-making” and “priority strategy options.” They will be developed through close collaboration between scientific activities and policy makers in order to meet the needs of policy makers. In the first phase, these products will deal with selected issues and countries.

Specific products of APEIS with respect to knowledge-based tools include the

following:

- Monitoring methodologies and networks that cover environmental disasters and degradation, and make full use of satellite technologies
- A set of assessment models (including an environment-economy model, an ecosystem/health impact model, a water resource/agriculture model, a material/recycle-economy model and an energy technology model) that enable integrated assessment of interactions relating to environmental degradation, abatement and development policies, and socioeconomic impacts
- Strategic databases and indicators that can be readily available for policy making
- A good practices inventory that compiles examples and cases illustrating the good use of innovative environmental approaches and strategies
- An inventory of innovative instruments that compiles breakthrough instruments used in each of the good practices

Priority strategy options will also be developed in key areas such as the following:

- Natural resource management (for example water management, food production, sustainable tourism and sustainable forestry)
- Environmental markets, such as environmental industry and finance
- Environmental technology, such as renewable energy and information technology
- Awareness and partnerships, such as eco-consciousness, environmental education and participation

The key areas will be further prioritized, subject to the needs of policy makers and the capacity of research institutes.

5. COORDINATION, IMPLEMENTATION AND MONITORING MECHANISM

APEIS has a three-level mechanism for coordination, implementation and monitoring. The supervisory bodies include the ECO ASIA congress, the ECO ASIA Panel and the Research Coordination Committee (RCC).

The ECO ASIA meeting of environmental ministers is the principal audience of APEIS to receive reports of the scientific activities, conduct policy discussions based on the outcomes, and also to provide policy guidance to the activities.

As one of its functions, the ECO ASIA Panel, established under ECO ASIA, reviews and endorses the overall project, and coordinates between the scientific activities and

policy makers. It consists of senior environmental officials from Asia-Pacific countries, and representatives from international organizations and projects such as APEIS that have been endorsed by ECO ASIA.

The RCC has been established to promote linkages and coordination between the three sub-projects, and to develop a draft overall research plan and summary reports to be reviewed by the ECO ASIA Panel. It consists of representatives from the three sub-projects of APEIS and from the APN.

6. CAPACITY BUILDING AND NETWORKING

Capacity building is one of the highest-priority activities in APEIS. The findings of APEIS activities will be widely disseminated and shared among researchers, policy makers and the public, to build the capacity for better-informed decision making. Among other plans, a series of scientific capacity building workshops at the sub-regional level will be organized periodically on specific topics, such as integrated monitoring, integrated assessment and policy options in collaboration with the APN and other institutions.

Links will be sought between APEIS and other mutually supportive initiatives at the international and regional levels. Such activities include the Millennium Ecosystem Assessment (MA), APN activities, and a GEF project known as the “National Performance Assessment and Subregional Strategic Environment Framework in the Greater Mekong Subregion (GMS).”

Notes on Networking

- (i) An ecosystem assessment project in western China -one of the regional components of the MA- is being implemented as a joint activity of APEIS and the MA. Ecosystem monitoring data produced by APEIS will be provided to the MA.
- (ii) The APN is an intergovernmental network to foster global environmental change research in the Asia-Pacific region, and to enhance scientific capacity -in particular in developing countries. As of July 2002, 21 countries are participating in the APN.
- (iii) The project titled “National Performance Assessment and Subregional Strategic Environment Framework in the Greater Mekong Subregion (GMS)” is being developed by the Asian Development Bank in collaboration with UNEP, NIES and IGES, making use of GEF funds. Modeling and case study outcomes of APEIS will be provided to this project through

NIES and IGES.

7. INFORMATION SHARING AND OUTREACH

APEIS puts high priority on information sharing and outreach in order to raise stakeholder awareness as well as to ensure transparency and accountability of the project. A wide range of information will be made available to targeted audiences, i.e., members of supervisory bodies and participating research institutes, and other stakeholders, by means of Internet websites, CD-ROMs and printed publications. For this purpose, an APEIS website will be developed and managed as a subset of the website of ECO ASIA.

The types of information to be provided to the public include documents on project design and implementation plans, reports of findings including technical papers, summaries of technical papers and overall summaries. The detailed technical papers are targeted to researchers and their summaries are for policy makers and the public. These reports will be produced annually in the form of progress reports during the first phase and final reports at the end of the first phase. In addition, meeting documents and data collected and processed by the sub-projects will be made available for the members of supervisory bodies and participating research institutes.

Provision of ad hoc products for specific country needs, such as natural disaster early warning data, may be considered taking into account the needs of policy makers and capacities of APEIS sub-project teams.

8. FUNDING

In FY2002 (April 2002 – March 2003), the Japan's Ministry of the Environment will appropriate 550 million yen (about US\$4.2 million) for APEIS activities endorsed by the ECO ASIA Panel. Detailed allocation of this budget will be determined in accordance with this implementation plan after its endorsement by the ECO ASIA Panel. Any contributions from other organizations will also be highly appreciated.

9. TIMETABLE FOR THE FIRST PHASE

Proposed timetable of APEIS for its first phase is attached to this document. It presents timetables for each activity as well as interactions among three sub-projects. For example, IEM will produce data products for the model parameterization,

verification and simulation practices of IEA in a timely manner. IEA will provide RISPO with model verification to assess and quantify the effects and impacts of preliminary innovative and strategic policy options that will be incorporated in the final policy options.

10. WORK PLAN FOR FY2002

10.1 INTEGRATED ENVIRONMENTAL MONITORING (IEM)

(a) Expected Outcomes and Products

The expected outcomes and products of the IEM sub-project in FY2002 include the following:

(i) A network of satellite data-receiving stations and a MODIS data analytical system

- Three satellite data-receiving stations of Terra-MODIS in Beijing, Urumqi and Singapore (National University of Singapore)
- Two data-analyzing centers located in IGSNRR and NIES, which store databases, including satellite data (e.g. MODIS, LANDSAT, ASTER, NOAA, TRMM), GIS data and measurements of ground-truth ecological stations

(ii) A ground-truth observation network for monitoring various ecosystems.

- Five ground-truth monitoring stations at Yucheng in Shandong Province, Fukang in the Xinjiang Vigor Autonomous Region, Taoyuan in Hunan Province, Haibei in Qinghai Province and Qianyanzhou in Jiangxi Province, China
- A consistent, quality-assured and documented dataset of long-term measurements involving micrometeorological factors, eddy covariance fluxes, vegetation characteristics, and soil properties from a variety of ecosystems, including grass land (Haibei), dry field (Yucheng), paddy field (Taoyuan), forest (Qianyanzhou) and semi-arid (Fukang)

(iii) A system of environmental indices for the monitoring of environmental degradation and disasters

- Development of a data-analyzing system to process high-level MODIS products, by which some important ecological variables will be produced
- Development of new indices to monitor the environmental degradation and disasters

(iv) A set of models to simulate terrestrial processes and to estimate plant productivity at the regional and watershed scale

(b) Research Plan

(i) Development of a preliminary version of a satellite database, including MODIS, LANDSAT, ASTER, NOAA, TRMM, and so on. The database will be comprised of the fundamental database, the index base, the model base, and the strategy option base, which will be systematically linked to each other. In support of the APIES research objectives, MODIS satellite data will be processed in the following steps: (1) receive daily MODIS data from the MODIS instrument onboard NASA's EOS Terra satellite and to create an approach to provide rapid access to MODIS data, (2) introduce NASA's data processing system for developing the high-level MODLAND products, and (3) validate these high level products by using ground-truth observations.

(ii) Development of a preliminary version of a ground-truth database, to include GIS data and measurements from ground-truth ecological stations. For this purpose, comprehensive ground-based and in situ observations and a consistent, quality-assured and documented database will be developed, which will include measurements of water vapor, energy exchange, and carbon dioxide from a variety of ecosystems.

(iii) Development of a system of environmental indices for the monitoring of environmental degradation and disasters

- Development of a data analyzing system to process high-level MODIS products, by which some important ecological variables, such as surface reflectance and temperature, Normalized Difference Vegetation Index (NDVI), Leaf Area Index (LAI), Fraction of Photosynthetic Active Radiation (FPAR), and Net Primary Productivity (NPP) can be produced.
- Development of new indices, such as Dust Storm Index (DSI), Water Deficit Index (WDI), and Soil Moisture (SM), to monitor the environmental degradation (e.g., deforestation, desertification and urbanization), and disasters (e.g., dust storms, air pollution, floods, fires, and so on).
- For the purpose of monitoring floods, a methodology will be developed to estimate river discharge using very high-resolution satellite data. Traditionally, river discharge is estimated by measuring the water level and converting the measurement to discharge using a stage-discharge rating curve. However, since

the successful launch of commercial satellites with very high-resolution imagery sensors, it has become possible to develop an efficient approach to estimate discharge using satellite data. The proposed method will be applied to the Yangtze River.

- Development of hybrid change-detection approaches based on a mix of categorical and radiometric change information, and their application to detect land cover changes in the Asia Pacific region during the period 1982-2001 based on NOAA NDVI data and MODIS NDVI data. There are four sub-procedures included in the new approach: (1) data normalization, including the best index slope extraction (BISE) method for cloud filtering and a normalization method to reduce the impact of climate change on NDVI data; (2) unsupervised classification of land cover for the referencing year; (3) change pixel detection using Change Vector Analysis (CVA) approach; and (4) change type labeling for change pixels.

(iv) Development of a set of models to simulate terrestrial processes and to estimate plant productivity at the regional and watershed scales

- Quantitative understanding atmospheric and terrestrial interactions that govern water and energy cycles on seasonal to inter-annual time scales and on regional and catchment scales. These include the roles of energy transfer processes, water vapor processes, terrestrial ecosystem influences, and the role of surface water, soil moisture and underground water.
- Estimation of carbon emissions by the Terrestrial Ecosystem Model (TEM). For this purpose, the following will be required: (1) construction of land cover maps and a LAI map with MODIS data; (2) construction of a soil map including organic matter, carbon density, total nitrogen and texture; (3) parameterization of the TEM according vegetation types; (4) production of output maps of NPP, NEP, carbon emissions, etc.; and finally (5) validation of the model using field experiment data.
- Estimation of crop productivity by an adjusted DSSAT model, which will couple with certain parameters, such as LAI, FPAR and canopy temperature, derived from MODIS data.

(c) Capacity Building Activities

The first APEIS Capacity Building Workshop on Integrated Environmental Monitoring of Asia-Pacific region will be held on 20-21 September 2002 in Beijing, China, in collaboration with the APN. The objectives of the workshop include capacity building

on the development of integrated monitoring systems as well as the exploration of monitoring network expansion. It will be jointly organized by NIES, IGSNRR and the National University of Singapore.

At this workshop, experts from NASA will be invited to give lectures on MODIS data processing technology and advanced research activities on MODIS and other satellite data. Experts from countries in the region that are not currently participating in the IEM sub-project will also be invited to explore the possibility of expanding the monitoring network.

Another important capacity building activity is to build a platform for researchers to conduct integrated studies at ground-truth observation sites. There are now four institutes in the Chinese Academy of Sciences that have joined this project. These institutes include the Institute of Geographical Science and Natural Resources, the Northwest Plateau Institute of Biology, the Institute of Subtropical Agriculture, and the Xingjiang Institute of Ecology & Geography.

(d) Collaboration with Other APEIS Sub-projects

IEM will produce data products in the receiving area of two stations for the model parameterization, verification and simulation practices of IEA after MODIS data calibration. The parameters -such as reflectance, albedo and LAI in 2002, with a time resolution of 8 days or 16 days and a spatial resolution of 1 km- will be provided for other APEIS sub-projects.

10.2 INTEGRATED ENVIRONMENTAL ASSESSMENT (IEA)

(a) Expected Outcomes and Products

The expected outcomes and products of the IEA sub-project in FY2002 include the following:

(i) Provision of a set of integrated assessment models (first version) as major tools of APEIS for the assessment of innovative strategy options in the Asia-Pacific region:

- Full version of AIM/Trend, a reduced-form model to project future socio-economic trends and environmental change for all 42 countries of the region
- Preliminary version of AIM/CGE, a general-equilibrium-type world economic model with environmental modules for regional use

- Preliminary version of AIM/Material, a environment-economy integrated model with material balance and recycling process modules for India and China
- Full version of AIM/Energy, a bottom-up technology selection model of energy use for the selected countries of the region
- Preliminary version of AIM/Ecosystem, a set of ecosystem models, including a vegetation dynamics model, an agricultural productivity model and a health impact model for selected countries of the region
- Preliminary version of AIM/Water, an integrated model of water discharge, water supply, demand, and water pollution for selected river basins and cities of the region

(ii) Provision of preliminary version of strategic database as well as indicators for APEIS use for the Asia-Pacific region

(iii) Provision of preliminary projections of environmental trends as well as preliminary assessments of innovative options based on the above models and database

(b) Research Plan

An Asian joint team consisting research institutes from China, India, Japan, Korea, Malaysia and Thailand will collaboratively promote IEA, based on a set of well-known computer simulation models for the region, collectively known as AIM (Asia-Pacific Integrated Model), which have been created over the last ten years for climate change and mitigation analyses.

(i) Development of fundamental structure of six models based on the AIM family of models including AIM/Trend, AIM/CGE, AIM/Material, AIM/Energy, AIM/Ecosystem, and AIM/Water.

- AIM/Trend is a multi-regional model based on a simple structure to project the conditions of the economy, energy and the environment for the target year 2032. It will be applied to the assessment of future trends of the economy and the environment and their mutual interactions, for all 42 countries in the Asia-Pacific region.
- The AIM/CGE model is a multi-regional, multi-sectoral, computable general equilibrium (CGE) model. It will be used to assess the environmental and economic effects of new market establishment, new investment, technology transfer,

and international trade.

- AIM/Material is a country-based CGE model dealing with environmental investment and environmental industry. In order to support AIM/Material, a bottom-up technology model will be constructed. The main feature of AIM/Material is in the integration between monetary and material balances, including waste recycling.
- AIM/Energy is a country-level bottom-up model that reproduces the technology selection process for energy supply and demand. Four hundred technologies listed in the model will help to determine the best mix of technologies, in consideration of future socio-economic trends. This model has already been applied to Japan, China, India and Korea, and there are now plans to apply it to the ASEAN countries.
- AIM/Ecosystem is a set of computer models that simulate vegetation dynamics, water discharge, agricultural productivity, natural processes of ecosystem change, land use change, and socio-economic change (such as health and economic impacts) caused by ecosystem change. These models can be linked to each other for integrated assessments of total ecosystem change. AIM/Ecosystem will be integrated at each country level for APEIS use.
- AIM/Water is one of the AIM/Ecosystem components which reproduces the processes of water discharge, water demand, water supply and water pollution. AIM/Water will have a specific component of city-environment interactions to assess in greater detail the effects of innovation strategies for large Asian cities.

(ii) Integration and application of these models to preliminary projections of future trends of socio-economic activities and environmental change, in order to clarify the tradeoffs between economic growth and the environment in the Asia-Pacific region. These models will be also applied to the preliminary assessment of strategy options to make breakthroughs with these tradeoffs—innovations such as the establishment of new environmental markets, development of new environmental technologies, new approaches to national land conservation strategies, establishment of new environmental infrastructure, and new arrangements for international cooperation.

(iii) Development of a preliminary version of the strategic database in order to integrate regional statistics and strategy option data with input assumptions, simulation outputs, and policy evaluation indices. The strategic database will be comprised of the fundamental database, the index base, the model base, and the strategy option base,

which will be systematically linked to each other in order to support the processes of policy making relating to sustainable development. The input-output interface of the database will be also developed for direct use by policy makers.

(c) Capacity Building Activities

In the process of model development and application, a capacity building program will be introduced by the IEA sub-project in the following three ways:

- By transferring models with detailed manuals to the Asian experts, and responding to requests for consultation on the model applications
- By holding a training workshop on model application and simulation operation. The first training workshop is planned for Delhi, India in October 2002, in collaboration with the APN
- By inviting experts to NIES to participate in the model development process

(d) Collaboration with Other APEIS Sub-projects

IEA will prepare priority in monitoring data/indicators for IEM and priority in policy option items for RISPO. Monitoring data/indicators supplied by IEM will be used in IEA modeling and simulation process, and policy options designed by RISPO will be evaluated in quantitative term by IEA.

10.3 RESEARCH ON INNOVATIVE AND STRATEGIC POLICY OPTIONS (RISPO)

(a) Expected Outcomes and Products

The expected outcomes and products of the RISPO sub-project in FY2002 include the following:

- (i) Collection of good practices based on literature and local information in the following categories of innovation.

Category of Innovation	Examples of good practices
Creation of Eco-Markets and Eco-Industry	Creation of new environmental financial mechanism Creation of inter-boundary market for recycled materials
Introduction of Advanced Technology	Application of information technologies
Development of Innovative Urban Systems	Development of sustainable urban transport systems Integration of urban environmental policies

Appropriate Use of Community Resources	Promotion of biomass energy use Involvement of communities in nature-based tourism
Networking of Small-Scale Innovations	Greening of small and medium-sized enterprises (SMEs) Sharing of local/indigenous knowledge and practices

(ii) Development of a prototype of *Policy Inventories*, consisting of a *Good Practices Inventory* and an *Innovative Instruments Inventory*.

(iii) Selection of concrete sites and topics for field-based case studies, and preliminary identification of basic ideas of *Strategic Policy Options*.

(b) Research Plan

(i) Research Procedure

Policy Inventories and *Strategic Policy Options* are produced in the following steps:

- Good practices are collected by literature review and field survey to be conducted by research teams consisting of IGES and partner research institutes, and from other existing projects such as GEF projects according to the developed guidelines and criteria.
- Innovative instruments, i.e., breakthrough instruments found in the good practices will be compiled into the *Innovative Instruments Inventory*. This inventory will consist of the following components: institutional arrangements; regulatory, technological and financial instruments; awareness-raising and partnership activities; and other instruments.
- *Strategic Policy Options* will be proposed based on the analysis of the *Innovative Instruments Inventory*, and some of them with higher priority will be further examined by pilot projects to demonstrate their effects, feasibility and applicability.

(ii) Research Activities in FY2002

- Development of a design of *Strategic Policy Options* and *Policy Inventories*, and setting guidelines and criteria for selecting good practices
- Organization of a research team consisting of IGES and other participating research institutes in the Asia-Pacific region for each research topic. In order to share RISPO framework within the team members, the first plenary workshop will be held in Thailand in October.
- Identification of good practices by the research teams based on literature review and data collection of local and other sources, and development of a prototype of

the *Good Practices Inventory* and *Innovative Instruments Inventory*.

- Analysis of the good practices to identify innovative instruments, and development of a prototype of the *Innovative Instruments Inventory*.
- Conduction of preliminary field surveys. Concrete sites and topics of the field surveys will be selected based on the above analysis. Field surveys likely to be conducted from FY2002 may include the followings:
 - Field survey on mechanisms for financing investment in energy efficiency in Thailand's industrial sectors in collaboration with the Thailand Environment Institute (TEI)
 - Field survey on urban environmental policy integration in China in collaboration with the Sino-Japan Friendship Center for Environmental Protection
 - Field survey on recyclable-material exchange systems in Japan and in the Philippines in collaboration with a research institute in the country

(c) Capacity Building Activities

Capacity building activities under RISPO are planned to start from FY 2003 along with the development of preliminary proposals of *Strategic Policy Options* and *Policy Inventories*. In FY2002, plans for future capacity building activities will be formulated.

A prospect of capacity building activities under RISPO is to disseminate its research outcomes with appropriate learning programs and materials, such as Internet-based tutorial courses, stand-alone CD-ROMs, and face-to-face workshops, etc. Programs and materials for capacity building will be developed and provided for policy makers in the region.

(d) Collaboration with Other APEIS Sub-projects

In order to link the modeling analysis by IEA and the field-based study by RISPO, an *innovation index* will be introduced and the effects of innovation will be quantified. Environmental and socio-economic indicators for each research topic to be used in this exercise will be identified through discussion between researchers of the IEA and RISPO sub-project teams.