



3. National Policy, Strategies & Action Plan on Conservation and Sustainable Use of Biodiversity, 2003–2007

The National Committee on the Convention on Biological Diversity has emphasized that it is of absolute necessity to formulate a national policy on the conservation and sustainable use of biodiversity, in order to enable continuation of efforts under the National Policy, Strategies and Action Plan on Conservation and Sustainable Use of Biodiversity (NBSAP), 1998–2002. The amended NBSAP, which was approved by the Cabinet on June 11, 2002, reflects the needs of the country, in addition to biodiversity issues of global concern.

Challenges for the National Policy, 2003-2007

There were various weak points that obstruct effective conservation and sustainable use of biodiversity, learned from implementing the NBSAP, 1998–2002.

* Provision of education, knowledge and promotion of awareness on value of biodiversity is the weakest point of any implementation on biodiversity, and thus has become the first priority for NBSAP. However, greater focus is needed for the amended NBSAP since there was very limited progress in this field during the implementation of NBSAP, 1998–2002. Efforts should be made to provide more information and better education to youths, educators and NGOs through more diversified media.

* Biodiversity data and information are still essential for facilitating conservation and sustainable use of biodiversity. In addition, agencies that were custodians of large amount of biodiversity information did not propose on building relevant databases and creating web sites. At present, the world has become smaller by the availability and accessibility of news and information. It is envisaged that without a dissemination of information necessary for biodiversity conservation, an improvement of the capacity for the conservation cannot be realized.

* Strengthening capacity of personnel and institutions on biodiversity is a matter that requires a lot of funding and continuation of efforts. It is accepted by various agencies that the officials have relatively limited knowledge on biodiversity and are without sufficient expertise on conservation and rehabilitation. The officials must be familiar with the use of computer to store information, and be acquainted with GIS to the extent that information produced by the system can be drawn for planning. Such system will allow the officials to learn the names of animals and plants in national parks/ wildlife sanctuaries and be able to identify wildlife non-hunting areas with wetland characters, thus recognizing their works as maintaining wetlands as bird habitats and not just another wildlife non-hunting areas.

* Research is a contributor to building capacity for conservation. While researches in public offices usually meet the conservation need, those conducted in universities remain mostly specialized endeavors or based on specific interests. Biodiversity research funding agencies in Thailand are often without clearly defined policy and goal. Such practices are unlikely to neither meet the national need nor achieve the national goals for biodiversity conservation.

Directions

Several recommendations of the National Committee on the Convention on Biological Diversity have provided directives that govern the nature of NBSAP, 2003–2007. The recommendations are considered as significant differences between NBSAPs for the years 1998–2002 and 2003–2007.

* The framework of NBSAP, 1998–2002 was again used since it was developed in accordance to the framework of the Convention on Biological Diversity. Such framework is a comprehensive directive for all aspects of biodiversity works in enabling the conservation and sustainable use of biodiversity and ensuring fair and equitable sharing of benefits deriving from the use of biodiversity.

* The proposed projects included in NBSAP, 2003–2007 should reflect the real needs. Such projects were previously omitted from NBSAP, 1998–2002. When the success of the implementation of biodiversity works was assessed, it was found that these projects have not yet been implemented.

* The monitoring mechanism was lacking in the previous NBSAP, with the absence of annual reporting of progress. Thus NBSAP, 2003–2007 emphasizes the role of the National Committee on the Convention on Biological Diversity as the mechanism for monitoring the status and success of NBSAP, with committees in the agencies undertaking monitoring and annual reporting.

In addition to the recommendations made by the National Committee on the Convention on Biological Diversity, various brainstorming sessions were organized to gather recommendations from national experts and stakeholders, and the following issues to amend NBSAP, 1998–2002 can be concluded.

Efforts

* The wetland management plans that were formulated in accordance to the Convention on Wetlands should be integrated, in order to reflect the linkage between the Convention on Biological Diversity and the Convention on Wetlands at the global level. The alliance between these two conventions exists as a joint work plan where the Convention on Wetlands' s focuses on freshwater ecosystems and marine and coastal ecosystems coincide with specific thematic areas on such ecosystems under the Convention on Biological Diversity. Inclusion of the wetland plans would thus bring the relationship into the implementation at the national level.

* The 7th Strategy (International Cooperation) of NBSAP, 2003–2007 is vital that Thailand's image at the international forum is clearly established. Enhancing the country's profile through nomination of World Heritages, ASEAN Heritages, Ramsar Sites, Biosphere Reserves and even joining the flyway network for migratory species under the Convention on Conservation of Migratory Species of Wild Animals should thus be focused under the amended 7th Strategy.

* Issues on GMOs and invasive alien species should be focused more in the amended NBSAP. This is due to persisting public confusion on GMOs issues and very little or no implementation on the management of invasive alien species, despite their potential of becoming a major threat to biodiversity in the country.

Formulation of NBSAP, 2003–2007 primarily aims to ensure result-based implementation in the area and to continue cooperation between relevant and competent agencies under common goals and in accordance to biodiversity management that was described in the Convention on Biological Diversity. In developing NBSAP, the National Committee appointed the Working Group on National Policy, Strategies and Action Plan on Conservation and Sustainable Use of Biodiversity for 2003–2007, consisting of representatives of relevant agencies and with the Office of Environmental Policy and Planning (OEPP) serves as a secretariat. The Working Group had set out to draft NBSAP for a 5-year period, between 2003–2007.

The Working Group met in 3 separate occasions to deliberate the issues, as addressed by the Convention, to be included in the institutional directive as well as associated measures work plans and projects for the 2003–2007 period. In addition to meetings, various activities were implemented. The preliminary draft of NBSAP was finalized. However, in order to ensure comprehensiveness of their components, multi-party forums were set up and their comments were incorporated in the final version of NBSAP (see Box 1).

Coordinating Mechanisms for the Implementation of the National Policy, Strategies and Action Plan

The coordinating and monitoring mechanisms for the implementation of the National Policy, Strategies and Action Plan on the Conservation and Sustainable Use of Biodiversity are in forms of the following.

National Committee

- The National Environment Board
- The National Committee on the Conservation and Use of Biodiversity
- The National Committee on the Convention on Biological Diversity
- The National Committee on Wetland Management

These Committees consist of representatives from relevant organizations, either government or NGOs, such as Royal Forest Department, Department of Fisheries, Department of Agriculture, Department of Livestock Development and OEPP.

The Working Group

This Working Group on the Monitoring and Assessment of the Implementation of the Policies, Measures and Plans, under the National Committee on the Convention on Biological Diversity will work as the coordinating body, which coordinates with the committee/working group from governmental departments. For the coordination at the local level, it will

be done under the annual Action Plan for Provincial's Environmental Quality Management.

The Annual Meeting

OEPP will work as the coordinating body to coordinate, collect and compile reports from the implementing agencies and present them to the meeting for monitoring and reporting the implementation of NBSAP, 2003–2007.

Box 1 : Milestones: Formulation of the National Policy, Strategies and Action Plan on Conservation and Sustainable Use of Biodiversity (NBSAP), 2003–2007

- The Chairperson of the of the National Committee on the Convention on Biological Diversity signed the Committee's order number 1/2001 appointing the Working Group on Formulation of the National Policy, Strategies and Action Plan on Conservation and Sustainable Use of Biodiversity, 2003–2007, on January 24, 2001. Mandates of the Working Group are to compile lists of projects related to conservation and sustainable use of biodiversity of relevant agencies as well as to propose national measures, program and projects on conservation and sustainable use of biodiversity for inclusion in NBSAP. The Working Group is chaired by Dr. Utis Kutintara, Dean of Faculty of Forestry, Kasetsart University and comprised of representatives of relevant agencies
- The Working Group on Formulation of NBSAP, 2003–2007 met for the first time on March 8, 2001 to determine its scope of work and issues to be included in the draft NBSAP. At the meeting, the Working Group endorsed the inclusion of the wetland management plan in NBSAP, based on the view that wetlands are ecosystems with high level of biodiversity and constitute a vital part of national biodiversity.
- The Office of Environmental Policy and Planning (OEPP), as the secretariat of both the National Committee and the Working Group, issued letters in April 2001 requesting 148 public and private agencies to review and provide additional input for targets, principles, strategies, objectives, measures and action plans in the draft NBSAP. Seventy-nine agencies later responded to the request.
- The Working Group met on June 21, 2001 to deliberate on reviews and additional input proposed for the draft NBSAP by 79 respondents.
- The National Committee on the Convention on Biological Diversity, in the 3/2001 meeting on June 26, 2001, asked the Working Group to revise the draft NBSAP in accordance to observations and recommendations of the National Environment Board (as agreed in the Board meeting on May, 31, 2001).
- The Working Group met on July 13, 2001 to deliberate on the proposed addition of biodiversity status and other revisions of draft NBSAP, as recommended by the National Committee. The Working Group also decided to send the revised draft to relevant agencies for further review and endorsement.
- The OEPP, as the secretariat of both the National Committee and the Working Group, issued letters in July 2001 requesting 151 public and private agencies for comments and to propose projects tentatively for the 2003–2007, to be included in the draft NBSAP. Fifty-five agencies responded to the request.
- The OEPP, as the secretariat of the Working Group, organized the following 2 meetings to gather opinions and recommendations from relevant agencies; the first meeting on August 8, 2001 at Maruay Garden Hotel, Bangkok and the Second Meeting on August 27–28, 2001 again at Maruay Garden Hotel, Bangkok
- The OEPP compiled opinions and recommendations from both meetings and lists of projects proposed by 77 agencies that responded to the requested letter in July, for final revision of the draft NBSAP. The final draft was then circulated to 191 agencies for final endorsement in September 2001. The Working Group met on September 15, 2001 to amend additional revision of the final draft before submitted to the National Committee on the Convention on Biological Diversity and the National Committee on Wetland Management.
- With the inclusion of national wetland management plan in the draft NBSAP, the OEPP, as the secretariat to the Technical Working Group on Wetlands and the National Committee on the Wetland Management, submitted the draft NBSAP, 2003–2007 to the Technical Working Group for endorsement at its 2/2001 meeting on September 10, 2001. The draft NBSAP were also presented before the National Committee on Wetland Management at its 3/2001 meeting on September 24. Both the Technical Working Group and the National Committee endorsed the draft.
- At the 4/2001 meeting on September 25, 2001, the National Committee on the Convention on Biological Diversity requested the secretariat (OEPP) to prepare an executive summary of the NBSAP. At the following meeting held on October 19, 2001, the National Committee formally endorsed the draft NBSAP, 2003–2007 and requested the secretariat to submit the NBSAP to the National Environment Board and upon the Board's approval, to the Cabinet.
- At the 5/2001 meeting on October 19, 2001, the National Committee on the Convention on Biological Diversity officially endorsed the draft NBSAP, 2003–2007 and requested the secretariat to submit NBSAP to the National Environment Board for endorsement of the following issues;
 - Endorsement of the draft NBSAP, 2003–2007 with a total budget of 7,538.97 million Baht.
 - Endorsement of the inclusion of projects in the action plans of the draft NBSAP, 2003–2007, in the "Biodiversity Conservation Work Plan" budget from 2003 onward.



4. Management Efforts

In addition to achievements from the implementation of the NBSAP, 1998–2002 mentioned in Chapter 2, Thailand had responded to Convention on Biological Diversity in various specific issues such as wetland management, invasive alien species regulation, Red Data, taxonomic data gathering, biosafety and information management & networking. This report elaborates mainly on biosafety, information management & networking priorities and invasive alien species issues.

Background

Actions on biosafety in Thailand were initiated by the National Genetic Engineering and Biotechnology Center (BIOTEC) in 1983. In 1995, the National Office on Science and Technological Development, governing the BIOTEC, established the National Biosafety Committee (NCB) to support, control, regulate, provide consultation and review on biotechnology researches through sub-committee on specific fields. Also in 1992, a biosafety guideline was formulated as a laboratory regulation on biosafety for every concerned agency. In addition, Institutional Biosafety Committees (IBC) were established in universities, education institutes and research institutes of both public and private sectors, as self-regulated mechanisms under the guideline as well as to coordinate efforts on biosafety with the NCB. After the Regulation of the Prime Minister Office on Conservation and Sustainable Use of Biodiversity entered into forces on January 12, 2000, responsibilities on biosafety fall under the Thailand Biodiversity Center, under the National Committee on Conservation and Sustainable Use of Biodiversity. Under this new framework, the Sub-committee on National Biosafety Policy was formed to supervise biosafety issues that derived from modern biotechnology, especially in the overall policy at the national level.

Despite the above-mentioned progress, Thailand remains without a legislation that directly addresses biosafety. There are, however, some efforts to adopt existing laws for such need. The Department of Agriculture has revised annexes of 1964 Plant Quarantine Act (revised 1999) to extend its original objective of minimizing pathogenic risk from imported seed of transgenic plants. The revised annexes now contain a list of 40 species where their transgenic varieties are prohibited from imported into the country, except for soybean and corn that used for processed food and as seeds for specific industries.

Policies

The Sub-Committee on Policies Concerning Biotechnology Products under the National Committee on International Economic Policy, has assigned the Working Group on Measures Concerning Production and Trade of Biotechnology Products, to revise the draft policy on genetically modified food and agricultural product (2002–2006) in accordance to its decision on February 13, 2001. The draft consists of policies in 6 areas as follow.

Policy on Production

Thailand has not yet produced genetically modified plants, animals and microorganisms or used genetically modified organisms in production processes for trade, unless scientifically sound evaluation has been conducted to warrant biosafety of such activities.

Policy on Human Resources and Technological Development

Supporting development and strengthening of capacity in research and production of genetically modified food and agricultural products to ensure self-reliance, effectiveness and competitiveness while taking into account safety of the consumers.

Promoting development of knowledge and experience for those associated with monitoring genetically modified food and agricultural products in several areas including research, laboratory analysis, biosafety evaluation and risk assessment.

Policy on Biosafety Evaluation

Biosafety evaluation and risk assessment of genetically modified food and agricultural products are to be carried out on scientifically sound basis and in transparent manner procedures basis. Relevant agencies are requested to jointly conduct these tasks using the same measures for imported domestically produced and exported products.

In the case where certain products may pose health risk to specific groups of consumers, such risks must be clearly displayed on the labels. This labeling measure is applied to imported, domestically produced and exported products.

Monitoring long-term impacts to health and the environment after production/cultivation or distribution of genetically modified products is approved.

Policy on Trade

Importation and domestic distribution of genetically modified food and agricultural products are subjected to prior biosafety evaluation and risk assessment.

Supporting preparation for exporting genetically modified food and agricultural products that their (bio) safety has been certified and in accordance to rules, regulations, conditions and demands of trading partner countries.

Policy on Public Relations

Collecting, analyzing and promoting compilation and dissemination of news and information on scientific issues, trade, governmental regulations and procedures and findings on genetically modified food and agricultural products in Thailand and other countries to involved parties and general public, to ensure correct understanding of the issues. These are to be carried out in an objective and transparent manner.

Policy on Participation

Supporting partnerships between public and private sectors, both domestically and internationally, in the implementation of policies related to genetically modified food and agricultural products, and providing support to the formulation of clear guideline on international trade of genetically modified food and agricultural products.

Status of Research and Development in Genetic Engineering

In Thailand, there are genetic engineering research and development activities in at least 5 groups of commercial plants, tomato, papaya, chili, cotton and orchid. The first four groups concern research and development on pest resistance, while the last one is research and development for producing new colors in existing species.

Details of research and development activities in each group are as follow:

Tomato

To tackle tomato yellow leaf curl disease caused by tomato yellow leaf curl virus (TYLCV), TYLCV-CP gene was inserted with agrobacterium method with NPTII (monitoring plasmid), NOS and GUS genes (inspecting genes in various parts of the transgenic plant) as components. The experiment is still confirmed in the greenhouses (the transgenic plants suffer from slower growth, 10–14 days behind the growth of the regular plants).

Papaya

To treat ringspot disease caused by papaya ringspot virus (PRSV), PRSV-CP gene was inserted by particle bombardment (gene gun), with NPTII (monitoring plasmid), 35S promoter and GUS genes (inspecting genes in various parts of the transgenic plant) as components. The Kaek Dum and Australian cultivar 2001 varieties were used as the hosts. The experiment is still confirmed in the greenhouses. Mahidol University and the Department of Agriculture (DOA) have also carried out similar researches.

Chili

To tackle chili vein-banding mottle disease caused by chili vein-banding mottle virus (CVbMV), (CVbMV)-CP gene was inserted via agrobacterium method with NPTII (monitoring plasmid) and GUS A genes (inspecting genes in various parts of the transgenic plant) as components. The experiment is still confirmed in the greenhouses (the amount of virus found varied between each plant).

Cotton

To provide resistance against cotton bollworm (*Helicoverpa armigera*), Bt gene from *Bacillus thuringiensis* was transferred as synthetic cry1A(b) by agrobacterium method with GUS genes (inspecting genes in various parts of the transgenic plant) as a component. Sri Somrong variety was used as the host for the experiment, which is still confirmed in the greenhouses.

Orchid

To produce new colors for *Dendrobium sabin*, chalcone synthase (CHS), chalcone isomerase (CHI) and dihydroflavonol reductase (DFR) were inserted. The experiment is still confirmed in the greenhouses.



Status on Importation

DOA, an authorized enforcer of the 1964 Plant Quarantine Act amended 1999, has issued a declaration banning importation of 40 genetically modified commercial plant species, except soybean and corn when used for production of animal feed/food and industry. Others are allowed for experiments under criteria and conditions set forth by the Department's Director General.

At present, DOA has approved import of 5 genetically modified plants for experiment. These are Bt corn (resistance against cotton bollworm), Round-up Ready corn and cotton (herbicide resistance), tomato to extend the ripeness, papaya with resistance against ringspot and Jasmine Rice 105 with resistance against bacterial leaf blight.

In addition, DOA has issued a declaration and the following actions to regulate the genetically modified plants in Thailand:

- * Department of Agriculture's Declaration on Request for Certification Documents from Exporters of Seeds, which are not genetically modified, issued on January 7, 2001.
- * Department of Agriculture's Declaration on Import of Plant Breeding Materials, including seed, where certification documents that such materials are not derived from genetically modified plants, from exporters are required, issued on February 8, 2001.
- * Department of Agriculture's Declaration on Cultivation of Genetically Modified Cottons, issued on March 6, 2001.

Status on Biosafety Testing

DOA issued a Declaration on Operational Guidelines on Request for Approval of Import or Transit of Materials Prohibited by the 1964 Plant Quarantine Act, 3rd revision (2001), on March 7, 2001. Importers are required to follow guidelines described in the Declaration as well as ensure that their activities are consistent with biosafety guidelines for experiments concerning genetically modified plants.

The guidelines comprise the following 3 steps.

- * **The First Step**
Studies conducted in confinement in the greenhouses and/or laboratories.
- * **The Second Step**
Studies conducted in small-scale experiment plots.
- * **The Third Step**
Large-scale field experiment.

The latest biosafety testing conducted by DOA, as assigned by the Ministry of Agriculture and Cooperatives, is the testing of Bt cotton (NuCOTN 33B) imported by Monsanto (Thailand). The testing was conducted in large experiment plots in 4 department's crop research centers and experimental stations. The testing has so far found neither negative impacts nor adverse effect to the environment nor natural enemies and other non-target organisms.

Status on GMOs Products

Labelling as a mean to inform the consumers of product's components that are derived from genetically modified organisms (GMOs), should be regulated in parallel with efforts to ensure accurate public understandings of GMOs, in order to mitigate public concerns and enhance consumer's right to know and choice.

The Food and Drug Administration (FDA) is currently drafting a Ministerial Declaration on Labelling of Food derived from genetic modification or genetic engineering. Under the Declaration, annexed soybean, corns and products derived from soybean and corn with genetic materials (DNA) or proteins resulted from genetic modification more than 5% in the first 3 main components which made up more than 5% of the weight of the products, must be labelled "Genetically Modified" with the name of the product. In order to prevent misleading to consumers, wording such as "GMO-Free", "Non-GMOs", "Without Components derived from GMOs" or "Selectively Excluded GMOs", are prohibited in the label.

After series of public hearing on the draft Declaration, the Working Group on Labeling on Genetically Modified Food approved the draft. The revised version must be submitted to the Sub-Committee on Safety of Genetically Modified Food, under the National Committee on Food, for further deliberation.

Trend

The Cartagena Protocol on Biosafety was created to ensure safety in movement of living modified organism with focus on transboundary movement and impacts to conservation and sustainable use of biodiversity as well as human health. Thailand needs to be prepared for meeting obligations of the Protocol. These include institutional development such as building appropriate databases and clearing houses on genetically modified organisms, establishing national focal point which acts also as the main biosafety clearing house and identifying Competent National Authorities which include departments and divisions with legal authorities in regulating biosafety.

Information Management & Networking

Background

As a focal point to the Convention on Biological Diversity (CBD), a long-standing priority of the Office of Environmental Planning and Policy (OEPP) has been the management and networking of biodiversity information to support conservation and sustainable use initiatives. This has manifest itself in projects such as the UNEP-supported Biodiversity Data Management Project (BDM) and recent initiatives aimed at developing metadatabases, the Thai Clearing House Mechanism, and harmonized reporting to international conventions through collaboration with national partners and regional organizations such as the ASEAN Regional Centre for Biodiversity Conservation (ARCBC).

Context

The effective management of biodiversity information is fundamental to the implementation of many provisions of the Convention. It is called for specifically under Article 7 Identification and Monitoring; supports *In-situ* (Article 8) and *Ex-situ* (Article 9) Conservation and the Sustainable Use of Components of Biodiversity (Article 10); is a cornerstone to developing programs in Research and Training (Article 12) and Public Education and Awareness (Article 13); and is vital in promoting the Exchange of Information (Article 17) and in facilitating Technical and Scientific Cooperation (Article 18), including the development of national Clearing House Mechanisms. Further, the effective management, networking and use of biodiversity information is instrumental in developing national strategies, plans and programs called for under Article 6 of the Convention. In Thailand, this has translated into the preparation of documents such as the National Policy, Strategies and Action Plan on Conservation and Sustainable Use of Biodiversity and Biodiversity Conservation in Thailand: A National Report.

Biodiversity Data Management Project (BDM)

Launched in the mid-1990s, Thailand was one of ten countries involved in the Biodiversity Data Management Project (BDM). This project was initiated to enhance biodiversity data management capacity of developing countries in support of implementation of the Convention. In Thailand, outputs of the BDM project included:

- * **Preparation of a National Institutional Survey.** This survey aimed at identifying datasets held by organizations, as well as institutional capacity to handle and manage biodiversity information.
- * **Development of a Guideline on Biodiversity Data Management.** This Guideline was developed as a measure for improving the management and availability of biodiversity information, and includes the following major components:
 - Guideline on the Development of Efficiency in Biodiversity Data Management.
 - Establishment of a Biodiversity Information Network (BINET).
 - Biodiversity Data Management Standards (BDMS).
- * **Preparation of a Biodiversity Data Management Action Plan.** In promoting the management and exchange of biodiversity information, the Action Plan comprises 4 policies, 15 measures and 51 specific activities. Elements of the Action Plan have been incorporated into the National Biodiversity Strategy, initially approved by the Working Group on Biodiversity Data Management under the National Committee on the Convention on Biological Diversity, and subsequently by the Cabinet in 1997.

Due to a downturn in the regional economy in the late 1990s, implementation of the Action Plan has proved difficult. Nevertheless, there has been a continued and increasing need for biodiversity information to support decision-making and educational processes in addressing environmental problems, and in enabling Thailand to meet its obligations to a range of international conventions and programs.

Identification of Information Management & Networking Priorities

Against this background, a number of priorities have been identified in the management and networking of biodiversity information in Thailand. These include the following:

- * Continued implementation of the BDM project, particularly revision of the institutional survey and building of institutional capacity to manage biodiversity information.
- * Enhanced institutional networking through mechanisms such as BINET.
- * Establishment of the Thai Clearing House Mechanism.
- * Harmonized reporting to the international conventions.

Taken together, these priorities form the basis of an integrated program of activities in information management and networking that supports conservation and sustainable use initiatives as well as monitoring and reporting requirements for a range of conventions and programs.

Collaboration between OEPP & ARCBC

The ASEAN Regional Centre for Biodiversity Conservation (ARCBC) is a joint EU-ASEAN initiative whose goal is to intensify biodiversity conservation throughout the region by working with a network of National Biodiversity Reference Units (NBRUs). Through this cooperative arrangement, integrated programs of research, training, networking and information management is being delivered.

In serving as NBRU for Thailand, OEPP and ARCBC are collaborating in a range of information management and networking activities to address stated priorities. These include updating the biodiversity information survey, metadatabase development, building institutional capacity, establishing Clearing House mechanism, and harmonized reporting to international conventions.

Updating the Biodiversity Information Survey

Based on the questionnaire design developed by UNEP-WCMC and used in the original BDM study (see Box 2), survey forms on Organizations, Datasets and Experts were prepared and distributed to several hundred organizations and individuals at both national and international levels in 2001. This effort has resulted in more than 300 questionnaires being returned on Organizations and more than 200 forms being returned on each of Datasets and Experts, respectively. Results are being managed in a relational database, and a Biodiversity Information Survey Report has been prepared, serving to outline the current situation in information management and networking in Thailand. The Report also draws some interesting comparisons with the original BDM survey. As part of the process in updating the survey, meetings with national partners were conducted and used to help determine the design, analysis and outputs (e.g. report and on-line metadatabases) of the survey questionnaires.

Box 2 : Development of three survey questionnaires

- Register of Biodiversity Specialists (to complement the ARCBC metadatabase on 'Biodiversity Specialists' for the region). A process was also elaborated to enable Thai experts to either complete the questionnaire on paper or enter details directly on the ARCBC website.
- Survey of Institutions. This survey questionnaire was based on the form used in the earlier Biodiversity Data Management (BDM) project, work of UNEP-WCMC in developing institutional surveys, and following review of current metadatabase developments.
- Survey of Datasets. Developed as for Institutional Details outlined above.
- Discussed the survey questionnaires with staff from national focal points to the international conventions and affiliated biodiversity institutions at a meeting facilitated by OEPP. This meeting also discussed information management and networking issues in Thailand, and harmonized reporting to international conventions. A report from this meeting is being prepared by the OEPP team.
- Process elaborated and agreed with OEPP staff for implementing the institutional survey.
- Preliminary discussions held with OEPP on further training and capacity building support from ARCBC.
- Process discussed with colleagues at ARCBC and OEPP for developing the Thai Clearing House Mechanism, with a view to extending the model developed to other countries of the region.

Metadatabase Development

An important output of the biodiversity information survey is presentation of a web-based catalogue on organizations, datasets and experts involved in the conservation and sustainable use of biodiversity. This metadatabase, due to be released in the second half of 2002, will be linked to ARCBC Interactive and, where possible, other metadatabases dealing with wider environmental issues at national, regional and

Building Institutional Capacity

A vital component in the management and networking of biodiversity information is building institutional capacity insofar as infrastructure, technology and human resources are concerned. Through support from ARCBC, this has translated into the purchasing of computer hardware and software at OEPP, the provision of training in computer programming languages and web design, and the facilitation of workshops in

Table 2 : Information Extracted from the Metadatabase on Datasets

<i>data_id</i>	<i>title_of_dataset</i>	<i>key_words</i>	<i>web_address</i>	<i>contact</i>
131	Butterflies in Thailand	butterfly, identification	www.butterflysite.com	webmaster@butterflysite.com
55	Wetlands	wetlands, inventory, national		sirikb@yahoo.com
115	Lichens in Thailand	lichens, taxonomy, pollution		kansri@ram1.ru.ac.th
105	National Park Database	natural resources, national park	www.forest.go.th	(66)2-5614292-716
116	Biodiversity of Marine Vertebrates	mammal, fish, mangrove		(66)38-391671-3

international levels. The metadatabase will allow on-line updating of institutional, dataset and expert details and will, in due course, be available in English and Thai languages. An extract from the metadatabase on datasets is illustrated in the Table 2.

developing information management and networking initiatives at a national level. The expertise gained is now being used to present the metadatabase and OEPP Biodiversity Series on the web, and will eventually be used to link organizations and datasets in support of networking activities in Thailand. In support of these initiatives, OEPP have also designated three staff to work specifically on information management and networking activities.

Establishing Clearing House Mechanism

Many countries have developed a Clearing House mechanism to the Convention on Biological Diversity. Development of these Clearing House mechanisms is intended to promote scientific and technical cooperation, and the exchange of information in support of biodiversity conservation and sustainable development.

In Thailand, presentation of an on-line metadatabase and links to key datasets themselves will directly support goals of the Clearing House Mechanism in the following ways:

- Provide an invaluable information resource.
- Support and re-invigorate networks such as BINET.
- Provide a platform for the further implementation of the Biodiversity Data Management Action Plan.
- Identify capacity building needs in partner institutions involved in the conservation and management of biodiversity, and support initiatives such as harmonized reporting to the international conventions.

Bodies such as the Informal Advisory Committee to the CBD Clearing House Mechanism (CHM), as well as other national and regional CHM focal points will be engaged to support the conceptual design and further development of the Thai Clearing House Mechanism-partnerships which could also facilitate the development of other national Clearing House mechanisms in ASEAN.

Harmonized Reporting to International Conventions

Internationally, an area of great interest is in developing mechanisms that simplify and streamline reporting requirements to international conventions. The UNEP World Conservation Monitoring Centre (UNEP-WCMC) is currently involved in a pilot project to review different models of harmonized reporting, one of which is being developed in Indonesia. ARCBC is currently exploring ways of providing regional support to this initiative that would allow extension and adaptation of appropriate models to other countries of the region. In Thailand, there have been initial discussions with focal points to the international conventions to consider key data holders in relation to the information requirements of the major conservation-related conventions. This process is being supported by information from the Biodiversity Information Survey, and it is envisaged that further discussions will result in a model being developed that addresses reporting needs in a Thai context.

S u m m a r y

There are a number of complementary initiatives currently ongoing in the management and networking of biodiversity information in Thailand. These initiatives are closely integrated and, collectively, provide the basis for a strategic program that promotes the effective management and networking of biodiversity information, and initiatives aimed at the conservation and sustainable use of biodiversity. Using the Convention on Biological Diversity as a framework for action, a further development has been the establishment of an increasing number of partnerships at national, regional and international levels in support of conservation efforts in Thailand.

B a c k g r o u n d

Invasive alien species has continuously been an issue discussed by the Conference of the Parties to the Convention on Biological Diversity. Concerns of international community over uncontrolled introduction of non-indigenous species has been confirmed by several reports on the failure to distinct the species from native ones. Moreover, invasive alien species have long records in causing changes to plant and animal communities, loss of biodiversity and even adverse impacts to economy with high cost for their control and eradication.

These effects can be seen from several species that take root in Thailand such as giant sensitive plants and water hyacinth.

W o r k i n g G r o u p o n A l i e n S p e c i e s

Efforts to combat adverse impacts from alien species in Thailand have been carried out under the National Committee on the Convention on Biological Diversity with OEPP serves as the secretariat. The Committee appointed the Working Group on Alien Species in Thailand on January 23, 1996 to compile information on non-indigenous species in the country and provide consultation on formulation of measures to control and prevent loss of biodiversity derived from the spread of alien species.

The Working Group and OEPP jointly organized 2 meetings to discuss and exchange experiences on alien species. The first one was held between October 24–26, 1996 at Amari Orchid Resort Hotel, Pattaya, Chonburi Province, while the other on December 16, 1997 at Chaopraya Park Hotel, Bangkok.

There were several discussions on legal aspects on controlling and eradicating alien species in Thailand. These discussions found several relevant legislation including the 1913 Waterhyacinth Eradication Act, 1964 Plant Quarantine Act (revised 1999), 1975 Plant Variety Act (revised 1992) and 1947 Fisheries Act.

A list of alien species in Thailand, containing approximately 1,500 species, has been compiled and is now available at www.thaialienspecies.com. In addition, the Working Group has formulated a work plan on control and prevention of loss of biodiversity derived from impacts of invasive of alien species. These information and efforts were presented to the public at another meeting held on May 22–23, 2001, to stimulate further dissemination of information, exchange of experience and enhancing capacity for future implementation.

Invasive Alien Species in Thailand

There are many invasive non-indigenous plant and animal species in Thailand. The notable ones are the following.

Waterhyacinth (*Eichhornia crassipes*)

Waterhyacinth is a native aquatic plant of South America. In its native habitats, the species does not adversely impact the environment since its populations are controlled by several natural grazers. Its introduction into Thailand has a long history. Waterhyacinth was taken from South America and exhibited at a show in New Orleans, U.S.A. The visiting Dutch citizens were fascinated by the species and took its for propagation in their home country. However, it was later found that climate in Amsterdam is not suitable for the species, so the waterhyacinth was sent to the Dutch colonies in Indonesia. The species entered Thailand from Indonesia during the reign of King Rama V and originally planted in Sa Pratum Palace. After the flooding, waterhyacinth in the Palace spread quickly into almost every natural freshwater reservoirs of the country and become one of the most serious

waterweed. Thailand enacted Waterhyacinth Eradication Act in 1913, which was before IUCN issued its first recommendation on the species. The Act imposed hefty fines (at the time) for transportation of waterhyacinth by car or train; however, did not contribute much impact on reducing its populations. Biological control is now used for controlling waterhyacinth in Thailand. The National Biological Control Research Center has introduced 4 natural predators to control the species which are mottled waterhyacinth weevil (*Neochetina eichhorniae*), chevroned waterhyacinth weevil (*Neochetina bruchi*), waterhyacinth moth (*Sameodes albiguttalis*) and waterhyacinth moth (*Xubida (Acigona) infusella*). Results from the use of these predators have been satisfactory with significant reduction in populations of waterhyacinth in several reservoirs.

Alligator weed (*Alternanthera philoxeroides*)

Alligator weed was another serious weed species. The species is now rarely found due to effective control by chrysomelid (*Agasicles hygrophila*), which was introduced from Argentina.

Water fern (*Salvinia molesta*)

Water fern is a new invasive alien species. It was previously sold in various markets. After control, water fern still can be ordered through black markets.

Giant sensitive plant (*Mimosa pigra*)

Giant sensitive plant was believed to first enter into Thailand by tobacco farmers who visited Indonesia on a field trip. The farmers found that the plant was used for composting organic fertilizer in Indonesia and brought its seeds back for such use in Mae Tang and Chiang Dao Districts, Chiang Mai Province. Soon, the species spread around cultivated plants and along irrigated canals near Mae Tang Irrigation Office. Believing that the species could be used to prevent collapse of bank areas from livestock, the Irrigation Office released the seed into irrigation canals and caused the species to quickly spread through out the country. Two species, seed bruchids (*Acanthoscelides puniceus*) and seed bruchids (*A. quadridentatus*), were introduced from Mexico for controlling the giant sensitive plant.



Siamweed (*Chromolaena odorata*)

Siamweed is originally from Central America. Its seeds are believed to be unintentionally introduced into Thailand as a contaminant of ballast. The spread of the species was a serious problem after the second World War, but its reputation is now improved due to its use as a herbal plant. Siamweed can be found in lower plain areas up to 600–900 meters above the sea level. Chalcid (*Branchymeria euploaeae*) and tephritid gall fly (*Cecidocharef connexa*) are used for biological control of the species.

Crofton weed (*Pamakani, Ageratina adenophora*)

Crofton weed entered into Thailand via Myanmar and Southern China. The species is similar to Siamweed and can be found at elevation over 600–900 above the sea level. The National Biological Control Research Center had introduced tephritid gall fly (*Procidochares utilis*) into areas of Doi Suthep and Doi Inthanon since October 19, 1989 as an experiment to control crofton weed. The result found in 2000 confirmed effectiveness of the insect in obstructing the growth of crofton weed.

Lantana (*Lantana camara*)

Lantana is a native plant of Mexico but has found to be a serious weed in several countries such as Hawaii, Australia and India. Lantana is not an invasive alien species in Thailand since there are many insect species that can be used for controlling its population.



Mile-a-minute (*Mikania micrantha*)

Mile-a-minute is a new alien species found in Chiang Mai Province and northern Thailand. The species is a creeper with leafs similar to Mexican creeper (*Antigonon leptopus*). The pace of its expansion in number was found to be exceeding even the giant sensitive plant. Mile-a-minute has been known as a weed in Malaysia for many years. It was, however, first found around Chiang Mai University approximately 10 year ago. Thus, it is believed that the species might be introduced from Malaysia by foreign experts or spread from Southern China where the species has also been found. Mile-a-minute can be used for controlling the giant sensitive plant, by blanketing the whole plant until its dead. Unfortunately, the species also damage other commercial species such as lychee, in this manner, causing serious economic loss to farmers. A species of thrips (*Scirtothrips citri*) was found to be able to control mile-a-minute but it is yet proved to be effective.

Giant African snail (*Achatina fulica*)

Threat from giant African snail was, at one time, more serious than the golden apple snail (*Pomacea canaliculata*). The National Biological Control Research Center introduced 2 molluscs from Hawaii, rosy snail (*Euglandina rosea*) and gonaxis snail (*Gonaxis quadrilateralis*), into Muak Lek District, Sara Buri Province and Pakchong District, Nakhon Rachasima Province as an experiment to control the species. Effectiveness of the species as found in the experiment has not been conclusive. However, the method that has proved to be very effective is collection of the snail for canning industry, export products to European market.

Draft Work Plan

Draft Work Plan on Control and Prevention of Loss of Biodiversity derived from Impacts of Invasive Alien Species;

Objectives

To enable coordination between public and private organizations in protecting biodiversity from impacts of invasive alien species and to maintain natural ecosystems.

- * To enhance awareness on impacts from invasive alien species.
- * To create mechanisms for education on invasive alien species and their control.
- * To reduce unintentional introduction of invasive alien species.
- * To ensure that intentional introduction is under control and has been adequately assessed before carried out, in particular on impacts to biodiversity.
- * To assist those involved in introduction of alien species in making informed decision and taking appropriate actions.
- * To ensure systematic monitoring of invasive alien species with early warning systems.
- * To facilitate eradication/control of existing invasive alien species with the most appropriate methods.
- * To create legal basis and international cooperation on prevention, eradication and control of invasive alien species.

Actions

Biodiversity agency is to carry out the following tasks.

- * Compile reports on alien species and their status in Thailand.
- * Prioritize alien species (based on the report) for control/eradication/management in accordance to their respected priorities and status.
- * Formulate regulations or laws that are necessary to control and prevent loss of biodiversity from the spread from alien species.
- * Establish databases on invasive alien species with linkage to international communities and disseminating information to relevant agencies.
- * Encourage, in international meeting, discussions on international regulations on import/export of alien species, global list of invasive alien species, establishment of global databases on alien species, and prohibited species for specific country.
- * Provide education and promote awareness on danger and loss derived from the spread of alien species as well as provide practical knowledge on controlling alien species through various media.

Spiralling whitefly (*Aleurodicus dispersus*)

Since it was firstly found in 1981, the spiralling whitefly has caused severe damages to several crops and fruits. The species often leaves the powder-like marks on leaf of plant. The National Biological Control Research Center has introduced coccinellid (*Nephaspis oculatus*) from Hawaii to control the species. The Center has also known of another invasive alien insect, coconut whitefly (*Aleurodicus destructor*) which is relatively similar in appearance to the spiralling whitefly and has long been a pest in Thailand without any control. The coconut whitefly is, after all, an invasive species only in the early phase of its introduction. It will gradually assimilate into ecosystems and become less serious due to control of natural predators.

Leucaena psyllid (*Heteropsylla cubana*)

Leucaena psyllid entered into Thailand in 1986, causing damage to Leucaena nationwide. The National Biological Control Research Center introduced coccinellid (*Curinus coeruleus*) from Hawaii, *Olla v-nigrum* from Tonga and encyrtid (*Psyllaephagus yaseeni*) from Trinidad, to control leucaena psyllid. The use of these species has proved to be effective.

✿ **Controlling Introduction of Alien Species**

Controlling Unintentional Introduction

Biodiversity agency is to implement and coordinate the following.

- * Disseminate information on invasive alien species in Thailand and oversea officers/staff who inspect imported plants and animals on the border, in order to facilitate their inspection.
 - * Disseminate information to oversea travelers who enter the country either by air or sea and enable them to take some care to prevent introduction of alien species into Thailand. Practical information may be provided via various media.
 - * Coordinate cooperation among relevant agencies in controlling import of alien species:
 - Coordinate for inclusion of provisions to prohibit introduction of alien species (including unintentionally) in any international agreements;
 - Coordinate for inspection of samples of plant and animal species intended for import and export;
 - Coordinate for review/study of transboundary movement of species from international development projects, such as International Water Diversion Project, etc.
 - Coordinate the following actions in controlling import and export.
 - Prohibiting export of specifically ordered species and species that have not been promoted for mass export, in order to reduce the risk from extinction;
 - Ensuring that exporters take adequate care in preventing contamination of products and package with alien species;
 - Ensuring that transport firms or importers undertake adequate prevention of unintentional introduction;
 - Movement of packages containing biological materials must be registered, to identify liable party in the case where unintentional introduction does occur;
 - Inspecting or issuing certificate from the point of export to confirm that goods are free from contamination as well as declaration by exporters from the point of export and certification to confirm that vehicles for transportation is free from contamination.
- Coordinate for providing information classifying risks of flights/shipments in order to enable target-oriented, effective, and timely inspection, including special inspection of goods from areas with problems or potential problems of invasive alien species, particularly from island states.
 - Coordinate for registering of imported biological materials.
 - Coordinate for insect fumigation of incoming flight to the Kingdom.
 - Coordinate with the Port of Authority of Thailand and the Harbor Department for eradicating alien species that contaminate ballast water and its sediments.

- * Monitor and evaluate the control of import of alien species and present the findings to the National Committee on the Convention on Biological Diversity in order to formulate regulations and laws to control such import, if necessary.

Controlling Intentional Introduction

Assigned introduction

- * Establish a committee/sub-committee, with biodiversity agency serves as secretariat, to undertake the following.
 - Formulate a guideline on risk assessment, including regulations and processes for approval of import of alien species.
 - Evaluate the risk when there is a request to import alien species for agricultural and nutritional benefit, especially for the species that have not been introduced and/or reported to be invasive in other countries.
 - Control exports in accordance to regulations of importing countries.
 - Control an escape of alien species into the environment.

Species that escape into the environment may become invasive and have adverse impacts on biodiversity. The Committee must formulate measures for relevant agencies and private sector to cooperate in controlling and preventing such escape, including by registering dangerous species to identify the sources and enable regular monitoring of the species.

Unassigned introduction

Biodiversity agency is to carry out the following tasks.

- * Forward the list of prohibited alien species to the Communications Authority of Thailand in order to declare postal ban of the species and prosecute lawbreakers.
- * Forward the list of alien species to plant/animal quarantine officers at airports and seaports to enhance efforts against trafficking.
- * Coordinate with relevant agencies for setting up or increase penalty for trafficking and include the cost in eradicating and controlling the spread of alien species in the fine.
- * Enhance public awareness on impacts of trafficking of alien species to biodiversity.

Management of Invasive Alien Species

Spread of alien species which are without any benefit and/or harmful to local animals/plants and ecosystems, must be controlled or eradicated. Immediate actions are vital since the greater the affected areas, more difficult it would be involved to control or remove the species. In any case, priority must be reserved for areas of special importance such as islands, protected areas, habitats with endemic and/or endangered species and areas with exceptional level of biodiversity.

In areas where alien species have established themselves, controlling methods with prioritized strategies and methodologies for respected species could be appropriate, providing that they comprehensively take into account available human and financial resources.

When problem from invasive alien species is known or reported to biodiversity agency, the responds must follow the following steps.

- * The biodiversity agency conducts initial fact-finding exercise.
- * If potential impact of the species is confirmed, the biodiversity agency must proposed the National Committee on the Convention on Biological Diversity to establish a task force to supervise action to control or irradiate the invasive alien species.
- * The task force plans and determines appropriate methods for controlling or eradicating the invasive alien species. In the case where enforcement of more than one legislation is required, authorized agencies must immediately consult together for timely enforcement.
- * Coordinating for cooperation from local agencies.
- * Regularly reporting to the National Committee on the Convention on Biological Diversity.
- * Monitoring the implementation until the spread of the species is stabilized. When confirm, the actions are then concluded.



Cost of Implementation

✱ Controlling Import of Alien Species

Biodiversity agency is to formulate a national plan on controlling import on alien species with identification of responsible agencies for each activity. The agency, through the national plan, will request for a budget from the government.

✱ Controlling or Eradicating Invasive Alien Species

Implementing and supporting units of public agencies are to allocate their own budget for the implementation. The cost can later be reimbursed from the biodiversity agency, under the regulation of the Ministry of Finance, providing that all required documents are submitted with reimbursement claims.

Legal Implementation

- ✱ Importers must be make liable to damage caused by spread of alien species and its impacts to biodiversity.
- ✱ Trafficker must be prosecuted.

Environmental Rehabilitation

In the case that invasive alien species destroy or deteriorate natural environment and biodiversity, the Ministry of Agriculture and the Cooperatives and the Ministry of Science, Technology and Environment are to jointly prepare environmental rehabilitation action plans for affected areas on a case by case basis.

Trends

Despite continuous efforts, Thailand is still adversely affected by problems from spread of alien species. These problems are often consequences of shortcomings in controlling importation of the species and the lack of understanding of long-term impacts from alien species to biodiversity. Thus, there is an urgent need to enhance dissemination of information to relevant agencies, organizations and individuals as well as mobilizing ideas to improve mechanisms for protection and eradication that are consistent with international efforts.