In Celebration of His Majesty the King of Thailand's 84th Birthday Anniversary

Encouraging Partnership between Business and Communities for Biodiversity


พระราชพิธีมหามงคลเฉลิมพระชนมพรรษา ๗ รอบ ๕ ธันวาคม ๒๕๕๔

"Reforestation of three types of trees for their fruit, timber for house construction and firewood yields four benefits. The fourth benefit which is important, is to conserve soil and the head watershed."

His Majesty King Bhumibol Adulyadej of Thailand

"...my father (His Majesty the King Bhumibol) has rehabilitated the forests above (through the Royal Projects in Cha-am and Hua Hin) to return to their habitats, I will then rehabilitate the forests below..."

Her Royal Highness Princess Maha Chakri Sirindhorn

Her Royal Highness Princess Maha Chakri Sirindhorn and the rehabilitation of the forests and coastal ecosystem in the Sirindhorn International Environmental Park, Cha-am, Thailand.

ORGANIZERS OF ASIA REGIONAL FORUM ON BIODIVERSITY IN 2011

RCE REGIONAL CENTRE OF EXPERTISE ON EDUCATION FOR SUSTAINABLE DEVELOPMENT
RCE Cha-am

ASEAN CENTRE FOR BIODIVERSITY

UNITED NATIONS UNIVERSITY
UNU-IAS
Institute of Advanced Studies

WWF

COLLABORATIVE PARTNERS :

สถาบันสิ่งแวดล้อมไทย
Thailand Environment Institute

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JBIB
Japan Business Initiative for Biodiversity

In Celebration of His Majesty the King of Thailand's 84th Birthday Anniversary

ENCOURAGING PARTNERSHIP BETWEEN BUSINESS AND COMMUNITIES FOR BIODIVERSITY

Asia Regional Forum on Biodiversity

3-4 November 2011
The Sirindhorn International Environmental Park
Cha-am, Phetchaburi, Thailand

FOREWORD

To ensure that Asian countries and businesses become key players in the advocacy for the sustainable management of biodiversity resources, the Sirindhorn International Environmental Park Foundation under the patronage of HRH Princess Maha Chakri Sirindhorn, in collaboration with the Royal Thai Government's Ministry of Natural Resources and Environment, and in partnership with the ASEAN Centre for Biodiversity, the United Nations University Institute of Advanced Studies (UNU-IAS) through the Regional Centres of Expertise (RCE) on Education for Sustainable Development (ESD) in Asia-Pacific, RCE Cha-am, and World Wildlife Fund (WWF Thailand) organized the Asia Regional Forum on Biodiversity.

Held in Cha-am, Phetchaburi, Thailand on 3-4 November 2011, the Forum was attended by over 200 representatives from the business sector, schools and communities. The Forum showcased best practices of biodiversity management involving communities in Southeast and South Asia and explored several themes including: expanded partnership with the business sector in Asia; development of private-public-state partnerships; the provision of incentives for investments on biodiversity conservation; encouragement of sustainable and biodiversity-friendly business activities; and the promotion of business and biodiversity initiatives to various business communities and other stakeholders at the national, regional and global levels.

The primary outcome of the Forum was the Cha-am Declaration on Biodiversity which notes the participants' commitment to, inter alia:

- Contribute to the preservation of the Earth's natural heritage through mainstreaming of biodiversity conservation and sustainable management;
- Produce goods and services in a manner that will contribute to the protection and conservation of biodiversity;
- Promote sound investments that will pave the way for environmentally sound technologies, products and services;
- Support global, regional and national efforts to halt the loss of biodiversity;
- Share the benefits of the economic utilization of natural resources fairly with those who grant access to them openly and cooperatively;
- Ensure the long-term viability of agriculture and fisheries for food production and income generation;
- Promote biodiversity conservation actions at all levels of government, communities, businesses and universities through education;
- Engage in transformative education on biodiversity conservation for sustainable development that can change behavior of all stakeholders; and
- Meet the basic needs for the present and future generation while maintaining balance between environmental, social and economic sustainability.

The Cha-am Declaration has been submitted to the Secretariat of the Convention on Biological Diversity (CBD) as additional inputs to the Tenth Meeting of the Conference of the Parties (COP10) to the CBD to be held in October 2012 in Hyderabad, India.

A key product of this Forum is this publication featuring best practices of business and community partnership on biodiversity conservation in the Asian region.

Sincerest gratitude goes to the Forum's organizers, partners, sponsors, organizing committee members, resource speakers and participants. Special thanks to the Japan Business Initiatives for Biodiversity for the production of this publication.

We dedicate this publication in memory of the late Executive Director of the ASEAN Centre for Biodiversity, Mr. Rodrigo U. Fuentes.

MESSAGE

Dr. Sumet Tantivejkul
Chairman, The Sirindhorn International Environmental Park Foundation under the Patronage of HRH Princess Maha Chakri Sirindhorn

It is with great pleasure that the Sirindhorn International Environmental Park (SIEP) Foundation under the Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn has contributed towards the production of this important publication out of the papers presented at the Asia Regional Forum on Biodiversity held in November 2011 in Cha-am, Phetchaburi, Thailand. SIEP is, by its mandate, positioned to promote education, public awareness, capacity building, and research innovations, and it builds international linkages and global partnership in environment, energy and natural resource conservation. It engages strategic alliances through networking both at the local, national and international levels.

It was through the initiative of Her Royal Highness that the previously environmentally degraded area has been rehabilitated and restored into its original natural condition. The rehabilitation of mangrove and beach forests to be learning center on nature and environment, and the promotion of biodiversity, are among the major thrusts of SIEP to educate and train students, youth, citizens both in the community and region including officials of government agencies and private organizations. These goals are aimed at realizing energy, natural resources and environment conservations in order to cope up with the national strategies on biodiversity and climate change.

SIEP also serves as lead organization of the Regional Centre of Expertise (RCE) on Education for Sustainable Development (ESD), known as RCE Cha-am, which is acknowledged by the United Nations University. SIEP was a participant at a side event organized by the United Nations University at the Convention on Biodiversity (CBD) Conference of the Parties (COP 10) in Nagoya in October 2010, where we had the opportunity to showcase biodiversity-related activities. It is fitting that the theme of the Asia Regional Forum on Biodiversity, from which contents of this publication were taken from, is in accord with the resolution at the Nagoya meeting which is 'Encouraging Partnership between Business and Communities for Biodiversity - Showcasing Best Practices'. It is our hope that this publication will contribute to sharing of knowledge and best practice in biodiversity conservation.

We gratefully acknowledge the generosity of business organizations that have provided funds to make the forum and this publication possible. We are thankful to the ASEAN Centre for Biodiversity and the United Nations University Institute of Advanced Studies for partnering with us in producing this important publication. We are appreciative of the support provided by the Japan Business Initiative for Biodiversity towards the production of this book.

(Dr. Sumet Tantivejkul)
Chairman
The Sirindhorn International Environmental Park Foundation
under the Patronage of HRH Princess Maha Chakri Sirindhorn

MESSAGE

UNITED NATIONS UNIVERSITY
UNU-IAS
Institute of Advanced Studies

United Nations University Institute of Advanced Studies

Kazuhiko Takemoto
Director, Education for Sustainable Development Programme
United Nations University Institute of Advanced Studies

On behalf of the United Nations University Institute of Advanced Studies (UNU-IAS), I express profound gratitude to the Sirindhorn International Environmental Park Foundation under the Patronage of HRH Princess Maha Chakri Sirindhorn, the ASEAN Centre for Biodiversity, and other partner organizations for the honor of collaborating in this book publication.

This publication features case studies presented at the Asia Regional Forum on Biodiversity held in Cha-am, Phetchaburi, Thailand in November 2011, among them are papers authored by participants from Regional Centres of Expertise (RCEs) on Education for Sustainable Development (ESD) from Asia-Pacific, acknowledged by the United Nations University. UNU-IAS is proud to be one of the co-organizers of the Forum.

Unsustainable human activities have imperiled the planet's natural biodiversity and this critical situation requires the international community to respond in solidarity and find creative solutions to address pertinent issues. We believe that none of these issues could be tackled without addressing the fundamental challenges and problems related to biodiversity conservation and education for sustainable development.

UNU-IAS' collaboration in this endeavor is anchored in its ESD Programme in response to the UN Decade of Education for Sustainable Development (UNDESD 2005-2014). The ESD Programme has several components, namely, advocacy and public awareness on ESD, promotion of regional centres of expertise on ESD, strengthening of ESD activities of higher education institutions, and advancing ESD knowledge through capacity building, and participation in international ESD processes.

We hope that this publication will constitute a useful reading and inspire people and business and other organizations to contribute towards protecting biodiversity and encourage them to communicate and share good practices for the protection and sustainable use of biodiversity.

(Mr. Kazuhiko Takemoto)
Director
Education for Sustainable Development Programme
United Nations University Institute of Advanced Studies

MESSAGE

ASEAN Centre for Biodiversity

Mr. Demetrio L. Ignacio Jr.
Acting Director, ASEAN Centre for Biodiversity

At first glance, people do not recognize the crucial connection between business and biodiversity. Business is perceived to be detached from biodiversity. Biodiversity, however, knows no boundaries, cutting across all sectors – the business sector included.

Business depends on biodiversity, relying on plant and animal species and ecosystem services for their products. While businesses can have direct or indirect impact on biodiversity, they also have relevant biodiversity-related knowledge, expertise, and resources needed to conserve biological resources. The business sector is an integral part of the solution to biodiversity loss.

This publication is a product of the collaboration among the Sirindhorn International Environmental Park Foundation under the patronage of HRH Princess Maha Chakri Sirindhorn, in collaboration with the Royal Thai Government, the ASEAN Centre for Biodiversity, and the United Nations University Institute of Advanced Studies through the Regional Centres of Expertise on Education for Sustainable Development in Asia-Pacific. It is a treasure trove of experiences shared by various companies and organizations across Asia on their conservation initiatives.

At the ASEAN Centre for Biodiversity, we believe that investing in biodiversity conservation makes sound business sense. Thus, we are promoting the link between business and biodiversity in the ASEAN region. We dedicate this publication to the late ACB Executive Director, Mr. Rodrigo U. Fuentes, under whose aegis the Centre has taken key steps to ensure that ASEAN Member States and businesses will become key players in the global business and biodiversity efforts.

It is our hope that this publication will inspire more businesses to contribute their share in biodiversity conservation.

(Mr. Demetrio L. Ignacio Jr.)
Acting Director
ASEAN Centre for Biodiversity

MESSAGE

Dr. Monthip Sriratana Tabucanon
Chair, Organizing Committee
Asia Regional Forum on Biodiversity

On behalf of the Organizing Committee of the Asia Regional Forum on Biodiversity held in Cha-am, Phetchaburi, Thailand in November 2011, I congratulate the Sirindhorn International Environmental Park Foundation under the Patronage of HRH Princess Maha Chakri Sirindhorn, the ASEAN Centre for Biodiversity, and the United Nations University Institute of Advanced Studies for the efforts in putting together this publication. We are thankful for the support of the Japan Business Initiative for Biodiversity in the production of this book.

The Forum, which was the source of case studies contained in this publication, highlighted best practices that link business, community, academic, governmental and non-governmental organizations, and civil society partnerships in biodiversity conservation efforts. It underscored the ability of these organizations to support key national policy objectives, identify capacity-building needs, and discuss follow-up actions that would promote biodiversity conservation and the utilization of lessons learned covering the areas of agriculture and fishery; forestry and wildlife conservation; tourism, education and research; and sustainable livelihood. It was indeed a successful forum and the production of this publication is a manifestation of success.

We are thankful to the business organizations that have provided support to the holding of the forum, which led to this book of learning cases on business and biodiversity. It is our earnest hope that this publication would be useful for those who are eager to learn success stories of good practices.

We deeply appreciate all the contributions made by the members of the Organizing Committee for their tireless efforts; the financial support provided by our sponsors; and the contributions of all speakers, facilitators and participants that led to our success.

Monthip S. Tabucanon

(Dr. Monthip Sriratana Tabucanon)
Chair, Organizing Committee
Asia Regional Forum on Biodiversity

BACKGROUND

The Asia Regional Forum on Biodiversity

At the Tenth Meeting of the Conference of the Parties (COP 10) to the Convention on Biological Diversity (CBD), the engagement of and collaboration with key actors and stakeholders, including the private sector as partners in the implementation of the CBD and integration of biodiversity concerns into their relevant sectoral and cross-sectoral plans, programmes and policies, was actively promoted.

Raising awareness about the values of biodiversity is a continuing task. Over the past decade, biodiversity has generated much interest. Zoos, aquariums, botanical gardens and nature shows are always popular. Yet beyond the knowledge of a few charismatic species, there exists a gap in public awareness about the critical role that biodiversity plays in providing the essentials for our survival and well-being.

Societies and economies benefit a lot from biodiversity. From the provision of food, preservation and restoration of human health and well-being to product innovation and invention, biodiversity has contributed to business growth and development. But the lack of awareness and understanding of the immense values of biodiversity has made societies overuse or misuse these resources. The lack of concern for biodiversity also means less public support for its conservation and sustainable use.

The critical role of the business sector in the sustainable management of biodiversity cannot be understated. Recognizing the valuable role of the business sector at COP 9 held in Bonn, Germany in 2008, the partnership between private sector and biodiversity through Business and Biodiversity Initiative (BBI) was formalized. There were 34 international companies that initially joined the BBI and signed the Leadership Declaration signifying their commitment to the three CBD's goals of biodiversity conservation, sustainable use of biodiversity, and access and benefits sharing of genetic resources. This momentum was carried over during COP10 held in Nagoya, Japan in October 2010. Now, more than 40 global companies have affirmed their commitment to sustainable management of biodiversity.

Recognizing the contribution of biodiversity to businesses and the need for biodiversity conservation, participating companies in the BBI are setting an example of instituting ways, methods and instruments for integrating and mainstreaming biodiversity into business management and activities. These global companies can be instrumental and influential in ushering in general public awareness and support for biodiversity conservation in the Asian region. To affirm these initiatives, COP10 adopted a number of decisions that encourage business engagement as reflected in Agenda Item 4.9 (b) of the Conference.

To ensure that Asian countries and businesses become key players in the advocacy for the sustainable management of biodiversity resources, the Sirindhorn International Environmental Park Foundation under the patronage of HRH Princess Maha Chakri Sirindhorn, in collaboration with the Royal Thai Government, the ASEAN Centre for Biodiversity, the United Nations University Institute of Advanced Studies (UNU-IAS) through the Regional Centres of Expertise (RCEs) on Education for Sustainable Development (ESD) in Asia-Pacific, organized and conducted the Asia Regional Forum on Biodiversity.

With the theme Encouraging Partnership between Businesses and Communities for Biodiversity, Showcasing Best Practices, the Forum was held on 3-4 November 2011 at The

Sirindhorn International Environmental Park, Cha-am, Phetchaburi, Thailand.

The Forum actively promoted public awareness about biodiversity through showcasing best practices of biodiversity management that involves communities in the region.

The Asia Regional Forum on Biodiversity demonstrated the best business practices including corporate social responsibility (CSR) efforts on biodiversity conservation that involved communities; demonstrated business leadership in biodiversity conservation in several sectors; shared ideas and approaches for conservation that involved communities among stakeholders; promoted biodiversity conservation strategies including indigenous knowledge; elicited commitments that can be translated into actions; built knowledge and shared experiences on small and medium enterprises engagement with communities that will further encourage them to build their biodiversity conservation capacities; and promoted general public awareness, education, and capacity building on biodiversity.

Forum participants were Asian government officials responsible for promoting cooperation between business activities and biodiversity conservation efforts; companies implementing CSR projects particularly on natural resource and environmental management and biodiversity conservation; regional institutions that support and encourage governments to strengthen ties between and among business communities in national, regional, and global levels; international organizations, NGOs, and others involved in the promotion of business and biodiversity initiatives in Asian countries; and Regional Centres of Expertise (RCEs) on Education for Sustainable Development (ESD) in Asia-Pacific.

The Forum highlighted the best business practices that linked business and community partnership in undertaking biodiversity conservation activities; underscored the ability of business sector and other organizations including non-government organizations to support the achievement of key national policy objectives; identified capacity-building needs; and discussed regional support needs and follow-up action that would promote biodiversity conservation.

The Forum was based on a strong participatory approach that supported the participants to define requirements and plans as far as possible, including the participation of a wide representation of stakeholders. Action plans were designed to support participants to meet their requirements and plans based on these inputs.

Key products of the Forum were the Cha-am Declaration and a publication on best practices in business and community partnership on biodiversity conservation in the Asian region, based on the case studies presented at the Forum.

Cha-am Declaration on Biodiversity

WE, the participants of the Asia Regional Forum on Biodiversity, recognize that nature is the foundation of life and that protecting nature is the joint task of business, government, academe, and other multi-stakeholders in society. Thus, we have committed ourselves to advocate for the protection and sustainable use of biodiversity in partnership with all sectors of society.

To this end, we declare our commitment to:

- Contribute to the preservation of the Earth's natural heritage by protecting species, ecosystems, and genetic diversity through mainstreaming of biodiversity conservation, sustainable management and advocacy in organizational plans and programs, as well as corporate social responsibility initiatives;
- Produce goods and services in forms and manners that will contribute to the protection and conservation of biodiversity;
- Promote sound investments that will pave the way for environmentally sound technologies, products and services;
- Use expertise, experience and resources to convince co-employees and customers, as well as the general public, to implement ecologically sustainable practices of living and consumption;
- Support global, regional and national efforts to halt the loss of biodiversity, including objectives and initiatives by the Convention on Biological Diversity, the Sirindhorn International Environmental Park Foundation under the Patronage of HRH Princess Maha Chakri Sirindhorn, the United Nations University Institute of Advanced Studies through the Regional Centres of Expertise on Education for Sustainable Development, the ASEAN Centre for Biodiversity and other relevant international/ regional agreements and institutions;
- Share the benefits of the economic utilization of natural resources fairly with those who grant access to them openly and cooperatively;
- Explore the potential for cooperation with scientific institutions, non-governmental organizations and governmental institutions with the aim of deepening involvement in biodiversity conservation;
- Ensure, in cooperation and networking with all stakeholders including business sector and communities, the long-term viability of agriculture and fisheries for food production and income generation through fair, ecosystem-based, community-centered, science & technology oriented, R&D approaches, while providing solutions to problems of pollution, disease, land degradation, desertification and climate change that are affecting sustainable agricultural and fishery practices;
- Promote biodiversity conservation actions at all levels of government, communities, businesses and universities through education;
- Explore channels of support for biodiversity conservation actions and wildlife and forest law implementation as well as enforcement such as through social sanction, capacity building and public awareness;
- Encourage national governments to recognize the role of business in biodiversity conservation actions;
- To engage in transformative education on biodiversity conservation for sustainable development that can change behavior of all stakeholders;
- Encourage the youth involvement in biodiversity and environmental conservation action to promote sustainable development through education, training and social activities;
- Explore appropriate channels by regular interactive meetings for mass media of different status (government, business, etc.) through media resource centers to create awareness on various issues relating to biodiversity conservation; and
- To meet the basic needs for the present and future generation using scientific innovation for research and development for appropriate utilization of local and indigenous knowledge with equity and equality while maintaining balance between environmental, social and economic sustainability.

With this declaration, we will work together to inspire other organizations by communicating examples of environment-friendly best practice; encouraging multi-stakeholder partnerships; promoting wide leadership and public awareness of the values of biodiversity and the need for cooperation from all sectors; and recognizing outstanding contributions to biodiversity conservation and advocacy.

This Cha-am Declaration is adopted on the 4th of November 2011 at the Asia Regional Forum on Biodiversity held in Cha-am, Phetchaburi Province, Thailand.

PROGRAMME

Asia Regional Forum on Biodiversity

3-4 November 2011
Dusit Thani Hua Hin Hotel and The Sirindhorn International Environmental Park
Cha-am, Phetchaburi Province, Thailand

DATE/TIME	AGENDA	ORGANIZATION / INDIVIDUAL
November 3	**DUSIT THANI HUA HIN HOTEL, CHA-AM**	
8:00 – 9:00	**Registration**	Organizers
9:00 – 9:30	**Opening session**	Session Chair: Prof. Sanit Aksornkoae, Chairman, SIEP Executive Board
	• Opening Statement from The Sirindhorn International Environmental Park (SIEP) Foundation Chairman	To be delivered by Prof. Sanit Aksornkoae
	• Opening Statements from the Co-organizers: United Nations University Institute of Advanced Studies (UNU-IAS)	Prof. Mario T. Tabucanon, Visiting Professor, UNU-IAS
	ASEAN Centre for Biodiversity (ACB)	Mr. Rodrigo U. Fuentes, Executive Director, ACB
	• Opening Statement from the Minister of Natural Resources and Environment, Thailand	To be delivered by Mr. Pithaya Pookaman (Vice Minister of Natural Resources and Environment)
	• Plaque Presentation	Prof. Sanit Aksornkoae
9:30 – 10:00	**Photo Session, Opening of Exhibition and Break**	SIEP
10:00 – 12:00	**Plenary Session**	Session Chair: Mr. Rodrigo U. Fuentes, Executive Director, ACB
	• Overview of the Forum	Dr. Monthip Sriratana Tabucanon, Chair, Forum Organizing Committee
	• Business and Biodiversity in the ASEAN Region: Good Practices and Prospects	Mr. Rolando Inciong, Head of Communication and Public Affairs, ACB
	• Biodiversity Conservation Embedded in Business: Some Examples and Implications from JBIB and Its Members	Dr. Naoki Adachi, Executive Director, Japan Business Initiative for Biodiversity
	• Business and Biodiversity in Thailand : The Case of Toyota	Mr. Watsachai Sittibusaya, General Manager, Safety and Environment Promotion Office, Toyota Motor Thailand Co. Ltd.
	• Role of RCEs on ESD in Biodiversity Conservation	Prof. Mario T. Tabucanon, Visiting Professor, UNU-IAS
12:00 – 13:30	**Lunch**	

DATE/TIME	AGENDA	ORGANIZATION/INDIVIDUAL
13:30 – 15:40	**Thematic sessions:** Case presentations on biodiversity conservation efforts with multi-stakeholders :	
	• Session A: Agriculture and Fishery	Session Chair: Prof. Sanit Aksornkoae
	• Session B: Forestry and Wildlife Conservation	Dr. Sonjai Havanond
	• Session C: Tourism, Education and Research	Prof. Mario T. Tabucanon
	• Session D: Sustainable Livelihood	Dr. Monthip S. Tabucanon (With assigned rapporteurs)
15:40-16:00	**Break**	
16:00-17:00	**Breakout Thematic Groups' Discussion and Discussion on Cha-am Declaration**	
	• Session A: Agriculture and Fishery	Session Chair: Prof. Sanit Aksornkoae
	• Session B: Forestry and Wildlife Conservation	Dr. Sonjai Havanond
	• Session C: Tourism, Education and Research	Prof. Mario T. Tabucanon
	• Session D : Sustainable Livelihood	Dr. Monthip S. Tabucanon (With assigned rapporteurs)

November 4

DUSIT THANI HUA HIN HOTEL, CHA-AM (Morning Session)
THE SIRINDHORN INTERNATIONAL ENVIRONMENTAL PARK (Morning & Afternoon Session)

9:00 – 10:30	**Plenary**	Session Co-Chairs: Prof. Mario T. Tabucanon, UNU-IAS; and Mr. Rolando Inciong, ACB
	• Presentation and Discussion of Recommendations from the Thematic Sessions	
	• The Cha-am Declaration on Business and Biodiversity	
10:30-10:50	**Break**	
11:00-12:00	Field visits:	
	• Huay Sai Royal Development Study Center	Huay Sai, SIEP
12:00-13:00	**Lunch**	
13:00-16:00	Field visits [Continue]	
	• Mrigadayavan Palace	Mrigadayavan, SIEP
	• SIEP's Mangrove & ESDC	ESDC (WWF), SIEP
	• Energy for Environment Center	SIEP, Suan Somdej Prasrinakarinthara Baromrajachonnanee, Hup Krapong Royal Project
16:00-16:30	Closing Ceremony	SIEP and co-organizers

OPENING STATEMENT

Dr. Sumet Tantivejkul
Chairman, The Sirindhorn International Environmental Park Foundation under the Patronage of HRH Princess Maha Chakri Sirindhorn

By Dr. Sumet Tantivejkul
Chairman, The Sirindhorn International Environmental Park Foundation under the Patronage of HRH Princess Maha Chakri Sirindhorn

Representatives of forum organizers, partners and sponsors; distinguished participants; ladies and gentlemen:

On behalf of the Sirindhorn International Environmental Park Foundation under the Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn, I have the honor and pleasure to welcome all of you to the Asia Regional Forum on Biodiversity. This is an auspicious international gathering central to the aspiration and vision of the Park, which is to be an international learning centre on rehabilitation and development of natural resources and environment. The Park is, by its mandate, positioned to promote education, public awareness, capacity building, and research innovations, and it builds international linkages and global partnership. It engages strategic alliances through networking both at the local, national and international levels.

It was through the initiative of Her Royal Highness that the previously environmentally degraded area has been rehabilitated and restored into its original natural condition. The rehabilitation of mangrove forest and beach forest to be a learning centre on nature and environment, and the promotion of biodiversity, are among the major thrusts of the Park to educate and train students, youth, citizens both in the community and region including officials of government agencies and private organizations. These goals are aimed at realizing energy, natural resources and environment conservations in order to cope with the national strategies on climate change. The Sirindhorn International Environmental Park also serves as the core of the Regional Centre of Expertise on Education for Sustainable Development (ESD) in the region where it is located.

The Sirindhorn International Environmental Park was a participant at a side event organized by the United Nations University at the Convention on Biodiversity (CBD) Conference of the Parties (COP10) in Nagoya in 2010. We had the opportunity to showcase the Park's activities on biodiversity conservation. It is therefore fitting and gratifying that the theme of this forum is in accord with the resolution at the Nagoya Meeting which is 'Encouraging Partnership between Business and Communities for Biodiversity – Showcasing Best Practices'.

We gratefully acknowledge the generosity of dedicated business organizations that have provided funds to make this forum possible – namely, Toyota Motor Thailand, PTT Public Company Limited, Charoen Pokphand Foods Public Company Limited, Electricity Generating Authority of Thailand (EGAT), Metropolitan Electricity Authority of Thailand, Chevron Thailand Exploration and Production Limited, Provincial Electricity Authority of Thailand, Asian Honda Motor Company Limited and Thai Airways International Public Company Limited.

In early 2011, the Park signed a Memorandum of Understanding with the ASEAN Centre for Biodiversity to join hands in promoting biodiversity from which the initiative in organizing this forum emanated from, in collaboration with the United Nations University Institute of Advanced Studies. I acknowledge with gratitude the holding of the meeting of the Asia- Pacific Regional Centres of Expertise on ESD yesterday at the Park under the auspices of the United Nations University. The Ministry of Natural Resources and Environment, WWF Thailand, and all organizations represented in the Forum Organizing Committee are gratefully acknowledged for their hard work in making this event a reality. We are thankful to the Japan Business Initiative for Biodiversity for their partnership and for encouraging some of their members to make presentations.

We welcome the participation of business organizations, Asia-Pacific RCEs, government agencies, academic institutions, non-governmental organizations, international organizations, civil society organizations, schools and all others, which have contributed to making the Asia Regional Forum on Biodiversity a success. We are thankful to all those who are making presentations and providing exhibits to share knowledge and information with all participants.

I wish the Asia Regional Forum on Biodiversity to be a great success. Thank you.

OPENING STATEMENT

Mr. Preecha Rengsomboonsuk
Minister, Ministry of Natural Resources and Environment, Kingdom of Thailand

By Mr. Preecha Rengsomboonsuk
Minister, Ministry of Natural Resources and Environment, Kingdom of Thailand

Representatives of forum organizers, partners and sponsors; distinguished participants; ladies and gentlemen:

First of all, on behalf of the Royal Thai Government, I wish to extend a warm welcome to fellow delegates from the various countries to the Asia Regional Forum on Biodiversity, held in Cha-am, Phetchaburi Province.

As the Party to the Convention on Biological Diversity, Thailand has obligations to achieve the Convention's objectives, namely the conservation and sustainable use of biodiversity, and the fair and equitable sharing of benefits arising from the utilization of genetic resources. The Ministry of Natural Resources and Environment, as the national focal point (NFP) for the Convention has implanted various actions, projects and initiatives related to biodiversity study, conservation and sustainable use, including the establishment of the National Committee on the Conservation and Sustainable Use of Biodiversity, to be national institutional mechanisms in order to effectively implement the policies and measures on biological diversity.

Moreover, Thailand has set up the Environmental Funds, which supported 32 biodiversity projects implemented by local communities and NGOs from 1994 to 2010. The Cabinet has approved the budget for related governmental institutions to implement biodiversity strategies and action plans. Furthermore, Thailand will formulate and draft its new National Biodiversity Strategy and Action Plan (NBSAP) in 2011, and the new NBSAP will be implemented during the years 2013-2017. Thailand will also integrate biodiversity strategies into the 11th National Economic and Social Development Plan (2012-2016).

This decade of 2011-2020, as declared by the UN as the International Decade of Biodiversity, relevant agencies and organizations are participating in the celebration, in particular in education and public awareness activities, regarding the importance and value of biodiversity and ecosystem services.

As Thailand is known as the "Kitchen of the World" and the "Land of Agriculture", the Ministry of Natural Resources and Environment emphasizes both *ex-situ* and *in-situ* conservation for agriculture. You can find more than 200 varieties of rice in paddy fields just in one province. The promotion of organic fertilizers is one of our priorities not only for well-being of the farmers but also to generate more income for rural and local communities in accordance with the Millennium Development Goals 1 and 7.

Another example is the ongoing project "Catalyzing Sustainability of Thailand's Protected Area System", which was developed by the Department of National Parks, Wildlife and Plants, with funding support from the Global Environment Facilities. The project's objective is to overcome barriers to sustainability of Thailand's Protected Area system.

The Thai Cabinet approved the budget for the Department of Marine and Coastal Resources to implement works regarding protection and conservation of island, marine and coastal biodiversity, in the year 2011, in order to achieve obligations under the CBD.

Thailand has set the ambitious target to increase the national forest cover from 30 per cent in 2006 up to 40 per cent by 2020. The constant effort on forest and protection as well as reforestation programmes through action and implementation plan by promoting people participation is one of the key successes in our efforts to reach our targets.

I would like to highlight that it is important to bring the business sector into biodiversity conservation and sustainable use. The business sector is one of the most important stakeholders, which has major impacts and contributions to biodiversity conservation and sustainable use. At present, at least 67 companies have implemented policy to raise public awareness and support the conservation and restoration of biodiversity.

In this Forum, best business practices that link business and community partnership in undertaking biodiversity conservation activities from various Asian countries will be presented, capacity building and regional support needs, and follow-up action plans will be identified, based on a strong participatory approach that will support participants to define requirements and plans according to their current situation and needs, which will have much contribution to the advancement of biodiversity conservation and sustainable use in the future.

Thank you.

TABLE OF CONTENTS

SESSION A

AGRICULTURE AND FISHERY

Using Vetiver Grass to Improve Compact Hardpan Soil for Plant Cultivation

Based on case study entitled : *"Demonstrational Experiment on Improvement of Compact Hardpan Soil by Using Vetiver Grass for Purpose of Planting Various Tree Crops"*

Authored by : *Aree Suwanchinda, from RCE Cha-am-Huay Sai Royal Development Study Center, Cha-am, Thailand*

Presented by : *Dr. Sonjai Havanond, from the Sirindhorn International Environmental Park (SIEP), at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Although most parts of Thailand are river basin areas suitable for agriculture, some areas are dominated by compact hardpan soil. Its highly condensed soil composition with extremely low porosity makes this kind of soil unsuitable for plant cultivation. Such areas of compact hardpan soil are caused by high defacement of the soil resulting from deforestation. Lack of proper means for prevention and improper use of land also contribute to the creation of compact hardpan soil. If the issue of compact hardpan soil problem is not addressed, its coverage may expand and affect crop production or reduce biodiversity. If the problem is resolved, the soil quality will be improved, making it suitable for agriculture and thus enriching the well-being of Thai people.

One of the strategies broached by His Majesty King Bhumibol Adulyadej, which has also been the result of some research, is the use of the vetiver grass *(Vetiveria* spp.*).* This serves as a natural tool to improve the components of compact hardpan soil to allow air, water and micro-organisms to penetrate into the soil and make it suitable for plant cultivation. Experiments using vetiver grass to improve compact hardpan soil were conducted at Huay Sai Royal Development Study Center, Sampraya Sub-district, Cha-am District, Phetchaburi Province.

Figure 1. Their Majesties the King and the Queen on a visit to Huay Sai Royal Development Study Center in Cha-am District, Phetchaburi Province on 3 April 1997.

Figure 2. Her Royal Highness Princess Maha Chakri Sirindhorn visited the Huay Sai Royal Development Study Center and the vetiver grass cultivation study area on 29 January 2007.

Objectives and Methodology

The one-year study (from October 2009-September 2010) applied previous methodology of treatments, research results and development; demonstrated the expansion of treatments to fruit trees, plants of economic value, legumes and fast-growing plants to an economical scale of investment; and demonstrated each step of the treatments in the research to allow interested people to apply such treatments in their areas.

This is a quantitative and qualitative research of demonstrative plots for improvement of compact hardpan soil for the eventual cultivation of four types of plants: fruit trees, plants of economic value, legumes, and fast-growing plants. Each consisted of 10 different samples with 10 plants for each sample totaling 100 plants per plot of 1 rai (1 hectare = 6.25 rai). The study used the strip plot method of five treatments and two replicants as follows.

For treatment 1 (T1),perennial plants were grown as controlled factor *(see Figure 3).*

Figure 3. Treatment 1 (T1), of the experiment.

For treatment 2 (T2), the vetiver grass was planted in a circle with an 80-centimeter radius consisting of eight holes of vetiver grass surrounding the trees and covered with 15 kilograms of mulching materials *(see Figure 4).*

Figure 4. Treatment 2 (T2), of the experiment.

For treatment 3 (T3), the vetiver grass was planted in a circle with an 80-centimeter radius surrounding the trees with two water pipes made of 1,000 cc plastic bottles and four air pipes made of 600 cc plastic bottles. These were buried underneath on the four sides of the plot to let the air in and covered the circle with 15 kilograms of mulching materials with two tubes of water and four tubes of air buried in the circle *(see Figure 5).*

Figure 5. Treatment 3 (T3), of the experiment.

For treatment 4 (T4), the vetiver grass was planted in two circles, one surrounding the other. The inner circle with a 60-centimeter radius had 55 vetiver grass surrounding the trees, while the outer circle with a 100-centimeter radius had 85 vetiver grass surrounding the inner circle. The inner circle was covered with 10 kilograms of mulching materials and the area between the inner and outer circles was covered with 20 kilograms of mulching materials *(see Figure 6).*

Figure 6. Treatment 4 (T4), of the experiment.

For treatment 5 (T5), the vetiver grass was planted in two circles, one surrounding the other. The inner circle had a 60-centimeter radius with 55 vetiver grass surrounding the trees and the outer circle with a 100-centimeter radius with 85 vetiver grass surrounding the inner circle. The inner circle was covered with 10 kilograms of mulching materials and the area between the inner and outer circles was covered with 20 kilograms of mulching materials. Two two-inch diameter 60-centimeter long pvc tubes of water and four 30-centimeter long tubes of air were buried in the inner circle.

To increase income, agricultural and ornamental plants may be grown in the vetiver circle in treatments 2, 3, 4 and 5 *(see Figure 7).*

Figure 7. Treatment 5 (T5), of the experiment.

Results

The research indicated that almost all of the plants grown in T1 without vetiver grass died or had withered and were expected to die soon. This is because the soil is still compact hardpan soil, which prevents root penetration resulting in the death of all plants. Other treatments revealed the following results:

Fruit trees and economic trees in Plots 1 and 2 yielded the best result in T2. Legumes and fast growing plants in Plots 3 and 4 yielded no significant difference in T2 to T5. It can be concluded that T2, where vetiver grass was grown in a circle with an 80-centimeter radius surrounding the plants with eight additional holds of vetiver grass in the circle covered with mulching of 15 kilograms, yielded the best result because the soil has been rapidly improved based on two factors. The first factor is the deep penetration of the roots of the vetiver grass reducing the density of the soil. The second factor is the mulching which changed the physical, chemical and biological nature of the soil and thus helped make the soil components suitable for plant growth. T2 thus yielded the best results.

Agricultural plants such as cut-flower plants grown in the circles of T2 to T5, T3 were found to yield the best result because the water and air tubes together with mulching covering the circle helped make the soil suitable for growing agricultural plants and flowers.

Recommendations

Based on the results of the experiment, it was agreed that the time spent for the research should be extended. A learning centre for the benefits of vetiver grass for the improvement of compact hardpan soil should be established. Research on the potential and benefits of vetiver grass in improving compact hardpan soil should be supported to cover extended areas which should likewise be promoted as study centres at the local and national level. Strategies for public relations and information dissemination should be carried out to encourage target groups to use vetiver grass in production.

An analysis where production can break-even in relation to investments made should be studied to systematically create incentives. Study on calculation of break-even point should

Figure 8. Produce from compact hardpan soil.

be conducted in two ways. One way is with respect to the yield, and another with respect to improvements in soil and water, climate, and ecosystem.

To achieve effective results, researches, problems and strategies should be supported. Establishment of a ready market for the produce from the compact hardpan soil should be initiated in the form of community markets, associations or cooperatives so that communities may be encouraged to participate.

The experiment can be replicated using other economic plants for other potential target groups. This may include public relations and trainings both in theory and practice in villages, schools and other community areas.

Figure 9. Demonstration and dissemination of knowledge on the improvement of compact hardpan soil at the experimental site, Huay Sai Royal Development Study Center by Mr. Aree Suwanchinda.

Figure 10. The successful experiment of upland rice cultivation on compact hardpan soil-a field visit by participants of Asia Regional Forum on Biodiversity in November 2011.

Business, Government and Community Join Forces to Rehabilitate Seagrass Habitat

Based on case study entitled : *"Seagrass Rehabilitation for Environment Conservation"*

Compiled by : *Metropolitan Electricity Authority of Thailand (MEA)*

Presented by : *Assoc. Prof. Dr. Noparat Bumroongragsa, from Prince of Songkla University, Thailand, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

The global warming crisis has had a tremendous impact on environment and natural resources, particularly marine resources. Coastal erosion reduces biodiversity; the unusual emigration of marine species leads to significant changes in the food chain; and destruction of habitats of marine animals destroys sources of food and shelter. As a consequence, an essential source of food for humans has been reduced and has become a significant problem.

Seagrass is an important natural marine resource that provides shelter, food and oxygen to many marine species. Seagrass beds are fertile with many marine species due to accumulated soil organic material and nutrients that flow from the mouths of rivers. Seagrasses provide habitats, food, egg laying sites, and nursery grounds for young marine animals, especially rare species such as dugong and sea turtle. Furthermore, seagrasses are natural barriers that help reduce wave actions and protect coastal areas from erosion. They also help improve seawater quality.

Based on a 2006 survey by the Institute of Research and Development of Marine, Coastal and Mangrove Resources, Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, it was found that the seagrass area in Thailand covered around 92,900 rai (14,864 hectares), of which 58,700 rai (9,392 hectares) are in the Andaman Sea and 34,200 rai (5,472 hectares) are in the Gulf of Thailand. The deterioration of seagrass habitats has been caused by destructive fishing activities that use trawl nets and push nets near the coastal areas. Shrimp farming accelerates the increase of soil particulates in the seawater, resulting in the obstruction of the growth of seagrasses. Moreover, the rise of seawater temperature due to El Niño has also led to the deterioration of seagrass habitats. This has led to a major economic problem since the decrease in marine resources cannot cope with the growing demand for fish and other marine species.

Trang Province has the potential for extensive fisheries due the area's rich marine resources coastal environment. It has a seagrass area of 20,000 rai (3,200 hectare), which is the most fertile seagrass habitat in Thailand. The fisherfolk community and local administration organization play important roles in natural resources management and conservation. However, in the past, some fishermen used illegal fishing methods which damaged marine coastal resources, particularly the seagrass beds.

The Metropolitan Electricity Authority of Thailand (MEA) is aware of the importance of environmental conservation and the need to protect seagrass habitats. As a result, MEA set up the "Seagrass Rehabilitation for Environment Conservation Project", and collaborated with Trang Province to regularly conduct seagrass planting activities at Kangkow Island (Koh Kangkow), Tha Kham Sub-district, Pa Lian District, Trang Province, in 2009-2010. Participants in the activities included MEA executives and staff, media and residents of Trang Province including fishermen, and the youth.

Objectives

The objectives of the project were to conserve seagrass habitats as source of food and nursery grounds of coastal marine animals, especially dugong, a threatened species; enhance community participation in sustainable natural

resources management and help support local livelihoods; and enhance harmony among local communities through participation in seagrass planting activities.

Implementation

A survey was conducted to select suitable areas for seagrass replanting. MEA then selected an area in Trang Province that used to have abundant seagrass habitats but were reduced by both natural disasters and human actions. Planting of seagrasses would thus help rehabilitate the area and restore it to a more fertile stage.

Among 12 species of seagrass found in Thailand, MEA chose to plant *Enhalus acoroides.* They are grown in separated plot, i.e. 2,000 plants by clumps and 1,000 plants by seeds to compare the growth of seagrass.

Figure 1. Preparing seagrass for planting in the coastal area of Trang Province.

The project was then promoted among relevant organizations in the local community, so that local people, specifically the youth, would participate and learn to care for seagrass habitats.

A total of 200 participants including MEA executives, staff and stakeholders, government officials, local people and youths, participated in seagrass planting and releasing of marine animals. MEA ran a campaign among staff members to disseminate knowledge and raise consciousness of the importance of seagrass rehabilitation for environment conservation.

Figure 2. MEA Executives and staff members plant seagrass.

Figure 3. School children having fun planting seagrass.

Figure 4. Tourists also participated in seagrass planting.

The project was vigorously promoted through media to raise awareness of the importance and usefulness of seagrasses. This helped generate a better understanding among the general public of the relevance of seagrass beds and its impact on marine resources and environmental management.

Monitoring and measurement of the project implementation was conducted to evaluate the survival rate of seagrass and natural resources fertility.

Outcomes

The project led to the enhancement of biodiversity and increase of seagrass beds, which had a significant effect on the coastal marine ecosystem. Seagrasses biologically and physically enhance relationships in the ecosystem, and have thus led to the growth of marine species, such as mollusks, fish, crabs, clam worms or rag worms, magnificent sea anemone or ritteri anemone, nudibranchs, sea slugs, black sea cucumbers and even threatened species such as sea turtles and dugong. The growth of seagrasses in the reefs and mangrove areas will help reduce strong waves and currents, and enhance sediment capture. Moreover, seagrass can release nutrients to nearby ecosystem. The complexity of seagrass habitats is important in enhancing the diversity of marine species and fertility of the ecosystem.

The local community and relevant organizations have improved consciousness in conserving natural resources and participating in the wise natural resources management to enable fisherfolk to continue sustainable fishery practices.

The project also enhanced harmony among people in the local community through the common participation in natural resources conservation. It also raised the consciousness of natural resources conservation among the youth.

Monitoring and Measurement

MEA, together with the Trang Provincial Fisheries Office, and the Institute of Research and Development of Marine, Coastal and Mangrove Resources, surveyed the survival rate of the seagrass twice a year. The survival rate of seagrass depends upon several factors such as reproduction, growth, area condition, and species found near the seagrass plating area. The results will show the increase in seagrass cover and fertility in the area.

Results

The results in 2009 and 2010 showed that survival rates with sprouting clumps were 35 per cent and 25 per cent, respectively. After planting of seagrass, the land became muddy with nutrients from soil organic matter. Therefore, the seagrass beds were growing well and became habitats of various marine species.

More marine species were found after planting, such as giant tiger prawn *(Penaeus monodon),* green tiger prawn *(Penaeus semisulcatus),* blue swimming crab *(Portunus pelagicus),* serrated mud crab *(Scylla serrata),* three-spot swimming crab *(Portunus sanguinolentus),* and threadfin bream *(Nemipterus* sp.*).* Notably, the moon snail *(Polinices* sp.*)* was again recorded after disappearing from the area for several years.

Local fishermen became more aware of the importance of seagrass and marine natural resources conservation. They do not fish in the planting area, thus contributing to the speedy rehabilitation of the seagrass habitats.

The project also enhanced harmony between the government sector and community through their participation in seagrass planting activities.

Soil and Water Conservation Initiatives in Rehabilitating Degraded Tropical Karst Lands

Based on case study entitled : *"Rainfed Agriculture in Central Philippines : SWC Initiatives in Rehabilitating Degraded Tropical Karst Lands"*

Authored by : *Dr. Elpidio T. Magante and Dr. Rumila C. Bullecer, both from RCE Bohol-Bohol Island State University, Main Campus, Bohol, Philippines*

Presented by : *Dr. Elpidio T. Magante, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

The vast rainforests of Bohol island in Central Philippines have been largely stripped off, starting with almost 400 years of Spanish colonization (1521-1898), resulting in biodiversity loss, and vulnerability to erosion and landslides. This was aggravated during World War II and the ensuing postwar rehabilitation, which required the cutting of a large number of trees to rebuild homes and other structures. Slash-and-burn agriculture then became rampant from 1960s to the 1980s. As a result of decades of plunder, the forests of Bohol have now been reduced to grasslands and rangelands.

The hills in the village of Limocon in the town of Valencia in Bohol have become denuded, marginalized for crop production, and vulnerable to landslides after years of slash and burn agriculture. A 27-hectare site in the area became the subject of rehabilitation and development. Soil and water conservation initiatives (SWC) have since resulted in gradual but continuous development of the area.

Research and Methodology

A recent study documented the achievements and the processes utilized by the Bohol Island State University (BISU) in rehabilitating a typical degraded karstic old rangeland in Southeast Asia. The study gathered lessons and experiences and disseminated replicable development approaches involving farming communities.

Primary data were gathered mainly through actual field visits, investigation, documentation of personal notes of the area's development history, and discussion of the experiences of the principal author and main area developer. Photographs and documents of related events were taken from the University's official records. Informal interviews of the farm caretakers and key farmer-informants were also made.

The Study Site

About 50 percent of the Limocon HERM family farm (14 hectares) has been developed into forested areas (10 hectares) and agroforestry farms (4 hectares). Some 13 hectares still need to be developed. The area has an elevation of 100 to 120 meters above sea level. The topography is rolling to moderately steep. The geology belongs to the Upper Miocene-Pliocene (sedimentary rocks) and soils consist of Faraon Clay (primarily clay-loam). The microclimate is generally dry with peak rains from June to October and a daytime temperature of 27^0-29^0C for the most part of the year. Major crops grown in the village including the study site are corn, rice, vegetables and coconuts, bananas and root crops like sweet potato, taro and cassava.

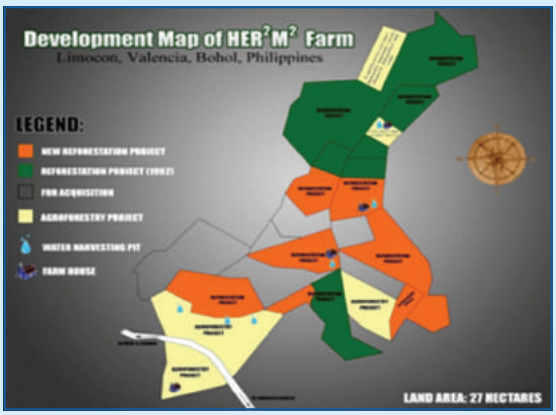

Figure 1. Development Map of HERM Farm in Limocon, Valencia, Bohol, Philippines.

Figure 2. Portions of the protected forests.

Early Development Initiatives

Protection of forest patches. The few forest patches amounting to about seven hectares have been protected since 1992. Tethering of carabaos or water buffalos, cattle and goats were prohibited inside and around these pocket forests to enhance natural regeneration and reduce soil compaction. The cutting or harvesting of trees was also prohibited. To increase protection, barbed-wire fencing was constructed in selected portions adjacent to neighboring pasture areas. This was deemed important to discourage animal owners from trespassing. Some of the adjacent lots were purchased by the principal farm developer to help save more land from further degradation. A decade after, the forest patches have become denser with enhanced regeneration.

Introduction of agroforestry. Farming has been practiced in a few selected spots of the area, usually at the foot of slopes and the narrow strips between hills where the soil is deeper and richer in nutrients. The agroforestry farms cover about four hectares. Trees and plants such as mango (on the periphery of the farms), coconut, cacao, coffee, lemon trees, jackfruit and some dipterocarps like *Shorea palosapis, Vatica mangachapui* and *Shorea contorta* were intercropped with corn, peanuts and root crops. As rehabilitation of the degraded slopes continues, hopes are high that these areas can soon be grown again with food crops.

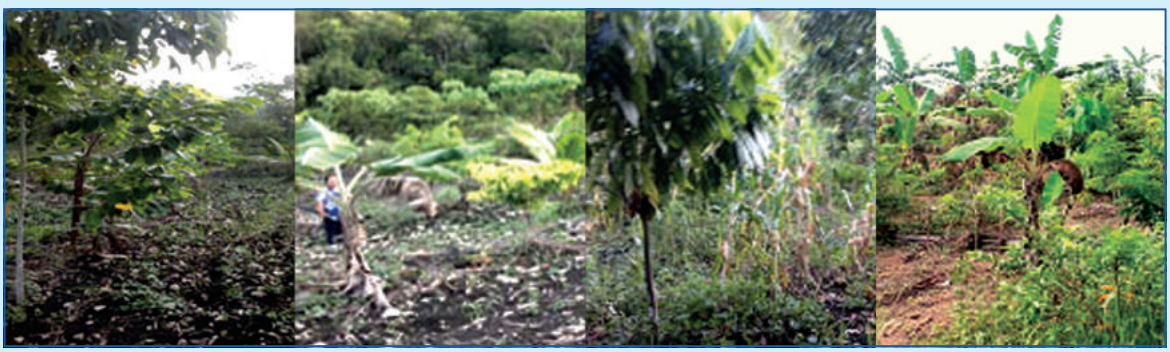

Figure 3. Agroforestry farms.

Figure 4. A portion of the contour farms.

Recent Developments

Tree Planting. Assisted natural regeneration and purposive planting have been conducted in the last five years. Native timber species such as the aforementioned dipterocarps and other indigenous timbers were planted in open areas dominated by *Cylindrica imperata, Lantana camara* and other associated weedy pioneers. Unfortunately, very small and barely plantable seedlings were mostly used and could hardly survive with moisture stress in the degraded environment. Replanting with bigger and pioneer-appropriate species has been recommended.

Contour Farming. In 2010, sustainable farming practices were initiated along slopes by establishing contour hedges and planting agronomic intercrops parallel to the contours with the strips. *Gliricidia sepium* was used as the main contour hedge. The strip crops included corn, sorghum, bananas, sweet potato and vegetables like *malunggay* and *sikwa.*

Introduction of SWC technologies through ERECON and ICRISAT. In the last couple of years, the University established linkages with the Institute of Environmental Rehabilitation and Conservation (ERECON) and the International Crops Research Institute for Semi-Arid Tropics (ICRISAT). Initial activities included a brief training of a few BISU personnel and farmers at the site on SWC measures through water harvesting (ICRISAT), and composting and mulching with soil in plastic bags around the base of the plants (ERECON).

Figure 5. Forging partnerships with ERECON and ICRISAT.

Four water harvesting holes have been made in strategic locations of the site where three have collected and retained water. The most appreciated impact so far is that farmers no longer need to bring down their water buffaloes from the hills to the watering hole below. Livestock owners can draw water from the water harvesting holes for the animals to drink or cool themselves.

Figure 6. Water harvesting holes.

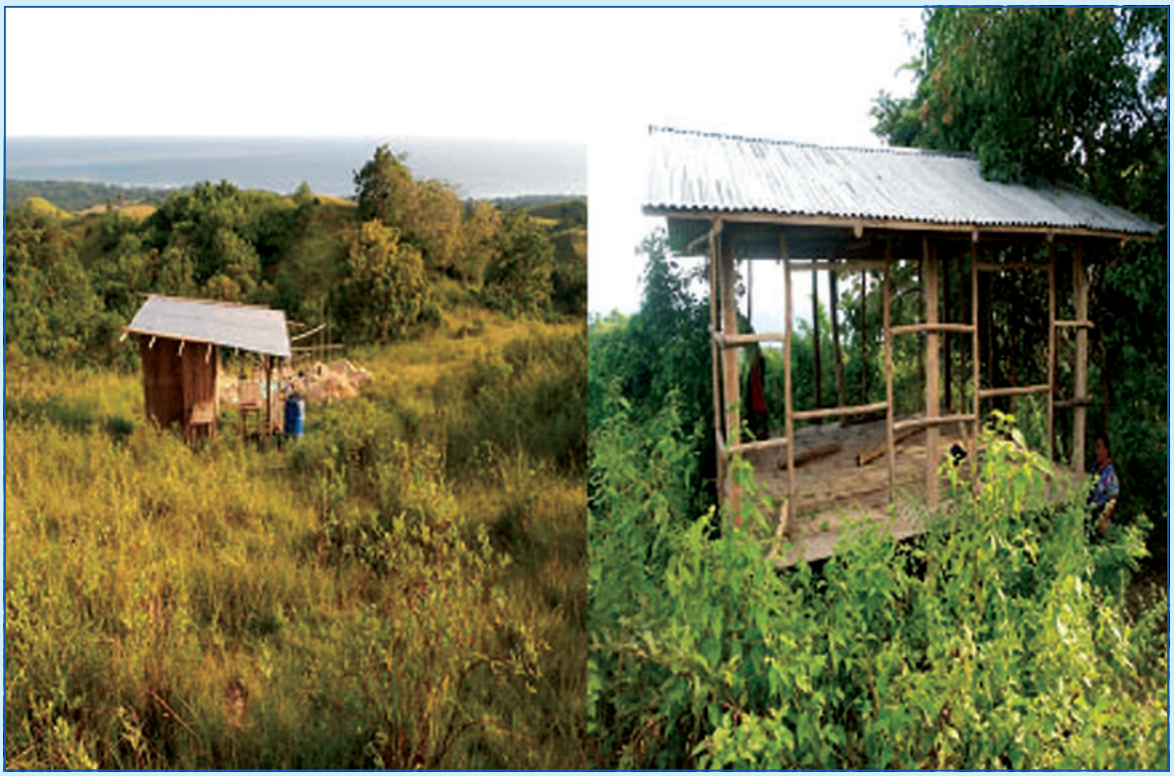

Figure 7. Under these farm huts are water harvesting holes.

Figure 8. Farmers are trained on mulching techniques.

Young coconuts which are mulched with the bagged soils around the base showed better growth performance. This same area had already resulted in the harvest of bananas, sweet sorghum and some vegetables.

A very important impact of the project is the capacity building of some 20 farmers, half of whom have already adopted the technologies. They were trained in contour farming and the use of bagged soil as contour barricades in slope cultivation and around plants such as coconuts as an SWC measure.

Lessons Learned

One of the major lessons of the experience was that restoring the productive and ecological services of the land requires more than just technical and material inputs. Hard work and a genuine, internalized interest in environmental conservation must be there to sustain the effort. There is also a need for resourcefulness when confronted with problems that demand swift decisions and actions.

It is never too late to rehabilitate degraded hilly grasslands. Involving the community at the incipient stage of land rehabilitation and restoration is important to ensure a concerted effort, faster spread of the technology and multiple learning.

There is still much to be learned about crop-site compatibility and adaptability in the HERM farm site conditions.

Moving Forward

Some 13 hectares of the area still need to be developed and rehabilitated. The more immediate concerns are the arrest or reduction of erosion on steep slopes through combined vegetative and structural methods; and ring-weeding, fertilization and watering of newly planted timber and fruit tree seedlings including some coconuts. These have to be done immediately and periodically until the plants are big enough to withstand growing space and light competition as well as moisture stress. Dying and barely surviving seedlings are best replaced with healthy vigorous ones.

Tree planting needs to be intensified but should also consider species priority and adaptability. Host species and food sources for birds, bats, butterflies and other wildlife species should be planted. Better area preparation such as providing bigger and deeper holes for planting needs to be practiced. Planting holes should be prepared with organic fertilizer and good soil.

The contour lines need to be properly relocated across slopes and hedgerows need to be improved and better managed, such as controlling the height of the *Gliricidia sepium* and other contour plants.

New water harvesting holes need to be strategically located near tree and horticultural nurseries and vegetable plots. There is also a need to improve moisture supply of newly planted seedlings through mulching.

More composting structures need to be constructed to produce more compost in strategic locations, especially with new planting areas.

More farmers can also be encouraged to try and adopt SWC methods in farming. Further research on SWC applications and their impact on growth, yield of plants, and land productivity can help propagate the practice and improve methods. Periodic collection of data and record keeping on growth and yield performance of crops, trees, pests and disease incidence, soil improvement, and biodiversity will help refine SWC methods.

Integrated Mangrove-Fishery Farming System

Based on case study entitled : *"Integrated Mangrove-Fishery Farming System"*

Authored by : *Dr. Vaithilingam Selvam, from M.S. Swaminathan Research Foundation, India*

Presented by : *Dr. Vaithilingam Selvam, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Livelihood security of coastal communities and ecological security of the coastal zones of India are under stress due to high population density, urbanization, industrial development, high rate of coastal environmental degradation, and frequent occurrence of cyclones and storms. The lives of more than 100 million people have been affected as they directly or indirectly depend on coastal natural resources for their livelihood. The problem is further aggravated by an expected increase in sea level due to climate change. An estimate indicates that the predicted sea level rise would lead to the inundation of about 5,700 km^2 of land along the coastal states of India and affect nearly seven million coastal families. Farming families and fishers, fish farmers and coastal inhabitants will bear the full force of these impacts through less stable livelihoods, changes in the availability and quality of fish, and rising risks to their health, safety and homes. Many fisheries-dependent communities are already vulnerable because of poverty, lack of social services and essential infrastructure. The fragility of these communities is further undermined by overexploited fishery resources and degraded ecosystems.

However, the projected increase in sea level rise and consequent salinization of land provide an opportunity to increase fish production through aquaculture. It is predicted by the Coastal Zone Management Subgroup of the Intergovernmental Panel on Climate Change that in many coastal areas, people would modify land use patterns and subsystems to ensure that such changes address new threats such as salinization and flooding due to climate change. One of the major predicted land use changes is the conversion of saline affected agriculture lands into aquaculture farms. However, the current situation of aquaculture in India warrants more responsible and sustainable aquaculture systems and practices. Development and demonstration of new approaches such as seawater/brackish water based integrated agro-aqua farming system would not only ensure livelihood security of the poor coastal families and ecological security of the coastal areas but also enhance adaptive capacity of coastal communities to sea level rise and climate change.

Current Scenario in Aquaculture in India

In India, aquaculture mainly refers to coastal land based shrimp farming or prawn farming. This emerged as an important sector for fisheries in late 1980s and is characterized by small-scale family-operated farms. Currently, more than 150,000 farmers are growing prawns in about 160,000 hectares of brackish water areas both on the east and west coasts of the country. During the early phase of prawn farming, the semi-intensive culture system was followed, which increased prawn production at the rate of 8.4 per cent per year until the mid-1990s. After that, coastal aquaculture suffered setbacks in terms of production, value and acreage. As a result, shrimp production, which was around 1.06 million tons in 2007-2008, has come down to 0.76 million tons in 2008-2009. Monoculture, disease, poor seed quality, excessive use of artificial feeds, increased input costs and decreased market value were the major factors that contributed to the decline in aquaculture production. Poor environmental management and lack of different activities to diversify livelihoods within the aquaculture farming system were also responsible for the current status of coastal aquaculture in India.

The social impact of decline in prawn farming is enormous. Many of the farmers, who converted their agricultural land into aquaculture farms, are now getting no income from either agriculture or aquaculture. Many of these families now migrate either temporarily or permanently in search of employment and livelihood. In this situation, the Integrated Mangrove Fishery Farming System (IMFFS), wherein cultivation of mangroves, halophytes (salt-loving plants) and culture of fish, crab and prawn are integrated, provides some tangible solutions to sustain coastal aquaculture and also strengthen resilience of coastal communities. This also provides an opportunity to integrate livelihood and the mangrove bioshield.

Integrated Mangrove Fishery Farming System

Design. Most of the prawn farms in India are rectangular shaped earthen ponds of about one hectare in size and a cluster of farms contains about 5 to 20 ponds. They are pump-fed – brackish water is periodically pumped in and out of the ponds to maintain water quality - and a kind of semi-intensive type of culture system is followed. Hatchery produced post larvae of prawn are transferred to ponds where they are fed with artificial feed until they reach marketable size, which takes about four to six months. As a result of this practice, the cost of inputs is always high and artificial feeds increase organic load leading to pollution.

In the Integrated Mangrove Fishery Farming System (IMFFS), earthen ponds are designed to provide space for growing saline-tolerant vegetations including mangroves and halophytes. Space for planting is created by constructing bunds inside the pond in a zigzag manner or as small mounds *(Figures 1 and 2).* These bunds and mounds can be created by digging the soil from the bottom of the pond. This will also make the pond deeper and below the tidal level. As a result, tidal water will fill the pond by gravitation during high tide and drain out during low tide. The pond can be made deeper to allow three feet of water to remain in the pond as standing water. The tidal water inlet and outlet can be established at opposite ends or a single structure can be used both as inlet and outlet. The ponds will be designed in such a way that nearly 30 to 35 per cent of the space is left for planting mangroves and halophytes whereas the remaining 70 to 65 per cent is left for holding seawater for fish culture.

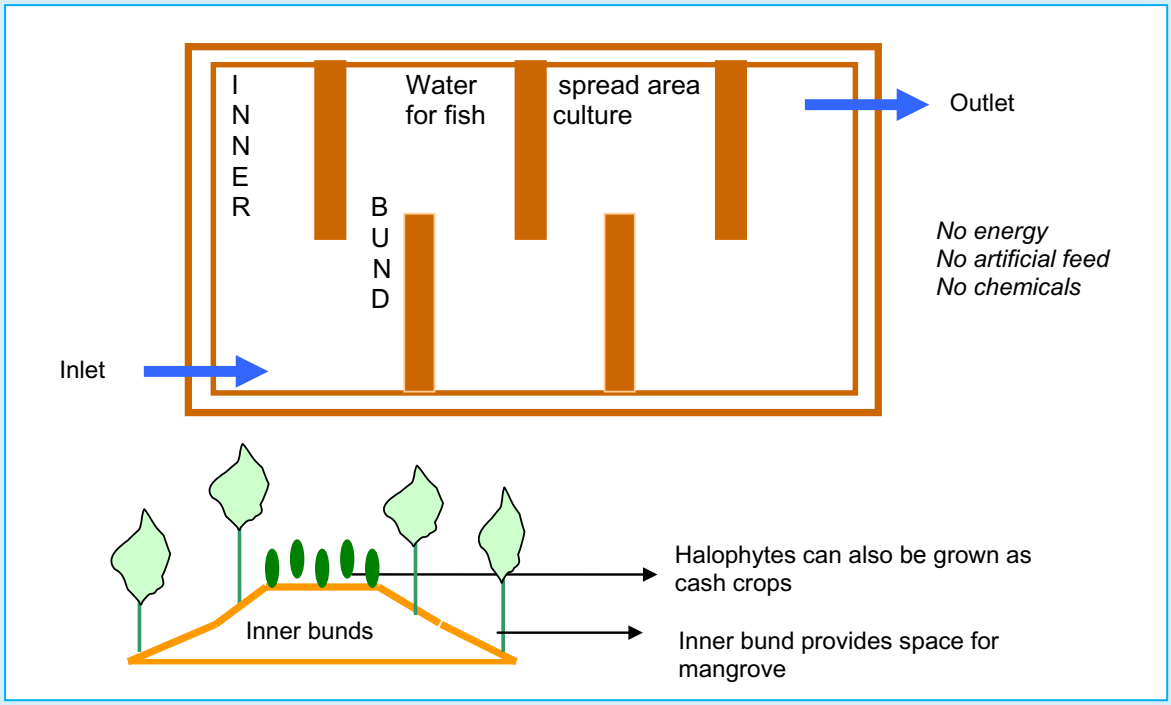

Figure 1. Design of a seawater based integrated agro-aqua farming system with inner bunds.

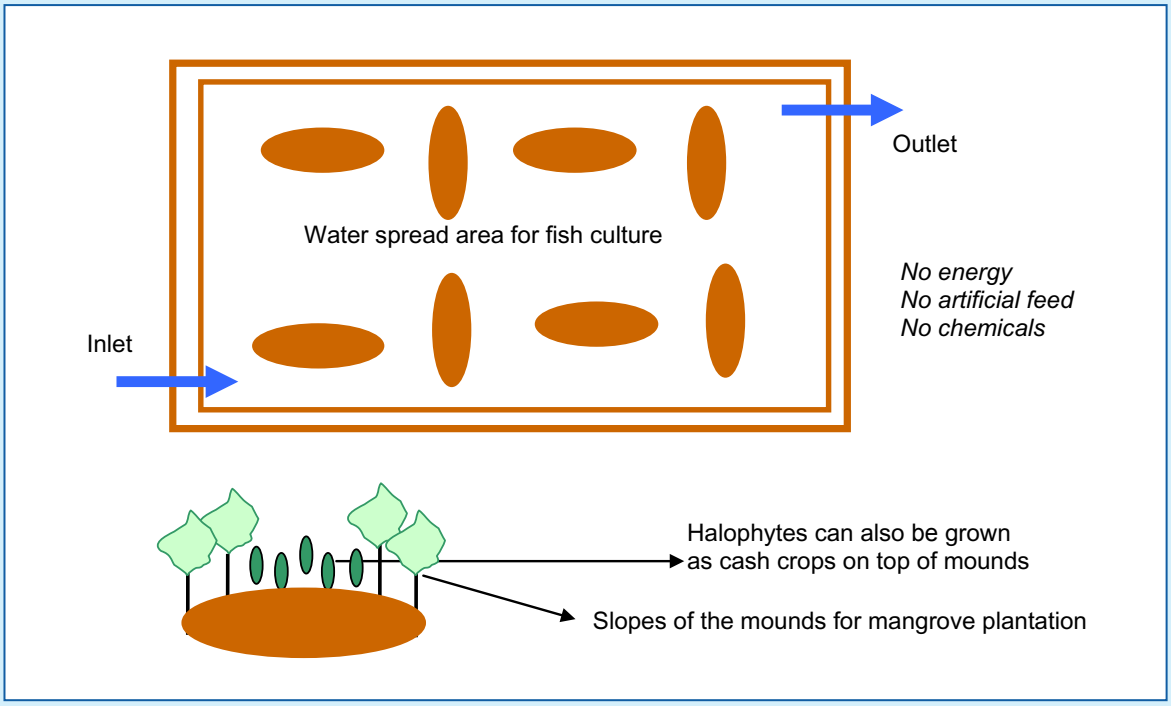

Figure 2. Another design of the seawater based integrated agro-aqua farm with earthen mounds.

Advantages. In IMFFS ponds, mangrove trees can be grown along the inner and outer bunds and mounds. On top of the bunds, halophytes such as Sesuvium or Salicornia can be cultivated. Fish can be grown in the water spread area. The mangrove plants, when they grow as trees in about 4 to 5 years, will act as a bioshield. They also provide necessary nutrients and feeds for fish, crabs, or prawns growing in the pond. The matured leaves, twigs and other plant matter, which fall into the water, will degrade and release nutrients and result in the formation of detritus or decomposed matter. These detritus particles become substrate for bacteria and fungus to grow, and they convert nitrogen present in the detritus into protein. In addition, a variety of enzymes are also produced during the process of decomposition. The presence of nitrogen, carbon, protein, enzymes, and fungi and bacteria increase the nutritive value of the detritus. Both crabs and prawns nourish detritus and thus, they get naturally balanced feeds. Thus, IMFFS ponds are ideal for the extensive culture of fish, prawn and crabs. Many halophytes, which are salt loving plants, can be grown as commercial crops on top of the bunds and can be harvested periodically for marketing. In the water spread area, initially fish and prawn can be grown together and later crabs can be cultivated.

Another advantage in the IMFFS is that only very limited energy is required for operation. Since water is exchanged daily by tides through gravitation, pumping water in and out of the ponds to maintain water quality is not required. Also there is no need to use an aerator to increase the oxygen content of the water. Secondly, daily exchange of water brings in fresh food in the form of planktons (microscopic plants and animals that float and drift in large numbers in sea and brackish water). This means there is no need to use artificial feeds. Zero use of energy and natural feeds significantly reduce input cost and prevent environmental pollution.

Experiments in Integrated Mangrove Fishery Farming System

An Integrated Mangrove Fishery Farming System has been established in partnership with a private entrepreneur and the local community in the Pulianthurai region of Nagapattinam District. This farm occupies an area of about one hectare and development of IMFF system was began in 2006. This farm has physical provisions in the form of inner bunds to grow mangroves and halophytes and enough water spread areas to culture fish, prawn and crabs.

Mangrove plantation. A total number of 1,723 *Rhizophora* saplings and 327 *Avicennia marina* saplings were planted in February 2006. *Rhizophora* saplings were planted in two rows along the lower edges of the bund whereas *Avicennia* saplings were planted about 2 meters above the *Rhizophora* plantation. Both *Rhizophora* and *Avicennia* were planted at 5 meters intervals in a row. Data on growth parameters of both *Rhizophora* and *Avicennia* were collected at three-month intervals and survival rate was observed once a month. At the end of a year, the survival rate of *Rhizophora* was about 70 per cent and that of *Avicennia* was 90 per cent. The average height of *Rhizophora* after one year was about 0.74 meters and the average number of leaves per plant was 36. The average height of *Avicennia* was only 0.21 meters. The reason for the low survival rate of *Rhizophora* was pest attack, which is not normally observed in wildlings. One species of sap-sucking scale insect of the Cicadae family was found affecting the leaves of the *Rhizophora* plants. This pest attack was noticed in 28 plants (1.6 per cent of the total population) and all of them died before control measures could be taken. It was observed that the attack by scale insect was severe when the salinity of the water in the farming system goes below 24 ppt. To prevent infestation, the plants were sprayed with different concentrations of neem oil, which showed that 5 per cent solution was very effective, when sprayed three times at an interval of 15 days. In March 2006, all the dead *Rhizophora* saplings were replaced with two-year-old nursery grown saplings. At the end of November 2009, all *Rhizophora* and *Avicenna* saplings were found surviving and *Rhizophora* reached an average height of 2.26 meters with about 46 stilt roots. *Avicennia* reached a height of about 1.69 meters with more than 60 aerial roots.

Halophyte plantation. A succulent halophyte namely, *Sesuvium portulucastrum,* which has commercial potential as a component of salads, was planted on the top and sides of the bunds in January 2007. Stem cuttings of about 15 cm in length were planted at an interval of 1 meter. The fresh weight of the plantation, measured at monthly intervals, showed that values increased from 542 g/m^2 in September 2007 to 1,132 g/m^2 in January 2008 and about 1,344 g/m^2 in April 2009. Observation indicates that the growth of this plant reaches its peak only during the northeast monsoon season.

Figure 3. A view of the Integrated Mangrove Fishery Farming System showing the inner bunds, outer bunds, mangrove plantation, halophytes and water spread area - April 2007.

Figure 4. A view of the IMFFS farm in October 2009.

Figure 5. Harvesting fish in the IMFFS pond.

Figure 6. Harvested sea bass fish.

Figure 7. Model IMFFS developed with participation of fishing community.

Experiments in Fish Culture

The local fishing community, who was involved in designing the IMFFS until monitoring, was satisfied with the mangrove and halophyte cultivation on the bunds. However, the villagers stated that the income from sea bass culture was limited. They suggested that fish mullet and tiger prawn can be grown together, which would fetch more income. In a one-hectare pond, 1,000 prawn juveniles and 2,000 fingerlings of mullet can be stocked with a stocking density of one prawn and 0.2 fish per sq. m. It is expected that there would be approximately 60 per cent of survival for prawn and 50 per cent for fish and an average body weight of 50 grams for prawn and one kilogram for fish. This would fetch a profit of about INR.40,000 / (USD 800) in 8 months. In another proposed experiment, about 4,000 fingerlings of sea bass will be cultured in a one-hectare pond with a stocking density of 0.4 fish per sq.m. The size of the stocking fingerlings will be 10 cm. An innovative practice will be followed to enhance survival and growth rate of sea bass. All the fingerlings will be first conditioned for the IMFFS environment in a happa in which brooders of tilapia fish will be introduced. They will act as biofeed by supplying young ones to sea bass during conditioning. It is expected that approximately 50 per cent of the fish will survive; at the end of eight months the body weight will increase to about 750 grams. It is expected that INR 70,000 (USD 1,400) to 80,000 (USD 2,000) will be generated as net profit at the end of eight to ten months.

Conclusions

Until December 2009, more than 1,500 fishermen including fish farmers, officials from Fisheries Department and specialists in coastal livelihood have been exposed to IMFFS. As an approach to the rehabilitation of derelict abandoned shrimp farms in the coastal belt, the IMFFS model has huge replication potential both at the national level and in the global arena. It would take care of both livelihood and ecological need of the coastal areas. While suitable for high saline areas, IMFFS is appropriate for suitable for sandy coastal areas.

IMFFS is highly suitable for crab culture. The root system of mangrove trees would provide shelter and food to a commercially valuable crab called mud crab or mangrove crab. Raising mud crabs is difficult in open aquaculture ponds because they easily climb the bund and move out. Secondly, mud crabs are cannibalistic and weak moulted crabs are killed and eaten by strong unmoulted crabs in the absence of any shelter. It is expected that when mangrove trees grow, its root system would provide a natural environment for the crabs and thereby prevent migration of crabs. The intricate root system would provide protection to moulted crabs. Most importantly, crabs are detritivourus (feed on detritus) and mangrove trees ensure availability of enough detritus for crab culture.

In terms of species, it is important to avoid carnivorous species. Rope culture of mussel can be tried in the pond along with fish culture since there is great demand for mussel in Kerala.

The main weakness of the system is initial costs (about INR 200,000 per acre – USD 4,000). A thorough study on economics of the farming system should be worked out to start the replication process. IMFFS should also be tried on a large scale and lessons learned from such trial should be used for replication.

Availability of land is the biggest issue though a large tract of saline affected lands are available in the coastal area of Tamil Nadu, most of which belong to government agencies. A remedy would be the development of policy support to allotting land to IMFFS.

Natural Resource Restoration for Income Generation and Sustainable Biodiversity

Based on case study entitled : *"Natural Resource Restoration for Income Generation and Sustainable Biodiversity in Mondulkiri, Cambodia"*

Authored by : *Dr. Lalita Siriwattananon, from RCE Greater Phnom Penh, Bunthan Ngo, from Royal University of Agriculture, Phnom Penh, Cambodia and Machito Mihara, from Institute of Environment Rehabilitation and Conservation, Tokyo University of Agriculture, Japan*

Presented by : *Dr. Lalita Siriwattananon, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Agriculture is one of the most important sectors of the Cambodian national economy, engaging more than 70 per cent of the total population. Rapid development of agricultural technologies depending on agricultural chemicals such as synthetic fertilizers, herbicide or pesticide has significantly increased agricultural production since 1990. However, intensive farming practices that heavily depend on agricultural chemicals cause adverse impacts on the natural environment and human health. The overuse of synthetic agricultural inputs damages long-term soil fertility and productivity of farmlands. Released from farmlands downstream, these chemicals degrade river systems and water quality. As a result, there has been a greater need for education for sustainable development (ESD) in the agricultural sector to ensure food safety and environmental conservation in Cambodia. Part of the efforts to promote ESD in Cambodia includes the establishment of RCE Greater Phnom Penh (RCE GPP) in December 2009.

RCE GPP builds public awareness and strengthens the importance of harmonizing agricultural development and the conservation of the natural environment. Stakeholder organizations include the Royal University of Agriculture (RUA) and Institute of Environment Conservation and Rehabilitation, Cambodia Branch (ERECON CaM), which works as coordinator of RCE GPP in the Secretariat Committee; Ministry of Agriculture, Forestry and Fisheries (MAFF); Ministry of Rural Development (MRD); Ministry of Education, Youth and Sports (MEYS); Ministry of Environment (MOE); and elementary schools and local organizations in target areas. In addition, Tokyo University of Agriculture (TUA), Institute of Environment Conservation and Rehabilitation (ERECON), and Association of Environmental and Rural Development (AERD) are part of the external advisory panel of RCE GPP.

In some areas of Cambodia, deforestation has advanced since the 1970s due to the expansion of agricultural lands under the Pol Pot regime. This resulted in severe flooding or drought downstream, environmental degradation and loss of biodiversity. These factors have strengthened the need to promote the restoration and conservation of the environment as well as the sustainable use and management of natural resources.

Collaboration

RCE GPP and ERECON have been collaborating with the Ministry of Environment of Cambodia and the United Nations University Institute of Advanced Studies for three years (2011-2013) through the project entitled "Natural Resource Restoration for Income Generation and Sustainable Biodiversity in Mondulkiri, Cambodia". The project focuses on environment restoration for income generation and sustainable biodiversity and has been implemented in two villages, namely Poutrom Mouy and Poutrom Pi in Mondulkiri province. The main occupation of villagers is agriculture with slash and burn practices. Forests have thus been cleared for agricultural purposes and timber. The main source of income comes from non-timber forest products, especially gum and resin from *Dipterocarpus* trees and wild honey. For many years, the local environment has been used extensively by local people without understanding the effects of deforestation on the environment and human wellbeing.

The project focuses on increasing local awareness of the importance of environmental conservation and restoring natural resources to generate a sustainable income and enhance biodiversity. Project activities include the introduction of sustainable agriculture, multi-cropping, agro-forestry and reforestation. Activities geared towards elementary schools are also implemented to educate children on the significance of biodiversity conservation.

Target Villages

The target villages are located in areas at 560 to 630 meters above mean sea level. The villagers are mainly from the ethnic group called Phnong, and their farming system is based on the slash and burn practice. In the villages, the forest area decreased from its original size in the past 30 years as the villagers cut trees for agricultural cultivation and collected timber to sell at markets. Agricultural practices in this area are also based on cropland rotation and shifting cultivation. Normally, villagers would divide agricultural land into two or three parts and practice shifting cultivation every few years.

Land Use Changes

The forest area is now only 20 per cent of the forest cover 30 years ago. For crop cultivation, the villagers used to grow rice associated with corn, banana or pineapple. However, there was a tendency for the rice yield to decrease each year. Villagers currently plant more fruit trees such as cashew nut, jackfruit and mango, which give them income. To address their daily needs, new areas are cultivated for rice and other crops through the slash and burn practice.

Crop Production

Currently, the main crop is rice, which is mainly produced for household consumption, while the main source of income is from collecting fruits, gum, resin and honey. Crop schedules are: rice cultivation, May to December; cassava cultivation, April to December; pineapple cultivation, whole year; corn cultivation, April to July; and pumpkin, cucumber, gourd or marrow cultivation, April to September.

Types of Forest

The types of forest in the target villages include natural forest managed by government; forest community area managed by committee members of the villages; and forest in the villagers' farmlands (rotation farms managed by ethnic group). In the past, the Phnong had access to any land in the forest and would plant anywhere. However, since a land tenure system has been established by the government, there are now specific boundaries for each household based on the household size. The area assigned to each household ranges from two to five hectares. As such, each family has its own land and holds the right to use resources in their specific areas.

Utilization of Natural Resources

Forest resource utilization. Natural resources such as wood and hedges are used in household

Figure 1. Deforestation for agricultural and wood purposes.

construction or are sold at the market. Collecting gum and resin is also popular in the villages. The most important tree for the villagers is *Dipterocarpus retusus,* which produces gum. The villagers try to keep this species on their own land or community area. However, forest resources continue to decrease each year due to deforestation.

Water use for agriculture. Water collected from rainfall or a small stream is used for irrigating crops. These, however, are not enough, especially in dry season.

Water use in household. Water collected from rainfall, groundwater or a small stream is used for household consumption. However, these are not enough to support daily consumption. When there is no rain, the villagers pray to the guardian spirit to ask for rain. They have also asked the provincial government for a deep well and set up a pumping system from the well. Although the villagers used to cut trees, they do believe that drought can be attributed to lesser trees in the villages.

Official management system for natural resources. Organizing the local community as well as setting regulation is ongoing. It is expected that natural forest in the community can be managed well by the local community. In addition, local authority may collaborate with local community to prevent illegal logging.

Activities and Outcomes

To promote the rehabilitation and sustainable use of natural resources, various workshops and seminars were conducted at the community level and at elementary schools. Surveys of natural resources helped local people understand the sustainable use of resources, relationships between livelihoods and natural resources, and the degree of degradation of natural resources. A plant nursery system has been set up and reforestation activities are conducted with local people as well as elementary school students. These activities help realize the final goals of this collaborative project, which are to enhance sustainable use of natural resources, create harmony between people and nature, and increase local awareness on environmental conservation.

Survey on effective approach for sustainable use of natural resources by local people. The survey evaluated the utilization of natural resources by local people, the relationships between livelihoods and natural resources, and the degree of degradation of natural resources. The effectiveness of participatory methods was also assessed through the observation of the activities to ensure sustainable resource management.

Figure 2. Interview and survey on the effective approaches to sustainable use of natural resources by local people.

Figure 3. Workshops and seminars for increasing local awareness on sustainable use of natural resources.

Promotion of sustainable use of natural resources. Workshops and seminars on restoring and conserving natural resources were conducted to raise awareness of local people and elementary school students. Leadership trainings and symposia were organized, and pamphlets were distributed to promote environmental protection.

Reforestation. Nursery systems for growing nursery trees were set up for reforestation activities, and to establish forests in the elementary schools.

Promotion of eri-culture, multi-cropping, gum, resin and honey productions in socio-ecological production landscapes for sustainable use of natural resources. Eri-culture, multi-cropping, gum, resin and honey productions were promoted to deepen environmental awareness and to raise income for local farmers. The cultivation of eri silkworm was promoted since its cocoon is very unique. It has a so-called 'nano-tube structure', which has high ultraviolet protection and high moisture absorbency.

Some of the hosts of eri silkworm are leaves of castor, cassava and papaya, which can be found in the villages and are not utilized. Local people can easily start eri-culture without any change of

Figure 4. Setting up tree nursery system for reforestation.

Figure 5. Promotion of eri-culture, multi-cropping, gum, resin and honey productions.

their land use. Eri-culture is also a good strategy for the sustainable use of natural resources because the eri silkworm is very sensitive to any kind of chemical substance. This will allow people to see the effect of chemical pesticides, cigarette smoke, and smoke from burning plastics, among others. To conduct eri-culture, local people need to stop or at least reduce usage of chemicals. Eri-culture may be an indicator of a clean environment as well as an educational tool for sustainable development.

Conclusion

This collaborative project deals with natural resource restoration to generate income and promote sustainable use of biodiversity in Mondulkiri. To promote sustainable use and management of natural resources with the collaboration of local communities, NGOs, elementary schools and the local government, various workshops and seminars were conducted at the local community-level and at elementary schools.

In the initial stage of the project, a survey was conducted to evaluate the utilization of natural resources by local people, relationships between livelihoods and natural resources, and the degree of degradation of natural resources. Plant nursery systems were set up and reforestation activities were conducted with local people and elementary school students. After the first seminar, the people became very interested in growing various types of trees in the nursery and are now planning to plant more trees around their communities. According to feedback from the target villagers, this project has provided a significant contribution to their understanding of natural resource management.

The series of activities under the project have increased the motivation of the villagers to protect their environment and have enhanced harmony between people and nature. Their awareness of the need to protect the environment has encouraged them to continue to participate in more activities to ensure the sustainable use of local resources.

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Species Composition of Freshwater Fishes in Nong Han Wetland

Based on case study entitled : *"Species Composition of Freshwater Fishes in Nong Han Wetland, Sakon Nakhon Province, Thailand"*

Authored by : *Dr. Puvadol Doydee, from Kasetsart University : Chalermphrakiat Sakon Nakhon Province Campus, Thailand*

Presented by : *Dr. Puvadol Doydee, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Nong Han Wetland (NHW) is the biggest lake in Northeast of Thailand, which is located in Sakon Nakhon Province. The wetland covers 7,456 hectares with about 0.75 meters in average depth and 158 meters elevation.

Linked to the Mekong River, NHW is a freshwater reservoir dominated by several species of aquatic flora and fauna. Aquatic vegetation in this wetland contributes to habitat complexity and diversity of freshwater fishes. This ecosystem is very important in terms of local business and biodiversity conservation since it supplies water for human use, and fish for food and income of the local community. The variety of fishes also provides various ecosystem services, such as the control of algal bloom. Nong Han Wetland thus plays a significant role in terms of ecological services, food security and community business.

An important undertaking in biodiversity conservation of freshwater fishes is defining its species composition and other related issues essential to resource management. Hence, a study was conducted to investigate the species composition of freshwater fishes in NHW; determine the dominance and rarity of species of freshwater fishes; and study the index of similarity to understand their structure and know what fishery resources are available for utilization and which species must be conserved.

Study Area

Nong Han Wetland in Sakon Nakhon Province, Thailand is composed of littoral and limnetic zones where high and low density of aquatic plants occurs. It is located in the Northeast of Thailand, 614 kilometers from Bangkok, and is part of the Greater Mekong Sub-region. The study area was suited around 17°11'56" N latitude and 104°11'9" E longitude. There are 18 islands in NHW, which serve as natural habitats for various species of birds, reptiles and amphibians. Two sites were selected based on water depth and aquatic plants density. Two difference sites were Don Chaing Ban and Don Sawan *(Figure 1)*. Site selection was based on layout of satellite image and actual field survey using Global Position System (GPS).

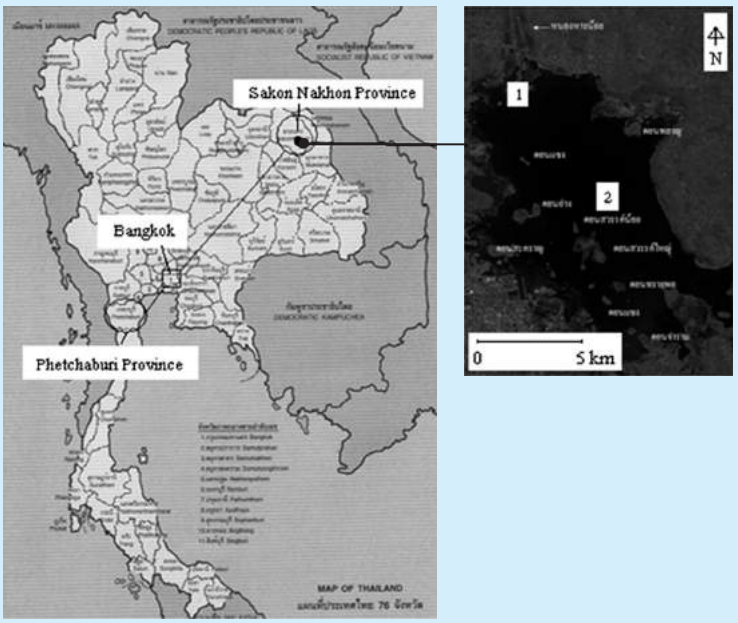

Figure 1. A study area in NHW, Sakon Nakhon Province, Thailand: Don Chaing Ban, littoral zone (1) and Don Sawan, limnetic zone (2).

Data Collection

The coordinates of the two sampling sites, Don Chaing Ban and Don Sawan, were recorded using GPS and validated with the geo-referencing method to display the collecting localities on the map. *Figure 2* presents the general overview of the two sampling sites. Gill nets, measuring about 2,000 meters in length and 2 meters in depth in different mesh sizes, were used for collecting freshwater fish from March to April 2011.

Results and Discussion

At least 23 species of freshwater fish were collected and identified *(Table 1),* where species richness had higher records in the littoral zone than the limnetic zone. Seven species of freshwater fish were gathered at every collection period, namely: *Puntius brevis, Hampala dispar, Oxyeleotis marmoratus, Tetraodon leiurus, Henicorhynchus siamensis, Osteochilus hasselti* and *Notopterus notopterus.* Four species were identified as both rare and indigenous *(Mystus nemurus, Trichogaster trichopterus, Channa striata* and *Macrognathus siamensis) (Table 1).*

Figure 2. Overview of aquatic plants and water bodies in the two study sites in NHW, Sakon Nakhon Province, Thailand: Don Chaing Ban (1) and Don Sawan (2).

Table 1. List of Freshwater Fish in Two Study Sites in Nong Han Wetland. Sakon Nakhon Province, Thailand: Don Chaing Ban (1) and Don Sawan (2) – March – April 2011.

No.	Vernacular name	Common name	Scientific name (Families)	Sites of Collection			
				March		April	
				1	2	1	2
1	Pla kod lueng	Yellow mystus	*Mystus nemurus* (Bagridae)	+	-	-	-
2	Pla kradi mor	Three-spot gourami	*Trichogaster trichopterus* (Anabantidae)	+	-	-	-
3	Pla krasub jud	Eye-spot barb	*Hampala dispar* (Cyprinidae)	+	+	+	+
4	Pla kam cham	Red-cheek barb	*Puntius orphoides* (Cyprinidae)	+	-	+	+
5	Pla kayang kang lay	Iridescent mystus	*Mystus multiradiatus* (Bagridae)	-	+	-	+
6	Pla chon	Striped snakehead fish	*Channa striata* (Channidae)	+	-	-	-
7	Pla Cha on	Butter catfish	*Ompok bimaculatus* (Siluridae)	+	+	-	+
8	Pla sa	Barb	*Labiobarbus siamensis* (Cyprinidae)	+	-	+	-
9	Pla ta pien khao	Common silver barb	*Barbodes gonionotus* (Cyprinidae)	+	-	+	-
10	Pla ta pien say	Golden little barb	*Puntius brevis* (Cyprinidae)	+	+	+	+
11	Pla bu say	Marbled sleepy goby	*Oxyeleotris marmoratus* (Eleotridae)	+	+	+	+
12	Pla pak pao	Puffer fish	*Tetraodon leiurus* (Tetraodontidae)	+	+	+	+
13	Pla pan kra jok	Siamese glassfish	*Parambassis notatus* (Centropomidae)	+	+	-	-
14	Pla soy khao	Jullien's mud carp	*Henicorhynchus siamensis* (Cyprinidae)	+	+	+	+
15	Pla soy nok kao	Bonylip barb	*Osteochilus hasselti* (Cyprinidae)	+	+	+	+
16	Pla salad	Grey feather back	*Notopterus notopterus* (Notopteridae)	+	+	+	+
17	Pla seao dam	Bornean leaf fish	*Nandus nebulosus* (Nandidae)	+	+	+	-
18	Pla sai tan ta dang	Beardless barb	*Cyclocheilichthys apogon* (Cyprinidae)	+	-	+	+
19	Pla na mong	Lini barb	*Osteochilus lini* (Cyprinidae)	+	-	+	-
20	Pla mo chang yeap	Striped tiger nandid	*Pristolepis fasciatus* (Nandidae)	+	-	+	-
21	Pla mo tes kang lay	Striped tilapia	*Oreochromis melanopleura* (Cichlidae)	-	+	-	+
22	Pla mo thai	Common climbing perch	*Anabus testudineus* (Anabantidae)	+	-	+	-
23	Pla load	Spotted spiny eel	*Macrognathus siamensis* (Matacembelidae)	+	-	-	-
Total species in each site				21	12	15	12

Figure 3. The dominant freshwater fishes in NHW, Sakon Nakhon Province, Thailand: *Puntius brevis (1) and Cyclocheilichthys apogon (2).*

Among all species, the golden little barb *(Puntius brevis)* and the beardless barb *(Cyclocheilichthys apogon) (Figure 3)* were the most common. The beardless barb fishes were collected in all sites except at Don Sawan during March 2011. The presence of these fishes implied that their food sources were readily available. It also meant that they were adapted to the environmental conditions of the wetland. They are economically important species and are used for making salted and fermented fish, or are sold as ornamental fish, thus generating income for local people engaged in small scale fisheries businesses.

The study revealed that the highest species richness of freshwater fish was in Don Chaing Ban (littoral zone) with 21 species. The variety of aquatic plants that serve as habitats and food for the freshwater fish may account for the species richness and conservation of fish species. Twelve species of fish were identified in Don Sawan, which implies that there might be less ecosystem support for a richer variety species. However, as this zone is in the open water where there is an abundance of plankton, freshwater fish in this site is likely bigger in size (length and weight) than in Don Chaing Ban.

Table 2. Index of Similarity (of Freshwater Fish in Two Study Sites in Nong Han Wetland, Sakon Nakhon Province, Thailand: Don Chaing Ban (S1) and Don Sawan (S2), March-April 2011.

Variables	March	April
No. of species in site 1 (S1)	21	15
No. of species in site 2 (S2)	12	12
No. of same species (C)	10	9
S1+S2 = (A)	33	27
2C = (B)	20	18
(B)/(A) = (D)	0.61	0.67
Index of Similarity (IS) = [(D) x 100]	60.61	66.67

Index of similarity (IS) of freshwater fish in NHW was also studied to examine the percentage of IS between the two sampling sites. The study found that the IS has higher value (66.67) during the collection in April 2011 *(Table 2).* This implies the even distribution of fish species and the low rate of movement in search of food since the fish will normally be laying eggs around the middle of May each year. As a result, the Department of Fisheries declared 16 May-15 September each year as the closed season for catching fisheries in Thailand.

There is less species richness in this study compared with others that have listed more than 40 species of freshwater fish observed in NHW. This implied that fishery resources are declining probably due to over exploitation and habitat degradation.

Conclusion

Nong Han Wetland is a complex ecosystem with rich aquatic flora and fauna. The wetland plays an important role in ensuring the supply of fresh water for human use and consumption while also serving as habitat for many organisms.

NHW was studied to determine species composition of freshwater fish in shallow and open waters from March to April 2011. Gill nets were used for the collection of species. The study revealed prevalence of economically important and rare indigenous fish species. Because of rich species composition recorded at the littoral zone, biodiversity conservation efforts can be initiated in that area using dominant fish species.

The Nong Han Wetland is likely to face environmental problems such as habitat degradation and deterioration of environmental quality from both anthropogenic disturbances and natural impacts, such as flood and drought. These habitats must be protected, coupled with increase environmental awareness and the cooperation of local communities. Moreover, the business sector, particularly businesses engaged in the fisheries industry, can also be tapped to support the conservation of fisheries biodiversity through their Corporate Social Responsibility programmes.

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Empowering Local Fisherman to Conserve Marine and Coastal Resources

Based on case study entitled : *"Local Fishermen Network Committee for Marine and Coastal Resources at Upper Part of Inner Gulf of Thailand"*

Authored by : *Trirach Pukotchasarnseen, Teerayuth La-orphanphol and Jaranporn Lertsahakul, all from Foundation for Environmental Education for Sustainable Development, Thailand*

Presented by : *Jaranporn Lertsahakul, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Thailand's marine and coastal resources are abundant and unique. Its two distinct coastal areas – the Gulf of Thailand in the south and the Andaman Sea in the southwest – feature impressive natural resources, including mangrove forests, coral reefs, beaches, and wetlands. These resources play important roles in Thailand's tourism industry, fisheries, trade, and the livelihood of locals. In addition, these resources provide specialized services, such as improving water quality, stabilizing shorelines, and providing a breeding and nursery ground for aquatic species, including commercially important fish.

While problems involving marine and coastal resources are often difficult to solve, the local fishermen from the provinces of Bangkok, Chachoengsao, Samut Prakarn, Samut Sakorn, Samut Songkram and Phetchaburi have joined hands to establish the committees of local communities network as the main engine for management and policy change in support of sustainable and wise use of marine and coastal resources.

Education for Sustainable Development Centre

The Education for Sustainable Development Centre (ESDC), Sirindhorn International Environmental Park, was established as a Regional Centre of Expertise on ESD in 2008 with the cooperation between The Sirindhorn International Environmental Park Foundation and WWF (Thailand). It was funded by Toyota Motor Thailand Co., Ltd., a company which is determined to stimulate the awareness of

Figure 1. Students engage in a learning activity at ESDC.

Figure 2. Students learn about solutions toward environmental and natural resources problems.

preservation and realization of the importance of the environment to the community and society in a sustainable manner. The ESDC is managed by WWF Thailand. The ESDC develops facilities and areas for environmental education and sustainable utilization; services the nature education curriculum according to the environmental education process; raises awareness and builds an understanding of the environmental and natural resources for sustainable development; promotes the conservation of biodiversity and natural resources; and advocates conservation and rehabilitation activities to all target groups at both the national and international levels.

The ESDC is located at an ecotone between flat plain and coast, and three different forest types meet here: deciduous, mangrove, and beach. Most of the area is composed of mangrove forests. Trees that grow here include *Rhizophora apiculata, Rhizophora mucronata, Bruguiera, Avicennia marina, Xylocarpus, Excoecaria agallocha, Thepesia populnea, Barringtonia asiatica, Acrostichum aureum, Pluchea indica* and *Suaeda maritima.* The ecotone serves as a nursery for aquatic animals and a significant habitat for many benthic animals such as marsh crab, rock oyster and snapping shrimp. It also provides a boundary between resident and visiting birds such as the Malaysian Plover, the White Throat Kingfisher, the Common Hoopoe and Kites. Through the process of environmental education and immersion to this ecological community, people experience different ecosystems and the biodiversity of natural resources.

Thailand's Coastal Profile

Thailand has a coastal line measuring 3,148.23 kilometers and covering 23 provinces. The inner gulf of Thailand has 2,055.18 kilometers covering 17 provinces. The Andaman Sea has 1,093.14 kilometers covering six provinces.

The coastal line of 220 kilometers in the upper part of inner gulf of Thailand cover six provinces: Bangkok, Chachoengsao, Samut Prakarn, Samut Sakorn, Samut Songkram and Phetchaburi. It has a rich national heritage which provides enormous benefits to its people. However, coastal wetlands are now under threat. Marine and coastal resources utilization is a main problem and has

Figure 3. The map area of coastal line in Thailand.

direct impact on estuarine productivity. The problems faced in the upper part of the inner gulf of Thailand are illegal fishing gear, coastal erosion, and ownership of sediment land which have a significant impact on marine and coastal resources degradation.

Empowering the Fishermen

The Regional Centre of Expertise on Education for Sustainable Development, Sirindhorn International Environmental Park, assisted in establishing the conservation group of local fishermen in Cha-am Sub-district in May 2011. Dubbed *Coastal Fishery and Marine Resources Conservation Group of Phetchaburi Province,* the group is composed of 44 local fishermen. The main objectives of the group are to solve the marine and coastal resource management problems found in

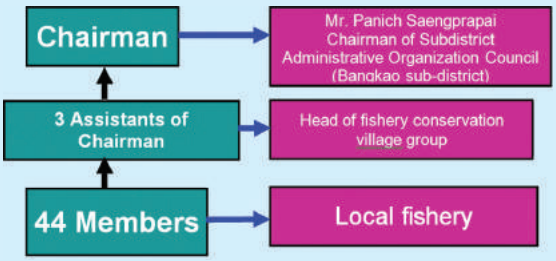

Figure 4. The structure of the Conservation of Fishery and Coastal Resources in Phetchaburi Province Group.

the area, as well as encourage the sustainable use of natural resources; raise public awareness; and coordinate with the Upper Part of Thailand Inner Gulf Conservation Network.

The local fishermen network committees are composed of 13 conservation groups across six provinces. The conservation groups involved are the committees in the regional and national levels of the Part of Inner Gulf of Thailand Solution Sub-committee. The sub-committee aims to encourage and empower the local communities for sustainable management of marine and coastal resources, as well as lobby for support from the relevant government agencies to strengthen local management and sustainable use. The Department of Marine and Coastal Resources Center and the Chumchonthai Foundation (CTF) support the process of establishing and empowering groups from the local and national levels. The ESDC is the main coordinator for Phetchaburi province.

One of the main strengths of the conservation groups is the active participation of local fishermen who are well aware of the problems related to coastal and marine resources. Every month, they organize a meeting to find the best solutions to these problems. Furthermore, they provide a platform where local voices can be recognized, heard and respected. They also provide a clear link between local and national policy levels, enabling information to be effectively communicated in both directions. This helps significantly in solving the problems of coastal erosion and illegal equipment, and the drafting and editing of the Act of Parliament on coastal and marine resource, and many others.

Since the majority of daily coastal management work takes place at the local government level, the ongoing executive functions of the Sub-district Administrative Organization, municipalities, district councils and traditional leadership structures should include natural resource management. This conservation group has an advisory board composed of the Chief of Cha-am District, the Mayor of Cha-am Municipality, the Head of Marine and Coastal Resource Conservation Center, Chumchonthai Foundation, and the Chairman of the Committee Network of the upper part of inner gulf in Thailand.

Figure 5. Meeting of the Conservation of Fishery and Coastal Resources in Phetchaburi Province Group.

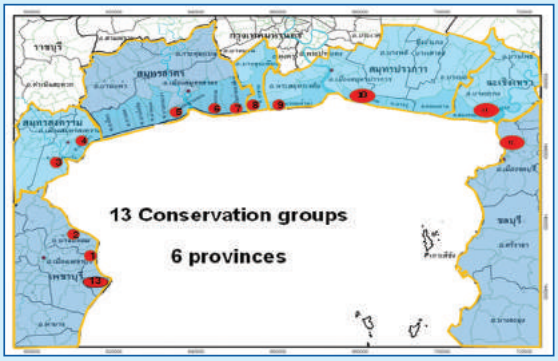

Figure 6. Conservation Groups in six provinces as regional Level of Conservation of Fishery and Coastal Resources.

The network, which started in 2011, had its first meeting on 18 to 20 January 2011. The meeting solicited the cooperation of the heads of local fishermen in each province and planned their strategy in strengthening marine and coastal resources and finding sustainable solutions to problems. Furthermore, linkages were fostered among the provincial level through the six provinces and the national level composed of the representatives from the network at the regional level. The sub-committee for resolution of upper part of inner gulf of Thailand is headed by its president, the Assistant Manager of the Office of the Prime Minister. The representatives from the regional level are the committees of marine and coastal resources management for sustainability which has the Director General of Department of Marine and Coastal Resources as president.

The effort to establish and empower groups from the local level to the national level is supported by the Department of Marine and Coastal Resources Center and Chumchonthai Foudation (CTF). ESDC is the main coordinator for Phetchaburi province.

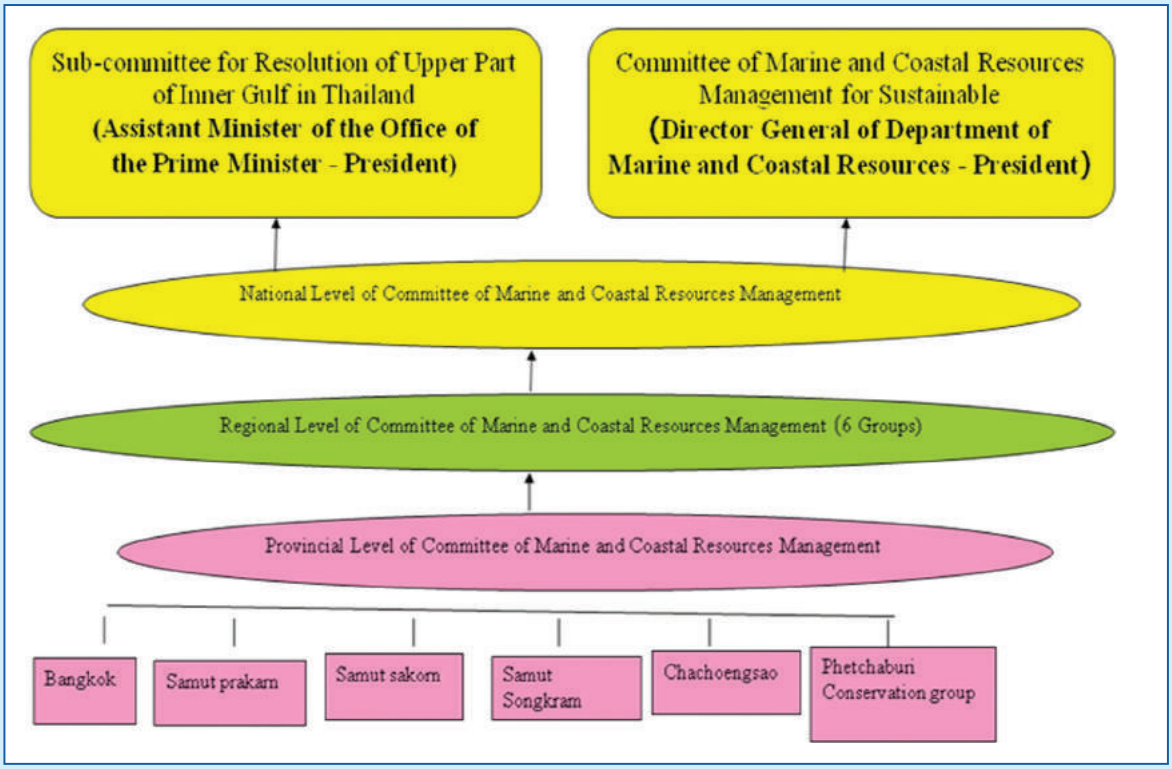

Figure 7. The structure of the national, regional and provincial network of Conservation Marine and Coastal Resources.

The structure shows that all members are fishermen who are leaders in their respective villages and local organizations. This means that the local fisherman conservation group involves the key stakeholders who are committed to solving all problems related to marine and coastal resources. The significance of this structure lies in its bottom-up approach. The task force would be the driving force throughout the entire process of strategy formulation from the local level (bottom level) up to regional and national level. The committee from the upper level will always report back to the stakeholder forum at each step of the process to invite feedback and to allow for the eventual correction following the feedback provided by key stakeholders.

A major lesson learned from this local fishermen network is that it is important to empower local people in finding the best solutions for problems. In their meetings, they are able to brainstorm the best possible solutions. Moreover, the network provides local fishermen with a sense of ownership of the natural resources in their community. Having a sense of ownership inspires them to conserve these resources for future generations.

Building effective stakeholder participation and engagement process not only improves stakeholders' information and buy-in on policy and strategy, but also helps mitigate problems that threaten project viability.

Identifying and engaging the correct and key stakeholders should be a priority at the inception of designing a national policy and strategy. Also, a stakeholder task force representing and reflecting various interests should serve as the driving force throughout its formulation.

Local fishermen also need capacity support through training and independent technical advice, or by setting up multi-stakeholder monitoring schemes in which communities participate alongside technical experts.

All these lessons learned reflect the sustainable management of natural resources that could serve as a best practice for every community.

ACKNOWLEDGMENT

The ESDC team wishes to thank Mr. Trirach Pukotchasarnseen, the manager of ESDC, Mr. Teerayuth La-orphanphol the advisor of ESDC. We also thank all supporters of ESDC especially Toyota Motor Thailand Company Limited for their corporate support of all budget for the management and implementing activities of ESDC. Special thanks to everyone of the Sirindhorn International Environmental Park for all kind cooperation and advices. Thanks are extended to all at Border Patrol Police Bureau, Royal Thai Police (Rama VI Camp) and Mrigadayavan Palace Foundation for utmost cooperation of all activities.

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SESSION B

FORESTRY AND WILDLIFE CONSERVATION

Planting Mangroves for Capital Protection

Based on case study entitled : *"Planting Mangrove for Capital Protection"*

Compiled by : *Metropolitan Electricity Authority of Thailand (MEA)*

Presented by : *Dr. Sonjai Havanond, from the Sirindhorn International Environmental Park (SIEP), at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

The gradual destruction of mangrove forests in Thailand have caused adverse impacts on the marine environment such as the reduction of nursery grounds of marine and coastal animals, as well as an imbalance in the coastal ecosystem. Other impacts include loss of livelihood and food sources since mangroves are nesting grounds for fish, crabs and other marine species; and coastal erosion, which may force people find new settlements.

The Metropolitan Electricity Authority of Thailand (MEA) supplies electricity to Bangkok, Nonthaburi and Samutprakarn Province and is aware of current social and environmental concerns in the country. MEA thus undertakes a number of activities focusing on environmental conservation, one of which is mangrove reforestation.

His Majesty the King of Thailand has expressed his wish to see mangroves restored to their original state. As a result, MEA has implemented the "Planting Mangroves for Capital Protection Project" following the King's initiatives for sustainable conservation of mangrove forest in Samutprakarn Province. This area is connected to the upper part of Gulf of Thailand and has a 45km-long coastline, of which some 30 km or 67 per cent has been affected by coastal erosion and are considered in critical condition. If this problem is not resolved, the coastline will be continually eroded.

Coastal erosion has led to a significant reduction of the mangrove forest along the coastline, resulting in the loss of valuable flora and fauna. Part of MEA's interventions is the construction of bordered poles and planting of mangroves to help coastal erosion and rehabilitate the mangrove forest. After the implementation of the project, there has been an obvious rejuvenation of the flora and fauna in the mangroves, resulting in a more fertile coastal ecosystem. It also provides nursery grounds for aquatic animals, habitats for both terrestrial species and birds; serves as natural barrier for the inland ecosystem provides; and helps improve the quality of people's livelihood in the area.

Objectives

The objectives of the project are to rehabilitate the deteriorated mangrove forest back to its naturally fertile state; increase mangrove forest area along the coastline of Thailand to enhance the coast's natural barrier (green belt), improve nursery grounds of aquatic animals, strengthen sources of fisheries and medicine, and improve ecological functions of mangrove forests; create education zones for youths and students and raise awareness on the significance of mangrove forests; construct natural breakwaters for sediment capture and protect the coast from strong waves; promote ecotourism in mangrove areas to strengthen people participation in mangrove protection; enhance awareness of the importance of mangrove forest among the general public to engage greater participation in the conservation of mangrove forests; coordinate collaboration among relevant organizations for sustainable mangrove forest conservation; and promote MEA as an organization that is serious about its social and environmental responsibility.

Project Implementation

Initiated in 2004 with a budget of 24,000,000 Baht (approximately US$ 783,500), the project has rehabilitated mangrove forests covering 532 rai (85.12 hectares). Biodiversity surveys reveal the presence of 32 species of flora and 43 species of fauna. Recorded species in the project area include the following:

Fauna	*Flora*
Terrestrial fauna	*Rizophora apiculata*
Macaca fascicularis (long tailed macaque, crab-eating macaque)	*Rhizophora mucronata*
Lutrogale perspicillata (smooth-coated otter)	*Avicennia alba*
Crab	*Avicennia marina*
Sesarma mederi (Meders mangrove crab)	*Avicennia officinalis*
Uca vocans (fiddler crab)	*Lumnitzera racemosa*
Scylla serrata (serrated mud crab)	*Clerodendrum inerme*
Shrimp	*Hibiscus tiliaceus*
Alpheaus euphrosyne (common snapping shrimp)	*Thespesia populnea*
Mollusk	*Bruguiera gymnorrhiza*
Paphia undulate (undulated surf clam)	*Bruguiera cylindrica*
Perna viridis (green mussel)	*Bruguiera sexangula*
Anadara granosa (cockle, ark shell)	*Xylocarpus moluccensis*
Crassostrea gigas (Pacific oyster)	*Xylocarpus granatum*
Fish	*Acanthus volubilis*
Boleophthalmus boddarti (Boddart's goggle-eyed goby)	*Acanthus ilicifolius*
Plotosus lineatus (striped sea catfish)	*Sonneratia ovata*
Lates calcarifer (giant seaperch)	*Sonneratia caseolaris*
Scatophagus argus (spotted scat, green scat)	*Sonneratia alba*
Sillago sihama (silver sillago)	*Ceriops decandra*
Bird	*Ceriops tagal*
Ardeola bacchus (Chinese pond heron)	*Derris indica*
Bubulcus ibis (cattle egret)	*Suaeda maritima*
Ardeola speciosa (Javan pond heron)	*Sesuvium portulacastrum*
Ardea purpurea (purple heron)	*Pluchea indica*
Phalacrocorax niger (little cormorant)	*Finlaysonia maritima*
Himantopus himantopus (black-winged stilt)	*Nypa fruticans*
Larus brunnicephalus (brown-headed gull)	*Excoecaria agallocha*
Chlidonias hybridus (whiskered tern)	*Phoenix paludosa*
Todiramphus chloris (collared kingfisher)	*Heritiera littoralis*
Halcyon smyrnensis (white-throated kingfisher)	*Acrostichum aureum*
Halcyon pileata (black-capped kingfisher)	*Acrostichum speciosum*
Halcyon capensis (stork-billed kingfisher)	
Alcedo atthis (common kingfisher)	
Haliastur Indus (Brahminy kite)	
Nectarinia jugularis (olive-backed sunbird)	
Coracias benghalensis (Indian roller)	
Rhipidura javanica (pied fantail)	
Dicaeum cruentatum (scarlet-backed flowerpecker)	
Centropus sinensis (greater coucal)	
Copsychus saularis (Oriental magpie robin)	
Aegithina tiphia (common Iora)	
Dicrurus leucophaeus (ashy drongo)	
Eudynamys scolopacea (Asia koel)	
Liza subviridis (greenback mullet)	
Egretta sacra (Pacific reef egret)	
Egretta garzetta (little egret)	
Casmerodius albus (great egret)	
Reptile	
Varanus salvator (water monitor)	

Bordered poles for coastal protection have also been constructed at the Prajulajomklow Fort of Samutprakarn Province. The bordered poles are made from old electric cement posts that are at least eight meters high. Old car tires, some donated by private companies and general public or bought by MEA, were used to cover portions of the cement posts to help slow down and break strong sea waves.

MEA provided funds to support mangrove planting projects arranged by students from secondary schools and universities. Aside from mangrove planting activities, the project also involved exhibits on mangroves, construction of boardwalks as nature trails, development

Figure 1. Top view of the protection area.

Figure 2. Old temple of Ban Samuth Jeen in Samutprakarn Province still remains because of the cement wall that protects it.

Figure 3. Bordered poles (old electric cement posts covered with old car tires) installed in the mud flat at Ban Laem Fa Pah, Samutprakarn Province decrease wave velocity and prevent coastal erosion.

of a website to disseminate knowledge and provide a better understanding of mangrove conservation, and building a network of conservationists among youths from age 8 to 17 years old.

The bordered poles have led to sediment accumulation. Based on data collected from 2005 to 2007, the recorded accumulated sediment was 42 cm thick.

Bordered poles can help reduce wave attack of up to 40 percent of the wave height, and can thus reduce 60 percent of wave action.

Figure 4. Three rows of old electric cement posts with seven layers of old tires can decrease wave velocity by 50 per cent and prevent coastal erosion.

In terms of the survival and growth rate of mangroves, the results showed that big-leaf red mangroves are growing well. However, it is necessary to plant mangroves on the shorelines toward the sea, and plant additional rows of *Avicennia* sp. to help protect the area from strong waves.

Figure 5. MEA officers plant mangroves in the coastal area.

Figure 6. University students and school children participate in mangrove planting activities.

Figure 7. Big-leaf red mangrove *(Rhizophora mucronata)* plantation in the coastal protection area.

Results

Mangrove planting activities have been successful, resulting in robust mangrove areas covering 200 rai (32 hectares) at Prajulajomklow Fort of Samutprakarn Province. Mangroves planted at Ban Thung La-ong Village in Kura Buri District, Phang Nga Province are also growing well but need to be maintained and monitored to ensure an increased coverage of the mangrove area. Mangroves planted at Bang Pu holiday resort, in Samutprakarn Province, however, were affected by wind and strong currents, therefore resulting in a 60 per cent survival rate. However, replanting has been implemented and it can be anticipated that the survival rate will be gradually increased due to barriers made from bamboos that have been installed along the area.

There has been great interest and participation in the youth camps for conservation of mangrove forest. After the camp, the youth participants gained more knowledge and a better understanding of mangrove conservation. Students from vocational colleges have also expressed interest in participating in the mangrove planting activities resulting in an average of 3,000 student participants per year. Through the project activities, they learned the values of mangrove forest, proper methods in mangrove conservation, and developed a deeper consciousness in natural resource conservation.

University students from Thammasat University and Chulalongkorn University have also participated in project activities and have likewise learned the importance of mangroves and are willing to support activities that will help increase the coverage of mangrove forests in Thailand. Students from Wat Pleng secondary school in Nonthaburi Province also enjoyed their experience with the MEA project. These students are now members of the mangrove forest conservation network who disseminate knowledge on the importance of mangrove forests and help spread awareness on the critical situation of mangroves among students of their respective schools. Aside from these schools, a number of educational institutions have expressed their interest to participate in mangrove planting activities.

Research on the installation of bordered poles along the shoreline has been promoted and gained the interest of media. Media attention has helped highlight the importance of mangroves among the general public and various organizations. Research also showed that from October 2005 to November 2007 (25 months), the accumulated sediment reached 42 cm, which will enable the growth of planted mangroves.

The project has also yielded the following outcomes: rehabilitation of mangrove forest back to its naturally fertile state; development of a source of community incomes that support sustainable livelihoods; awareness among the youth of environmental issues and the importance of mangrove forests; protection from coastal erosion; and the creation of a natural green belt in Samutprakarn Province that can protect Bangkok from natural disasters.

Promoting Plant Genetic Conservation

Based on case study entitled : *"Plant Genetic Conservation Project Under The Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn Responded by Electricity Generating Authority of Thailand (RSPG-EGAT)"*

Authored by : *Sukanda Ekompitak, from Electricity Generating Authority of Thailand (EGAT) for Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Humans and other organisms heavily depend on plants for food. Biodiversity creates a wild plant gene pool that adds to the narrow genetic base of established food crops. This helps produce new varieties which are resistant to pests and diseases and ensure improved productivity.

However, "between 1960 and 2000, the demand for ecosystem services grew significantly as the world's population doubled to six billion people," according to the 2005 UN Millennium Ecosystem Assessment.

Rapid population growth has led to a change from traditional to intensive agricultural systems. People now live longer and child mortality is lower. The stress on existing resources for food has intensified. Of the 7,000 species of plants which have been domesticated over the 10,000-year history of agriculture, only 30 account for 90 per cent of all the food that humans eat every day.

Data from Food and Agriculture Organization (FAO) show that in recent decades, there has been alarming genetic erosion within plant species. About three-quarters of the varietal genetic diversity of agricultural crops have been lost over the last century. Many wild strains of staple food crops are endangered. For example, one quarter of all wild potato species are predicted to die within 50 years, making it difficult for future plant breeders to ensure that commercial varieties can cope with a changing climate. The possibility of one-fourth of species becoming extinct looms as a result of widespread habitat changes brought by mankind.

Plant Genetic Conservation in Thailand

In Thailand, there are notable initiatives to conserve plant genetic resources. In 1961, His Majesty the King Bhumibol Adulyadej started conserving *Dipterocarpus alatus,* an endangered tropical forest tree found in Thailand, Cambodia, Laos, Myanmar, the Philippines, and Viet Nam. It is a very important source of construction timber.

His Majesty the King also created a demonstration forest which is home to a collection of various plant varieties from all regions of Thailand. The forest was established within his residence, the Chitralada Palace, for students to study. In 1985, His Majesty the King ordered the conservation of the jackfruit in the Grand Palace.

In vitro conservation is used to preserve the unique characteristics of plants. In 1988, the conservation and propagation of rattans *(Calamus* sp.*)* was started in the Royal Development Study Center.

These initiatives form part of the Royal Chitralada Agricultural Projects which include a diverse range of activities for experimentation and research purposes, aimed at solving various problems related to agriculture. Successful projects are used for demonstration purposes. The demo projects are opened to the general public so that they could visit and study them, as well as make use of the knowledge gained. In implementing these projects, emphasis is placed on His Majesty the King's "Sufficiency Economy" mantra. Under this principle, villagers are encouraged to become self-sufficient and improve their long-term quality of life.

The projects make use of scientific and technological methods in conducting studies, research and experimentation. Simple and easy-to-understand demonstrations are prepared for individual farmers and other interested members of the public.

RSPG Foundation

In 1992, Her Royal Highness (HRH) Princess Maha Chakri Sirindhorn founded the Plant Genetic Conservation Project, which seeks to encourage Thai people, especially the villagers and students, to be aware of the values of native plant species and conserve them for the future. In 2008, HRH the Princess established the Plant Genetic Conservation (RSPG) Foundation to extend and expand the Plant Genetic Conservation Project activities and utilize the conserved plant genetic materials in more meaningful ways.

The RSPG Foundation has joined hands with government offices, universities, non-government organizations, and local companies to better assist the villagers around Thailand in identifying, selecting, propagating and conserving the native plant species as the germplasm banks in most of the villages and schools and some government agencies' offices. Some of these native plant species have been used for medicinal purposes, food, beverages and industrial use.

EGAT Supports the Plant Genetic Conservation Project

One firm supporter of the Plant Genetic Conservation Project is the Electricity Generating Authority of Thailand (EGAT), a state enterprise that owns and manages the majority of Thailand's electricity generation capacity, as well as the nation's transmission network. It is managed by Thailand's Ministry of Energy.

Since May 2005, EGAT has been working to conserve plant genetic resources in all floristic regions and nearby dams in Thailand under the RSPG-EGAT Project (Plant Genetic Conservation Project Under The Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn Responded by Electricity Generating Authority of Thailand). The conservation initiative is implemented in 12 areas covering 35.3280 km^2. These are Bhumibol Dam, Sirikit Dam, Srinakarin Dam, Vachiralongkorn Dam, Ratchaprapa Dam, Bang Lang Dam, Ubonrat Dam, Sirindhorn Dam, Chulabhorn Dam, Nam Pung Dam, Huay Kum Dam, and Lam Takong Chonlapawattana Hydro Power Plant. The three main activities under RSPG-EGAT are protection of plant genetic resources, planting and preservation of plant genetic resources, and special activities in support of plant genetic conservation.

The ultimate goal of RSPG-EGAT is to train key personnel who will maintain plant genetic resources in support of farmers and Thailand's business sector. Its objectives are to promote a greater understanding of plant genetic conservation among personnel and organizations, and to introduce volunteers and companies to plant genetic conservation; to build links among various organizations including government agencies and the private sector; and to create a plant genetics database system that can be shared throughout the country.

Protecting Plant Genetic Resources

EGAT has allocated 11 dams covering an area of 33.7344 km^2 *(Figure 1)* for its effort to preserve original plant genetic resources. These plant genetic protection areas will be used to study plant genetic resources and to help maintain a valuable natural resource for future use.

Figure 1. An image of 11 areas of RSPG-EGAT project.

Through the project, 78 people consisting of EGAT officers, RSPG researchers from Naresuan University in Payao and Pissanulok provinces, and local researchers explored the physical and biological natural resources in Sirikit Dam,

Figure 2. An image of exploration of plant genetic conservation areas.

Uttaradit province, as shown in *Figure 2*. From the exploration, they wrote 26 research reports which will serve as important sources of information.

Sixty three people consisting of EGAT officers, local intellectuals, and researchers from Chulalongkorn and Burapha Universities explored the physical and biological natural resources in Vachiralongkorn Dam, Kanchanaburi province. They came up with 18 research reports.

Fifty seven EGAT officers, researchers from Khon Kaen University, and local intellectuals explored the physical and biological natural resources in Sirindhorn Dam, Ubon Ratchathani province. They wrote 23 research reports.

Through the project, EGAT built and maintained 1,237 dikes and constructed a 3,266 kilometer-wide firebreak so as to conserve plant genetic protection areas.

Table 1. Number of plants and location size for Plant Genetic Conservation in all dams.

Dams	Protection of Plant Genetic (in km^2)	Planting and Preservation of Plant Genetic (in km^2)
(1) Bhumibol Dam	12.9648	1.048
(2) Sirikit Dam	3.0336	0.0288
(3) Srinakarin Dam	1.64	0.0704
(4) Vachiralongkorn Dam	1.52	0.0576
(5) Ratchaprapa Dam	2.2688	0.12
(6) Bang Lang Dam	0.5376	0.016
(7) Ubonrat Dam	2.3696	0.128
(8) Sirindhorn Dam	4.7024	0.0608
(9) Chulabhorn Dam	1.3024	0.0512
(10) Nam Pung Dam	1.9936	0.0032
(11) Huay Kum Dam	1.4016	-
(12) Lam Takong Chonlapawattana Hydro Power Plant	-	0.0096
Total	**33.7344**	**1.5936**

Figure 3. Youth training for plant genetic conservation.

Planting and Preserving Plant Genetic Resources

EGAT has provided 1.5936 km^2 around 11 dams to cultivate local plants and herbs *(Table 1)*.

Through the project, EGAT cultivated varieties of dominant and edible plants including local and endangered species. Two hundred fifty-four species (3,921 plants) were planted in the 11 dams. The plants all had botany and benefit tags to acknowledge those who planted them.

Special Activities in Support of Plant Genetic Conservation

Apart from planting and preserving plant genetic resources, EGAT also supports the communication and education initiatives of the RSPG Foundation. It helps generate a greater awareness among communities for the need to conserve natural resources. Under the theme "gathering local knowledge and learning together in the wild," EGAT works with the locals and students within areas near the dams.

Through the project, EGAT renovated 11 natural study routes in order to encourage youth and other people (3,500 people per year) to learn about plant genetic resources; trained RSPG-EGAT volunteers, youth and local people (3,000 people per year) as shown in *Figure 3*; and provided various communication tools such as brochures, videos and local radio.

Power of Sustainable Future

Based on case study entitled : *"Power of Sustainable Future"*

Authored by : *Srisurang Massirikul and Pichapong Pokapun, both from PTT Public Company Limited for Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Founded in 1978 under the Petroleum Authority of Thailand Act of 1978, the state enterprise PTT Public Company Limited has played an important role as a National Energy Company with the goal of ensuring long-term energy security by providing sufficient high-quality energy supply at a fair price. An equally important objective of the company is the implementation of corporate social responsibility initiatives that promote environmental protection among its stakeholders.

PTT's Perspective on Biodiversity

Since 1994, PTT has been promoting biodiversity conservation as a key step toward sustainable development. Its efforts to conserve the environment covers five aspects: forest rehabilitation, wildlife conservation, soil conservation, water conservation and biodiversity conservation.

Apart from supporting massive reforestation activities, PTT is also committed to reducing carbon emission sources by ensuring efficiency in its operations. It continues to invest in research and development to develop environment-friendly technologies. Benchmarking with peers that implement best environmental practices in their operations is another key priority for PTT. The company believes that the success of its conservation programme lies in engaging communities where it does business.

Figure 1. The Sirinath Rajini Mangrove Ecosystem Learning Centre, established by PTT in Pranburi District, Prachuap kirikhan Province, Thailand.

Golden Royal Jubilee Reforestation Project

In 1994, PTT launched the Golden Royal Jubilee Reforestation Project in honor of the King of Thailand on the occasion of the 50th Anniversary of his accession to the throne. Under this project, PTT has reforested 407,499.2 acres (1,018,748 rai) of land in 416 Forest Plantation Targets (FPT) covering 48 provinces nationwide. The trees in the reforested areas absorbed a cumulative volume of 18.17 million tons of carbon dioxide and released 14.5 million tons of oxygen between 1994 and 2008.

Research shows that there are 100 species of fauna including 50 big animals such as bulls, elephants, hornbills, tigers, red bulls and 4,000 species of flora in the reforested area. Apart from forest rehabilitation and protection, the company also promoted income-generating activities to improve the quality of life of 150,000 in over a hundred villages all over the country.

The Sirinath Rajini Mangrove Ecosystem Learning Centre

In the heart of Pak Nam Pran in Thailand's Pranburi District lies a vast expanse of land covered with lush mangroves. Over the past years, the area has been attracting over 100,000 visitors a year who want to learn more about mangroves and its importance to biodiversity. The 126-hectare (786 rai) mangrove forest was developed by PTT in 1997. From a once-abandoned shrimp farm, the area has been transformed into a healthy mangrove forest that now serves as home to 20 species of flora, 65 species of marine benthos, 15 species of birds and 19 species of fish.

In honor of Her Majesty the Queen, the company built the Sirinath Rajini Mangrove Ecosystem Learning Centre within the mangrove forest in 2004 to promote a greater appreciation of mangroves.

"Conversion of mangroves into shrimp farms has been a major factor in the degradation of mangrove ecosystems in Thailand and in many other parts of the ASEAN region. The need to rehabilitate and restore ecosystem functions in coastal areas is well recognized, particularly in light of the future threats the region faces from climate-related impacts. In this light, the Sirinath Rajini Mangrove Ecosystem Learning Centre serves as an example of how degraded coastal areas can be rehabilitated and their natural functions restored," Dr. Janaka de Silva, programme manager of Mangroves for the Future, said. "More importantly," he added, "the centre serves as a hands-on learning facility for stakeholders on the process and benefits of rehabilitating degraded coastal areas and helps to share knowledge both nationally and internationally."

Figure 2. Mangroves planting : A PTT's CSR Activity.

To further improve its mangrove conservation programme, PTT joined hands with the International Union for Conservation of Nature (IUCN) to raise the potential of the Sirinath Rajini Committee in its studies on using proper waste water management, harnessing the local wisdom of the Pranburi fishing community, and developing site-specific biodiversity management.

To run the centre, PTT has invited the stakeholders of Sirinath Rajini Mangrove Ecosystem Learning Centre from various sectors to join the management committee in creating an effective and sustainable benefit to the community. Five sectors are represented: government and educational sector, community and non-government organizations, local private sector, PTT, and local administrative authorities.

Biodiversity Resources Management Project

In partnership with the Biodiversity Research and Training Programme (BRT), PTT conducts area-based research using a multidisciplinary approach. For the Thong Pha Phumi project, PTT found rare species such as Rajini crab or

Thaiphusa sirikit and other valuable biological resources. The research has inspired and generated a new body of knowledge that has already appeared in scientific journals and other publications. This has been helpful in boosting public awareness of biodiversity. This joint project has also supported training for the local community, school teachers and students in protecting 12,000 acres (30,000 rai) of the Western forest complex. The research project was conducted in two phases from 2002 to 2007.

Figure 3. Youth participated in PTT's mangrove planting activity.

Following the success of the biodiversity research in the Thong Pha Phumi Project, PTT conducted a three-year research from Had Khanom to Kao Nan (Nan Mountain), Nakorn Sri Thammarat Province. The research demonstrated an ability to combine core knowledge and sustainable development for the conservation of natural resources to create a knowledge base of bio-resources from seashore to mountain. This has never been done before in Thailand. It also involves the study of interrelationships between the community and biological resources in the area.

Green Globe Award

Launched in 1999, PTT's Green Globe Award is a programme that recognizes individuals and groups who dedicate their lives in biodiversity conservation and environmental rehabilitation. Thus far, there have been 396 awardees from the community, individual and youth categories. These people were able to increase and conserve forest cover in 85 communities by more than 640,000 acres (1,600,000 rai). They also conserved more than 10,000 acres (25,000 rai) of mangrove forest in Thailand. Through the award, PTT also recognized 82 role models and 59 youth groups who are crucial in promoting conservation in Thailand. These champions help mainstream biodiversity conservation into the lives of 20 different tribes who live in the country, including Mhong, Karen, Yao, Akha , and Paka Kor Yor.

84 Tambons on the Sufficient Path Project

To honor His Majesty the King on the auspicious occasion of his royal 80th birthday, PTT introduced "84 Tambons (Sub-district) on a Sufficient Path Project" in 2007. A Tambon is a rural administrative division at a sub-district level compromising of a few villages. The project is inspired by His Majesty the King's philosophy of sufficiency economy in the development of people's living condition in the rural areas through self-reliance.

The 84 targeted Tambons were selected from two dedicated groups. The first group, known as the Nine Pilot Tambons, was from the Green Globe Award network, a forested area of the One Million Rai Reforestation Project, civil society groups, and the communities where PTT operates. The second group is composed of volunteer Tambons that responded to the announcement to join the project.

In December 2007, PTT and the first nine Tambons pledged to undertake the project with unwavering commitment to bestow the target area to His Majesty. After accepting applicants nationwide for the second phase, the project selected 42 additional Tambons.

Development and Promotion of the Utilization of Vetiver Grass

This project is dedicated to educating people about the importance of vetiver grass, a tropical plant which has become a popular low-cost and efficient system for soil and water conservation, soil stabilization, pollution control, and waste water treatment. To date, PTT has engaged over

100 communities in using this wonder plant. They are now part of PTT's vetiver grass network and are actively promoting the cultivation and utilization of vetiver.

Engaging Communities

The secret behind PTT's successful corporate social responsibility projects is the strong relationship with the communities where they operate. Public forums are conducted to brainstorm ideas with all stakeholders. PTT uses "participatory management" to ensure that representatives from every sector have a direct hand in managing the conservation projects. Apart from providing jobs and livelihood opportunities to villagers, the oil company also educates them about the need to conserve the natural resources in their area, highlighting that "if they take good care of the environment, the environment will continue to take good care of them."

Benefits from PTT's Projects

PTT's projects provide economic, social and environmental benefits to communities where the company operates. Economic benefits include stimulation of economic growth where projects are implemented; teaching people about His Majesty the King's self-sufficiency economy theory; and providing infrastructures to support the community's wellbeing.

Social effects include creation of jobs in the communities; opportunities to learn and gain access to knowledge resources aimed at creating equality among people; transfer of knowledge management tools for community's benefit; people's participation in decision making; and establishment of a biodiversity conservation network.

Environmental effects include strengthening of environmental conservation efforts of the community; creation of awareness on environmental conservation; community decision making on environmental protection and conservation; and implementation of reforestation of wasted areas.

PTT as Role Model for the Business Sector

For PTT, biodiversity conservation is a key step toward sustainable development. One of its goals is to serve as a role model for biodiversity conservation and advocacy. To achieve this, the company is actively promoting the relationship between business and biodiversity in forums not only in Thailand, but elsewhere in the world. Its efforts have not gone unnoticed. It has received numerous awards for its conservation projects, including the Platts Global Energy Award, an outstanding award on the Promotion of Biodiversity Conservation from Thailand's Office of Natural Resources and Environmental Policy and Planning; Thailand Corporate Excellence Awards from HRH Princess Maha Chakri Sirindhorn; Corporate Social Responsibility Awards from the Stock Exchange of Thailand; and the King of Thailand Vetiver Awards.

ASEAN Champion of Biodiversity

In May 2011, PTT was recognized by the ASEAN Centre for Biodiversity (ACB), the ASEAN Foundation (AF) through the Japan-ASEAN Solidarity Fund, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the European Union (EU), the Secretariat of the Convention on Biological Diversity (SCBD), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Asian Institute of Journalism (AIJC) as the second placer in the business category of the ASEAN Champions of Biodiversity.

The ASEAN Champions of Biodiversity is a recognition programme for outstanding projects on biodiversity conservation and advocacy in the ASEAN region. The award is aimed at generating greater leadership, public and media awareness of the problems facing the region's rich but highly threatened biodiversity and the need for a concerted effort in biodiversity conservation and advocacy.

With this award, PTT became part of ACB's cadre of champions who serve as Ambassadors of Goodwill for biodiversity conservation.

Biodiversity Study for Sustainable Mine Rehabilitation

Based on case study entitled : *"Biodiversity Study for Sustainable Mine Rehabilitation (Bharinto Mine, Indonesia)"*

Authored by : *Sanicha Pinyocheep, Thaweewat Teplertbun and Dr. Wit Soontaranun, all from Banpu Public Company Limited, Thailand, Ignatius Wurwanto and Ivan Manalu, both from PT. Indo Tambangraya Megah Tbk, Indonesia*

Presented by : *Dr. Wit Soontaranun, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Banpu was first established in Thailand in 1983 as a coal-mining venture and has been listed on the Stock Exchange of Thailand since 1989. The company has also diversified into coal mining in Indonesia, Australia and Mongolia. In Indonesia, the company established PT. Indo Tambangraya Megah Tbk. (ITM), which supplies coal amounting to around 23 million tons per year from four mining operations specifically PT Indominco Mandiri, PT Trubaindo Coal Mining, PT Jorong Barutama Greston and PT Kitadin Embalut.

In 2010, ITM commenced a coal mine operations called "PT Bharinto Ekatama (Bharinto), located in Central Kalimantan in the Heart of Borneo (HoB).

HoB is well known globally for its biodiversity richness, providing habitats to 10 endemic species of primates, more than 350 species of birds, 150 species of reptiles and amphibians, and 10,000 species of plants. From 2007 to 2010, a total of 123 new species have been recorded in the region. This inspired the World Wild Fund for Nature to initiate the Heart of Borneo agreement to protect a 220,000 km² forested region on Borneo Island. The agreement was signed by the governments of Brunei Darussalam, Indonesia and Malaysia in Bali on 12 February 2007.

There are more than 1,100,000 hectares of coal concessions within the HoB, indicating the potential impacts and environmental degradations in this area.

Figure 1. The location of Bharinto.

The Company Philosophy

At Banpu, a sustainable development policy has been established together with an environmental policy and corporate social responsibility (CSR) policy for balancing the company's long term growth and social responsibility. The company realized that coal mines temporarily occupy very large areas for excavating coal. Consequently, there are potential risks from environmental degradation and consequent impacts to surrounding communities.

The fundamental principles of Banpu's environmental policy are conserving natural resources, minimizing the negative effects, and enhancing the environmental quality whenever reasonably practicable.

The company strives to protect natural habitats and biodiversity in its concession areas by carrying out detailed site assessments. Although open-pit mining operations require the removal of the forest habitat, long term impacts can be minimized through careful and thorough pre-project assessments and post-project site rehabilitation. Adequate management plans for the rehabilitation will include provisions for pre-mining assessments, storage of sediment and top soils during mining activities, strategies to remove soil with minimal disturbance, and replanting the area to encourage natural regeneration.

In the meantime, the company has established a community development policy which seeks to understand the host communities' needs and develop an effective community development programme that focuses on active participation of the community members. The programme aims to improve the quality of lives for the surrounding communities.

Community development programmes cover the improvement of infrastructures and public utilities, career development, education support, and the preservation of local customs and traditions.

To achieve both environmental performance and community development, the integrated approach was initiated by synergizing environmental management plans with community development programmes at Bharinto as the pilot project.

Objectives and Expected Outcome

The objectives of the project are to develop a database of the existing conditions, carbon traps and plant diversity in the area for the development of an effective mine rehabilitation plan; collect high ecological value plants and potential plants (such as orchids) for conservation prior to commencing mine operations; collect the local wisdom in the utilization of potential of plants, identify needs of the community and establish partnerships; and establish effective and sustainable community development programmes which support mine rehabilitation.

Expected outcomes of the study are database for developing an appropriate rehabilitation plan for restoring environmental conditions and biodiversity richness in post-mining areas; good partnership with the communities and a community development programme which could serve the needs of the communities; sustainable mine rehabilitation so that communities could sustainably utilize resources; and a role model for mine rehabilitation and community development for other sites.

Bharinto Biodiversity Study Master Plan

Bharinto is collaborating with Purwodadi Botanical Garden to examine the biodiversity in the area prior to commencing its operations. The research team has established a master plan for biodiversity study as shown in *Figure 2.*

The company has finished the first phase of five study plans. In the first phase, the study defined the existing conditions and biodiversity richness of the area. Physical, chemical characteristics and organic material of soil, temperature, humidity and light intensity of the existing ecological condition were collected in the database as benchmark for restoring the proper condition for future reforestation activities.

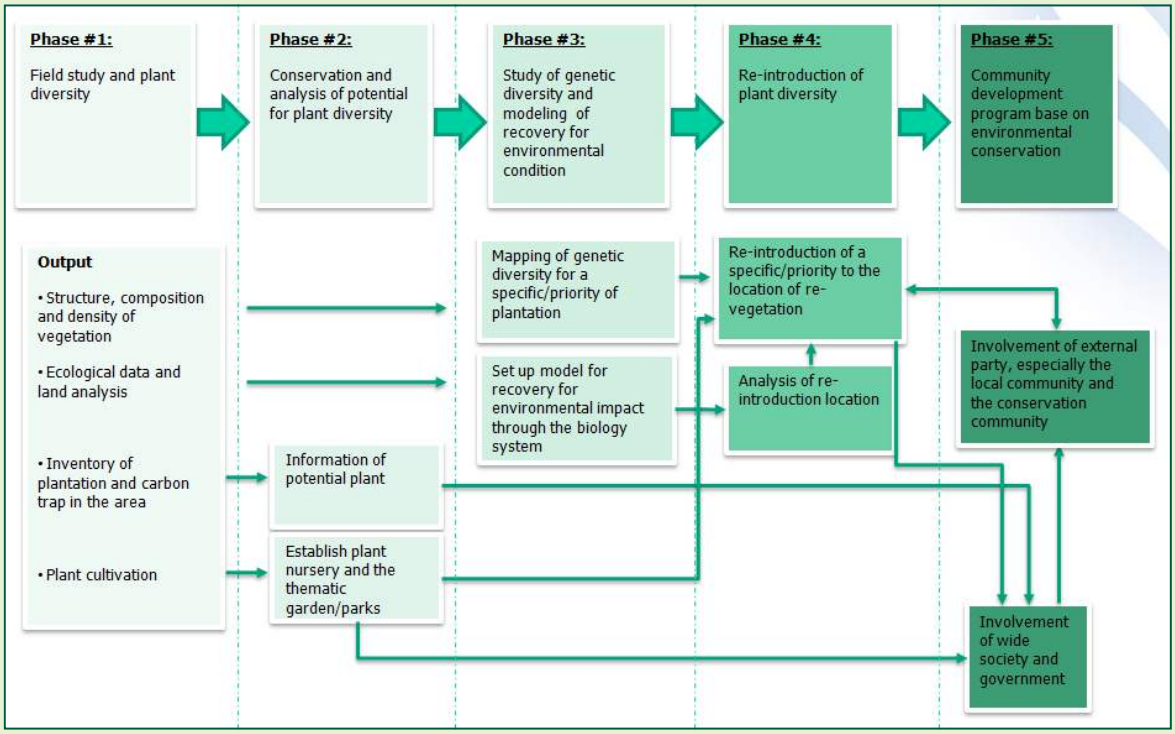

Figure 2. Bharinto Biodiversity Study Master Plan.

The research team conducted field studies to collect data and assessed the characteristics and diversity of flora. The study revealed that there were many endemic species in the Dipterocarpaceae family such as *Shorea* sp. (around 14 percent), *Eusidexylon zwageri* (9 percent) and *Shotea lamellata* (6 percent).

Carbon stock in the area was also estimated and analyzed. Plants which contribute to the carbon trap in the area are composed of *Shorea* sp. (35 percent), *Shorea lamellate* (21 percent), *Eusideroxylon zwageri* (16 percent), *Ficus* sp. (12 percent) and *Pasartocarpus bracteatus* (12 percent).

Local people were engaged in the research team during the field study. Key individuals in the communities were interviewed to determine local wisdom in the utilization of various plants. Plants are mainly used for medicine (46 percent), handicrafts and building (21 percent), food (16 percent), ceremony decoration (14 percent), poison (1 percent) and others (2 percent).

Using this information, samples of plants were collected for cultivation at Purwodadi Botanical Garden. After mining operations are complete and during the rehabilitation of the area, the removed top soil will be back-filled and these cultivated plants will be used to replant, accelerating the restoration of the area's ecology post-mining. Continuous monitoring will be employed, together with genetic analysis of the flora in the rehabilitated site.

Conclusions

The results from the study will be useful for mine rehabilitation and establishment of the community consultation programme. The programme will facilitate biodiversity enrichment by maximizing socio-ecological functions, serving the needs of communities while enhancing community awareness to preserve, and sustainably managing biodiversity richness.

The biodiversity study programme is being conducted from 2010 until 2017. When the mine rehabilitation model is finished, the community consultation programme will also play a major role in biodiversity enrichment for the post mining areas. The potential activities are cultivating, re-planting, monitoring and maintaining the post-mining area.

A major lesson is that engagement with host communities from the beginning of the project definitely helps the company understand their needs and enhance the partnership for rehabilitation in the future. On the other hand, the communities also gain the benefits from the sustainable use and management of biodiversity.

ACKNOWLEDGMENT

The company wishes to acknowledge the research team from Purwodadi Botanical Garden, Biological Sciences, Natural Resources and Environment Department, Ir. Solikin, MP, Destario Metusala, Siti Sofiah, Koeswojo, Sri Wuryanti, Suef and other contributors for collaborating and consulting the biodiversity study at Bharinto.

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Participation of the Private Sector in the Management and Monitoring of Biodiversity Conservation

Based on case study entitled : *"Emerging Participation of the Private Sector in Management and Monitoring of Biodiversity Conservation in Indonesia"*

Authored by : *Dr. Petrus Gunarso, from RCE East Kalimantan-Tropenbos Indonesia, East Kalimantan, Indonesia, Dr. Sukartiningsih, from Mulawarman University, East Kalimantan, Indonesia and Ishak Yassir, from Balitek Konservasi, Samboja East Kalimantan*

Presented by : *Dr. Petrus Gunarso, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Indonesia has about 120 million hectares of designated forestlands, of which about 50 million hectares are intact or primary forests *(World Bank, 2003; FWI/GFW, 2002).* From the biodiversity point of view, Indonesia's forests contain about 10 per cent of the world's flowering plant species, 12 per cent of mammalian species, and 17 per cent of the reptilian and amphibian species *(Matthew et al., 2002).* In terms of total conservation areas, Indonesia covers more than 22 million hectares of protected forest and conservation forest that consist of 50 national parks, 175 nature reserves, 16 grand forest parks, 47 wildlife sanctuaries, 81 tourism parks, and 15 hunting parks. Indonesia has also more than 31 million hectares of protection forest.

Since the late 70s, biodiversity conservation in Indonesia has been the responsibility of the central government. After the fall of the Suharto government in 1998, Indonesia transitioned into a democratic and decentralized government. However, biodiversity management and conservation remains the responsibility of the central government. Consequently, many small and isolated conservation areas received very little attention. With low priority, inadequate budget, and lack of local government support, most of the biodiversity conservation areas and areas with high biodiversity values became degraded.

This situation is similar for production forests. After the reformation era, production forests were increasingly pressured by population growth, illegal logging, forest fire, and land use change for agriculture, transmigration, timber plantation and oil palm. These pressures not only increased the rate of deforestation but also caused the collapse of forest concessions. The rate of deforestation increased from 1.2 million hectares per year in 1996, to 1.67 million hectares per year between 1984 and 1997, to above 2 million hectares per year. The deforestation rate decreased to about 1.17 million hectares per year between 2003 and 2006.

Between 1990 and 2000, the number of active forest concessions in Indonesia decreased drastically from 580 units (61.4 million hectares) to 362 units (39.2 million hectares); and continued decreasing, however at a slower pace, in the period 2000-2010, from 362 units (39.2 million hectares) to 303 units (24.9 million hectares) that only 167 concessionaires or 55 per cent are actually active *(Table 1).*

The decrease of the number of active forest concessions is also caused by the abandonment of over-logged forests. These areas lack management and become open access for illegal logging, intrusion of forest by local people, and forest fire that change rapidly over-logged forest (secondary forest) into marginal land. Land conversion into oil palm plantations, particularly by small holders, is another reason for forest degradation. Following the decline of timber extraction, other forms of natural resource extraction emerged such as expansive oil palm plantations and coal mining. In 2010, Indonesia became the world's largest oil palm producer in terms of total area planted (8.045 million hectares) and total crude oil palm production of 20.5 million tons per year.

Table 1. The development of forest concessions between 1992 and 2010 in Indonesia.

No.	Year	Number of HPH (Units)	Total area (Million hectares)	
			Decree	Effective
1.	1992	580	61.38	42.97
2.	1993	575	61.70	43.19
3.	1994	540	61.03	42.72
4.	1995	487	56.17	39.32
5.	1996	447	54.09	37.86
6.	1997	429	52.28	36.60
7.	1998	420	51.58	36.11
8.	1999	387	41.84	29.29
9.	2000	362	39.16	27.41
10.	2001	351	36.42	25.49
11.	2002	270	28.08	19.66
12.	2003	267	27.80	19.46
13.	2004	287	27.82	19.47
14.	2005	285	27.72	19.40
15.	2006	322	28.78	20.15
16.	2007	323	28.16	19.71
17.	2008	308	25.90	18.13
18.	2009	304	25.66	19.96
19	2010	303	24.95	17.46

The Emerging Interest in Conservation

Growing awareness of climate change issues and commitment to sustainable forest management have encourage a number of 'green companies' to voluntarily apply for Forest Stewardship Council (FSC) - controlled wood certification, which is conducted by SmartWood as an FSC-accredited Certifying Body. These commitments include provisions to conduct high conservation value forest (HCVF) assessments of forest concessions and also palm oil plantation prior to strong willingness to identify, maintain, protect and prevent clearing areas of high conservation value (HCV). HCV areas are those that are important to the conservation of rare and endangered species, ecosystems and landscapes, secure critical environmental services, and are vital to local livelihoods and cultural identities.

The voluntary designation of part of the production area into high conservation value areas potentially increase and improve management and monitoring of biodiversity conservation. The HCV-concept was initially difficult to apply due to lack of guidance from the FSC. This was then addressed by UK-based consultancy ProForest, which in 2003 published *High Conservation Value Forest: A Global Toolkit,* which provided a detailed application of the HCV concept.

In Indonesia, guidelines were drafted in 2003, and in 2006, a consortium of HCV users set out to update the toolkit to improve its effectiveness. The revision was organized by a consortium of NGO partners under the coordination of the Indonesian Resource Institute and Daemeter Consulting. Also involved were The Nature Conservancy, Tropenbos International Indonesia Programme (TBI Indonesia), Worldwide Fund for Nature (WWF), Conservation International, Fauna and Flora International, and Rainforest Alliance. The toolkit revision was meant to provide a logical structure and detailed explanation of the HCV concept and address questions such as the application of the HCV-concept to different sectors (aside from natural forest management).

After the revision of the HCV-toolkit, many private sector companies began testing these guidelines in the identification of high of conservation values, in both forest and plantation ecosystems (timber and palm oil plantation). In February 2011 at the FSC General Assembly in

Kota Kinabalu, Sabah, Malaysia, HCV Network Indonesia announced that 450,000 hectares of forest area and oil palm plantation areas have been saved or protected into areas with high conservation value.

Case Study of "Landscape Level in Kampar Peninsula of Riau Province, Indonesia"

The Kampar landscape covers about 671,124 hectares of peat swamp forest, which consist of two large peat domes, with more than 20 meters peat depth *(Figure 1).* The landscape also has four wildlife reserves, namely Danau Pulau Besar, Tasik Belat, Tasik Metas and Tasik Serkap Wildlife Reserves. The identification of the site as a Key Biodiversity Area and Important Bird Area also increased the value of Kampar Peninsula and stressed the need to protect the peat swamp forest ecosystem. The distribution of existing companies in the Kampar Penisula map overlaid on the land use system shows that there are 22 companies that focus on logging, forest plantation and palm oil plantation *(Figure 2).*

However, the forest is categorized as partly deforested peat and tends to degrade continuously despite efforts to sustainably manage the area. The Kampar ring, which refers to land around the Kampar Peninsula with peatland less than three meter in depth, is legally possible for plantation but threatened by illegal logging, fire, and uncontrolled drainage, among others. This situation requires immediate, decisive and cohesive intervention by all concerned parties.

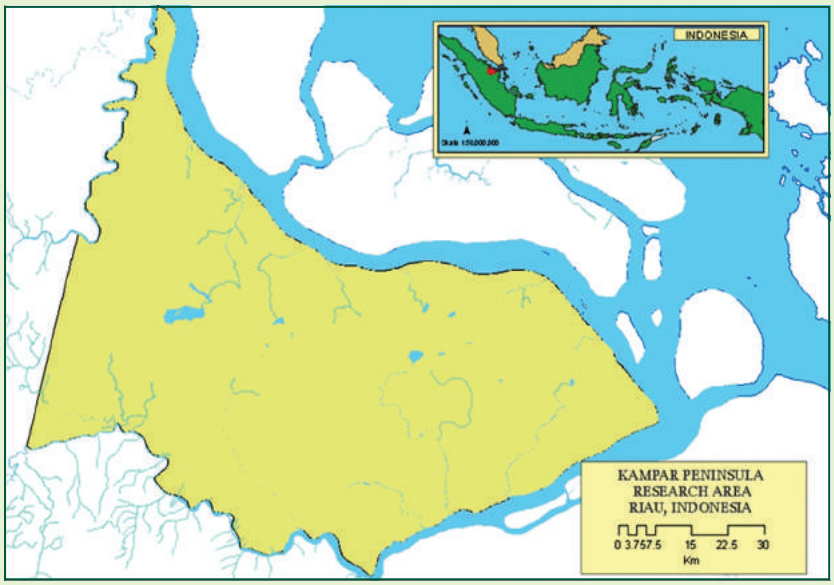

Figure 1. The Kampar Peninsula peat swamp forest in Riau Province.

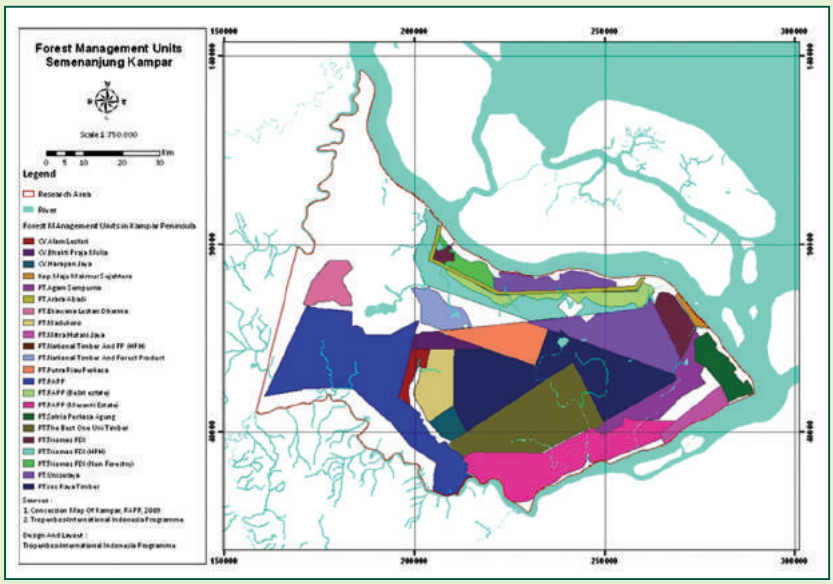

Figure 2. The existing companies in Kampar Peninsula.

Based on the HCV assessment for an Industrial Forest Plantation by the Tropenbos Indonesia Programme in cooperation with APRIL and FORDA in 2010, a zoning scheme for Kampar Peninsula was proposed *(Figure 3)*. Details of the proposed zoning of Kampar Peninsula show that protected peatland areas need to be excluded from any activities, except for landscape restoration activities, around 235,518 hectares (35 per cent) from the total area *(Table 2)*.

The result of the HCV assessment at landscape scale designated about 35 per cent from the Peninsula to be "conserved and protected" and around 65 per cent to be used as a "limited cultivation area".

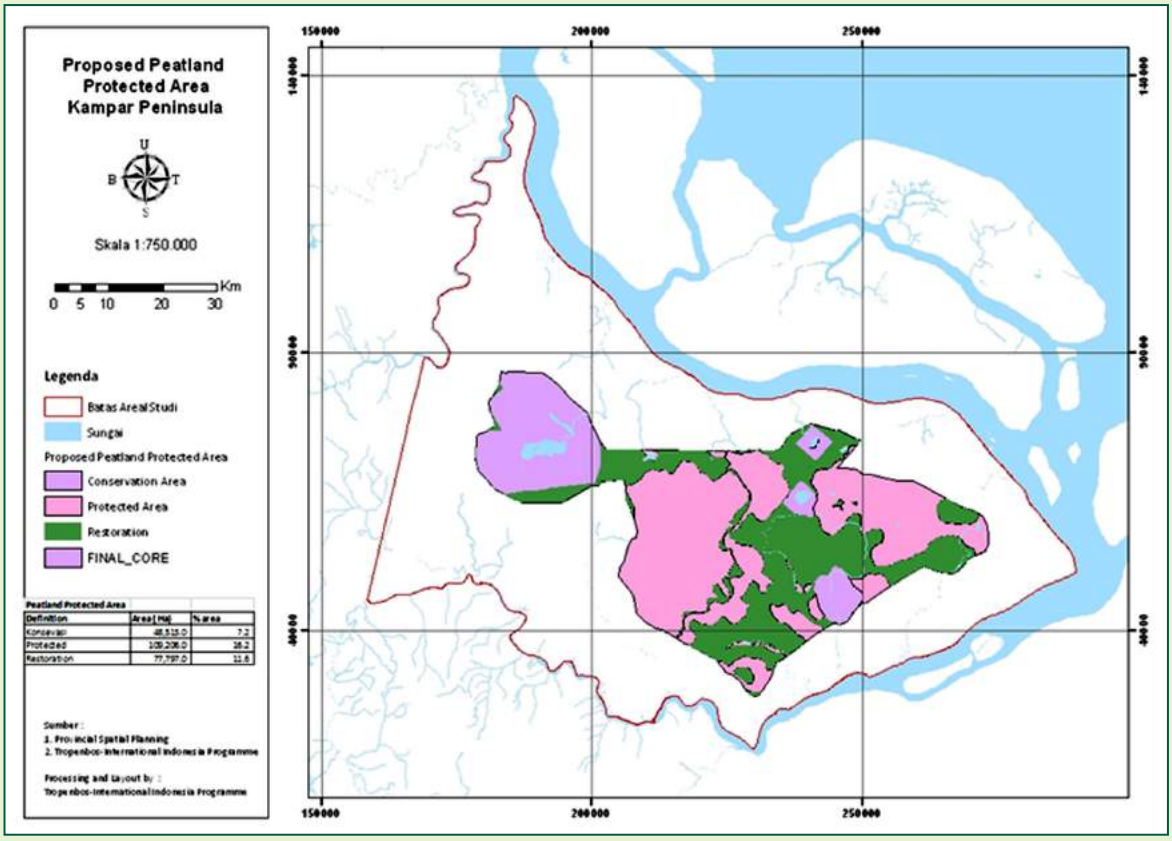

Figure 3. Proposed result of HCV to protect and conserve a peatland area in Kampar Peninsula.

Table 2. Proposed zoning of Kampar Peninsula for protection and limited cultivation area.

No	Main Zone	Utilization	Area (Hectares)	Percentage (%)
1.	Protected Peatland Area	Conservation	48,515	7.2
		Protection	109,206	16.2
		Restoration/Rehabilitation	77,797	11.6
		Total	235,518	35.0
2.	Limited cultivation Area	Protection	49,534	7.4
		Local community use	74,183	11.0
		Limited cultivation	311,889	46.5
		Total	435,607	65.0
Grand Total			671,125	100

Considering the results of the HCV assessment on Kampar Peninsula, APRIL's commitment and initiative to develop sustainable plantation forest management will lead to the conservation of Kampar Peninsula's environmental values and maintain HCVs within forest management units in the area. Applied water management in the plantations is a crucial factor that needs to be proven as having zero impact on the Kampar Peninsula. The development of an appropriate plan can provide profits and benefits through the collaborative effort of Kampar Peninsula stakeholders, including other investors, local government, NGOs, and local communities.

Touching this larger context rather than focusing on HCV can have a positive impact on investors, government, NGOs, and local people and their commitment to sustainable plantation and forest management. This can be done with greater engagement with other stakeholders in restoring the environmental services of Kampar Peninsula.

HCV and its Impact on Biodiversity

The HCV concept has grown from a tool designed for sustainable wood, timber, and palm oil production and other activities with attention to social, cultural and biodiversity issues, into a concept with broader implications for society. The application of the HCV concept pressured companies to improve forest management practices. Many green companies also realize their corporate commitments to engage in 'best practices', often beyond those required by national laws and regulations. The HCV concept is based on voluntary participation, but government and international recognition of this concept has acknowledged that voluntary action is needed to complement formal regulation to achieve sustainable forest management.

Tropenbos International Indonesia Programme was interested in doing the HCV assessment on Kampar Peninsula because of its commitment to promote HCV application to benefit forests and people. Problems with peat swamp forest ecosystems have now become a public concern because of their role in life supporting systems. A number of attributes are attached to the peat swamp forest in Kampar Peninsula, such as:

1. The unexplored wealth of biodiversity in the peat swamp forest and importance to scientific development.
2. The peat swamp forest encompasses conservation areas such as Suaka Margasatwa Tasik Belat, Danau Serkap (Lake of Serkap), Tasik Metas and Tasik Burung, which have habitat types and aquatic fauna typical of peat bogs.
3. The area is a key site for peat swamp forest biodiversity and an important area for birds.
4. The site plays an important role in maintaining the stability of the water system because the peat dome serves as water storage.
5. The peat swamp forest is a huge storehouse of carbon which plays an important role in climate change mitigation.

Synergies of action are needed to ensure the successful conservation of the Kampar Peninsula. Forest management also needs to consider other stakeholders such as local communities who want to contribute to conservation activities.

Collaborative management of the ecosystem-based conservation landscape is expected to answer these problems as well as to accommodate interests of all stakeholders. The concept was also a response to the need of Indonesia to develop successful multi-stakeholder management of tropical forests that can be used as a model in other areas.

Conclusion

The emerging voluntary participation of private companies on HCV assessment, although it was due to market pressure, shows their potential role in supporting biodiversity conservation. Government recognition, market incentives, and recognition from the international community are needed to encourage further participation of the private sector. While conservation is the responsibility of government, the voluntary participation of private companies should be encouraged to ensure the greater sustainable of biodiversity resources.

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Conservation of a Biodiversity Surrogate

Based on case study entitled : *"Conservation of a Biodiversity Surrogate (Gibbon) : Lessons Learned from Mahidol University"*

Authored by : *Dr. Sompoad Srikosamatara, from Mahidol University, Thailand*

Presented by : *Dr. Sompoad Srikosamatara, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Mahidol University is a research university that originated from Thailand's first hospital, Siriraj Hospital, which was founded by H.M. King Chulalongkorn in 1888. The university was established as the University of Medical Sciences in 1943. It was then renamed with great honor by H.M. King Bhumibol Adulyadej in 1969, after his father H.R.H. Prince Mahidol of Songkla, who is widely regarded as the 'Father of Modern Medicine and Public Health in Thailand'. The university became autonomous in 2007.

The educational institution, which has an academic and administrative staff of 26,000, nurtures approximately 18,000 undegraduate students and 10,000 post-graduate students annually. Its annual revenue is about 28 billion baht, while annual expenses is estimated at 27 billion baht.

Found in the capital city of Bangkok, Mahidol University has several campuses. Two of these are older inner-city campuses in the Bangkok metropolitan area. The 17-hectare Bangkok

Figure 1. White-handed gibbons during rehabilitation process before releasing back to the forest.

Noi Campus hosts the Siriraj Hospital. The Phayathai Campus, which spans 32 hectares, has many faculties. The university also has an expansive campus in the suburban area – the 210-hectare Salaya campus which functions as a hub for university administration. The university is expanding its facilities for various academic faculties and research activities. It has provincial campuses in Kanchanaburi (950 hectares), Nakhon Sawan (270 hectares), and Amnat Charoen province (68 hectares).

With its goal of being the "Wisdom of the Land", Mahidol University has continuously strived for educational excellence, outstanding research, leadership in healthcare services, and global outlook.

With traditional strength in medicine (two Faculties of Medicine and four University Hospitals) and sciences (most prominent science faculty in Thailand), Mahidol University has become an increasingly multi-disciplinary institution, including the social and cultural disciplines with emerging strengths in Music and endangered language researches.

The university hosts 17 faculties, six colleges, seven research institutes and three centers. Annually, Mahidol University produces 1,000 medical doctors, serves 4.4 million out-patients and 0.12 million in-patients. It shares the top two Thai universities ranking with Chulalongkorn University. With its strong commitment to internationalization, Mahidol University actively collaborates with over 130 overseas academic insitutions, offers 148 international programmes for students from 50 countries, and produces over 1,500 professional papers annually. Autonomous transformation has enhanced Mahidol University's efficiency, flexibility and ability to innovate and standardize its practices with those of other world-class universities.

A programme at the university level to encourage partnership for biodiversity conservation between the university and local communities is still in its nascent stage. University-supported research on biodiversity based on faculty members' interests offer some guidelines for best practices. Results of these research projects can be used to scale up processes from one facet of biodiversity in one area to multiple facets in a number of areas, from research to education, and from biodiversity conservation to sustainable development.

Mahidol University and Biodiversity Conservation

Biodiversity is not only broad in concept, but also in operation. It is obvious that the link between biodiversity, medicine and science lies in the search for the medicinal and biotechnological values of biodiversity. Mahidol researchers have searched for these through disciplinary coordination among the fields of chemistry, botany, pharmacy and biotechnology. Biodiversity utilization is the mainstream biodiversity research pursued at Mahidol University. Other angles of biodiversity research like biodiversity conservation have been carried out by research minorities due to faculty members' personal interests. This type of research has contributed significantly to biodiversity conservation, but only for a few species such as the Hornbill, elephant, Asian wild cattle, and gibbon researches.

While the research conducted on biodiversity conservation by Mahidol researchers is limited in number, lessons learned from each case can contribute a great deal toward scaling up conservation efforts. In each case, the conservation operation can be seen as "surrogates" or "biodiversity representatives." Species-based surrogates may include Umbrella Species (species conservation conferring some protective status to numerous co-occurring species), Focal Species (species to determine landscape characters for restoration purposes), Keystone Species (for conservation planning for ecosystem process of high ecological integrity), and Indicator Species (a cheaper index species for other species which are difficult or expensive to measure).

One notable research supported by Mahidol University between 2009 and 2011 is a research project entitled Involving Local Communities in Conservation and Restoration of Threatened and Endangered Gibbons in Khao Soi Dao Wildlife Sanctuary, Chanthaburi Province and Lum Nam Pai Wildlife Sanctuary, Mae Hong Son, Province, Thailand.

The research was conducted to: implement action research at a site-based level and to

accumulate knowledge in two follow-up study sites to conserve and restore two endangered gibbon species; build up a network of conservation volunteers at the community level to conserve and restore two endangered gibbons; develop a knowledge management system to support the conservation and restoration of endangered gibbons; and offer lessons learned to conserve and restore endangered and threatened biodiversity.

The research is based from the accumulated studies conducted on the pileated gibbon *(Hylobates pileatus)* in Khao Soi Dao (KSD) Wildlife Sanctuary, eastern Thailand since 1980 and the White-handed gibbon *(Hylobates lar carpenteri)* in Lum Nam Pai Wildlife Sanctuary, northern Thailand since 1997. *H. pileatus* is sexual dichromatic. *Hylobates lar carpenteri* is the northernmost subspecies of *H. lar.* Both male and female species can be either black or buff or light-colored. It is a more hairy sub-species, possibly due to colder climate in the past in northern Thailand. Both species of gibbon are endangered.

Figure 2. A Ph.D. student from Mahidol University is working on the conservation of white-handed gibbon in Mae Hong Son Province, Northern Thailand.

The study on Pileated gibbon followed the international trend in the 1980s when studies were conducted to document the ecology and behavior of the species compared to other gibbon species. The study on *H. lar. carpenteri* is a product of an area-based study approach in Mae Hong Son Province in 1997. Basic knowledge about gibbon study (can be called gibbonology) accumulated since 1938 by C.R. Carpenter have given advantage for more action research. Carpenter collected 146 specimens of gibbon and deposited them at Harvard University's Museum of Comparative Zoology (MCZ). This is considered a milestone in physical anthropology. Two scientists should be mentioned in relation to this milestone. Harold Coolidge organized the expedition. He is the founder of the International Union for Conservation of Nature (IUCN) and regarded as the "Father of Wildlife Conservation." The other is Sherwood Washburn who joined the expedition as a graduate student. When he became a professor, he encouraged more study on primate behavior in natural habitats. He is an important person in "physical or biological anthropology and primatology". The trend involving this type of study influenced the study of pileated gibbon in the 1980s.

Traditionally, it is necessary to know basic information about populations, ecology and behavior when conducting biodiversity conservation initiatives. This is the main idea of the study of pileated gibbon conducted in the 1980s. The population survey in the intensive study site in 1978 estimated the group density of five groups per square kilometer. Twenty-eight years later in 2006, the density was estimated at only 0.87 groups per square kilometer. The study site, which is in the middle of the sanctuary, was accessible only by walking. It can take about half a day to reach the site. Clearly, there are limitations in the traditional way of biodiversity conservation.

To address the limitations, Mahidol University embarked on new action research by setting up a conservation network of non-timber forest

products (NTFPs) collectors which can help in conservation. From May to December 2009, 101 members of local NTFPs collectors joined the network. The current research involves surveying the site occupancy of Pileated Gibbon in the hunted-over valley.

The study sites in Mae Hong Son are at Muang Paem and Aaela, located partly in Lum Nam Pai and San Pan Daen Wildlife Sanctuary. It is a fragmented forest with small and fragmented population of gibbons surrounded by mosaic ethnic landscapes of Black Lahu, Red Lahu, Karen, Lisu, Shan and Lau. The main ethnic landscape in the study site is Karen and Black Lahu. Forest fragmentation has been affected by rotational cultivation practices. The total population of gibbon in upper Mae Hong Son is about 300 individuals. Home range of the main study group is about 40 to 61 hectares. Artificial and habitat corridor have been initiated.

For gibbon reintroduction, there is collaborative research with Lum Nam Pai WS as a releasing site and the Wildlife Rescue Centre for best practices on animal welfare and sources of gibbons for experimental releasing. Many elevated cages (4x6x6 meters with 2-3 meters above the ground) and their connectivity to rehabilitating gibbons were made before releasing near Susa Waterfall, Mae Suriya District. Rehabilitated gibbons include Dollar-Kookoo's Family of four individuals and Talae-Pamai's Family of three individuals. Activity budgets of both groups indicate high level of social behavior. It also shows that they are ready to be released into the forest.

After demonstrating sexual behavior, Gibbon Group 1 welcomed a new baby in October 2011. The more we stay in the area, more gibbons ("Pambok": one-year-old-baby in May 2010, and "Pangpag", a juvenile female in December 2010) of local subspecies *(H. lar carpenteri)* from neighboring villages were donated to the project. This allows the future release of local subspecies.

Sustainable Programmes

The gibbon project is just one example of a research involving community and biodiversity conservation, which was driven and sustained by the research interest of an individual faculty member of Mahidol University. With additional support from the University for this kind of research, different biodiversity surrogates in various areas can be covered. Apart from encouraging more communities to get involved in conservation, supporting this type of research will also result in more accomplishments, as well as best practices and lessons learned. All accomplishments will contribute to the "University Social Responsibility," extending from the traditional output of education and research responsibilities.

Some important lessons can be learned from these small-scale initiatives which can be called "little conservation."

1. These conservation actions are important at the local scale, but may be low priority at national or international scale. New and clear mechanisms of support should be established to firmly back this type of local initiative.
2. Given the low number of conservationists at the national scale, mechanisms to empower students to do real conservation work are necessary. For our studies, three Ph.D. students have been involved. Producing local conservationists should be encouraged and considered a priority.
3. Conservation researchers (both scientists and students) are mostly urban-based. To sustain conservation actions at the local scale, there is a need to develop a cadre of supporting staff called "para-conservationists". A para-conservationist usually stays in the local area, loves nature, and helps manage conservation sites. Moreover, they should be willing to boost their capacity to implement conservation work. They should be another focus of actions to empower people in order to appropriately synergize conservation actions.

Sustainable Strategy

This research provides food for thought for universities that plan to establish research and education programmes on biodiversity conservation and sustainable development. It is important to highlight some points that will help in replicating and scaling up this type of research.

Figure 3. A Ph.D. student from Mahidol University is working on the conservation of pileated gibbon in Khao Soi Dao Wildlife Sanctury, Chanthaburi Province, Southeast Thailand.

1. The research interest of individual faculty members should be encouraged.
2. The research is influenced by both international trends (primatology) and local trends (area-based research).
3. The local trend can make use of knowledge accumulated internationally, but have to be applied to specific areas. This can be done by collecting both key international information and extra information specific to the area. By combining these two sources of information, "wisdom specific to the area" can be developed.
4. This new type of research should be taught and learned by new-generation researchers. This can be done by empowering graduate students to handle such research.
5. Given the university's interest, the research can be replicated, scaled up, and even used to address to a bigger issue related to sustainable development.

It is important to note that the university system in Thailand is experiencing major reforms in higher education, both structurally and functionally. Thailand has massified higher education expansion. Competition for excellence in the academic field has stimulated semi-competition among universities for recognition, students and research funding.

Another recent trend involves encouraging cooperation among various fields both within and among universities for multi-disciplinary research. This is similar to the international trend.

The involvement of communities in the project shows local demand, but also indicates the social responsibility of the university. This requires not only developing the "wisdom of the area," but also university leadership. This operation research can be added to the experiences accumulated through the process of setting up Regional Centres of Expertise (RCE) on Education for Sustainable Development facilitated by the United Nations University Institute of Advanced Studies (UNU-IAS). In fact, similar to RCE, a university can foster a campus environment that assists students in their learning in preparation for biodiversity conservation and sustainable development.

Conclusions

Encouraging an individual faculty member to pursue his or her own research interests on biodiversity conservation is one of the major strengths of Mahidol University under its Medicine and Science programme. Lessons learned from the project provide guidelines for future replication and scaling up operation for the university to develop a programme for community involvement on biodiversity conservation. This lesson learned can add to experiences derived from RCEs facilitated by the UNU-IAS. Additionally, creating campus environments that assist students in learning biodiversity conservation, social responsibility and sustainable development is one initiative that any university can do.

ACKNOWLEDGMENT

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ASEAN Wildlife Enforcement Network: Regional Initiative on Wildlife Enforcement to Protect Biodiversity

Based on case study entitled : *"ASEAN Wildlife Enforcement Network (ASEAN-WEN) : Regional Initiative on Wildlife Enforcement to Protect Biodiversity"*

Authored by : *Chrisgel Ryan Ang Cruz, from ASEAN-WEN Program Coordination Unit*

Presented by : *Chrisgel Ryan Ang Cruz, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Southeast Asia is home to some of the world's greatest biological diversity, which humans rely on for food, livelihoods, medicines and other aesthetic pleasures. Not only is biodiversity important to human lives and communities, biodiversity also has significance to the national economy – with healthy ecosystems contributing to the provision of environmental services vital to the survival and sustainability of populations and nations.

Negative Effects of Illegal Harvesting and Trading in Wild Flora and Fauna

Southeast Asia's biodiversity, however, has, for the longest time, been threatened by various external and internal factors. One such threat is the presence of illegal harvesting and trading in wild flora and fauna, which causes destruction and degradation at many dimensions. First, it contributes to destruction of the environment where natural ecosystems and essential environmental services are degraded. It also entails an irrevocable loss of biodiversity through extinctions of species. Second, it results in economic damage through the loss of revenue and taxes for biodiversity and natural resources that should have been accruing to the national economy. Third, it causes degradation to national security and human health. In this regard, said over-exploitation contributes to the increased presence of organized crime and the spread of potential transmittable vectors and diseases from wildlife to human populations.

While the commercial value for biodiversity and natural resources has driven the illegal trade in timber and wild animals and plants, factors such as extremely low levels of law enforcement, coupled with local poverty and international demand, have further facilitated the growth of over-exploitation and illegal activities into a crisis in Southeast Asia. Porous border, well-established trade routes (by land, sea, or air), increase in efficient transport infrastructure, endemic corruption, lax policies and legislations, and lack of strong will to prosecute environmental cases have all served to make the over-exploitation of biodiversity and natural resources through illegal harvesting and trading of wild animals and plants an easy and low risk activity in Southeast Asia. Southeast Asia has undertaken its role in the problem of illegal harvesting and trading of wildlife as an exporter

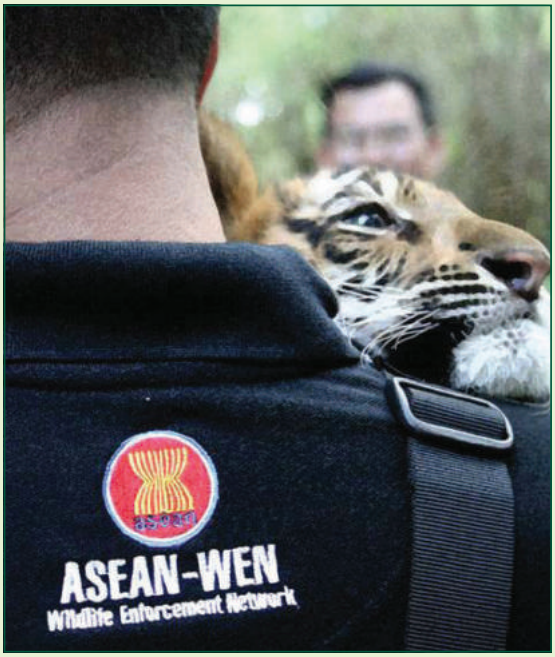

Figure 1. ASEAN-WEN is an integrated regional inter-governmental network for collaboration to fight agiansts wildlife crime.

and source of biodiversity; as importer and user/consumer of biodiversity; and as transit points from bio-diverse areas such as in Africa and South Asia to other areas such as China, Japan, Europe, and the United States of America.

Regional Cooperation vs. Illegal Wildlife Trading

All ASEAN Member States, namely Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam, being parties to the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), have been collaborating and providing commitment to control the trade in wild fauna and flora through strengthened and enhanced cooperation in the region. On 11 October 2004, an ASEAN Ministerial Statement on CITES on the occasion of the 13th Conference of the Parties to CITES acknowledged the need for an effective cooperation and coordination among all relevant wildlife law enforcement agencies, including having strengthened policy, legislations and enforcement efforts in the ASEAN region. This led to the adoption of an ASEAN Regional Action Plan on Trade in Wild Fauna and Flora (2005-2010) in 2005 which specifically provided under its Objective 2 the aim to promote networking among relevant law enforcement authorities in ASEAN countries to curb illegal trade in wild fauna and flora, with Thailand as the lead country to further develop this initiative.

Figure 2. Wildlife confiscated from arrested trafficking.

ASEAN-WEN

In December of 2005, the ASEAN Wildlife Law Enforcement Network (ASEAN-WEN) was launched at a Special Meeting of the ASEAN Ministers Responsible for the Implementation of CITES in Bangkok, Thailand, and targeting its membership as open to officials from CITES authorities, customs, police, prosecutors, specialized governmental wildlife-law enforcement organizations and other relevant national law enforcement agencies.

Under the ASEAN Institutional Framework on Forestry Cooperation, which directly contributes to the ASEAN Economic Community, one of the three Pillars of the ASEAN Community, ASEAN-WEN was established as a regional inter-governmental law enforcement network responding to Southeast Asia' alarming levels of wildlife trafficking, and acting as a platform for ASEAN Member States to share information and learn from best practices. ASEAN-WEN has also been recognized in various platforms in terms of its direct and potential contribution to the ASEAN Political Security Community based on its reporting links with the Senior Officials on Transnational Crime, and to the ASEAN Socio-Cultural Community through environmental sustainability and protection.

In particular, various regional policies and statements have identified the continuing role of ASEAN-WEN: (a) Declaration No. 24 of the ASEAN Declaration on Environmental Sustainability in 2007; (b) ASEAN Socio-Cultural Community (ASCC) Blueprint 2009-2015 under D8 commitments to promote sustainable management of natural resources and biodiversity; (c) ASEAN Regional Action Plan on Trade in CITES Wild Fauna and Flora 2011-2015; and (d) ASEAN Ministers on Agriculture and Forestry Ministerial Statement on "ASEAN and International Year of Forests 2011", which recognized achievements and continuing efforts in addressing threats and challenges faced by the forestry sector in the region which include enhancing efforts in addressing international trade of endangered species and wildlife enforcement.

In its 1st Annual Meeting in 2006 in Thailand, the Terms of Reference of ASEAN-WEN was finalized, containing the following general

objectives: to establish at the national level an ASEAN-WEN committee responsible for coordinating each member country's activities in relation to wildlife law enforcement and combating of illicit harvesting of and trade in wild fauna and flora; to conduct awareness raising programmes to raise the awareness of wildlife crime and illicit trade in wild fauna and flora; to produce training materials on combating wildlife crime and illicit trade in wild fauna and flora, and organize training activities for wildlife and other law enforcement officers or participate in relevant training seminars for enforcement personnel; and to improve collaboration, cooperation, and information exchange between and among law enforcement agencies and national task forces.

ASEAN-WEN Programme Coordination Unit

The Programme Coordination Unit (PCU) was also developed and established in the 1st ASEAN-WEN Meeting to support the work of ASEAN-WEN and the required key actions to implement the objectives of ASEAN-WEN. The PCU's functions are to coordinate and facilitate technical support to ASEAN-WEN member countries and their respective national task forces in support of anti-wildlife trafficking activities; provide support for the convening of ASEAN-WEN meetings, seminars, workshops, exchanges, and training programmes; create and manage an ASEAN-WEN website; facilitate regional sharing and exchange of best practices and lessons learned among ASEAN-WEN member countries; and coordinate with ASEAN Secretariat, ASEAN Member States, international organizations and donor agencies to facilitate technical and financial support for the development of ASEAN-WEN. Thailand, through its Department of National Parks, Wildlife and Plant Conservation (DNP), accepted hosting the ASEAN-WEN PCU. Through the Royal Thai Cabinet Resolution 0506/8247 in May 2007, the PCU as ASEAN-WEN's permanent secretariat located in Bangkok was formally accepted with DNP providing office location and in-kind support for the PCU's operations.

Each ASEAN-WEN Member State has appointed a National Focal Point from CITES Management Authorities or Wildlife/Forestry Agencies, and focal points from relevant enforcement agencies, such as the police, customs, Attorney General's office, fisheries and plant quarantine agencies, trade/general administrative agencies, immigration and checkpoints authorities, and relevant federal government agencies, to support efficient coordination of regional and national activities in relation to wildlife law enforcement and the combating of illicit harvesting of and trade in wild fauna and flora among and between relevant national wildlife law enforcement agencies.

Partners

ASEAN-WEN is also supported by supporting organizations under Rule 15 of its Rules of Procedure to provide the technical and/or financial assistance to ASEAN-WEN as identified by ASEAN Member States. Partners include the CITES Secretariat, Interpol, World Customs Organisation (WCO) and the ASEAN-WEN Support Programme comprising of TRAFFIC Southeast Asia and FREELAND Foundation, and other partner organizations that may provide support and agreed to by ASEAN-WEN. From 2005-2010, via a cooperative agreement with the US Agency for International Development (USAID), ASEAN-WEN Support Program (FREELAND Foundation and TRAFFIC) provided technical and policy support to the development of ASEAN-WEN and its national task forces through capacity building, communications, partnership, and networking initiatives.

Key Achievements

Key achievements include increased efforts at wildlife law enforcement among and between wildlife law enforcement agencies in the 10 ASEAN Member States, yielding large numbers of seizures of live animals, dead animals, animal parts, derivatives and products, and related arrests and convictions across the region; increased capacities of wildlife law enforcement officers and institutions on wildlife trade regulation, species identification, protected areas enforcement, investigation, and wildlife forensics, as well increased awareness among the judiciary; development of training management packages on protected areas enforcement, nature crime investigation, judiciary awareness, and wildlife trade regulation; development of species

Figure 3. ASEAN-WEN involvement activities : Regional cooperation of anti-trafficking network, raising of public awareness and training programmes.

identification guides for wildlife law enforcement authorities in ASEAN on commonly traded species; and numerous public awareness campaigns in airports, border areas, and with private sector and communities.

Continuing capacity building activities supporting wildlife law enforcement authorities in the ASEAN region have also been provided under the East Asia Biodiversity Information Initiative (ESABII) with support from the Ministry of the Environment, Government of Japan on Regional Training of Trainers (ToT). Other achievements include development of new reptile species identification guides; follow-up trainings on wildlife trade regulation and species identification in specific countries like Viet Nam and Cambodia; and TRACE Forensics Network and Darwin Initiative to support development of Wildlife DNA Forensics capacity in the region under an ASEAN-WEN Wildlife Forensics Project (2010-2012).

In the 6th ASEAN-WEN Annual Meeting in the Philippines in May 2011, the USAID introduced a new regional programme which will continue the successes of ASEAN-WEN and its new and expanded support programme called ARREST (Asia's Regional Response to Endangered Species Trafficking). ARREST, a private-public partnership is a five-year Asia-wide regional program implemented by FREELAND Foundation which aims to combat the illegal wildlife trade in the region through consumption reduction campaigns, law enforcement capacity building support and strengthening of regional networks to combat wildlife crime.

Engagements and links with the private sector are being explored under ASEAN-WEN and projects supporting it. In particular, the private sector's potential role on consumption reduction and public awareness, opportunities for alternative livelihoods to illegal wildlife harvesting and trade, support for capacity and needs on wildlife enforcement by national task forces, and support for the sustainability of regional networks at strengthened sustained collaborations to protect biodiversity have been identified as potential recommendations for private sector engagement.

Mixed Forest Plantation for Biodiversity and Ecotourism

Based on case study entitled : *"The Success and Utilization of Mixed Forest Plantation Under Biodiversity Implementation in Farm Chokchai"*

Authored by : *Dumrong Chaiglom, Reforestation Consultant, Thailand*

Presented by : *Dumrong Chaiglom, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Farm Chokchai in Pakchong District, Nakorn Ratchasima Province in Thailand was in the area initially named "Dong Phaya Yen" or the "Cool Jungle" by King Rama V during His Majesty's inspection tour for railroad construction to the northeastern boundary in 1898. The area used to be covered with tropical evergreen forest, which was unfortunately wiped out at the end of World War II due to population expansion and the need to develop land for agriculture. Reforestation under mixed transplanting with both indigenous and exotic tropical tree species was implemented to regenerate biodiversity in 1994. This mixed forest plantation is located on the southwestern point of the northeastern plateau near the Friendship Highway about 150 kilometers from Bangkok. The plantation has been maintained and developed as a sustainable green area for eco-tourism activities in the farmland and also for the protection and conservation of its ecological functions.

The Plantation

The mixed forest plantation of Farm Chokchai is located on the corner of the southwestern point of the northeastern plateau. The area has an average elevation of 300 meters and is surrounded by the mountain ranges of Dong Phaya Yen on the west from Khao Yai National Park, Nakorn Ratchasima Province, northward up to Phu Rheua National Park, Loey Province.

The average rainfall is 1,000 ml. The rainy season starts from May to September, winter is from October to February, and the dry season is from March to April. Highest temperatures in the plantation have been recorded at 26°C, while in the open area of grassland nearby, the temperature climb to as high as 46°C. The forest plantation is evidently a natural tool for the reduction of air temperature and will definitely benefit environmental conservation particularly in the efforts to reduce global warming.

Transplanting Operations

Depending on site quality and topography, transplanting operations were implemented in two phases:

Phase 1: Mixed transplanting operation with seedlings of various indigenous and exotic species was implemented in the area of less density of weeds and free from buttress from Casuarina plantation in 1994.

Phase 2: Mixed transplanting operations with saplings of the indigenous and exotic species was implemented in the area with density of weeds and buttresses of old stumps from the earlier Casuarina plantation within the northern part of the area from 1995 to 1996.

Table 1. Tree species of seedlings for mixed plantation.

No	Scientific Name	Local Name	Common name
1	*Swietenia macrophylla* King	Mahogany	Broad Leaf Mahogany, False Mahogany
2	*Azadirachta indica* A. Juss. var. *siamensis* Valeton	Sa Dao	Neem Tree, Siamese Neem Tree
3	*Azadirachta excelsa* (Jack) Jacobs	Sa Dao Thiam, Sa Dao Chang	Indian Walnut
4	*Pterocarpus indicus* Willd.	Pra Doo Ban	Burmese Rosewood
5	*Dalbergia floribunda* Craib.	Pra Doo Daeng	-
6	*Afzelia xylocarpa* (Kurz) Craib.	Ma Kha Mong	-
7	*Dipterocarpus alatus* Roxb.	Yang Na	Yang
8	*Hopea odorata* Roxb.	Takien Thong	Iron Wood
9	*Peltophorum dasyrachis* (Miq.) Kurz	Nonsi	Copper Pod
10	*Vitex pinnata* Linn.	Tin Nok	-
11	*Diospyros mollis* Griff.	Ma Kleu	Ebony Tree
12	*Litsea glutinosa* (Lour.) C.B. Robinson	Mee Men	-
13	*Mechelia longifolia* BL.	Champee	White Champaka
14	*Holarrhena antidysenterica* (L.) Wall ex A. DC.	Moak Luang	Luang Kurchi, Easter Tree
15	*Acacia catechu* (L.F.) Willd.	Si Siat	Catechu Tree, Cutch Tree

Table 2. Tree species of saplings for mixed plantation.

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1	*Swietenia macrophylla* King	Mahogany	Broad Leaf Mahogany, False Mahogany
2	*Azadirachta indica* A. Juss. var. *siamensis* Valeton	Sa Dao	Neem Tree, Siamese Neem Tree
3	*Pterocarpus indicus* Willd.	Pra Doo Ban	Burmese Rosewood
4	*Dalbergia floribunda* Craib.	Pra Doo Daeng	-
5	*Dipterocarpus alatus* Roxb.	Yang Na	Yang
6	*Hopea odorata* Roxb.	Takien Thong	Iron Wood
7	*Peltophorum dasyrachis* (Miq.) Kurz	Nonsi	Copper Pod
8	*Vitex pinnata* Linn.	Tin Nok	-
9	*Diospyros mollis* Griff.	Ma Kleu	Ebony Tree
10	*Litsea glutinosa* (Lour.) C.B. Robinson	Mee Men	-
11	*Michelia longifolia* BL.	Cham Pee	White Champaka
12	*Holarrhena antidysenterica* (L.) Wall. Ex A. DC.	Moak Luang	Kurchi, Easter Tree
13	*Artocarpus lakoocha* Roxb.	Ma Had	Monkey Jack
14	*Cassia fistula* Linn.	Ratcha Pleuk	Golden Shower
15	*Chukrassia tabularis* A. Juss.	Yom Hin	Almond Wood, Chickrassy
16	*Bauhinia purpurea* Linn.	Chongko, Sieo Daek Dang	Purple Orchid Tree
17	*Mammea siamensis* Kosterm.	Sarapee	-
18	*Toona ciliata* M. Roem.	Yom Hom	Indian Mahogani, Cigar-box Cedar
19	*Cassia floribunda* Cav.	Khi Lek America	American Cassia
20	*Homalium tomentosum* (Vent.) Benth.	Kha Nang	Moulmein Lancewood

Results

The mixed forest plantations have been established as a greenbelt in the farmland surrounded by various forms of development, including agricultural areas, tourism establishments, residential communities and resorts.

Mixed transplanting with seedlings in Phase 1 in the area free from old stumps of Casuarina and less weeds was a successful establishment of mixed vegetation *(Figure 1).* Now the whole plantation has been developed as a camping area and convention hall for tourists and visitors.

Mixed transplanting with saplings in Phase 2 provided a remarkable landscape inside the plantation *(Figure 2).* The majority of exotic species could not survive due to pests and poor soil structure except for Mahogany *(Swietenia macrophylla* King*).* It was the only plant species that could grow and create a good atmospheric landscape with a dense and long lasting green canopy almost all year round. It was also observed on its ability for natural regeneration inside the forest plantation since 2008. Mahogany has survived and reproduced several generations of forests in Thailand since it was introduced in the country as a shaded tree by Henry Alabuster (1836-1884), one of the first British diplomats to the Court of Siam who became advisor to King Rama V in 19th Century.

Figure 1. Mixed forest plantation with seedlings.

Figure 2. Mixed forest plantation with saplings.

Figure 3. Camping ground and tourists under the shade of the plantation.

Figure 4. Transportation for ecotourism in the farmland.

Figure 5. Zoological park inside the forest plantation.

Utilization of the Plantation

Mixed forest plantation on Phase 1 has been developed as a recreation park for tourists and visitors in 2008, where they can stay overnight in the camping boutique *(Figure 3).* All facilities covering from camping ground to convention hall inside the plantation are ready for visitors.

Transportation for group tours is available through rolling cowboy carts *(Figure 4)* for sight-seeing throughout the farmland and the greenbelt of mixed forest plantation.

An open zoo and wildlife sanctuary is also set up inside the mixed forest plantation for tourists and visitors *(Figure 5).*

The whole forest plantation ecosystem now has a broad spectrum of benefits not only

Figure 6. Greenbelt of mixed forest plantation in the farmland.

to ecotourism business in the farmland, but also to natural protection in terms of providing wind breaks at the beginning of monsoon, soil erosion protection during the rainy season, soil moisture collection in the dry season, soil quality improvement by the natural decomposition of fallen leaves to form rich humus, including the reproduction of beneficiaries in the undergrowth, such as edible fungi and medicinal herbs. The greenbelt of mixed forest plantation in Farm Chokchai *(Figure 6)* is also a natural tool for reducing air pollution generated from livestock and vehicles along the Friendship Highway. The regenerated forest also helps reduce intense heat from global warming.

Conclusion

Reforestation with mixed transplanting to strengthen biodiversity conservation using indigenous and exotic species on the northeastern plateau inside Chokchai Farm, Pakchong District, Nakorn Ratchasima Province that began in 1994 has now developed into a recreation park for ecotourism inside the farmland. The mixed forest plantation provides a broad spectrum of benefits that not only supports ecotourism, but also protects and conserves environment and the ecology of the farmland. Although this implementation is small scale, it may provide inputs into action plans for reforestation in other areas.

SESSION C

TOURISM, EDUCATION AND RESEARCH

Promoting Sustainable Tourism for Biodiversity Conservation

Based on case study entitled : *"Sustainable Tourism for Biodiversity Conservation-Case Study : El Nido Resorts, Palawan, Philippines"*

Authored by : *Mariglo Rosaida I. Laririt, from Ten Knots Development Corporation, El Nido, Palawan, Philippines*

Presented by : *Lorrima Cifra de Dios, from El Nido Resorts, Philippines, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Pristine waters, breathtaking views, astonishing level of marine biodiversity – these make the municipality of El Nido in Palawan, Philippines a favorite holiday destination among local and international tourists. Unfortunately, these are the same qualities that make it a target of poachers and illegal fishers.

To ensure that El Nido's richness will be protected, Ten Knots Development Corporation (TKDC) is balancing resort operations with environmental conservation.

The name Ten Knots is based on the definition of knot as a unit of speed of one nautical mile per hour. The founders of Ten Knots were divers who explored dive sites in the Philippines on their dive boat. They believed that ten knots is the ideal speed for getting to their dive destination while cruising leisurely to appreciate nature's endowments. Thus, the name Ten Knots reflects the company's ideals to strive for a balance between meeting human needs and caring for nature.

Today, the Ten Knots Group is owned by ACC Resorts, Inc. and Ayala Land Inc. It includes Ten Knots Philippines, Inc. (TKPI), which focuses on property management, and Ten Knots Development Corporation (TKDC) which owns and operates the El Nido Resorts in various islands in Bacuit Bay in the Municipality of El Nido in Palawan, Philippines. Miniloc Island Resort

Figure 1. El Nido resorts, the eco-friendly resorts in Palawan, Philippines.

opened in 1981 and now has 50 cottages; Lagen Island Resort, which opened in 1998, has 51 rooms. A third resort in the same area, Pangulasian Island Resort, opened in January 2012 with 43 rooms. A fourth property, Apulit Island Resort, located in Taytay, Palawan, was acquired and re-opened in December 2010, and has 50 rooms.

According to Mr. Jose Ma. Lorenzo Tan, Vice Chairman and CEO of WWF-Philippines, "El Nido Resorts has embraced its responsibility for environmental stewardship, preserving the diversity and maintaining the ecological system of El Nido in Palawan."

TKDC upholds what is known as its Quadruple Bottomline of sustainable tourism: financial growth, environmental stewardship, community engagement, and organizational development. Operating in a Managed Resource Protected Area known for its high biodiversity, the resorts devote resources to conservation of the natural environment through guest participation, staff commitment, and community involvement. Success comes in the form of high environmental integrity in the areas where the resorts operate; high guest satisfaction with the quality of the natural environment; and the interpretation provided by trained guides, international recognition through awards, expanding community-based partnerships, and continued financial profitability. Key success factors include a highly trained workforce, high local employment ratio, good corporate governance, and an approach to conservation that is both scientific and socially pragmatic.

The company's conservation efforts is championed by a lean Environment Department that has been carrying out environmental programmes and activities at and around its resorts.

Instilling Love for the Environment Among Employees

The Be GREEN (Guard, Respect, Educate El Nido) programme is one of the Environment Department's biggest projects. Be GREEN is a series of environmental practices training seminars that educate staff in biodiversity conservation, environmental legislation, ecological solid waste management, water conservation, and energy conservation. Though the latter four topics may not be directly related to biodiversity conservation, the knowledge and skills gained by the staff from these seminars all contribute towards biodiversity conservation.

Since the programme started in 2007, over 900 full-time and part-time individuals have successfully completed the training. In order to put the training into practice, El Nido Resorts conceived of "Pa-Berdehan: The El Nido Resorts Eco-Challenge", where staff members form teams and implement a project that applies the principles learned during the Be GREEN seminars. Past winning entries include using used plastic water bottles as floats in fabricated kayaks and the scheduling of air conditioning in the guest rooms and restaurant to minimize energy usage while maintaining guest comfort. Be GREEN videos have been produced and shown at the airport lounge for departing guests, as well as donated to various groups such as schools, tour operators, travel agents, and enthusiastic resort guests.

Whenever possible, employees also volunteer their off-duty hours to do coastal and underwater clean-ups.

Involving Guests in Conservation Efforts

Guests are also involved in environmental education activities. Tourists are provided with information on the natural surroundings of the resorts, including an introduction to the species found in El Nido. Every week, resort guests are treated to the Green Hour, hosted by the company's Environmental Officers. Short presentations on biodiversity and conservation efforts entice guests to stay on and ask questions, mostly on how they can help in these conservation efforts.

Wildlife Monitoring

In February 2008, El Nido Resorts launched El Nido Biodiversity Online, a database of El Nido's flora and fauna. The database includes information such as species profiles (common name, scientific name, habitat, distribution, etc.), photos, and sightings in El Nido. Guests and staff who spot these organisms as they go around El Nido are encouraged to report their sightings to the Environmental Officers, who then update the database. El Nido Biodiversity Online

is a valuable tool in biodiversity conservation as it increases the knowledge and awareness of both visitors and the local community, thus promoting stewardship.

The Environment Department also provides training in the identification of El Nido's flora and fauna, basic ecology, and nature interpretation to the Resorts' guides. Because of this training, the guides are better able to connect resort guests to El Nido's unique biodiversity. This leads to increased appreciation, better visitor management, and greater participation among guests in biodiversity conservation activities. Members of the department also attend conferences such as the National Association for Interpretation International Conference in order to meet, share experiences with, and learn from colleagues from all over the world. This enables them to develop new interpretive programmes for the guests and to further improve the level of nature interpretation provided by the guides.

Working with the Community on Conservation Efforts

In April 2006, El Nido Resorts partnered with the local community and El Nido Foundation, Inc. in the installation of artificial reef modules (EcoReefs) in Tres Marias, a former dive site devastated by illegal fishing, coral bleaching, and typhoons. El Nido Resorts provided logistical and manpower assistance during the installation. Up to now, El Nido Resorts conducts regular inspection of the artificial reefs.

Also in 2006, El Nido Resorts supported the first-ever Philippine Cockatoo Translocation Project, an initiative of the Katala Foundation, Inc. which aimed to re-introduce previously captive, extremely endangered Philippine Cockatoos to the wild, in the hope of re-stocking their population. El Nido Resorts-Lagen Island continues to monitor the birds that were released in November 2006.

El Nido Resorts also champions the conservation of endangered sea turtles, with tag-and-release programmes in cooperation with the Protected Area Office, and hatchling releases from nests safeguarded by resort staff.

The Crown-of-Thorns Starfish Clean-up is another key activity that sparked several identical efforts from various groups in the local communities during the prolonged period of infestation from 2009 to 2011.

Figure 2. Crown-of-Thorns Starfish Clean-up.

Protecting Coral Reefs through Mooring Buoys

To prevent anchor damage on coral reefs, El Nido Resorts' Dive Team installed and maintains mooring buoys in 21 sites around Bacuit Bay. These are especially important in high-traffic areas such as the Small Lagoon and South Miniloc. Boat and dive operators from other resorts, as well as fishermen, are all enjoined to use these buoys.

Communicating Conservation

El Nido Resorts is able to share its advocacy of sustainable tourism and biodiversity conservation both locally and internationally through the various print and online media. "Enchanting El Nido", a nature show on YouTube produced, written, filmed, and hosted by the Environmental Officers showcases the flora, fauna, and geological features that may be found in El Nido. The message of the videos is always one of hope – that even though these species are endangered, they can still be saved through collective action on our part. The department also regularly contributes articles such as "Ecofriend of the Month" and "Ask Mariglo" to E-scape, El

Figure 3. El Nido Resort's diving course for tourists in one of the Philippines' richest reserves of marine life.

Nido Resorts' bimonthly e-newsletter that reaches 17,000 subscribers. Print materials produced by the department include the book "A Guide to the Birds of El Nido, Northern Palawan, Philippines", kids' activity sheets and placemats, and signage for the passenger lounges of El Nido Airport.

Celebrating the Environment

Every year, El Nido Resorts joins the world in celebrating Earth Day, World Ocean Day, and the International Coastal Cleanup Day, through coastal and underwater cleanups, presentations from the Environment Team and film showings. El Nido Resorts also promotes awareness of the need to take action on climate change by participating in Earth Hour.

Investing in Environment-friendly Technologies

In addition to providing world-class amenities to guests, TKDC has also invested in scale-appropriate technologies in order to mitigate the resorts' impacts on the environment: sewage treatment plants, desalination plants, materials recovery facility, rainwater catchment system, reed beds, fuel-efficient generators and boat engines, energy-efficient lighting, and solar panels.

Successes in Conservation

By being actively and responsibly present within the areas of high biodiversity, resort operations have discouraged environmentally destructive and illegal activities, such as wildlife poaching, blast fishing, illegal logging, and other forms of wildlife extraction. By investing in infrastructure and people, negative impacts of resort operations are mitigated. Through good corporate governance and fiscal discipline, TKDC has continued to enjoy financial profitability. Training staff and providing educational opportunities for visitors and the local community continues to expand the base of partnerships for conservation. This has also resulted in consistently favorable reviews from guests in the enjoyment of nature and nature-based activities, as well as in the quality of nature interpretation. Sharing and communicating with online communities encourage others to duplicate best practices. Joining competitions has allowed TKDC to benchmark itself against others in the same industry.

Recognitions Received

Just over the past five years, TKDC has received the following awards:

- Pacific Asia Travel Association ("PATA") Gold Award for Environmental Education

Programme for El Nido Resorts GREEN ("Guard Respect Educate El Nido") Campaign, 2011

- ASEAN Green Hotel Award for the years 2008-2009 and 2010-2011
- Responsible Tourism Award, 2009, given by www.wildasia.org
- Sustainable Hotel Award in the Sustainable Destination Category, 2010, given by Hotel Investment Conference Asia Pacific
- Travel and Leisure's "Our Fifteen (15) Favorite Green Hotels," 2008 and 2007, for US, South Asia and Australia
- British Airways' Tourism for Tomorrow Awards, 2007, Investors in People Category
- Conde Nast Travel Green List Awards, 2006
- Islands Blue List Award, 2007

It was also nominated in the 2011 ASEAN Champions of Biodiversity, a recognition programme for outstanding projects on biodiversity conservation and advocacy in the ASEAN region. Managed by the ASEAN Centre for Biodiversity, the award is aimed at generating greater leadership, public and media awareness of the problems facing the region's rich but highly threatened biodiversity and the need for a concerted effort in biodiversity conservation and advocacy.

According to Mr. Nieves B. Rosento, municipal councilor of El Nido, Palawan, "El Nido Resorts' contribution to the overall image of El Nido as a municipality that promotes responsible tourism practices is unquantifiable. Leading by example, they have shown other operators how to run island resorts with proper environment-saving infrastructure." He added that "El Nido Resorts has also consistently shown support for the collection of Conservation Fees and the Ecotourim Development Fund by the Local Government Unit, acting as Special Collecting Agent. These funds have been used for the sole purpose of environmental protection."

Challenges

As tourism becomes an increasingly important economic activity in natural areas around the world, local governments are faced daily with the daunting task of balancing the delicate relationship between economic development and environmental conservation. Tourism can benefit biodiversity conservation only if it adheres to principles of sustainability and if laws are applied equally, properly and efficiently.

Conflicts arise when government units are not able to implement environmental laws properly. Carrying capacity studies are rendered useless when limits are exceeded and no sanctions are imposed. Environmental compliance becomes optional, and breakdown of order ensues. This proves as a disincentive to companies, like TKDC, that have been faithfully adhering to regulations.

On the other hand, irresponsible tourism operators flourish undeterred. Some uncooperative boatmen, for example, drop anchor wherever their guests desire to stop to swim or snorkel. Some resorts operate without the requisite Environmental Compliance Certificate (ECC). Also, too many government agencies that have jurisdiction over El Nido have resulted in confusion as to who truly is in charge of environmental protection. Is it the local police or the Protected Area Office or the El Nido Environmental Law Enforcement Council?

Government budgets for infrastructure for sustainable development, including biodiversity conservation, must be passed. At present, there is minimal presence of government authority in the bay to discourage illegal activities. The police do not even have their own patrolling resources. As a result, TKDC had to bridge the gap by including in its annual budget the requirements for a government-deputized Environmental Enforcement Officer who does regular patrols.

Finally, government should be strict yet simplify bureaucratic processes, and create incentives for sustainable tourism practitioners to attract responsible investors.

Partnership Strengthens Biodiversity Conservation and Sustainable Development

Based on case study entitled : *"Environmental Education for Sustainable Development and Biodiversity Conservation-Case Study : Bangpu Nature Education Center"*

Authored by : *John W.K. Parr, from Fauna & Flora International, Trirach Pukotchasarnseen and Teerayuth La-orphanphol, both from Foundation for Environmental Education for Sustainable Development (Thailand)*

Presented by : *Teerayuth La-orphanphol, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

The Bang Pu Nature Reserve covers 102 hectares of mangroves and mudflat habitats and is located in Samut Prakan Province, 12 kilometers east of the provincial capital, and 37 kilometers from Bangkok. Managed by the Royal Thai Army (RTA) since 1947, the reserve was mainly used by the RTA as a rehabilitation facility for soldiers.

The coastal area of Samut Prakan Province has largely been cleared of mangroves to make way for aquaculture, urbanization and industrial developments. Less than 1,600 hectares of secondary mangroves still remain and are usually found as a narrow fringe along the seaward margins. One hundred two hectares of mangroves are protected within the nature reserve at Bang Pu, constituting a notable remnant and is a very important site for resident and migratory birds, as well as other coastal and marine species.

Bang Pu is a well-known destination because it supports the largest and most noticeable concentration of wintering gulls in the country, and attracts visitors particularly during the cool season. Bang Pu is recognized as an Important Bird Area because it serves as a staging post and wintering area for some 150-300,000 migratory waterbirds that visit the site annually. Of these, Bang Pu regularly supports concentrations of 10,000 to 20,000 shorebirds, terns and gulls.

The relative intactness of the representative habitats and the rich avian biodiversity, combined with the area's accessibility and proximity to Bangkok, suggest that the site has high potential to be developed as a nature education centre. This created the partnership between World Wide Fund for Nature (WWF) Thailand, the Royal Thai Army and Toyota Motor Thailand Co., Ltd., leading to the establishment of the Bang Pu Nature Education Centre (BNEC).

Habitats and Species Diversity in Bang Pu Nature Reserve

The Bang Pu Nature Reserve is dominated by mangrove and mudflat habitats. Only 53 plant species have been recorded within the site, indicating the highly disturbed nature of the reserve. The mangrove forest is predominantly *Avicennia marina* and *A. alba.* Enrichment planting has been promoted in recent years, with stands of *Rhizophora apiculata* and *R. mucronata,* as well as *Sonneratia caseolaris, Xylocarpus* sp. *Ceriops* sp. and *Nypa fruticans.* Back mangrove species include *Thespesia populneoides,* and *Lumnitzera racemosa,* while *Sueda maritima* is found in open areas.

The mangroves are used for breeding and roosting by large waterbirds. Some 200 bird species have been recorded in the reserve. These include a loose breeding colony of little cormorants *(Phalacrocorax niger),* cattle egrets *(Bubulcus ibis)* and black-crowned night-heron *(Nycticorax nycticorax),* which are at the reserve from January to June each year. Asian openbills *(Anastomus oscitans)* have colonized the mangrove, with several hundred pairs breeding each year. Other regular visitors include up to 30 painted storks *(Mycteria leucocephala),* a small number of grey herons *(Ardea cinerea),* purple herons *(A. purpurea)* and spot-billed pelicans *(Pelecanus philippensis).* Among smaller waterbirds, little heron *(Butorides striatus)* and black-winged stilt *(Himantopus himantopus)* also breed in small numbers.

In August, migrant waders arrive from their Siberian or Central Asian breeding grounds to join over-summering individuals. As many as 1,500 to 2,000 black-tailed godwit *(Limosa limosa)* use Bang Pu as a roosting site throughout the wintering months. Some 36 shorebird species have been recorded in the reserve including the greater sand plover *(Charadrius leschenaulti),* lesser sand plover *(C. mongolus),* little ringed plover *(C. dubius),* Kentish plover *(C. alexandrinus),* grey plover *(Pluvialis squatarola),* Pacific golden plover *(P. fulva),* marsh sandpiper *(Tringa stagnatilis),* common redshank *(T. tetanus),* common greenshank *(T. nebularia),* ruddy turnstone *(Arenaria interpres),* sandpipers and stints *(Calidris* spp.*).*

Each winter, 6,000 to 8,000 brown-headed gulls *(Larus brunnicephalus)* feed and roost on the mudflats. Among them are the black-headed gull *(L. ridibundus),* black-tailed gull *(L. crassirostris),* Heuglin's gull (*L. heuglini),* Mongolian gull *(L. mongolus),* Pallas' gull *(L. ichthyaetus),* and slender-billed gull *(L. genei).* The common gull *(L. canus),* little gull *(L. minutus)* and black-legged kittiwake *(L. tridactyla)* were new records that were first discovered at the reserve.

Figure 1. Brown Headed Gull in Bang Pu Nature Education Centre.

Aside from the tremendous population of birds, the site supports notable populations of mangrove fauna, including water snakes and mudskippers. Recorded mudskippers include *Periophthalmodon schlosseri, Boleophthalmus boddarti, P. septemradiatus, P. chrisospilos, P. septemradiatus, P. schlosseri.* Fifteen species of crab have been recorded from the site, including the grapsid crabs *Ilyogynis* sp., *Episesarma versicolora, Metopograpsus* sp. *and Uca annulipes.* The mudflats also support substantial populations of shellfish, other crustaceans, and approximately 70 species of benthic fauna.

The Establishment of the Bang Pu Nature Education Centre

WWF Thailand recognized the potential of the Bang Pu Nature Reserve for nature education, due to its proximity to Bangkok and the presence of large populations of waterbirds and shorebirds. WWF Thailand illustrated the potential of the site to the RTA by inviting representatives to visit the Mai Po Nature Reserve in Hong Kong in March 2003, a wetland education centre managed by WWF Hong Kong. The Mai Po Nature Reserve had strong similarities with the Bang Pu site, being an extensive network of rehabilitated shrimp ponds, mangrove and coastal mudflats.

Following this successful visit, the RTA and WWF Thailand agreed to establish the nation's first urban nature education centre at Bang Pu in December 2002. A Memorandum of Understanding (MOU) was signed between the Commander-in-Chief of the RTA and the Country Representative of WWF Thailand on 20 August 2003. Under the agreement, the RTA pledged to take responsibility for the infrastructure, while WWF Thailand would provide the educational services. The site was designated as a Royal Project to celebrate the 72nd Anniversary of Her Majesty the Queen Sirikit, with the formal name Bang Pu Nature Education Centre.

Following the signing of the MOU, corporate sponsorship was sought to develop the site. On 27 April 2004, Thai Life Insurance Public Co., Ltd. approved funding of educational activities for US$ 165,227 (6,543,000 *baht*) for three years. A reserve manager, four educational officers and an administration officer were appointed by WWF Thailand. Toyota Motor Thailand Co., Ltd. also agreed to finance provision of infrastructure components on 5 January 2006 for US$ 683,000 (20.5 million baht) covering an eight-year period.

The nature education centre features a reception hall, a visitor centre, a small auditorium and office space, all of which are constructed at the entrance to the reserve. Facilities inside the reserve include an eight-meter high wildlife

observation tower, four bird observation hides, 500 meters of boardwalks and 2.5 kilometers of nature trails. The Port Authority of Thailand funded a bird observation tower overlooking the mudflats for US$ 44,248 (1.5 million *baht*) in August 2008.

Nature Education Activities

WWF Thailand prepared training manuals and a full range of leaflets and brochures about specific faunal and floral groups found within the nature reserve for distribution to primary and secondary school teachers. Binoculars and telescopes, bird guides and other education materials are also available for the use of students and members of the public, together with a range of other field guides on different nature topics. Equipment such as projectors and musical instruments are also used to support activities undertaken in the lecture theatre.

The Samut Prakarn Provincial Educational Office under the Ministry of Education arranges educational visits to the BNEC. Organized parties of 50 to 60 students visit the nature education centre for fixed periods of time. Schoolchildren from secondary schools (Levels 7 to 9) in Samut Prakarn Province are particularly targeted as the age groups most likely to benefit from nature education.

Following an introductory session, the WWF nature educators divide the participants into groups and take educational walks around the reserve. BNEC has developed curricula for four different age classes, which also relate to the curricula and activities of the local schools. These courses comprise curriculum for primary schools (Levels 1 to 3 and Levels 4 to 6) and secondary and high schools (Levels 7 to 12). Modules focus on Bang Pu Flora; Bang Pu Birds, Waterbirds and Gulls; Mudflats and Benthic Fauna; and Bang Pu Biodiversity. There is also a curriculum for general groups.

Outcomes

Integration of environmental education in schools. The Environmental Education Unit of WWF Thailand has been implementing environmental education programmes for six

School activity for introductory session at BNEC

Bird watching activity

Coastal ecosystem activity

Mangrove plantation activity

Figure 2. Nature education activities at Bang Pu Nature Education Centre (BNEC).

years for a variety of audiences, including teachers, students and the general public. It has also developed formal environmental education curricula for different target groups. Because of the success of its environmental education programmes and modules, these have been integrated and applied at national student camps under the auspices of the Office of the Basic Education Commission, Ministry of Education.

Increased environmental awareness among students and visitors to BNEC. Since the implementation of the formal nature curriculum, 42,000 students from 74 schools in Samut Prakan province and nearby areas have benefitted from nature education activities at BNEC from May 2005 to February 2011. The achievements of BNEC are highlighted by the visits by HRH Princess Maha Chakri Sirindhorn and His Royal Highness Prince Dipangkorn Rasmijoti.

Biodiversity conservation. The nature education centre has helped protect the biodiversity of the reserve through mangrove forest reforestation, and habitat development and improvement. This has led to the increase in population of the resident and migratory birds, and has strengthened the survival of many endangered species.

Lessons Learned

Environmental partnerships strengthen outcomes. The BNEC represents a partnership between different stakeholders with very different mandates. The Royal Thai Army provided support by supervising the construction and maintenance of wildlife observation hides, boardwalks and paths. It also utilized its powerful profile and connections to heighten both public interest and media interest in the site. WWF Thailand developed quality education programmes for schoolchildren and used its global conservation network to link with other nature and wetland centres in the region. Finally, the business sector financed the education programme as part of their respective corporate social responsibility programmes.

The importance of support from the business sector in nature education. Three nature education centres in Thailand, namely Bang Pu Nature Education Centre in Samut Prakran Province, Nature Agriculture Education Centre (NAEC) in Pathumthani Province, and the Education for Sustainable Development Centre (ESDC) at Sirindhorn International Environmental Park (SIEP)- a nature education facility of RCE Cha-am, in Phetchaburi Province, have all benefitted from substantial support from the business sector. Aside from BNEC, Toyota Motor Thailand Co., Ltd. also provides financial support to ESDC, while Thai Bridgestone Co., Ltd. is providing support to NAEC with 36.7 million baht for eight years. All three centres were formed through collaborations between the government, WWF Thailand, and the local community with significant support from business sector.

The effective collaboration among the government, a committed conservation organization, and the private sector in the development of the Bang Pu Nature Education Centre and other environmental education centres in Thailand shows that the three sectors can work together towards a common goal. Biodiversity conservation can only work with the support of all stakeholders. Synergy between stakeholders is significant in expanding environmental education and knowledge, protecting Thailand's biodiversity, and thus ensuring sustainable development.

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Twenty Million Students vs. Climate Change

Based on case study entitled : *"Paryavaran Mitra (Friend of Environment) Programme in Assam, a North Eastern State of India"*

Authored by : *Simanta Kalita, from RCE Guwahati-Centre for Environment Education (CEE), Guwahati, India, Sudhir Kumar Sinha, from ArcelorMittal, New Delhi, India, Prabhjot Singh Sodhi, Pramod Kumar Sharma and Bijoy Sankar Goswami, from CEE, India and Partha Pratim Baruah, from Gauhati University, Guwahati, India*

Presented by : *Simanta Kalita, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

India is targeting 20 million students to combat climate change. *Paryavaran Mitra* (Friend of Environment) is a nationwide initiative to transform 20 million students into Paryavaran Mitra through participation in curricular and co-curricular activities and projects. It is an action-based handprint, focusing on sustainability and climate change education. The goal of the *Paryavaran Mitra* programme is to create a network of young people across the nation to gain the knowledge, awareness and commitment to meet the challenges of global citizenship and climate change.

A *Paryavaran Mitra* is a child, a teacher, or any individual who has taken steps from awareness to positive action, and reflects this commitment in every aspect of life; someone who takes a leadership role, and assumes responsibility to promote and initiate cooperative action in their spheres of influence. To become a *Paryavaran Mitra,* a school guides and builds the capacity of students to take positive environmental action at the individual, school, family and community levels.

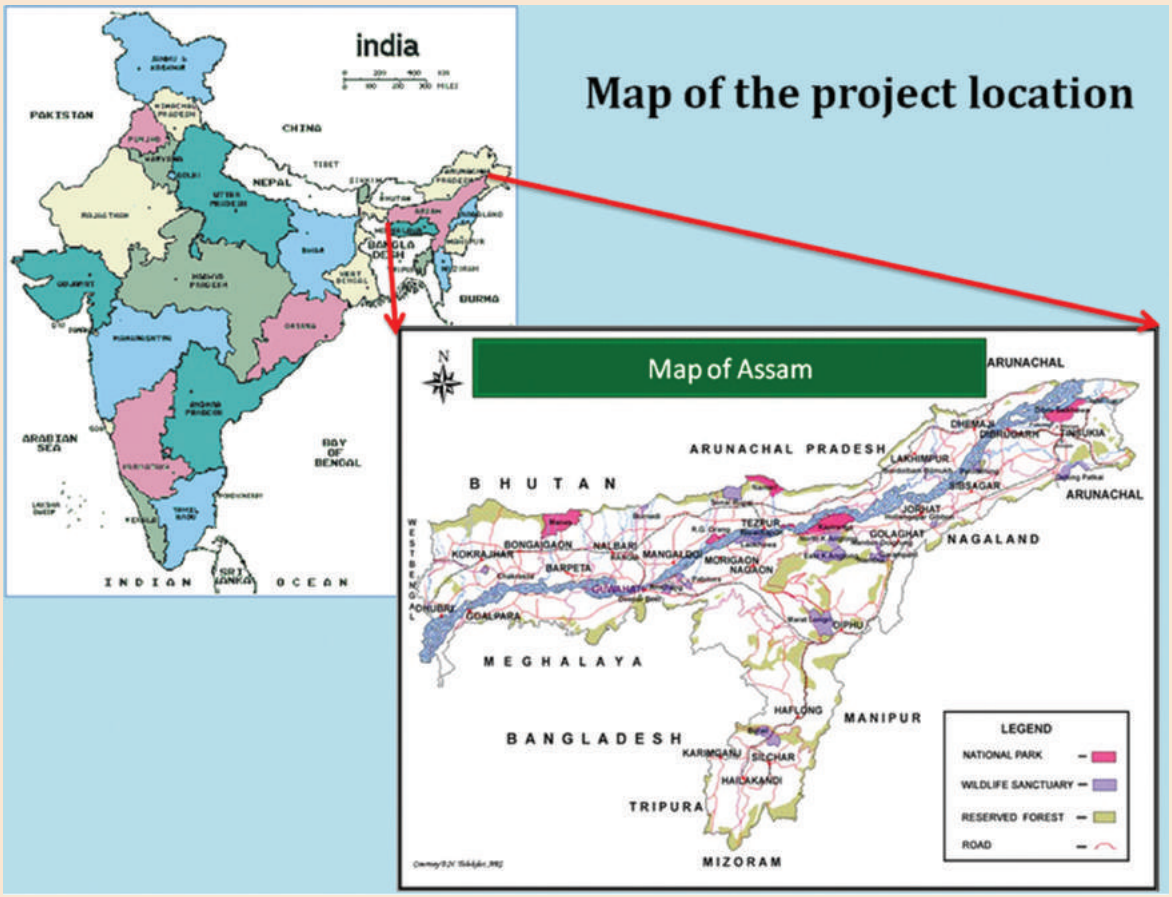

Figure 1. Map of the project location.

The programme builds on the experience of the National Green Corps Programme (NGC) of the Ministry of Environment and Forests (MEF), and National Environment Education Programmes in Schools (NEEPS) Project of the Centre for Environment Education. NGC has been a flagship programme of the MEF that works in a club approach by forming eco-clubs in schools. On the other hand, the NEEPS includes a whole school approach involving local non-government organizations (NGOs).

A *Paryavaran Mitra* school is one that provides support, time and space for students and teachers to be actively engaged in learning by doing. In other words, it is a school that promotes exploration, discovery, thinking and action. The programme envisages engagement of the *Paryavaran Mitra* in five thematic areas: biodiversity conservation, water and sanitation, energy, waste management, and culture and heritage related to environment.

It may be the largest school programme anywhere in the world undertaken for sustainability action since it reaches out to 2 lakh (200,000) schools in India. The programme is being jointly implemented by the Centre for Environment Education, ArcelorMittal, and the Union Ministry of Environment and Forests of the Government of India, in partnership with RCE Guwahati (in North East India) and various State Government Agencies.

The Target and Reach

The nationwide programme reaches out to 20 million students in 2 lakh (200,000) schools. In the state of Assam, the programme reaches out to 800,000 students in approximately 8,000 schools in 27 districts. The activities of the programme primarily targets students from 11 to 15 years old. The project, beyond schools, is now addressing the local NGOs, parents and local communities in some districts.

Thematic focus

The programmes in Assam mostly focuses on biodiversity conservation (55 per cent), followed by waste management (15 per cent), water (14 per cent), energy (10 per cent), and culture and heritage (6 per cent). Assam is specifically focusing on biodiversity conservation, particularly the conservation of tigers, river dolphins, hoolock gibbons and agro-biodiversity.

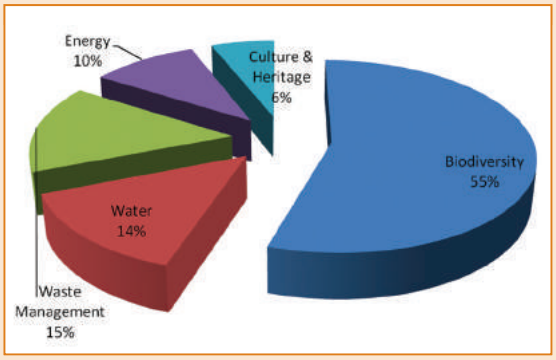

Figure 2. Thematic focus of the programme in Assam.

Partnerships

The major inputs to the programme include partnerships with ArcelorMittal, National Green Corps (NGC) Eco-club network, Saturday-Club network of Sarba Siksha Abhiyan Mission (SSA), RCE Guwahati, and grassroot level NGOs.

At the national level, ArcelorMittal has brought in resources for the development of the resource materials and the day-to-day programme implementation, except training cost. Partnership with the Ministry of Environment and Forests has enabled the programme to use the National Green Corp network nationwide as a vehicle to reach out to target stakeholders.

There are 5,200 schools in Assam under the NGC network and each school has a trained teacher for facilitation of the eco-club activities. In these schools, the *Paryavaran Mitra* programme reaches out through the NGC State Nodal Agency, Assam Science Technology and Environment Council (ASTEC), which in turn works with the District Implementation and Monitoring Committees. Eco-club members take the initiative to engage larger schools through both campus and off-campus activities. The cost of training of the NGC teachers is shared by the State Nodal Agencies through the NGC programme. Implementation of the programme is jointly monitored by ASTEC and CEE teams.

There are around 2,500 Saturday Clubs in Assam under SSA. The Community Mobilization component of the Sarba Siksha Abhiyan Mission forms the Saturday Clubs and arranges the training of the teacher in-charge. CEE provides

resource materials and manpower for the training of the teachers. Monitoring of the programmes is done jointly by CEE and SSA.

The partnership with RCE Guwahati was a key input to the programme. RCE Guwahati partners help in translating the programme guide booklet and publicity posters into Assamese, the local language, which enables the easier transmission of key messages of the programmes.

There are 16 grassroot NGOs serving as implementing partners of the *Paryavaran Mitra* programme at the district or sub-district levels. These NGOs help orient the teachers, bring in additional schools, and monitor the schools.

Jawahar Navodaya Vidyalaya (JNV) (Schools) is a network of rural schools. There is one JNV in each district. The orientation of the principals of JNV was organized by the JNV Authority and the *Paryavaran Mitra* team provided manpower for the orientation.

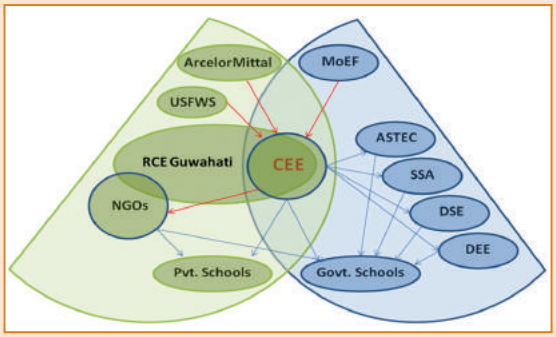

Figure 3. Partnership model of ***Paryavaran Mitra*** programme in Assam.

The above diagram explains how the programme was planned strategically for government and private schools. While CEE occupied a central role in coordinating the entire programme, RCE Guwahati played a key role in trans-adapting the materials, and handholding the NGOs. The red arrows in the diagram indicate the monetary flow and this input was very critical. The blue arrows indicate technical support at various levels.

Planning and Role Clarity

A considerable time was invested in planning for the programme. After establishing partnerships, modules were developed and trans-adapted. Roles were divided for training of Master Trainers and teachers among CEE, ASTEC and SSA. Activities in Saturday Club schools were facilitated by SSA.

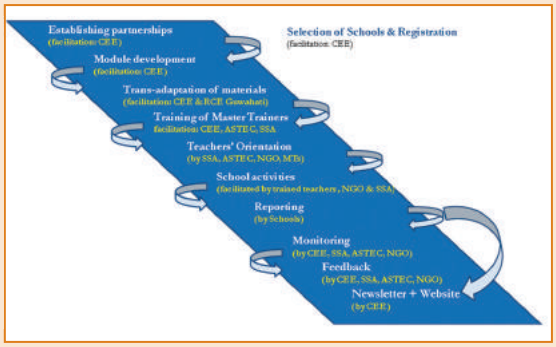

Figure 4. Activity flow of the programme.

Add-on Programmes

Since the programme has a national dimension, it needs local specificity. Since the focus of the programme in Assam is biodiversity conservation, additional components for conservation focused on local flagship species. The tiger is the national animal of India and the highest density of tigers is found in Kaziranga National Park, which is located in Assam. Hence, a programme has been added to 100 pilot *Paryavaran Mitra* schools around tiger habitats. In addition, the Ganges River Dolphin has been declared as the national aquatic animal of India and it also happens to be the state aquatic animal of Assam. Thus, a pilot for dolphin conservation has been added to 100 schools around dolphin habitats. The Hoolock Gibbon is the only ape found in the Indian Sub-continent and as such, a programme on its conservation has been added to 130 *Paryavaran Mitra* Schools.

Another programme on water and sanitation is being added for the development of 20 schools into model water sanitation schools.

Newsletter and Website

A fortnightly e-newsletter is published and circulated by the Secretariat to the list-serve for sharing/dissemination of information. The project website has dedicated pages for each state. Schools are given a login ID and password. The website acts as a link for all schools.

Activities

School activities include plantation drives, environmental pledges, wall paintings, wall magazines, model making, exhibitions, popular talks, mini dramas, quiz competitions, rallies, signature campaigns, slide shows, environmental movie shows, environmental games, and debates, among others.

World Wetland Day celebration

Environmental pledges

Environmental games

Plantation drives

Student talks

Rallies

Wall magazine

Model making

Figure 5. School activities of Paryavaran Mitra Programme.

Achievements

The most significant achievement was the mainstreaming of the programme in Assam by the State Education System. The programme has been endorsed by Directorates of Primary and Secondary Education.

Other remarkable achievements include the orientation of more than 1,200 teachers in Assam on ESD issues, including biodiversity conservation, water and sanitation, energy conservation, waste management, and culture and heritage.

School campuses are cleaner since schools participating in the programmes are taking the initiative to keep their campuses clean. It is very challenging as most of the schools don't have boundary walls or fencing around campuses, as well as proper water and sanitation facilities.

Plantation drives by schools have led to the planting of local plant species and the increase in campus greenery. Some schools have set up medicinal plant gardens. Some of the urban schools have replaced their tungsten bulbs with CFL bulbs, which have considerably reduced the electricity consumption of the schools.

The programme has also helped change the behavior of children, who used to kill or chase away birds, butterflies and other animals in the schools. Now, the children are more caring of the animals they see on campus.

The various school networks have also been strengthened through programmes such as the Jawahar Navodaya Vidyalaya and National Children Science Congress in the State. Students and teachers guided by the programme have also participated in various state and national competitions and exhibitions such as the TUNZA Asia-Pacific Conference of the United Nations Environment Programme, Central Board of Secondary Education National Science Exhibition, National Children Science Congress (national and state levels), and the NGC National meet.

Lessons Learned

The important lessons learnt from the programme include the following:

1. Government-public-private partnership is essential in a large scale education programme and helps in creating ownership. India is a vast country with a large number of schools and interventions require large scale investments of money, time and manpower. Critical inputs include the support of ArcelorMittal for quality educational materials, capacity building and management costs. Costs of trainings, delivery of materials, monitoring and others have been shared by NGC, SSA, and civil society organizations. Trans-adaptation of resource materials by RCE Guwahati partners is another critical input.
2. A pilot to serve as model is also essential before making such investments. On the other hand, creating ownership at the grassroot level is important for the sustenance of the programme, which is possible only with government endorsement. Public participation is essential for school-community linkages and outreach programmes, and also for social monitoring of the project activities.
3. Use of local language provides better acceptance. Learning outcomes at the school level are faster if instruction is done in the mother tongue. Trans-adaptation of the programme's information, education and communication (IEC) materials has been a critical input that facilitated faster learning.
4. Degree of behavior change in students depends on the quality of teacher orientation and materials provided. Quality IEC materials and Training of Trainers are equally important for proper implementation of any programme at the grassroots level. The support of ArcelorMittal and CEE's experience in implementing ESD over two and half decades have been instrumental in this regard.
5. Selection of specific local issues allows people to quickly relate to the programme. Hence, the issues addressed by the programmes were all selected with local relevance. Around Tiger habitats, the programme focused on tiger conservation; around dolphin, on dolphin conservation; around hoolock gibbon habitat, on gibbon conservation; in urban areas, on waste management and energy issues. It drew attention of students when linkages between

Bihu, the State festival of Assam, and agro-biodiversity was analyzed and shown to them. Local specificity was also important for ensuring community participation.

Sustainability and Replicability

Sustainability requires internalization of the values of a programme. A large number of schools have already internalized the learnings of the programme and are now engaged in carrying out their own awareness drives. Schools such as Hindustani Kendriya Vidyalaya, Maharshi Vidya Mandir have conducted rallies on various environmental days including World Environment Day, Earth Day, Global Handwashing Day and World Wetlands Day to create public awareness.

Some schools such as North Guwahati Girls' High School have been able to influence local level decision making. They surveyed and measured the water leakage from all the public sources in the vicinity and pressured the local government authority to repair or replace all the leaking taps in the area. Dhemaji Girls' High School, on the other hand, has established a seed bank of local agro-biodiversity and has prepared a dance drama video on environmental protection.

The programme could be replicated elsewhere by a similar partnership adapted to local conditions. Ownership by the local government, sponsorship by the public or private sector, and engagement of civil society organizations should be explored to replicate the programme. Since SSA has partnered in this phase and has conducted teacher training programmes, it will broadly influence the overall agenda of teacher training in the future. The Government of Assam has initiated a mass teacher training programme of 5,000 teachers. ASTEC, CEE, DSE and RCE Guwahati have been involved in the initiative. The module of this training programme is by and large similar to the *Paryavaran Mitra* module.

Future Plans

Once the first phase of the programme is over, an intensive review of its activities, achievements and challenges will be conducted to draw up a future course of action. Already, all possible efforts are being made to mainstream the programme and create ownership at the government and local levels. Conduct of teacher training programmes will continue through the NGC network. Learnings at the current phase suggest that the trained teachers are better equipped to handle ESD issues both in curricular or co-curricular situations.

FURTHER READINGS

1. National Green Corp New Document (http://moef.nic.in/divisions/ee/NGC_Bro.pdf)
2. Paryavaran Mitra Website (http://paryavaranmitra.in)
3. Explore, Discover, Think, Act booklet (http://paryavaranmitra.in/PM_Book.pdf)
4. About Navodaya Vidyalaya (http://navodaya.nic.in/welcome%20sbs.htm)
5. NGC Case studies (http://paryavaranmitra.in/NGCcasestudy.html)
6. NGC programme in Assam (http://www.astec.gov.in/ngc/index.htm)

SLOW LIFE and Biodiversity

Based on case study entitled : *"A Study of the Social and Environmental Responsibility Programme at Six Senses and Evason Hua Hin : Business Practices on Biodiversity Conservation"*

Authored by : *Nanthawee Kerdchuen and Srichan Monrakkharom, both from Six Senses and Evason Hua Hin, Thailand*

Presented by : *Srichan Monrakkharom, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Six Senses and Evason Hua Hin is a leading ecotourism-based resort in Thailand. Biodiversity conservation plays an important role in the resort's day-to-day operations. It is committed to improving the ecological and carbon footprint from activities associated within the resort and spa: providing accommodations, dining, excursions, spa, sports and aquatic activities.

The resort's core purpose is to create innovative and enlightening experiences that rejuvenate the guests' love of SLOW LIFE (Sustainable, Local, Organic, Wellness, Learning, Inspiring, Fun and Experience). Its operations are committed to developing a sustainable practice, continuously monitoring its performance in conserving the biodiversity in the resort and spa, and supporting the surrounding local community.

Six Senses and Evason Hua Hin has Biodiversity Operational Guidelines, Resort Best Practices Audit, and SLOW Audit used as indicators to ensure that day-to-day operations meet high environmental standard. Biodiversity plays an important role in day-to-day operations: from fabrics to furniture in guest rooms, from food in the restaurants to the natural habitat concept designed for the resort's landscaping which allows plants and animals to thrive as an ecosystem that provides guests with opportunities for recreation and enjoyment.

Ensuring Efficient Water Management

Water is increasingly becoming a global, environmental issue. Depleted aquifers and pollution are transforming fresh water into a rare commodity that could be the cause of future conflicts. The hospitality industry is unfortunately a big consumer of water. The resort faces water shortage problem every year during the drought season. The local community finds itself in the same predicament as well, experiencing short supply due to insufficient rainwater stored in the Pranburi reservoir. The resort's freshwater supply mainly comes from irrigation water, ground water, and collected rain water during rainy season.

Six Senses and Evason Hua Hin aims to reduce its water consumption. To this end, it has implemented a water saving and recycling programme, along with the campaign for guests to conserve water.

Water Saving Programme. One of the goals at the resort is to reduce water consumption through a water recycling programme. Approximately 60 per cent of water consumption is recycled for gardening, to supply the ponds and canals around the resort. Treated water from its water treatment plant is re-injected into man-made ponds and streams around the resort. Plants, vegetation, and the garden are maintained by using treated water. Water is slowly absorbed into the ground and stored in a natural aquifer.

Water efficiency gadgets are installed in showers and toilets. A float adjusting technique decreases the water level of storage tank in guests' restrooms, enabling the resort to save water from flushing. In addition, the resort encourages the hosts (staff members) and guests to reduce water consumption.

Energy Saving Programme. Laundry is one service that consumes a lot of water and energy – energy to heat the water, run the machines, dry and iron the clothes. Guests can help in the conservation effort by reducing the amount of laundry to save water and detergents. An ECO Card and a Bronze Palm Tree are placed on the beds with instructions on how to save water and energy. Instructions are further explained by the resort's guest relations officer responsible in escorting guests to their rooms.

Figure 1. Six Senses and Evason Hua Hin's main lobby called Chill by the Pond.

Figure 2. A child guest taking Six Senses Drinking Water.

If the guests leave the towels hanging, it means they would like to use them again. However, if the guests leave their towels on the floor, it means they would like the towels replaced.

If the guests require the bed sheets to be changed, they have to place the bronze palm tree on the bed. If they do not leave the palm tree on the bed, the room attendant knows that the guests wish to use the same bed sheets the following day.

Clean Water Project Fund. The resort banned in October 2009 all imported water in its properties and introduced its own Six Senses Drinking Water – Still or Sparkling – packed in re-usable glass bottles. The water is further enhanced and energized by VitaJuwel gem stones to become Six Senses Wellness Water. By doing so, Six Senses has eliminated carbon emissions from transportation of water as well as plastic waste.

Beginning November 2010, the resort dedicated 50 per cent of its water sales to provide clean water for people without access. It is estimated that one billion people do not have access to safe drinking water, 2.5 billion people lack access to basic sanitation services, and four children die of water related diseases every minute.

Figure 3. ECO card and bronze palm tree providing instructions on water and energy conservation.

In 2011, the resort invested and participated in a Global Clean Drinking Water Campaign where participating hotel and resort properties around the world bottle and sell their own water and donate a certain percentage of proceeds to clean drinking water initiatives. Collectively, the participating resorts can help in providing access to clean drinking water and basic sanitation universal within a decade, reducing carbon footprint by avoiding shipping bottled water over

Figure 4. Six Senses Drinking Water.

long distances, reducing plastic waste as water is served in re-useable bottles, and diminishing toxic chemicals that are leached into the water table. As an industry, the resort now has an opportunity to generate even more money to provide clean water for everyone *(A. Oines, 2011).*

Responsible Purchasing and Local Supply Chain

Biodiversity plays an important role in the resort's day-to-day operations. The resort's SLOW LIFE philosophy is designed around responsible business practice, including products and services that conserve biodiversity.

The resort has developed a Food and Beverage (F & B) No No List as a guide for all the chefs on how to comply with sound biodiversity practices. The IUCN Red List serves as guide in sourcing items under the F&B No No List. The list includes threatened and endangered species. Thus, the resort does not serve shark's fin, blue fin tuna, caviar, red snapper, and giant lobster.

Locally produced fruits and vegetables, meat, fish and seafood are purchased. The resort also makes sure that the techniques used to produce these items are environment-friendly. Currently, the resort is collaborating with local fishermen to identify products that are available locally depending on the season, also ensuring that farming, fishing and other production techniques cause the least impact. Everyday, each restaurant in the resort displays Catch of the Day menu on the wooden board, including fresh seafood received from local fishermen for the chef to create special menus, for example, Roasted Pak Nam Pran Cotton Fish with organic brown rice or home-made baked potato.

Six Senses and Evason Hua Hin has worked with suppliers and other partners to improve the sustainability of the resources purchased from them. SLOW LIFE philosophy and Sustainability Policy are reviewed with the suppliers. Every week, a resort's truck is sent out with the chef to the local market Nong Buay in Petchburi province. Not only does this reduce "food miles" but it also generates income for the local farmers and the community.


SIX SENSES

Hua Hin

The Living Room

SLOW LIFE Romantic Dinner
(Sustaibale-Local-Organic-Wellness-Learning-Inspiring-Fun-Experience)

Homegrown Garden Vegetable Salad
Herbs, grass, and leaves with our own Six Senses cold pressed olive oil

Crab Maki
Fresh local crab, avocado, Japanese rice, dried tomato & cucumber dressing

Paknampran Squid
Pocketed with butter poached onions, squid ink sauce

Confit & Crispy Pork
Infused with rosemary Chinese pepper, grilled local mango & organic sea salt

Organic fruit and Valrhona chocolate fondue

Figure 5. SLOW LIFE Dinner Menu.


SIX SENSES

EVASON HUA HIN
A SLOW LIFE RESORT

Fruits and Vegetable Requirement : November 2011 at Nong Buay Local Market

No.	Description		Unit	OTY Requested	Market Price	Total Price
1	Asparagus Green	หน่อไม้ฝรั่งเขียว	Kg	14	54.28	759.92
2	Corn on cop	ข้าวโพดฝัก	Kg	20	7.5	150
3	Sugar plum	น้อยหน่า	Kg	20	26	520
4	Guava	ฝรั่ง	Kg	20	8	160
5	Garlic	กระเทียม	Kg	30	25	750
6	Shallot	หอมแดง	Kg	30	13	390
7	Onion Large	หอมหัวใหญ่	Kg	50	10	500
8	Cucumber Large	แตงกวา	Kg	50	12	600
9	Banana Horn	กล้วยหอม	Pcs	50	1	50
10	Dragon Fruit	แก้วมังกร	Kg	50	40	2000
11	Mango Nam Dok Mai	มะม่วงน้ำดอกไม้สุก	Kg	60	12	720
12	Rose Apple	ชมพู่กิมจูไต้หวัน	Kg	66	15	990
13	Coconut Young (S)	มะพร้าวอ่อนลูกเล็ก	Whole	70	7	490
14	Papaya Ripe	มะละกอสุก	Kg	90	17.32	1,558
15	Carrot	แครอท	Kg	100	18	1,800
16	Tomato Large	มะเขือเทศใหญ่	Kg	110	14	1,540
17	Water Melon Jintara	แตโมจินดารา	Kg	300	10	3,000
Grand Total						15,979

Figure 6. Fruits and vegetables list from Nong Buay Market.

SLOW LIFE and Biodiversity Conservation

Unavoidably, business has exploited many natural resources for decades, making it a driver of biodiversity loss. Today, we have to think how we use biodiversity resources in a sustainable manner. As biodiversity is a vital asset for any tourism destination, Six Senses and Evason Hua Hin's philosophy is developed around the core purpose of creating innovation and leading a SLOW LIFE: Sustainable, Local, Organic, Wellness, Learning, Inspiring, Fun and Experience. SLOW LIFE indicates a commitment to resort guests to provide complete and unique experiences, while at the same time improving the well-being of employees and local communities.

SLOW LIFE means responsible business, enabling Six Senses and Evason Hua Hin to provide benefits through biodiversity conservation and local community development. Learning SLOW LIFE practices at the resort hopes to remind guests to emulate such practices at home. Other hotel chains can also apply these practices in order to conserve biodiversity.

The resort's founder Sonu Shivdasani and his wife Eva Malmstrom continue to give encouragement, guidance, and support for all employees, enabling them to continue contributing to a profitable business while caring for the communities and the environment. Theirs is a vision for making business to help better the environment and the communities and the business running in harmony with the environment and cultural surrounding.

Six Senses and Evason Hua Hin has proved that living luxury could go along with sustainability. Guests keep on coming back, actively contributing to the resort's social and environmental mission while enjoying the ultimate luxurious experiences.

All these indicate that responsible business is possible.

ACKNOWLEDGEMENT

For the success of this study, we would like to express our sincere gratitude and appreciation towards visions on responsible business of Six Senses Founder, Sonu Shivdasani and his wife Eva Malmstrom who give encouragement, guidance, and support for entire employees of theirs to think of caring communities and the environment. This is a vision for making business to help better the environment and the communities and the business running in harmony with the environment and cultural surrounding.

We also would like to thank you to all hosts (staff members who are working in the resort) who are committed to the Core Purpose, their endless effort and understanding. Lastly, we would like to convey our appreciation to our great supporters – the guests who are intelligent sophisticated SLOW LIFE'ers.

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A. Oines. **Six Senses Sustainability Report 2010 - 2011,** Oct. 2011.

Using Social Networking to Promote Multi-Cultural Dialogue on Biodiversity Conservation

Based on case study entitled : *"Multi-Cultural Dialogue on Biodiversity Conservation Using SNS : A Case Study of the Biodiversity Cyber Dialogue Project for CBD COP10 Conducted by RCE Chubu"*

Authored by : *Reita Furusawa, from RCE Chubu-Chubu University, Japan*

Presented by : *Reita Furusawa, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Gone are the days when organizations were limited to phone, fax and face-to-face interaction to reach out to their audiences. Traditionally, conferences and meetings are conducted to serve as venues for dialogue among multi-audiences. In the past decade, however, the world has witnessed the increasing popularity of social networking among various sectors. They are tapping the power of the Internet to reach audiences from many parts of the globe. Recognizing that the Internet provides a venue for instant dialogues, RCE Chubu tried an innovative approach to promoting multi-cultural dialogue on biodiversity conservation – social networking.

RCE Chubu is one of the 88 Regional Centers of Expertise (RCEs) on Education for Sustainable Development (ESD) acknowledged by the United Nations University (UNU). The UNU RCE is an initiative for promoting the United Nation's Decade of Education for Sustainable Development (D-ESD) 2005-2014. Although the United Nations Educational, Scientific and Cultural Organization (UNESCO) is the lead agency of the D-ESD, UNU is another key international organization implementing D-ESD promotional activities. The UNU RCE aims to create "a network of existing formal, non-formal and informal education organizations, mobilized to deliver education for sustainable development to local and regional communities."[1]

How it All Began

The Tenth Conference of the Parties to the Convention on Biological Diversity (CBD COP10) was held in Nagoya City, Aichi Prefecture, Japan from 18 to 29 October in 2010. Discussions among the State Parties to the CBD took center stage, while various stakeholders such as international organizations, the private sector, non-government organizations, research and educational institutions conducted side events and exhibitions.

As focal point for a network organization based in Aichi and neighboring areas for promoting ESD, RCE Chubu saw an opportunity to conduct a side event during COP10. In 2009, it proposed to the global RCE network to spearhead a project called Biodiversity Cyber Dialogue.

Objective of the Cyber Dialogue

The Biodiversity Cyber Dialogue is based on the idea that discussions made via the Internet are meant to provide a worldwide overview of the diversity of ideas about biodiversity, including opinions from the South and from the different sectors of the civil societies who have less access to the global discussion among the State Parties to the CBD.

Entrenched on the idea of ESD, the Biodiversity Cyber Dialogue invited individuals and groups concerned with the unsustainable global trends and developments to share their concerns and raise their voices to call the attention of the State Parties, the corporate sector, media practitioners, and the research communities on the various political-economic and socio-cultural dimensions that negatively impact or reduce cultural diversity and biodiversity.[2]

The Cyber Dialogue was aimed at bringing in different voices, which are often unheard, on board in shaping the direction for sustainable

development and biodiversity conservation. More importantly, the Cyber Dialogue attempted to increase the level of engagement by many actors and stakeholders to represent the widest possible range of opinions and views.

Through the Cyber Dialogue, marginalized groups were given the opportunity to engage in a multi-cultural dialogue like the more visible groups invited by RCEs and other biodiversity-related organizations. Under this set-up, the more proactive groups were able to share their activities and challenges in biodiversity conservation, as well as the good practices aimed at coping with identified unsustainable trends. RCE Chubu believes that an important step towards achieving mutual understanding and consensus building on biodiversity conservation among diverse groups is to document the views, analyze the various dimensions that enhance or negatively impact the scope and objectives (scenario analysis), and collectively chart the best possible strategy. The objective of the Cyber Dialogue project was to draft a declaration of civil society at the COP10 through the discussions in the social networking service site of the Cyber Dialogue Project as one tool in this process.

Implementation of the Cyber Dialogue

In preparing for COP10, the implementation of Cyber Dialogue underwent three phases.

Preparatory Stage of the Cyber Dialogue

The test run in Japanese for the Cyber Dialogue commenced in the summer of 2009. During this phase, both the social networking service and the mailing list were generated and utilized. The strengths of the social networking service were identified. These included:

- *Suitability* – It is suitable for thematic discussions. Participants found that using the function of tree displayed system was ideal and enabled them to classify and search even more and diverse topics.
- *Accessibility* – The method was easily accessible and it drew on comprehensive discussions on biodiversity in the most practical and simplified way.
- *Innovativeness* – The approach created a social network of various stakeholders who are engaged in biodiversity conservation. A crucial lesson learned from the activity was the fact that despite their differences in terms of goals and operations, one critical element for consensus building trade-offs and mutual understanding was to bridge the communication divide. Developing simple and efficient forms of communication on commonalities was needed so that goals which are for the good of the society as a whole are pursued, ensuring biodiversity conservation and sustainable development.

Table 1. The Implementation of Cyber Dialogue (Phase 1-3).

Phase	Time	Event
Phase 1	May 2009 – December 2009	• Announcement of launching the Cyber Dialogue • Posting of the comments on the CBD Online Discussion Site
Phase 2	January 2010 – October 2010	• Co-conduct of the Cyber Dialogue with JCN-CBD • Launch of the Japanese site SNS (I-dialog) • Discussion on the declaration from civil society
Phase 3	October 2010 (during COP 10)	• Conduct of Global Dialogue Forums • Public appeal of Aichi Nagoya

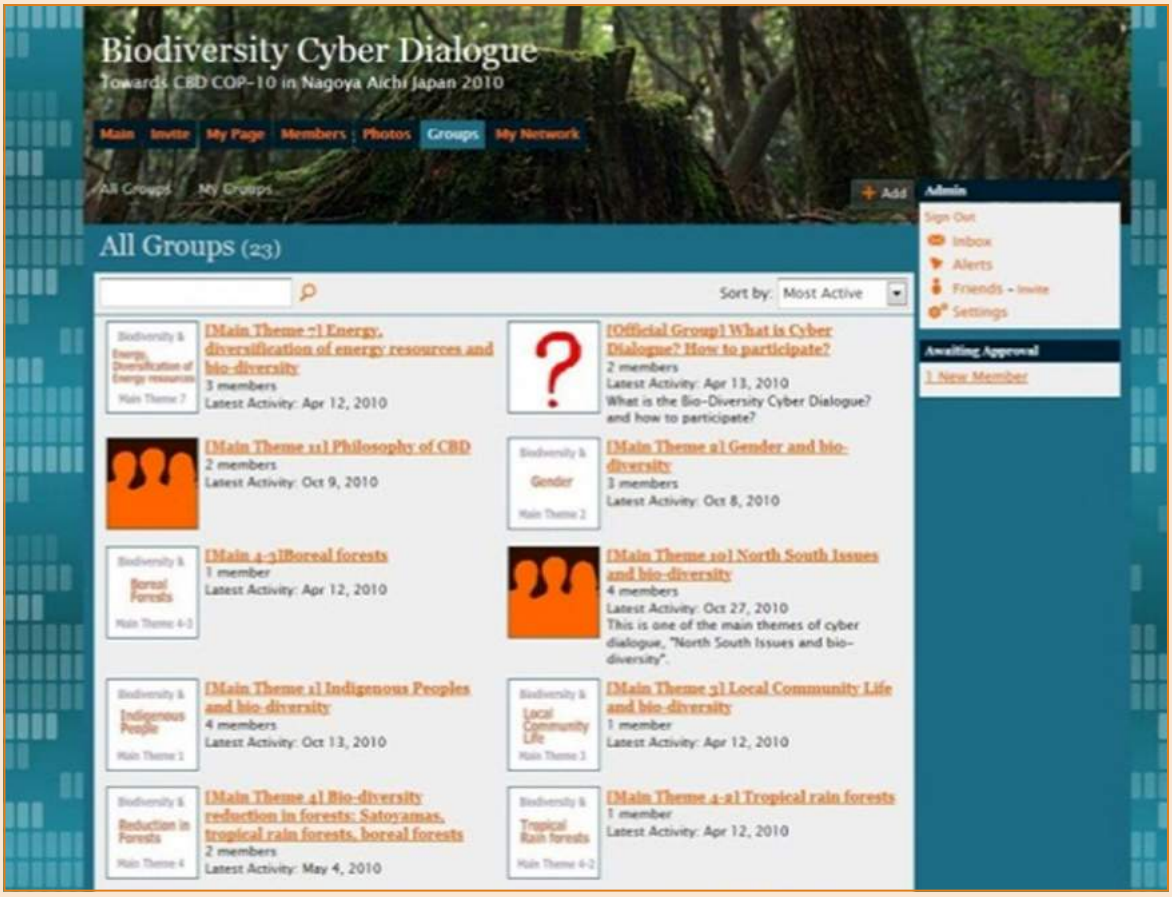

Figure 1. The Cyber Dialogue Website (NING).

The organizers looked at two options for the social networking service to use as platform for the biodiversity discussions. One option was to use pre-existing global social networking sites such as Facebook or LinkedIn. The other option was to create a new social networking system. After studying its options, RCE Chubu launched the Cyber Dialogue social networking service site using the NING system. Established in 2005, the US-based NING is a successful social networking service provider. As of June 2011, it had over 90,000 social websites running on its NING Platform.[3]

The Cyber Dialogue Website (NING)

After the system was set in place, RCE Chubu requested other RCEs to recommend individuals and groups who might be interested to participate in the dialogue. They started inviting people from Asia then branched out to the worldwide network of ESD-RCEs.

In the SNS site, main themes were posted in the "Group" section. In that section, an individual can start discussions and report good practices. One can also create other themes, as well as participate in discussions within the main themes.

In the beginning, the topics were chosen by the working group of Cyber Dialogue in RCE Chubu. This group was led by Dr. Kinhide Mushakoji, a steering committee member of RCE Chubu and former vice rector of UNU who has a strong international influence and network, especially on the theme of human security and peace building. Under his facilitation, the working group set nine initial main themes for the discussion: Indigenous Peoples and Biodiversity; Gender and Biodiversity; Local Community Life and Biodiversity; Biodiversity Reduction in Forests, Satoyamas, Tropical Rain Forests and Boreal Forests; Aquatic Life, Oceans, Coastal Regions and Biodiversity; Genetic Manipulation, Genetic Resources and Biodiversity; Energy, Diversification of Energy Resources and Biodiversity; Legal Frameworks and Institutions for Biodiversity; and The Economics of Ecosystems and Biodiversity (TEEB).

Discussion on the Philosophy of the CBD

The first discussion in the Cyber Dialogue focused on the philosophy of the CBD. This was led by Dr. Mushakoji and Mr. Hiroo Komamiya. According to Mr. Komamiya, the philosophy on sustainability was missing in the preamble of the CBD. Dr. Mushakoji and Mr. Komamiya drafted the document to advocate to the State Parties to adopt a statement as a preamble to its post 2010 Objectives Document. The document was posted at the "Aichi-Nagoya International E-Conference on the Post 2010 Biodiversity Target (ANIEC 2010)," which was organized by the CBD Secretariat and aimed to enrich the discussions in COP10. After the posting, the document was opened to the general public who were willing to participate in the dialogue, or in sharing their experiences in order to substantiate the different points raised in this dialogue.

Apart from RCE Chubu, the civil society of biodiversity in Japan united as the host country's citizenry. A networking NGO called "Japan Civil Network of Convention of Biological Diversity" (JCN-CAB) was established on 25 January, 2009. RCE Chubu, as one of the non-governmental networks in host city of the COP10, joined JCN-CBD.

Collaboration with JCN-CBD

The second phase of the Cyber Dialogue project started in January 2010 when Chubu RCE-ESD Promoting Network (CREPN), an individual membership network and one of RCE Chubu's main partner organizations, co-organized an event with JCN-CBD. The collaboration on Cyber Dialogue was a key topic at the event.

In April 2010, i-dialog, a Japanese version of the social networking service for the Cyber Dialogue was created using the system of the Open SNP. This is a Japanese social networking service used mainly for local community development. Dr. Hiroshi Wazaki, the founder of Open SNP, conducted research on community development and social networking service, and promoted the system to local governments and community development organizations. He also attempted to create a domestic network of local community development organizations to share the experiences of creating social ties in their communities.

Figure 2. The i-dialog Website (Open SNP).

The advantage of using Open SNP was that the system enabled users to make public selected discussions of communities. One of the disadvantages faced by most social networking services at that time was that the discussions were shown mainly to the users who signed and logged in to the system. Unlike these social networking services, Open SPN allows the owner of a social networking service to make some of the discussion groups, called Community, open to the public without asking the people to sign up and log into the system.

The JCN-CBD had thematic working groups such as the Working Group on Wetland Biodiversity, Bioregion Working Group, Gender and Minority Working Group, and many other groups. Each of these groups used the Cyber Dialogue site for different purposes. Some groups used it for public discussion, while some sub-groups used it as a message board for their members. One important outcome of the partnership with JCN-CBD was the publication of a position paper for presentation at the COP10. This encouraged participation from groups who used the site as a discussion space for drafting the position paper.

The problem, however, was that the social networking service was not functioning as the organizers had expected. One of the challenges identified in the use of Cyber Dialogue was the difficulty in logging in for some people. This

was attributed to the variation in IT literacy and competencies among individuals.

In some cases, even after logging in, a number of participants got too busy and failed to post comments. To solve the problem, the organizers used Mailing Lists in addition to the social networking service. They then forwarded the comments from the Mailing Lists to the social networking service.

Cyber Dialogue and TEEB

The TEEB Group was one of the sub-groups in JCN-CBD who used Cyber Dialogue website. The TEEB study aims to draw attention to the global economic benefits of biodiversity, highlight the growing costs of biodiversity loss and ecosystem degradation, and draw together expertise from the fields of science, economics and policy to enable practical actions on conservation and management.[4] The members of JCN-CBD's TEEB Group were mainly from the private sector. They advocated that biodiversity conservation should be considered in harmony with current social trends.

In JCN-CBD's position paper, the members argued that since citizens are the final decision makers and end-users of biodiversity, it is necessary for them to participate as key players in the development of a green economy.[5] TEEB identified and highlighted four ideas that have the potential to accelerate TEEB operations from citizens' point of view. The ideas all relate to increasing the scale and magnitude of sustainable activities and properties. These ideas lead to a greater adoption of green accounting, green incentives, green market, and green professionalism measures. The discussions were shared in the Cyber Dialogue social networking service site, and led to a debate toward the final phase of the Cyber Dialogue project.

The Cyber Dialogue and COP 10

The third phase of the Cyber Dialogue was implemented during COP10. The event had two meetings: MOP5 from 11 to 15 October and COP10 from 18 to 29 October. During COP10, JCN-CBD and CERPC organized forums in order to present the outcomes of the thematic groups

Figure 3. Press briefing of the Appeal at COP 10.

of JCN-CBD. They also made public the final result of the Cyber Dialogue project.

The forums such as *A Proposal of the 13 Grandmothers to COP10, Revival of the Bioregion, Biodiversity and Peace, and A Dialogue of Japanese and International Citizens to Finalize the Aichi-Nagoya Appeal,* were held at the Interactive Fair for Biodiversity.

The Declaration and Consensus Building

The first draft of the declaration was drafted by Dr. Mushakoji, Dr. Hanochi, Mr. Komamiya and Mr. Ohnuma, and circulated and modified through discussions in the social networking service and Mailing Lists. The drafters were willing to publish it as the declaration of civil society of the host country, Japan. This was acknowledged by the JCN-CBD Steering Committee.

Some groups such as the TEEB Group of the JCN-CBD, however, had different sentiments on the draft's suitability for the general public. The criticisms on economic growth, pointing out that "neoliberalism has adopted a 'growth principle', which regards economic growth to be of top priority over anything else"[6] could not easily be accepted. On the other hand, the groups of Bio-region and Gender and Minority did not fully accept the concept of TEEB. The draft of the declaration was circulated. A signature-collecting booth was set up inside and outside the venue of COP10. Finally, the drafters made public the draft by naming it *A Draft Declaration by Citizens of Aichi Nagoya.* The drafters held a press briefing on 28 October at the sidelines of COP10.

With respect to consensus building, the social networking service did not function as an effective tool. Although the content of the draft was discussed on the social networking service, the key debate on economic growth was not visible on the website. Instead of using the special networking service site, people opted to discuss issues in person during forums. Some opted to use e-mail exchanges among a small number of people which included members of the steering committee of JCN-CBD and some members of RCE Chubu.

Conclusion

In conclusion, the Cyber Dialogue Project, an unprecedented opportunity for using the social networking service for the international discussion of biodiversity-related issues, demonstrated to us both achievements and challenges.

A key outcome of the project was the fact that it led to multi-thematic and cross-cultural dialogue on biodiversity. The viewpoints of minorities, both genders and indigenous peoples, were all represented and deemed equally important as the points of view of other previously more influential quarters.

The Cyber Dialogue Project also provided a platform for stakeholders from various sectors to discuss important biodiversity-related issues. Although JCN-CBD was a cluster of different interest groups, the Cyber Dialogue Project attempted to engage in a cross-sectoral and multi-thematic communication strategy by starting and using the Cyber Dialogue.

In reference to the private sector and biodiversity, although there was an unresolved debate between TEEB members and the drafters of the Appeal during the COP10, the Cyber Dialogue Project opened up a platform for starting such discussions among different interest groups. The continuation of these discussions may lead to cross-boundary learning and mutual understanding in the long term.

Another achievement was that the Appeal of the Citizens of Aichi Nagoya was made public during COP10. Although the Appeal was not widely reported by media, the drafters and members of RCE Chubu are trying to develop a discussion using the first outcome of the Cyber Dialogue toward COP11 which will be held in India in 2012.

The implementation of the Cyber Dialogue Project was not without challenges. One challenge involved technical issues for using the social networking service for multi-cultural and multi-sectoral dialogue. These difficulties included limited IT literacy among some participants and the lack of time for them to log in to the website. Since the social networking services site was an original and independent website, the chance for the participants to log in was also very limited. After COP10, in the second period of the Cyber Dialogue from COP10 to COP11, the working groups of the Cyber Dialogue decided to use Facebook instead of continuing with the original

site using NING. Another challenge was language barrier, which proved difficult to overcome.

Although the social networking service site of the Cyber Dialogue Project provided a platform of discussion for the stakeholders of biodiversity conservation especially for the civil society in Japan, it was regarded as complementary in functioning with face-to-face meetings or personal communication through e-mail. The groups that used the site were mainly people from the Chubu area. It remains to be seen how people from other areas could perform and the key factors that may motivate or foster the success of the Cyber Dialogue methodology.

In terms of consensus building, the site was not effective because the participants of the SNS did not want to have a debate in public. They still preferred personal communication.

Thus, this report attempted to bring out the outcomes of the first period of the project and suggested the challenges and potentials of the tool to contribute to the second period of the Cyber Dialogue toward the COP11 in 2012.

ACKNOWLEDGEMENT

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Promoting Biodiversity Education

Based on case study entitled : *"The Status Quo of Education for Biodiversity in Beijing Normal University : Case Study in School of Geography"*

Authored by : *He Yaqiong and Wang Min, both from RCE Beijing-Beijing Normal University, China*

Presented by : *He Yaqiong, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

In 1992, the United Nations Conference on Environment and Development (UNCED) recognized the crucial role of education and public awareness in the quest to achieve sustainable development. The Parties to the Convention on Biological Diversity (CBD), which includes China, reinforced the importance of public education and awareness by working to integrate biodiversity into education systems in their countries.

In China, Beijing Normal University (BNU) is at the forefront of promoting biodiversity education among students in higher learning institutions. An educational institution under the guidance of China's Ministry of Education, BNU is known for emphasizing teacher education and basic learning in both the arts and the sciences. The university's predecessor, the Normal College of the Imperial University of Peking, was founded in 1902. With a history spanning 110 years, it is one of the oldest universities in China.

The university's School of Geography was founded when BNU was established. Through the years, it has made significant contributions to the development of national geography research and education. In the process of training young geography teachers, the School of Geography attaches great importance to teaching students basic geo-related subjects, including biodiversity.

As the material basis for the survival and development of human society, biodiversity is an important factor for maintaining the balance of ecosystems *(He Maoheng, 2010),* and it has become one of the most valuable physical resources, and formed a support system for sustainable development all over the world *(Feng Weibo, 1994).* Biodiversity education has been one of the most important topics in environmental education *(He Maoheng, 2010; Zhu Miaoyuan, 2009).*

Actions in Support of Biodiversity Education

While the School of Geography is not a professional institute established for biodiversity research, it implements a number of actions in support of biodiversity education. These actions are integrated in school curriculums and field courses. Through the school curriculums, students are able to acquire new knowledge on biodiversity and its conservation. The more important component is the field course which ensures that knowledge gained in the classroom is understood and implemented. Students are also encouraged to apply for financial assistance from the school for innovative projects. These projects are expected to enhance their biodiversity-related awareness and capacities. The School of Geography places emphasis not only on the mastery of knowledge, but also on students' involvement and innovation. It also ensures that students are happy as they learn.

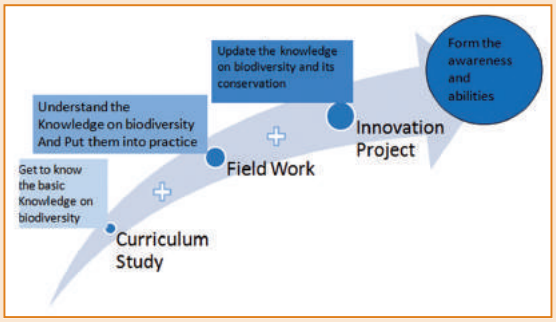

Figure 1. The main component of the education actions on biodiversity and its conservation.

Construction of the Theory Curriculum

Geography is a science that deals with the description, distribution and interaction of the diverse physical, biological and cultural features of the earth's surface. It is an integrated science in which a number of elements work together as a whole. Therefore, the construction of a geography curriculum should not only be concerned about its individual branches. It is more important to pay attention to the impacts of the complex relationships among the disciplines.

For biodiversity education, the School of Geography professional courses include *Botanic Geography and Ecology* for the teaching of basic knowledge; and *Analysis Technologies for Experiment of Physical Geography* which places emphasis on the analysis technologies used in identifying plant species. In other courses, biodiversity is seen as a main element in the geographical environment. Discussions are focused on the relationship with other elements such as climate, soil, etc.

Table 1 presents a list of main biodiversity-related courses that BNU offers. It also shows the corresponding instructors, course type, and teaching time. These courses are offered for undergraduate students in their second and third year, as well as for graduate students in their first year. Botanic Geography and Analysis Technologies for Experiment of Physical Geography are compulsory courses which students have to finish in a particular period of time under a certain standard. The rest of the courses are selective. This means that students may decide which and when to study depending on their interests. Most courses will last one term at least for 17 weeks at three hours every week.

Botanic Geography is offered in the second term in Grade 2, after the student has learned *Geology and Geomorphology, Weather and Climate* and other basic content, and has acquired a certain understanding of physical geography environment. *Soil Geography* is offered during the same term so that students can easily understand the geographic occurrence from the biotic and abiotic perspectives. *Ecology* is offered to students who are interested to have a deeper understanding of biodiversity.

Field Work for Active Learning and Self-teaching

Field work is a bridge between classroom teaching and non-classroom learning. Apart from preparing students for lifelong learning, it is also an effective teaching method to generate enthusiasm among students.

Besides offering a traditional wild environment for field work, the school also established an Internet platform to improve the efficiency of field work. The School of Geography's field work system includes three steps: pre-internship, field trip, and post-evaluation and experience sharing.

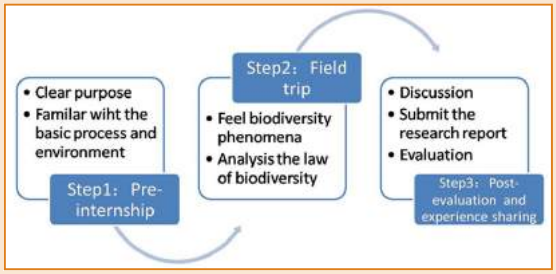

Figure 2. Three steps in a field work system.

Table 1. Biodiversity-related courses.

Course	Instructor	Type*	Time
Botanic Geography	Qiu Yang	C	51H, 17W
Analysis Technologies for Experiment of Physical Geography	Gao Xiaofei	C	24H, 8W
Ecology	Qiu Yang	S	34H, 17W
Physical Geography	Qiu Weili	S	51H, 17W
Advanced Physical Geography	Zhang Wenbo	S	51H, 17W
Evaluation Technologies of the Regional Natural Conditions	Wang Jingai; Qiu Yuejie	S	51H, 17W

**Note: C is Compulsory Curriculum; S is Selective Curriculum.*

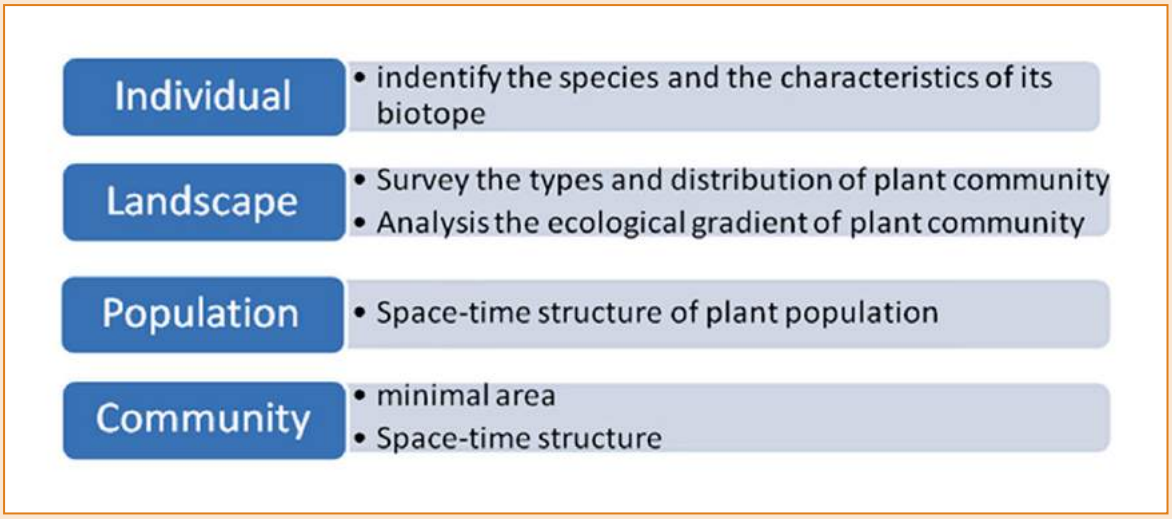

Figure 3. The main content of the field work on biodiversity and its conservation.

Step 1, pre-internship, is offered mainly using Internet platform where the school has established plenty of simulation scenarios using multimedia tools such as radio spots and photos. Through these tools, students can have a feel of the places they will visit prior to the actual field trip. The purpose of this step is to help familiarize students with the field work environment.

Step 2, field trip, is the most important part of the field work learning process since it enables students to go out and discover biodiversity, observe the relationships between plants and the environment, and understand the characteristics and laws of biodiversity. During this step, students are trained comprehensively in teamwork and problem analysis.

In Step 3, post-evaluation and experience sharing, the school uses both the live and online discussion methods. Through these platforms, students share their experiences and challenges. Their reports are then submitted to the network platform and evaluated either by the teacher, the student himself, or his classmates. Experience sharing is a valuable learning component as students can always use it as a guide when they go to further field work.

Currently, the internship on biodiversity and its conservation is a compulsory subject for undergraduate students in the School of Geography. It is usually taken in the second semester in Grade 2 (combined with the study of *Botanic Geography*) and the next summer holiday from July 15 to August 10. The five practice bases for biodiversity are: the campus in Beijing Normal University; Xiaowutai Mountain, Yu Town, Fengning County, Hebei Province; Erdao Village, Datan Town, Fengning County, Hebei Province; Xiaolong Men Forest in Mentougou District, Beijing City; and Jiufeng Forest Park in Haidian District, Beijing City.

The field work encompasses four important levels. Teachers are in charge of assigning specific arrangements for practice schedule.

Innovative Projects for Further Learning and Research

The university encourages students to pursue an innovative project, for which students can apply for financial support from the university. Their teachers can help them with the application process. Four to five students and one instructor can form a small group according to their interests. The annual budget for innovative projects is 3,000-5,000 RMB. While the project budget is very limited, it offers students an extraordinary opportunity to pursue in-depth learning and research.

Evaluation

The School of Geography employs various methods to evaluate students' learning achievements. Through these methods, the teachers try to get an objective assessment of the students' knowledge, skills and attitude.

For the classroom curriculum, the evaluation is focused on students' mastery of biodiversity-

related knowledge. Their performance in class, thematic work, and the basic knowledge test are all monitored and form part of the evaluation result of the curriculum. Both the teachers' evaluation and students' self-assessment are considered. The final score can be between zero to 100.

For the field work, the most important components of the assessment are the participation in the field work, the quality of the final report, and the students' self-assessment. Students are also assessed based on their ability to identify a plant; analyze the relationship between the characteristics of the plant and natural environment; make plant specimens; design biodiversity-related experiments and put them into use; survey simple biodiversity issues; and analyze the reasons of their formation. The final assessment result is presented as either excellent, good, qualified, or unqualified.

For the innovative project, the commission which funds the project will give an objective evaluation of the significance, inputs and outputs of the project every year. Based on the project's progress reports, the commission monitors the specific process, and determines whether or not to continue supporting the project.

Students' Satisfaction Survey

To better understand the status of biodiversity-related courses in the School of Geography, a survey was conducted among students to know their level of satisfaction over the biodiversity courses offered. Problems and challenges faced also formed part of the survey.

The survey participants were undergraduate students who major in geography science and graduate students who study geography education. What is common among these survey subjects was that most of them are preparing to become future geography teachers. Arming these future geography teachers with knowledge and understanding of biodiversity and its conservation not only can enhance the development of their professional knowledge, but also promote the implementation of biodiversity education in middle school in the future. The sample group had 81 members, including 67 undergraduate students with 13 males and 54 females, and 14 graduate students with 4 males and 10 females.

The satisfaction survey on Botanic Geography. Botanic Geography is a compulsory curriculum for undergraduate students and is a core part of biodiversity education in the School of Geography. In the survey, 93 per cent of students think it is necessary to offer it as a course, while only 2.4 per cent of students think it is unnecessary. Meanwhile, 83.4 per cent of students are satisfied with the biodiversity education offered by the school, while only 12 per cent feel the need for improvement.

Table 2 shows that 88 per cent of students think the course improves their awareness of biodiversity and its conservation, as well as fulfills their related basic knowledge. Of the participants, 76.2 per cent of students agree that the course enhances the development of their related abilities. From the interviews conducted, the School of Geography found that some students think one month is short for the field work. Some feel that one limitation is the fact that students only imitate what their teachers do during field work.

Table 2. Students' satisfaction on "Botanic Geography".

	Totally Right	Right	Neutral	Wrong
The course is necessary	42.9%	50.0%	4.8%	2.4%
I am satisfied with it	28.6%	54.8%	11.9%	4.8%
It improves my consciousness	47.6%	40.5%	9.5%	2.4%
It fulfills my knowledge	42.9%	47.6%	7.1%	2.4%
It enhances my abilities to study and research	23.8%	52.4%	35.7%	11.9%

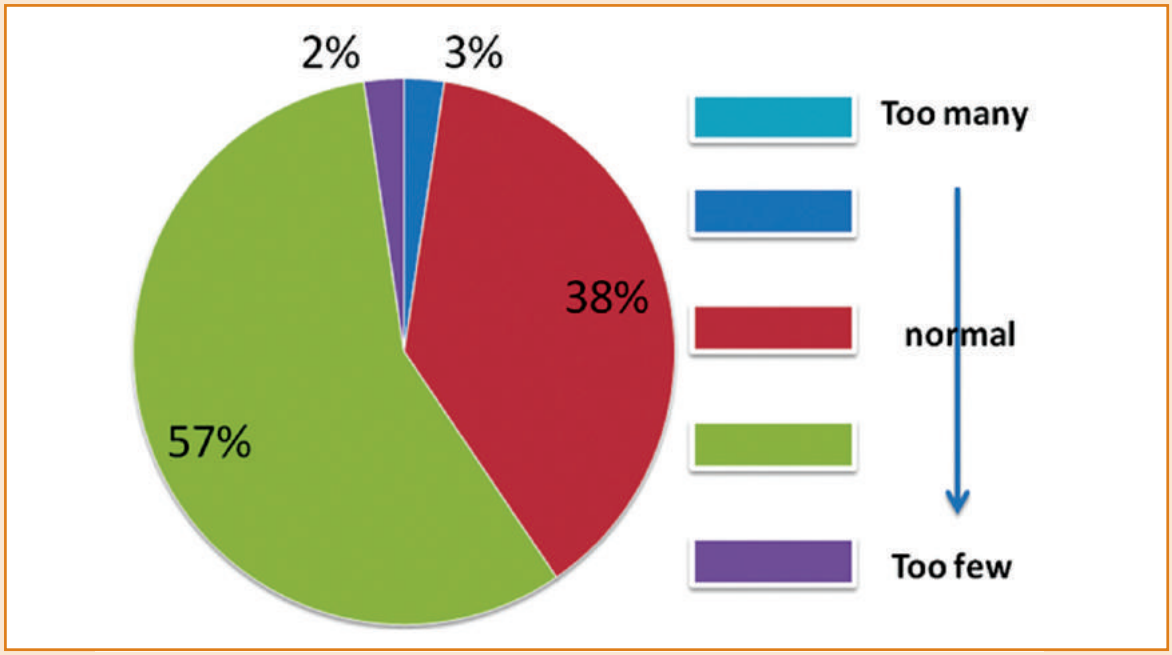

Figure 4. Satisfaction about the number of courses offered.

Overall, however, students think that they reap significant benefits from studying the *Botanic Geography* course and related field work. Below are some of their comments:

- Teachers' love of physical environment impressed me deeply.
- I feel much closer to nature, and my passion and enthusiasm for protecting biodiversity are inspired greatly.
- I got to know a lot of plants, and can understand their ecological characteristics.
- I realized that it's very necessary to conserve biodiversity after learning the distribution and status of plant communities in China and all over the world.
- I understood that the types of plant in different places vary on their different biotopes, and there is a very close relationship between biodiversity conservation and ecological balance.
- From the study in classroom and internship, I have learned the simple methods and processes of biodiversity survey.

The satisfaction survey on curriculum system for education of biodiversity. On the number of courses offered by School of Geography, 38 per cent of the students think the number of courses is appropriate, while 57 per cent of students said the current courses are not enough to meet their needs.

Among students polled, 57.1 per cent said they plan to select other biodiversity-related elective courses, and 38.1 per cent said they will consider learning if they are interested. According to the respondents, their main purpose for learning biodiversity is to upgrade their professional knowledge of the related area, and gather materials which they can use when they teach in middle school in the future. At the same time, they indicated that they would choose the relevant books to read.

Conclusions

Using a combination of classroom teaching and practical activities, students of BNU's School of Agriculture have learned the basic knowledge of biodiversity. Their observation skills for interpreting the relationship between biology and environment are also greatly enhanced. The courses also significantly improve students' abilities for data analysis. After experiencing these forms of education, students from the School of Geography said they would like to be much closer to nature, and that the courses have boosted their passion and enthusiasm for biodiversity conservation.

The school, however, also recognizes that it cannot rest on its laurels since there are challenges to be addressed. Below are some of the problems faced in implementing the biodiversity-related courses:

- The number of teachers working on biodiversity and related subjects is very limited. This affects the number and types of courses that are offered to students. The guidance provided by teachers to students about further study and research is also very limited.
- The content of the course pays more attention to the relationship between the basic characteristics of biodiversity and its geographical environment, but little attention to the specific methods and measures for biodiversity conservation.
- Most study time is still in the classroom, and the evaluation is mainly based on the mastery of basic knowledge. Though the school has various kinds of field work for different students and purposes, they are still too short and hastily conducted. Students generally believe that the link between theory and practice need to be strengthened further.

In the School of Geography, most students are taking the path towards becoming geography teachers in middle school or becoming a geography education-related staff. Because of this, the school sees the need to not only expand their students' biodiversity-related knowledge, but also focus on the formation of biodiversity conservation awareness and the implementation of biodiversity conservation measures.

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The author would like to thank UNU-IAS and the Sirindhorn International Environmental Park who provide financial assistance and so many helps for the participation of the forum in Thailand to share our experiences. Thanks to members of RCE-Beijing and Center of Education for Geography and Sustainable Development in Beijing Normal University, especially Prof. Wang, and Dr. Wei. Thanks are also given to students in School of Geography who spend so much time for the questionnaires and interview.

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"Grand Prize Winner" – HRH Princess Sirindhorn Cup
The Sirindhorn International Environmental Park Photo Contest 2011
Photo by : Monthicha Tatong
Scientific name : *Upupa epops*
Common name : Common Hoopoe
Photo taken at the Sirindhorn International Environmental Park, in 2011

SESSION D

SUSTAINABLE LIVELIHOOD

Biodiversity Stewardship for Sustainable Livelihood: A Community's Paradigm Shift

Based on case study entitled : *"Biodiversity Stewardship for Sustainable Livelihood : A Barangay's Paradigm Shift"*

Authored by : *Jose V. Reaño, from Broadchem Corporation, Philippines*

Presented by : *Jose V. Reaño, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Broadchem Corporation is a private entity established in 1989 as a product development company for new and emerging products for the animal health industry in the Philippines. As a fast-growing and dynamic company, it has a strong corporate social responsibility (CSR) programme with a focused advocacy on education, livelihood and environment.

The company's current thrust is "Embracing Green" and is highly synonymous to its biodiversity programme initiated in 2004 in Atisan, a mountain village in San Pablo, Laguna, Philippines. Prior to Broadchem's intervention, Atisan was in a sorry state, considered as a case example of one of the most neglected or ignored communities in San Pablo. The village was in dire poverty; slash and burn farming was rampant; soil erosion was frequent; and people lacked alternative livelihoods. Most of all, the residents simply did not know or lacked knowledge on how to be good stewards of nature.

With these challenges, Broadchem forged a partnership with the Atisan community with the following simple and highly doable objectives: to become able stewards in order to protect Atisan's biodiversity; create livelihoods for the farmers and provide nature-based socio-economic benefits; and enable sustainable use of natural resources and effectively manage threats to nature.

Planting Indigenous Trees for Livelihood

In the past, Gmelina and Mahogany trees were planted in Atisan. As the trees were not indigenous to the area, most of them did not grow well. Drawing from this experience, Broadchem encouraged the Atisan farmers to plant local trees. Applying multiple cropping to curb erosion and manage pests and diseases in the mountainous area, a wide variety of cover crops and fruit trees were planted.

Today, the main produce of Atisan is Bignay, which is scientifically called *'Antidesma bunius'*. Bignay trees, which produce nutritional and medicinal fruits, are being processed into fruit wines which can compete with the leading brands of red wine in the market. Bignay wine is an organic and indigenous fruit wine with exotic and flavorsome red wine characteristics. It is rich in powerful anti-oxidant properties. The ripened Bignay fruits are carefully handpicked from about 10,000 trees located at the cool mountain range of Atisan. In 2011, the community produced 12,000 bottles of dessert wine, which has 11.5 per cent alcohol. Their goal is to produce 30,000 bottles. Other nutritional products that are being processed from Bignay fruits are jam, jelly, juice, vinegar and bread wine pastries.

The Bignay leaves are also being processed into a premium tea which serves as a supplement to lower blood sugar. The leaves are believed to have therapeutic properties which may have a huge potential in processing and converting into a nutraceutical product for diabetics.

Other indigenous produce such as Kalumpit, Karamay, Catmon and Kaong are all locally harvested in the area. The by-products are pickles, sweet ingredients, candies, pastries, etc. There are more locally grown fruit-bearing trees in the community which are being processed as well, among them, Guyabano, Anonas, Suhang Gubat and Libas.

There are also wild herbal plants growing in the area such as Banaba, Lagundi, Sambong, Bagoh, Balobo, Kalay, Libas, Tanglad, Himbabao and other numerous native plants. Many of them have proven curative and healing properties recognized by the Philippines' Bureau of Food and Drugs. These plants are being studied as potential source of livelihood through the manufacture of natural medicines.

Alternative Livelihoods

Broadchem also provided a number of slash and burn upland farmers and charcoal makers with capital to plant ginger and yam, taking them away from their destructive practices. Farmers were taught about the concept of sustainable livelihood as a key component in biodiversity stewardship. Supplemental livelihoods include beekeeping and organic farming. The people were taught practical beekeeping instead of constantly destroying wild bee colonies in the mountain. The community was supplied with the necessary tools, queen bees, bee wax and other components in beekeeping. Now, the community is producing a sizeable supply of raw honey which is sold in Manila and nearby places.

At present, Barangay Atisan can be considered a model of agricultural biodiversity. The general atmosphere, the environment and the people's attitude have fairly showed a renewed interest in planting indigenous trees, plants and crops.

Return of the Species

With the once denuded area now thick with trees, Atisan's biodiversity has improved. Some animal species that have migrated to other areas are now back and thriving. Wild pigs, exotic birds, reptiles, and insects have been noticeably growing in numbers. An interesting source of food for the people is the edible snail which is locally and commonly called Bayuko *(Rysota otaheitana),* an edible land snail which has a meat similar to that of abalone and whose shells are used to craft decorative items. Bayuko has grown in numbers and has become a specialty exotic food cooked with coconut milk.

Tariktik is a horn bill species which has become endangered in the area. The species has slowly grown in numbers. Another bird which may be considered endangered is 'kuling' which is now proliferating in the area as a result of the improved environment.

Biodiversity and Business Synergy

Today, Broadchem's 16-hectare farm in Atisan is quickly gaining popularity for its land management practices in a once-denuded forest area.

Broadchem's biodiversity programme, while taking care of the area's biodiversity and meeting the livelihood needs of the residents, is also ensuring the future of children. The company is supporting the education of the farmers' children through scholarships and providing computers in the lone community school.

It's a win-win situation for both Broadchem and Atisan. The village has been a case of a turnaround community from sheer poverty with land erosions and natural degradation to a biodiversified village. Broadchem's partnership with Atisan has brought about new business opportunities for the company. A new business venture for Broadchem that involves the community is the processing of organic indigenous fruits into wines, juices, jams, jellies, bread and cakes. The venture is currently giving a decent livelihood to a sizeable number of families who used to be plain overseers of the once marginal lands, and additional income for Broadchem. Most of all, the partnership has generated a significant biodiversity and business synergy.

Lessons Learned

For the last seven years, Broadchem and the people of Atisan have learned the following critical lessons vital to biodiversity stewardship: sustainable livelihood programme is highly essential to biodiversity stewardship; people will take care of the environment and its biodiversity as long as there is sustainable livelihood; opportunities to promote agricultural biodiversity to reduce poverty can be replicated in other areas; and continuous education, information sharing, training and technology infusion are critical elements of sustainability.

The key lesson learned is that people who are given alternative sources of livelihood using resources in their communities would eventually work together to protect and sustain their

Figure 1. Mr. Jose C. Reaño, President of Broadchem Corporation discussed with the team about the community's product development.

environment. Broadchem's biggest impact on the community is the realization by the people that ecosystem is a complete source of life for all living things and that their future largely depends on the wellness of the environment.

These critical lessons are now being shared with other non-governmental organizations, private individuals and even government agencies so that this model can be replicated and sustained in other communities in the country.

Broadchem is championing conservation in the uplands by teaching communities how to conserve biodiversity and soliciting the participation of local communities through the provision of livelihood coming from the plant parts and fruits of native trees that also serve the purpose of reforestation. Through its environmental conservation advocacy, the company has paved the way towards showcasing and developing innovative model for sustainable reforestation.

"The uniqueness of Broadchem's strategy is that of combining preservation, reforestation and environment, and watershed protection in a business model that will guarantee not only sustainability but more importantly, success and high probability of replication. Considering the limited resources of developing countries in the region amidst the numerous socio-economic challenges they face, the participation of business in biodiversity protection and preservation is truly the way forward. However, the only way to entice business to enter into such endeavor is not by sheer corporate social responsibility philosophy, but if there is profit foreseen to be earned from it. With this framework, business people will be attracted to engage in biodiversity protection," said Ms. Ma. Lourdes Orijola, assistant secretary of the Philippines' Department of Science and Technology.

Biodiversity and Corporate Social Responsibility: Perspectives from East Water

Based on case study entitled : *"Biodiversity and Corporate Social Responsibility (CSR): The Perspectives from East Water "*

Authored by : *Kanyanart Virapandu, from East Water (Public) Company Limited., Thailand*

Presented by : *Kanyanart Virapandu, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Biodiversity has been in the spotlight in the environmental arena for several years. Now, it is finally moving forward and penetrating the business sphere. At first glance, people do not recognize the crucial connection between business and biodiversity. Business is perceived to be detached from biodiversity. Biodiversity, however, knows no boundaries, cutting across all sectors – the business sector included. Business depends on biodiversity, relying on plant and animal species and ecosystem services for their products: food, medicine, water, building materials, paper, fuel, fiber, and more. Nature provides business with the fundamental components for long-term profits and survival. While businesses can have direct or indirect impact on biodiversity, they also have relevant biodiversity-related knowledge, expertise, and resources needed to conserve biological resources. The business sector is an integral part of the solution to biodiversity loss.

Biodiversity is considered an important issue in Thai society, especially in the business arena. Many government agencies are encouraging the private sector to take part in addressing the issue of biodiversity loss. The business and biodiversity movement in Thailand began with several meetings to brainstorm possible areas of cooperation between the government and the private sector.

The biodiversity issue is seen as a channel that helps support charitable acts that have sustainable benefits to society. Sustainability is the main factor that challenges private sector to hold their corporate social responsibility (CSR) activities. The goal is not only to whitewash (or greenwash) or be seen as mere charitable acts. The ultimate goal is to ponder about the social benefits of these charitable acts in the long run. Important issues such as biodiversity fuel the need to hold CSR activities in a sustainable manner.

The Eastern Water Resources Development and Management Public Company Limited (East Water Co. Ltd.) realizes the importance of focusing on biodiversity conservation CSR not just an act of charity, but as something that can provide a tangible and sustainable benefit to society.

East Water was set up by a cabinet resolution on 25 September 1992 to manage and supply raw water for industry and household consumption through a network of underground water pipelines. Maintaining the water supply is an important factor in the plan to develop the Eastern Seaboard region to become Thailand's major industrialized zone.

East Water is also working to develop environmental management for utilities and renewable energy. Its mission include: increase in investment and development of the water business for sustainable growth; increase in investment in environmental infrastructure, utilities and renewable energy business; provision of excellent services to customers; and management with good governance, corporate social responsibility and stakeholders' relationship to sustain stakeholders' satisfaction.

Professional management and good corporate governance enable East Water to successfully exploit the capital market and raise funds to build and operate the underground pipeline network. As a major shareholder in East Water, the Thai government has earned 3 billion baht in tax

revenue and dividends. It also has served itself some 6 billion baht in new investments. East Water has provided its customers with a reliable supply of water for over 19 years.

The company has been holding several kinds of CSR activities aimed at providing a better quality of life to communities, conserving the environment, supporting the youth, and conserving the cultural and religious activities of communities. East Water is trying to integrate these activities and apply them with the core concept of biodiversity.

CSR Activity by East Water

Addressing corporate social responsibility is a key mission of East Water. Emphasis is placed on community, water and environment, youth and society, as well as culture and religion. East Water conducts CSR activities based on sustainability. The company employs its expertise on water management to improve the quality of life in communities, while conserving the environment.

In 2011, the company implemented several projects, based on initiatives covering four main issues to empower the communities.

1. **Water resources development and environmental project: Royal Rain Making, aquatic animals release, mangrove forestation project, and canal dredging.**

   Realizing the value of natural resources and glorifying auspicious opportunities such as the Royal days, East Water organized activities such as canal dredging in cooperation with local communities and governmental agencies. These projects were mostly held in the eastern regions of Thailand. In 2011, East Water held these kinds of activities in Chachoengsao. Apart from canal dredging, the company also demonstrates its concern for the environment by holding various activities related to conserving aquatic creatures and general natural circumstances. A salient activity is the releasing of marine biodiversity such as fishes. Growing trees in the forest and growing mangroves are also crucial activities. Thus far, the company has conducted plant growing projects in operation areas in Rayong and Chachoengsao. Last but not least, East Water also highlights the significance of water concerns for residential consumption nationwide. It supports the Royal Rain Making Project by offering 5 million baht. Through this, the company aims to help areas affected by the drought and provide rain water for communities and agricultural areas.
2. **Development of quality of communities' life project: Clean drinking water for community, community's tap water system improvement and training.**
3. **Education support and creation of innovation projects.**

   East Water established the East Water Young Leader Projects which has been organized for three consecutive years. To date, the project has reached 320 schools and 1,200 young leaders have completed the camp.

East Water's CSR and Biodiversity

East Water is one member of the private sector that is eager to learn more about biodiversity. Before implementing CSR activities, the company carefully studies whether or not it really does abide by the concept of biodiversity conservation. From a long list of activities, East Water selects projects whose outcomes will meet the concept of both biodiversity and sustainable development.

East Water has two categories when considering the application of biodiversity in its CSR activities: environment/improving and developing ecology, and educating and building realization toward environment.

Efforts on environment / improving and developing ecology are divided into two projects – developing water resources and environment, and Royal Rain Making. The first one is focused on water resources and the environment, particularly in the operating areas of East Water. Recognizing the importance of water resources in the surrounding areas, East Water implements several activities such as releasing marine species or growing plants in forests and wetlands. These activities will have a positive impact not only on East Water's production, but also to communities near the operating area. Moreover, these activities

will help restore the richness of biodiversity. The company sees great potential in the Royal Rain Making project. It believes that the project can help alleviate problems caused by drought and enhance humidity, which can then be beneficial to biodiversity.

Efforts involving education and the building of realization toward the importance of environment and biodiversity focus on youth and community members. These include competitions and dissemination of information. The 3R Innovative Competition – Reduce, Reuse, and Recycle – is East Water's flagship activity. It provides a platform for young people to create innovations in managing and conserving water. This activity has a significant bearing on the issue of biodiversity, especially on ecological concerns.

Children in primary school are also targeted for the East Water Young Leader Camp project. In the camp, several activities are conducted to generate a greater interest among children about water issue. This methodology has been proven to be effective not only in educating students about the concept of water, but also about its importance.

East Water also involves members of the community in its CSR projects. In one project, the company empowers community members by teaching them how to manage and fix local pipelines. Apart from ensuring the effective management of pipelines, the project also fosters cooperation among the members of communities. These projects ultimately reap environmental benefits and contribute to biodiversity conservation initiatives.

Apart from holding activities or events related to biodiversity, East Water advocates biodiversity conservation within the company. Information dissemination is conducted by publishing articles in the company's internal magazine. The company's executives realize that this issue must be deemed a priority not only by the corporate communication department, but by the entire organization. Involving everyone in biodiversity conservation helps ensure that the company is more successful in its conservation efforts.

Figure 1. East Water's 3R Innovative Competition Project provides opportunities for students to show their talent and creativity in creating 3R innovation. In 2010, the Bio-unique Team from Chulalongkorn University won the first prize.

Figure 2. An article about biodiversity and its importance is disseminated through the EWG Magazine, East Water's internal magazine, as part of the company's information dissemination efforts.

The effort to create activities in support of biodiversity conservation represents East Water's concern for both the community and the environment. Each activity is designed to be effective, sustainable, and to achieve lasting outcomes.

Conclusion

East Water realizes the importance of biodiversity and tries its best to create activities that fit perfectly with the concept of biodiversity. However, sustainable development should be added as one of the company's core actions. In implementing CSR activities, the company checks whether or not they fit the concept of biodiversity and sustainable development. As a company that is studying the crucial link between business and biodiversity, East Water will continue designing and implementing CSR activities that will cover the issue of biodiversity and sustainable development to deliver profound benefits to both the community and the environment.

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Himalayan Biodiversity and the Need for a Climate Change Knowledge Network

Based on case study entitled : *"Conserving Himalayan Biodiversity-Need for a Climate Change Knowledge Network"*

Authored by : *Dr. Abdhesh Kumar Gangwar and Rashmi Gangwar, from RCE Srinagar, Jammu & Kashmir, Centre for Environment Education (CEE Himalaya), India*

Presented by : *Dr. Abdhesh Kumar Gangwar, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

About 10 per cent of the world's population lives in mountains and another 40 per cent occupies watershed areas below them. More than half of the world's population relies on mountain water to grow food, produce electricity, sustain industries and, most importantly, to drink. Mountain water helps to sustain ecosystems in both highland and lowland areas, contributing greatly to the conservation of the world's biodiversity. While mountains harbor some of the world's richest biological diversity, they also provide homes for some of the world's poorest people. Eighty percent of the world's population relies on traditional medicines and wildlife resources, yet one in every eight species of plants, many originating in mountain biomes, faces extinction.

In India, the much-hyped 'Green Revolution' degraded much of the crop diversity in the plains as it promoted and encouraged monoculture. Fortunately, this practice did not reach mountain areas due to accessibility. This inaccessibility proved a 'blessing in disguise' and saved the rich biodiversity of the mountain regions of India and the Himalayas.

Majority of the population in both developing and underdeveloped countries rely heavily on biodiversity as a source of food, shelter and livelihood. In India, more so in the Indian Himalayan Region (IHR), communities survive by harvesting biodiversity products from the wild. The deterioration of biodiversity and the extinction of species is therefore a serious concern and people's participation in the conservation and sustainable use of biodiversity becomes even more significant.

Aside from the many factors that cause biodiversity loss, the impacts of climate change have made it imperative for governments and communities to address issues in biodiversity conservation. Mountain ecosystems are particularly vulnerable, and there is a felt need to establish connections between climate change and mountain biodiversity since this will affect the lives of mountain communities in the future. It is important for communities to understand the expected socio-economic consequences of the impacts of climate change to ensure their participation in conservation. They also need to understand what lifestyles and behavior stimulate climate change and thus contribute to biodiversity loss, particularly in the context of mountain regions.

Success Stories in Biodiversity Conservation

The Centre for Environment Education (CEE), which works as an International Resource Centre for Education for Sustainable Development (ESD), believes that Communication, Education and Public Awareness (CEPA) campaigns are important in drawing attention to lifestyles that lead to conservation of natural resources and a healthy planet. Biodiversity conservation is one of the thrust areas for the centre and through its Himalayan initiative 'CEE Himalaya', various programmes have been and are being implemented to help conserve Himalayan ecosystems and species. Many of these activities have been integrated into formal education, non-formal education, or are part of action projects of non-government organizations.

Formal education programmes include environmental education in schools, where ESD

Figure 1. Awareness Programme in small group through direct contact with women.

is integrated in the curriculum, syllabus, as well as textbooks. Extra-curricular initiatives include the implementation and support for programmes such as the National Green Corps, Environmental Education in School System, and National Environment Education Programme for Schools. A number of projects have also been introduced to help teachers and students understand the impact of lifestyle on climate change and the biodiversity of planet. These projects include Parayavarn Mitra, Pick Right, and Creating Young Green Champions. CEE Himalaya also raises awareness on biodiversity by providing manuals, guides and activity books that focus on the status of species and ecosystems.

Non-formal education activities include the documentation of Traditional Knowledge on biodiversity and programmes that encourage communities to support conservation in protected areas. There are also various activities that raise community awareness by celebrating environmental events.

Action projects that are done with the support of NGOs include the Darwin Initiative, which focuses on the conservation of biodiversity with the support of various national NGOs. The United Nations Development Programme-Global Environment Facility Small Grants Programme (UNDP-GEF SGP) also provides support for initiatives that focus on climate change, and the wise use and conservation of biodiversity.

Communicating Biodiversity Conservation through a Multimedia Mobile Exhibition

CEE has been working in IHR since 2002 and has been promoting greater awareness of biodiversity through out-of-classroom programmes for teachers and students. A mobile multimedia exhibition, fitted in a re-fabricated Mahendra Savari sports utility vehicle, was developed to increase the programme's reach and make it more effective. The exhibition consists of interactive experiments, panels, exhibitions, presentations and other tools to engage participants, including children, youth and community members, in programmes that stimulate environmental awareness. The exhibits use simple working models and include

information that form part of the school's science curriculum. In the past five years, the exhibition has been shown to over 2,700 schools and viewed by 210,500 students and 12,812 teachers. CEE has also conducted Teacher Training Workshops (TTW), which provide teachers with an orientation on biodiversity conservation. A total of 35 TTWs have been conducted with the participation of 1,500 teachers.

Science Express: Exhibition on Wheels

Science Express (www.scienceexpress.in) is a unique science exhibition on a 16-coach train that travels across India and showcases cutting-edge research in science. An Indo-German collaborative project, the Science Express was launched on 30 October 2007 by the Honorable Prime Minister of India Dr. Manmohan Singh and German Chancellor Dr. Angela Merkel. This innovative exhibition has received an unprecedented response and created four national records. The project had three phases and ended in April 2010. The exhibition has traveled over 50,000 kilometers, covering 150 locations during 600 exhibition days, and drawing 5,100,000 viewers, mostly students.

This state-of-the-art mobile exhibition promoted scientific interest among the general public and encouraged students to pursue higher studies and careers in science. It hosted interactive exhibits developed by the Max Planck Society, Germany; Department of Science and Technology, Government of India; and Vikram A Sarabhai Community Science Centre, Ahmedabad. It also housed the 'Joy of Science' hands-on lab for conducting science and mathematics experiments, as well as exhibitions on climate change and India's heritage in science and technology.

Science Express is now being converted into the Science Express Biodiversity Special (SEBS), where the first eight coaches are being redone to show case India's rich and unique biodiversity. The first coach will cover a general introduction on biodiversity, and the rest will focus on one or more bio-geographical zones, specifically Himalayas and trans-Himalayas, deserts and semi-arid regions, Gangetic plains, Western Ghats, Deccan, North East region, and coastal regions and islands.

Development of a Climate Change Knowledge Network

In the past, mountain ecosystems, despite their evolutionary significance, and ecological value and services, have largely remained marginalized from the sustainable development agenda. Perspectives have changed since the Rio Earth Summit in 1992 and awareness of mountain ecosystems have since increased significantly. In this context, the richness, representativeness and uniqueness of mountain biodiversity have gained considerable attention in recent decades.

The mountains of the Himalayas, which continue to evolve and thus exhibit great dynamism, represent the youngest and yet most complex mountain system on Earth. Unfortunately, they are also among the world's 34 biodiversity hotspots. Given that the impacts of climate change have been and are predicted to be of highest magnitude in higher latitudes and altitudes, there is an urgent need to understand intensity and

Figure 2. CEE training workshop.

direction of ongoing and potential changes in the structure and function of biodiversity elements in such areas. In this regard, the Himalayan region, with its unparalleled vertical profile, emerges as the most 'vulnerable' candidate among the high altitude landscapes of the world. The region therefore requires immediate attention and action in terms of understanding patterns and processes of change to develop a realistic plan for the conservation and sustainable use of the region's biodiversity under a changing climate.

Recognizing the immediate need for such actions in the region, stakeholders must build on the existing knowledge and information base across the region, and enhance information generation through globally accepted protocols. Relevant information must be made available to various users, and the research and scientific community must also make a transition from largely qualitative to predictive research on biodiversity and climate change.

This situation calls for the establishment of a Himalayan Biodiversity and Climate Change Knowledge Network (HBCC-KN) with institutions currently working in the IHR. The HBCC-KN envisages establishing mechanisms to increase the understanding and exchange of knowledge on biodiversity and climate change issues within the Himalayan Region, and make this knowledge available to various stakeholder groups in the region and the international community. The initiative also aims to promote the cross fertilization of ideas, efforts and collaborations between and among members of the network. The HBCC-KN would therefore ensure the availability of reliable information and knowledge products, which could subsequently support national and international policy process and the programmes addressing the issues of biodiversity conservation and sustainable development, particularly under various climate change scenarios in the region.

The envisaged knowledge network would be based on the following principles: simplicity (so as to be simple, user-friendly and accessible to all interested groups); equity (treating all members on an equal platform); and mutual learning (respecting each other's knowledge and contributions). The major objectives of the HBCC-KN include the promotion of synergy between specialists, researchers, and development and extension workers who are currently pursuing studies and addressing issues pertaining to biodiversity and climate change in isolation; harnessing of knowledge base of specialists, researchers and development and extension workers to understand response patterns of Himalayan biodiversity towards climate change; development of best possible options for natural resource management and livelihood; ensuring sustainability of ecosystems and improve quality of human life in the region; building partnerships among member countries to create an effective flow of research based information/knowledge, and best practices; enhancing understanding of the linkages between biodiversity, climate change and sustainable development in the region; and strengthening region-specific information and knowledge on biodiversity and climate change to positively influence international negotiations.

The Himalayan Biodiversity and Climate Change Knowledge Network will benefit from the collaboration between RCE Srinagar, which is located in North Western Himalaya, and CEE Himalaya, which works across the Indian Himalayas. With support from and in collaboration with other premier institutions such as GB Pant Institute of Himalayan Environment and Development, India and International Centre for Integrated Mountain Development, Kathmandu, Nepal and others, the CCKN will be set up, strengthened and used to help protect mountain biodiversity. The Indian Himalayan Region deserves such attention because not only is the region rich in biodiversity and cultural diversity, it is also very susceptible to adverse impacts of climate change. Climate change will have severe impacts on biodiversity and consequently affect people's livelihoods and environmental sustainability.

IHR will benefit from the establishment of a climate change knowledge network since the region encompasses rich biodiversity, provides vital ecological services, and also serves as home for some of the region's poorest peoples. Efforts to protect mountain ecosystems must also be supported by communities to ensure environmental sustainability and improve quality of life.

Partnership: Key to Success and Sustainability of Community Programmes

Based on case study entitled : *"Partnership-Key to Success and Sustainability of Chevron's Community Programs"*

Authored by : *Tharanit Thapanandana, from Chevron Thailand Exploration and Production Ltd.*

Presented by : *Tharanit Thapanandana, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

Chevron is one of the world's largest integrated energy companies. Headquartered in San Ramon, California, the company conducts business in more than 100 countries. Chevron Thailand Exploration and Production led in producing the first natural gas in the Gulf of Thailand in 1981 from its Erawan Field. The company continuously supplies natural gas which is one of the major sources of energy for Thailand's electricity generation.

With its vision, to be the global energy company most admired for its people, partnership, and performance, Chevron conducts its business in a socially responsible and ethical manner. The company respects the law, supports universal human rights, protects the environment, and provides benefits to the communities where it operates. Such business ethics are aligned with the company's seven values, comprising: integrity, trust, partnership, diversity, ingenuity, protecting people and the environment, and high performance.

Corporate Biodiversity Policy

In 2007, Chevron adopted a Biodiversity Statement and declared biodiversity assessment as part of its Environmental, Social and Health Impact Assessment (ESHIA) process for major projects. This policy guides staff to protect habitats near and around company operations and enables them to share their best practices through the Chevron Biodiversity Network.

Chevron has set measures to put its biodiversity conservation statement into action. Protecting the safety and health of people and the environment is a Chevron core value. The company strives to avoid or minimize significant risks and impacts that its projects and operations may pose to sensitive species, habitats and ecosystems. Chevron undertakes activities to raise internal and external awareness of the importance of conserving biodiversity and how the company.

Chevron's Biodiversity Conservation Efforts in Thailand

In Thailand, Chevron has set its biodiversity focus in four areas (4E's): economic development, education, employee engagement, and environment and energy conservation.

The 4E's are interweaving and play key roles in the company's corporate social responsibility (CSR) programmes: from initiation to preparation, planning through to completion, with community participation integrated in the planning and implementation processes. Monitoring and evaluation are conducted for every initiative to measure success and benefits, and use the lessons learned in improving future programmes.

Strong partnership and ownership from all parties are the foundation of success in achieving project milestones and sustainability. Thus, Chevron's CSR programmes turn from generally 'philanthropic' to 'social investment', where the community's true needs are well recognized and fulfilled. In its planning processes, business goals and objectives are considered synchronously with social goals and objectives. Through this arrangement, business and community work together for the common good. Transparency at work, mutual benefits, friendly partnership, improving capabilities, and better livelihood for the community are the key outcomes of Chevron's CSR programmes.

Business and Community Partnerships in Thailand

Managing Solid Waste in Schools and Communities. One of Chevron's signature CSR programmes is the 12-Participatory School Waste Management Project dating back to 2004 when the company was still known as Unocal. Chevron has allied with 12 schools in Songkhla Province where its onshore facilities are located. Partnering also with the Public Health Division of Singhanakorn District, the project plan has been laid out to the participating communities, step-by-step, seeking alliance and commitment from the teachers in target schools, implementing the project according to proposals from the school staff. The project included coaching and mentoring, and periodical monitoring and evaluation.

Various project activities have been carried out, for example, establishment of recycle waste bank, production of handicrafts made from recycle waste, production and use of bio-fertilizer, and waste management campaigns in schools and nearby communities, among many others. A schools network was set up to share knowledge and experience and to ensure sustainability of the project. Students were encouraged to adopt this initiative at home, share with parents, and eventually with the whole community. Experiences, success stories, and lessons learned are shared with other schools in other locations.

Chevron applies a 'check-gate' system during project implementation to make sure that all partners remain true to their commitments. Today, the project is self-sustaining and is being used as a model for other schools and communities. Recently, Chevron worked with additional 12 allied schools to introduce the concept in Pha-ngan Island in the Gulf of Thailand.

Saving the Mangroves. In the Sathing Mo area, Chevron is saving the mangroves with the community and nearby schools as partners. The company has provided technical and financial support to the community and schools for the mangrove rehabilitation programme. The community and schools are allowed to decide on conservation activities on the condition that Chevron will discontinue supporting the initiatives if the project milestones are not achieved or the community does not see the importance of the project. With such arrangement, project milestones have been achieved. As a result, the company provided more assistance, including the building of a walking trail into the area. The trail allows people and students to visit the mangroves, providing hands-on experience that raises their awareness of the significance of mangroves and their biodiversity to local livelihoods and people's well-being.

Conserving Coral Reefs. In 2010, Chevron forged a partnership with the International Union for Conservation of Nature (IUCN) for the implementation of a project on Participatory Integrated Waste Management for Conserving Coral Reef Around Tao Island in Surat Thani Province. The company provided financial support to the project, which aims to preserve and protect living coral reef ecosystems from human activities by improving waste management practices on the island.

During the partnership signing ceremony, Aban Marker Kabraji, Regional Director, Asia, IUCN Thailand Programme, said, "We appreciate that Chevron has demonstrated a strong commitment to sustainability. We would like to see the collaboration we forge today, flourish to fully support the integration of biodiversity concerns and opportunities into your business planning at all scales. This agreement commits us to work together more closely towards improving coastal health for the benefit of the people."

Keys to Success of Business and Community Partnership

There are certain key factors that are essential and crucial for the success of conservation projects supported by the business sector, which may include but not just limited to: strong and long-term company commitment, turning corporate social responsibility policy and action from philanthropic to social investment, partnering with independent organizations to develop the projects, partnering with communities (developing the projects based on community needs, gaining community acceptance and commitment, and integrating different areas of focus into the project; focusing on capacity building for community (ensuring project sustainability and providing

Waste management website training for 12-Participatory School Waste Management Project in Songkhla Province.

Sathing Mo Mangrove Forest Conservation Project in Songkhla Province.

Establishment of artificial reefs at Thasala District, Nakhon Si Thammarat Province.

Contribution Agreement Letter for the Implementation of Participatory Integrated Waste Management for Conserving Coral Reef Around Tao Island, Surat Thani Province.

Figure 1. Chevron's CSR programes.

support where necessary), and monitoring and evaluation.

Environmental CSR programmes, whether or not specifically focused on biodiversity, will have positive impacts on the variety of life on Earth. The key to success is the strong partnership between business and the community. Although business and community may have totally different goals, objectives or interests, they can work together towards a common goal – biodiversity conservation. To start a partnership, business and community need to have a link – friendship – as a starting point for further steps. Once business and community trust each other, walk together and work together, then true and unbreakable partnership will follow. Success and sustainability in any CSR or biodiversity project with mutual benefits is within reach.

Developing Sustainable Livelihoods

Based on case study entitled : *"Community and Biodiversity : Developing and Marketing an Intercropping System of Banana and Torch Ginger for Sustainable Income Generation at Balik Pulau, Penang"*

Authored by : *Dr. Salfarina Binti Abdul Gapor, Dr. Asyirah Abdul Rahim and Muhamad @ Abd Malik bin Daud @ Adb Aziz, all from RCE Penang-Universiti Sains Malaysia (USM), Penang, Malaysia*

Presented by : *Dr. Salfarina Binti Abdul Gapor, at Asia Regional Forum on Biodiversity, Cha-am, Thailand, November 2011*

The Sustainable Livelihood Approach (SLA) was introduced in Malaysia in the early 1990s by Chambers and Conway as a livelihood concept that comprises people, their capabilities and their means of living, including food, income and assets. Tangible assets are resources and stores, and intangible assets are claims and access. A type of livelihood is environmentally sustainable when it maintains or enhances the local and global assets in which livelihoods depend, and has net beneficial effects on other livelihoods. It is socially sustainable when it can cope with and recover from stress and shocks, and provide for future generations.

Malaysia is still struggling to reduce economic disparities between those in the rural and urban areas. The district of Barat Daya in the southwest area of Penang is predominantly inhabited by the Malays, whose employment is still dependent on natural resources. Much of the younger generations have become factory workers and operators in the Free Trade Zone of Bayan Lepas, but many, especially among pensioners, retain employment as farmers and fishermen. Although incidence of poverty in Penang is also one of the lowest in the country, at 0.04 per cent in 2004, there is a significantly large "easy poor" group, especially in Balik Pulau. "Easy poor" households are those whose incomes are just above the poverty line, with low safety net, and can become poor when breadwinners are faced with an accident, death or retrenchment.

The causes of poverty in Malaysia differ from other countries because poverty is not commonly associated with lack of subsidies or capital aid from the government. Poverty is partly attributed to attitudinal problems, mainly described by the local policy makers and implementers as "fatalistic attitudes" and deep demoralization. Poverty may also be caused by political intervention that may deny rights to forms of governmental aid. Hence, this project not only aims to encourage economic activities but also instill hope and motivation to work and succeed among the farmers cluster groups in Balik Pulau.

Balik Pulau is a town in Penang, Malaysia, which literally means "back of the island". The town has around 50,000 residents, many of whom commute daily to towns like Ayer Itam, Georgetown and Bayan Lepas to work. Modern Balik Pulau is a self-sufficient township, serving the greater Southwest District (Daerah Barat Daya), one of the five districts in the state of Penang with basic municipal facilities including a hospital, police headquarters, fire station, post office, TNB power station, TM telecommunications station, PBA water authority office, provincial court, Islamic Syariah court, government-owned Bank Simpanan Nasional, a bus station and a new big wet market complex and food court that opened in December 2007. These are all within a five-minute driving distance from its three-junction town centre, a subtown area called "Kongsi". Terrace housing is available at Taman Pondok Upeh, which is located near Maktab Rendah Sains MARA Balik Pulau (MRSM BP).

Balik Pulau is home to several schools and higher learning institutions. A new international secondary school, the Prince of Wales Island International School, opened in September 2011. Higher learning institutions include Kolej Kemahiran Tinggi MARA (KKTM) and Kolej

Teknologi Pulau (KTP). A university focusing on tourism is being developed near the western coast of Pantai Acheh.

The town has several major banks, Indian Muslim restaurants including at least three Indian-Muslim Nasi Kandar outlets operating around the clock, two 24-hour convenience shops, at least three petrol stations, several clinics and various shops.

The northwestern coast of the Penang Island is considered the fruit bowl of Penang, which features fruit plantations and spice gardens. Fruits include durian, rambutan, *langsat, duku,* mangosteen, nutmeg, clove and star fruit. Balik Pulau is famous for its durian plantations, which include the 'ang heh' (red prawns) and 'holo' (gourd like) variety. A lot of people visit Balik Pulau just to taste durian. Balik Pulau is also famous for its 'laksa', which is a spicy fish soup with noodles.

Promoting Sustainable Livelihood

An action research project promoting sustainable livelihood is being implemented in Balik Pulau. The area has a number of banana plantations but it has one major pest problem, specifically, constant attacks from the panama disease or scientifically known as Fusarium wilt. The introduction of torch ginger *(Etlingera elatior)* as bio-control plants can reduce the attack of Fusarium wilt. There are 13 villages involved in the project *(Figure 1).*

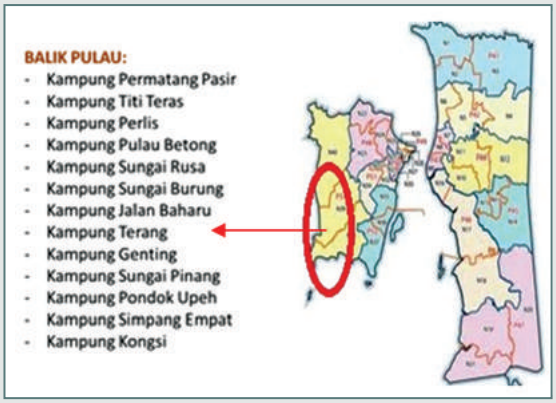

Figure 1. Map of Penang showing the 13 participating villages.

The project is driven by partnership between the academe, through Universiti Sains Malaysia (USM) and the private sector, through Sidratul Corporation, which uses the Islamic Manufacturing Products (IMP) certification. The IMP is not only about producing halal products but it is an "index" to produce *"Halalal Toyyiban"* (permissible and good) goods and services. A halal product is chosen because of its potential as a promising and profitable business. The project aims to link the community with the herbal company; create a One Stop Centre and Cooperative for the collection of the torch ginger and banana for marketing purposes; and train and motivate the farmers and villagers in downstream activities of torch ginger and banana as the main high value end products.

Methodology

The action-oriented research project is long term, cyclical and continuous. The process starts with a preliminary survey to identify participants. This is followed by setting up a field trial intercropping torch ginger and banana plot in USM to test the best distance, understand the disease, treat the disease, and determine soil and hydrology factors. The project employs intercropping at six meters between the banana trees and torch ginger at three meters with the banana. A waterway is also built to create sufficient drainage for the banana plants at 1.5 meters between the plants *(Figure 2).*

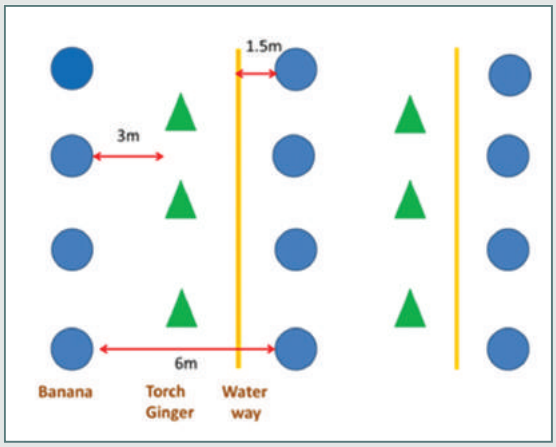

Figure 2. Intercropping method of banana and torch ginger.

Interested participants are identified through dialogue, consultation and benchmark data collection of existing activities (banana and torch ginger smallholders, acreage of plantation, species planted, current markets and price, among others).

After securing trust and establishing rapport with the participants, USM liaises with various herbal companies in the northern areas. Vicinity is also important to cut transportation costs of the raw materials. A nursery is also set up in the village to ensure sustainable supplies of seedlings for the project in collaboration with the participants.

The project selected Sidratul Enterprise, which uses the IMP certification. The discussions with the herbal company focus at the types of herbs demanded by the companies, products, and mode of supply to the company. As part of its Corporate Social Responsibility programme in Balik Pulau, the herbal company agreed to conduct workshops on motivation, training on drying and production of herbal products, and marketing. The social motivation training is also aided by an NGO known as UNGGAS (Pertubuhan Menangani Gejala Sosial Malaysia or Malaysian Organization to address social problems).

In terms of economic production, a cooperative known as *Koperasi Warisan Lestari* (KOWARI or Sustainable Heritage Cooperatives) was set up to address the legal aspects of the business, including contract selling to the private sector, management of the plantation, production, and marketing of end-products. Another existing cooperative, *Koperasi Usaha Kampung* (KUKAM or Village Initiative Cooperatives) produces the banana flour and paper, while KOWARI markets the products. The coop members are village residents. The role of USM, under the Centre for Global Sustainability Studies (CGSS), is mainly to facilitate networking between the villagers and the private sector, to ensure sustainable supply of raw materials from the villagers, and to ensure ready market for the end-products *(Figure 3).*

The Figure also shows other stakeholders that function as buyers of the end-products. In the case of banana flour as anti-pollutant agents, buyers include government-linked companies responsible for water treatment (Puncak Niaga), the Penang local authority (Majlis Perbandaran Pulau Pinang or MPPP), and potential government agencies that will continue to fund the programme such as the Malaysia Industry-Government Group for High technology (MIGHT) and the Performance Management and Delivery Unit (PEMANDU).

The cooperative is also responsible for setting up the drying facilities to process the torch ginger and the One Stop Centre (OSC) which will showcase the banana and torch ginger products *(Figure 4).* The project is being closely monitored by USM.

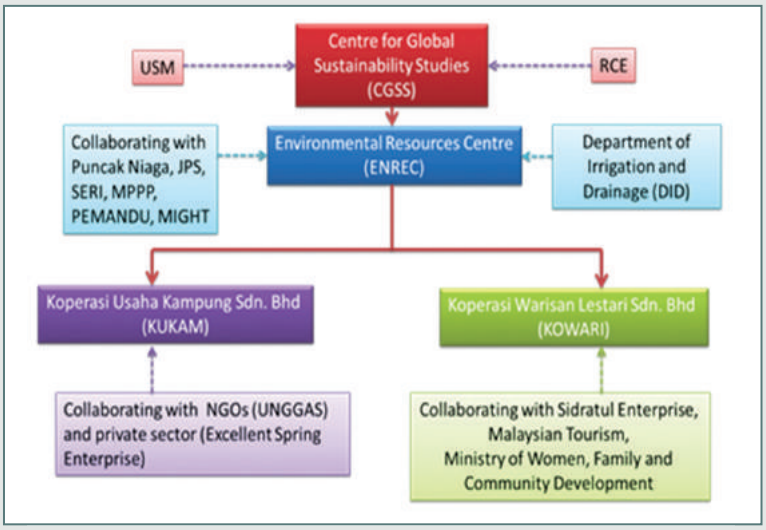

Figure 3. Roles of different stakeholders.

Figure 4. Design of the one stop centre to showcase the products.

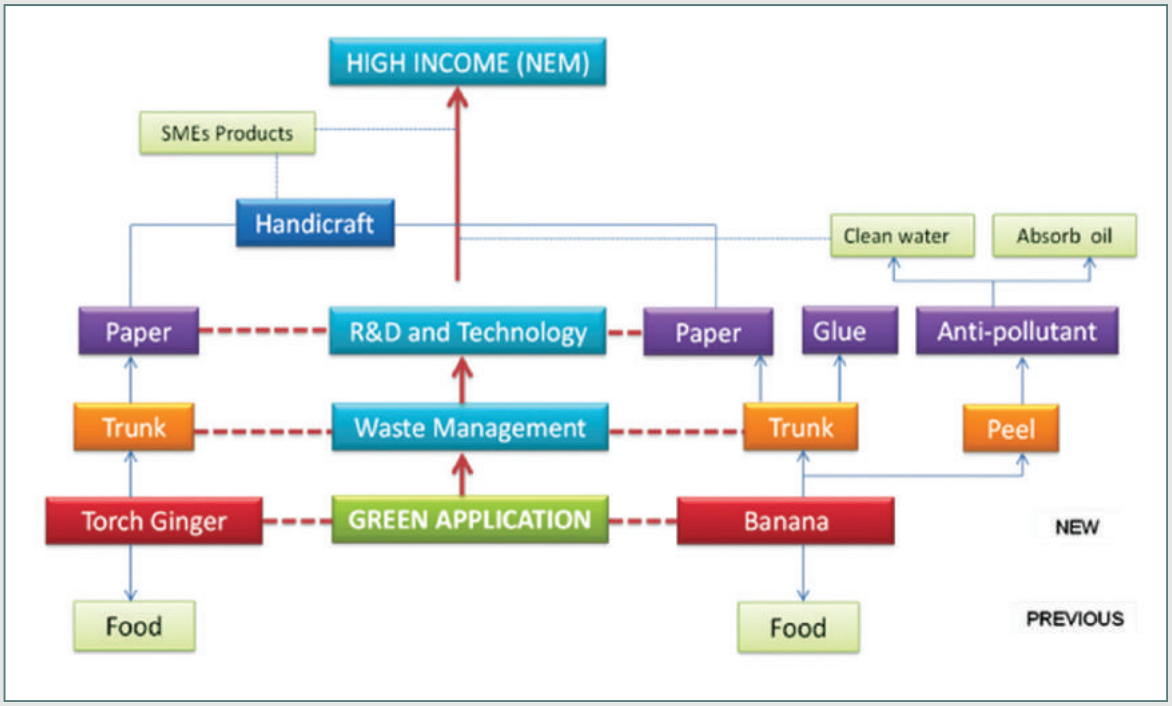

Figure 5. Creating green products for high income.

Impacts

The project has managed to create green products to generate higher incomes for the communities *(Figure 5).* The impacts of the project include transfer of technology to the communities, such the processing of banana and torch ginger into high value downstream products.

For example, the banana flour is not only used for food but also for non-food products, such as for glue, which can be laminated to strengthen plywood, and also used as anti-pollutants *(Figure 6).*

Banana papers are also produced from the trunks which previously had no value. These can be used as stationeries, handicrafts and interior decoration, such as to produce ornamental decorative lampshade *(Figure 7).*

The torch ginger is also produced not only for food additives, but new products such as body lotion, shampoo, beverages, and paper, among others *(Figure 8).*

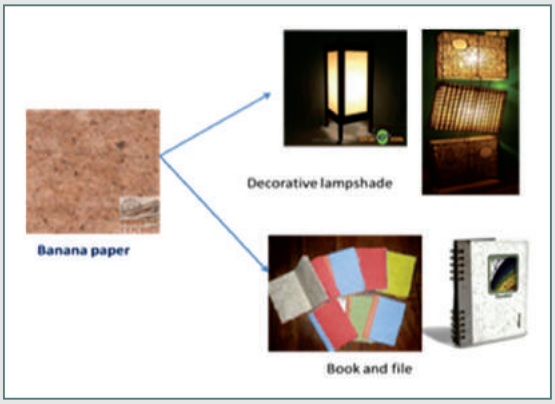

Figure 7. New product: banana paper.

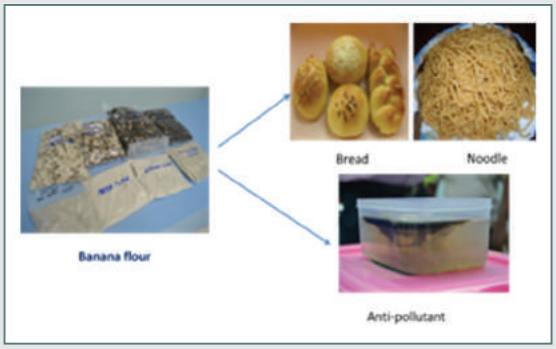

Figure 6. Banana flour as anti-pollutant.

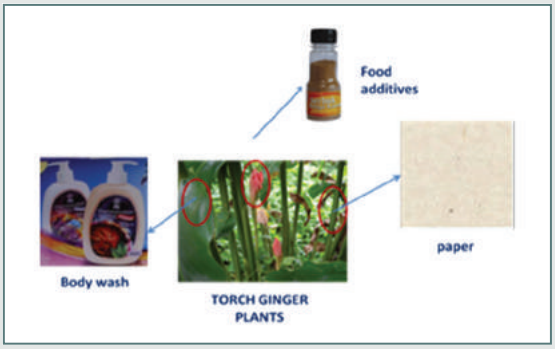

Figure 8. New products from torch ginger.

Through the project, farmers are linked directly to the potential markets. In many cases, rural producers in Malaysia have problems accessing markets or can only sell their products to middlepersons. They are often exploited by the middleperson who buys products at unreasonably low prices. Opportunities for networking and direct selling will increase their bargaining power and choices in the market. Through the project, the farmers are now more motivated and creative in their farm management and diversification of end products. For instance, the technology to produce banana paper has now been adapted to produce papers from other fruits, such as durian and rambutan skin. Moreover, farmers become more professional in managing the cooperatives.

Conclusions

Action research is not an easy and straight forward process. It is important for the researcher to take into consideration the needs of the stakeholders. For this case study, needs analysis was done using the Assets Based Community Development approach. The researcher also needs to create rapport with the community. Action research is a slow and cyclical process, and priority should be given to minimize conflict among all stakeholders.

The project can be replicated by adopting the process to other areas. However, the researcher must take into account that all cases are unique, and any action should consider local specificity in accordance with the site's situation, strengths and weaknesses.

ACKNOWLEDGMENT

The authors would like to acknowledge USM for funding the programme under the grant "Delivery Sustainability Excellence: Showcasing Balik Pulau as a Sustainable Village". The authors would also like to thank all stakeholders, especially the communities in Balik Pulau and Sidratul Enterprise.

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“Consolation Prize” for General Participant
The Sirindhorn International Environmental Park Photo Contest 2011
Photo by : Sanhakoch Thepyothin
Scientific name : *Periophthalmodon schlosseri*
Common name : Mudskipper
Photo taken at Princess Sirindhorn Mangrove, the Sirindhorn International Environmental Park, in 2011

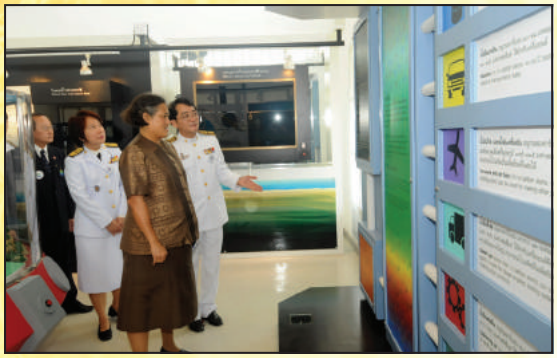
"First Prize Winner" for Student
The Sirindhorn International Environmental Park
Photo Contest 2011
Photo by : Chumpon Rodrakwongthai
Red-claw marsh crab *(Perisesarma eumolpe)* eats
propagule of grey mangrove *(Avicennia marina).*
Photo taken at Princess Sirindhorn Mangrove,
the Sirindhorn International Environmental Park, in 2011

THE SIRINDHORN INTERNATIONAL ENVIRONMENTAL PARK

The Sirindhorn International Environmental Park (SIEP), located at the Rama VI Camp, Cha-am Sub-district, Cha-am District, Phetchaburi Province, was established by the Border Patrol Police Bureau, Huay Sai Royal Development Study Center and Foundation of Mrigadayavan Palace, in commemoration of HRH Princess Maha Chakri Sirindhorn's 48th Birthday Anniversary in 2003. SIEP was immeasurably blessed by HRH Princess Maha Chakri Sirindhorn via grand opening on 19 July 2008.

SIEP is administered by SIEP Foundation under Patronage of HRH Princess Maha Chakri Sirindhorn, which is chaired by Dr. Sumet Tantivejkul. SIEP aims to be a learning center for the dissemination of knowledge and training on conservation of energy, natural resources and environment for youths, school and university students and the general public, both Thais and foreigners. It also promotes knowledge and experiences that can be applied in day-to-day life, with its goal of becoming an international learning center for the conservation of energy, natural resources and environment. SIEP has provided various and all-inclusive learning activities, creating innovations, and connecting science and technology both domestically and internationally, together with local wisdom for sustainable development.

SIEP also operates as a living natural museum and serves to expand and disseminate the works on the conservation of energy, natural resources, environment and biodiversity in light of the initiatives of HM the King and HRH Princess Maha Chakri Sirindhorn to become clearly evident of the Thai people and foreigners. SIEP is a place to study and learn about mangrove rehabilitation, beach forest, mixed deciduous forest and habitats of various species. It also acts as a center to promote ecotourism and historical tourism of high values both to Thailand and the world. In addition, SIEP has been acknowledged as a Regional Centre of Expertise (RCE) on Education for Sustainable Development (ESD) by the United Nations University-Institute of Advanced Studies.



SIEP Learning Activities

There are numerous learning activities which encourage and promote innovative thinking and creativity related to natural sciences and technology within the country and abroad while linking to local knowledge and appropriate technology for sustainable development. The primary target groups of the center are students, youth and the public, including officials of governmental organizations, the private business sector, local and international NGOs and international organizations.

The Princess Mangrove Plantation

After the partial dredging at Bang Tra Noi canal and Bang Tra Yai canal by the Border Patrol Police Bureau in order to prepare the area for mangrove plantation, HRH Princess Maha Chakri Sirindhorn planted red mangroves on 17 August 1994 and suggested to "do learn how to survive the planted mangroves and then plant more". The lesson learned from this area later served as model for other similar mangrove planting sites. The "Princess Mangrove Plantation" is one of the important learning sources in the country on mangrove ecosystem and mangrove restoration.

Energy for Environment Center

The Energy for Environment Center has been supported by Energy Policy and Planning Office, Ministry of Energy, through the Energy Conservation Promotion Fund through the exhibitions of energy for environment which aim at providing information about energy efficiency and through training programs on energy efficiency and renewable energy technologies. The two-way communication exhibitions are displayed and divided into three groups. Each group contains different methods to deliver information on energy and environment, such as using models or simulation models, give a demonstration, and do experimentation. In addition, there are two exhibitions on the Sufficiency Economy. The first station displays philosophy of sufficiency economy, the concepts developed by HM the King, with the support of the Crown Property Bureau. The other station demonstrates energy usage in line with the sufficiency economy principle, with the support of the Department of Alternative Energy Development and Efficiency, Ministry of Energy aiming at introducing knowledge on technologies of alternative energy and conservation to the real practice in local communities and communities all over the country.

Wastewater Treatment System: The Integrated Constructed Wetlands

The Integrated Constructed Wetlands is the system for wastewater treatment using natural processes integrated with plantation. The plants to be used in the process are those found in natural wetlands, such as bulrush, reed, and cattail. The wastewater from lodging houses of police officers at the Rama VI Camp about 200 cubic meters daily has been discharged to the area of constructed wetlands of 9.5 rais (1.52 hectares). The technology applied to this treatment is developed from the King's Royally Initiated Laem Phak Bia Environmental Research and Development Project. Thus, this technology plays an important role in promoting environmental conservation and biodiversity. This wastewater treatment system is operated by the Wastewater Management Authority.

Learning Center for Coastal Erosion Protection

At the coastal area of SIEP, there are several structures constructed to prevent beach erosion. Breakwaters and groins in front of the Park are for beach erosion prevention. Jetties at the mouth of the canals are constructed for allowing seawater flowing into and out of the mangrove area. This helps in balancing the mangrove ecosystem and also in breeding of aquatic species. Moreover, it serves as shelter for local fishing boats.

Learning Center for Renewable Energy

In SIEP, there are two sets of solar cells installations. The first photo voltaic power generation of 28.86 kilowatts-hour has been installed at the parking lots of the Energy for Environment Center building. The other set of 16.095 kilowatts-hour has been installed at Energy and Environmental Conservation Camp. The generated electricity goes into the grid and some are independently used in lighting the parking area and the walkways. A solar water pumping system is also installed for watering the forest area.

The Park has utilized wind energy for agricultural purposes. The wind turbine of 21 cubic meters per day pumping capacity has been installed. The pumped water is used in terrestrial forest and agricultural areas. The project demonstration of electricity generation from a small wind turbine is organized by installing three wind turbines of one kilowatt-hour each, serving as a mini-wind farm system. This project is promoting the learning and understanding of clean energy usage and demonstrating wind power as an alternative energy in the near future.

Energy and Environmental Conservation Camp

The Energy and Environmental Conservation Camp is supported by the Energy Conservation Promotion Fund, Energy Policy and Planning Office, Ministry of Energy. SIEP training courses and activities have been setup for all people interested in energy and environment conservation. Many types of guesthouses which have been designed for energy saving, the outdoor campsite, and the patio are available at the Park. Besides, there is a dock for canoeing; an opportunity for learning nature and eco-tourism.

International Environmental Camp

The Park is also sponsored by the Institute for the Promotion of Teaching Science and Technology in the role of a place for training teachers in science, mathematics and technology on environment, energy conservation and alternative energy development. The Park contains many types of guesthouses to accommodate trainees and other interested individuals.

Energy and Environment Library

The Energy and Environment Library is housed in the Energy for Environment Center. This library houses a collection of books and other media on energy and environment arranged for learning, searching and referencing purposes. It also produces books and other media for distribution to interested schools for use in energy and environment teaching and learning. The library also serves as a center for exchanging ideas and comments between other libraries and its members to create a knowledge network on energy and environment. The library is like a treasure of wisdom for all Thai and foreign users.

Tree Planting Activity

Aside from being a learning center on conservation of natural resources and environment, building environmental awareness in young people and general public on realizing the importance of tree planting in order to reduce the impact of climate change and enhance the biodiversity, SIEP has been part of "Plant for the Planet! Plant for the Future!- The Billion Tree Campaign" in Thailand in cooperation with the Foundation for Global Peace and Environment of Japan, the United Nations Environment Programme (UNEP), the Department of Environmental Quality Promotion, Ministry of Natural Resources and Environment, Thailand.

This project started in 2008 and was divided into three phases. During the first phase, five types of trees were planted by HRH Princess Maha Chakri Sirindhorn along the beach nearby Bang Tra Noi canal on 19 July 2008 : *Barringtonia asiatica, Derris indica, Diospyros areolata, Syzygium cumini,* and *Manilkara hexandra.* Phase 2, which started in 2009, involved planting trees in temples and schools in Cha-am District, Ta Yang District, and Kaeng Krachan District, Phetchaburi Province. This phase was concluded in November 2010, with 15 participating schools and temples completing their activities. Phase 3 started in 2010 and focuses on mangrove planting in SIEP and vicinity area.

Moreover, SIEP in cooperation with the Thailand Environment Institute launched the "Green SIEP with Royal Gracious Kindness Project". It aims to help maintain the balance of nature, conserve genetic diversity of local plants and suitably restore natural fertility in accordance with the royal initiative of HRH Princess Maha Chakri Sirindhorn. Activities include planting of selected species in mangrove, mixed deciduous and beach forests as well as the releasing of aquatic animals in SIEP area. Numerous participants from organizations of public and private sectors joined the activities.

RCE Cha-am

SIEP has been accredited by the United Nations University as a Regional Centre of Expertise on Education for Sustainable Development of Cha-am or "RCE Cha-am" since 28 March 2008. The contributions of RCE Cha-am in the ultimate objective of the royal initiative to rehabilitate and restore the natural environment of the region, and as a learning center on energy, natural resources, environment, and biodiversity are significant. By mobilizing multi-stakeholders and making contributions where they can do best in line with the respective mandates, make the efforts more effective. There is learning by all concerned, and through knowledge learned and new research findings revealed, RCE Cha-am can offer more with the participation of partners.

From the time HRH Princess Maha Chakri Sirindhorn planted the first mangrove tree in coastal area at Mrigadayavan Palace, SIEP today has been developed considerably in conservation of energy, natural resources, environment and biodiversity, building awareness in conservation for young generation, and generating new knowledge in natural conservation and utilization. SIEP Foundation continues to support SIEP activities to accomplish the set objectives and to continue the royal development projects.

ASEAN Centre for Biodiversity, working to conserve Southeast Asia's biodiversity for future generations

Biodiversity is the short way of saying biological diversity, which includes all the various forms of life on Earth. Also referred to as the web of life, biodiversity provides us with air, water, food, medicine, shelter, livelihood and a host of ecosystem services. This web of life, however, is fast becoming endangered due to the demands of growing human population, as well as our wasteful and inefficient consumption patterns.

Biodiversity in Southeast Asia

Southeast Asia, also known as the Association of Southeast Asian Nations (ASEAN) region, occupies only three percent of the world's total land area, but it is home to 19 percent of all plant and animal species assessed by IUCN *(IUCN Red List of Threatened Species, 2012.2).* The region has three of the 17 known mega-diverse countries (Indonesia, Malaysia and Philippines), but it has four of the world's 34 biodiversity hotspots (Indo-Burma, Philippines, Sundaland and Wallacea).

Southeast Asia is home to 28 percent, almost 70,000 square kilometers, of all known coral reef areas. About 95 percent are at risk from local threats, with almost half in the high and very high threat categories *(Burke, et.al, 2011).* Out of 12,699 species assessed in the region, 2,786 are threatened *(IUCN Red List of Threatened Species, 2012.2).*

Composed of ten Member States (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam), the ASEAN region continues to lose many of its plant and animal species due to climate change, deforestation, habitat change, illegal wildlife trade, pollution, population growth, and other causes.

Her Royal Highness Princess Maha Chakri Sirindhorn takes Interest in biodiversity conservation.

Former ASEAN Centre for Biodiversity Executive Director, Mr. Rodrigo U. Fuentes briefs HRH on the Centre's activities.

ACB: ASEAN's response to the challenge of biodiversity loss

The ASEAN Centre for Biodiversity (ACB) is ASEAN's response to the challenge of biodiversity loss. It is an intergovernmental regional centre of excellence that facilitates cooperation and coordination among the ten ASEAN Member States and with relevant national governments and regional and international organizations on the conservation and sustainable use of biological diversity, as well as the fair and equitable sharing of benefits arising from the use of such natural treasures.

ACB's goals are to serve as an effective coordinative body to facilitate discussion and resolution of cross-country biodiversity conservation issues; provide a framework and mechanism for sharing information, experiences, best practices and lessons learned for efficient access of ASEAN Member States; implement a pro-active approach in monitoring and assessing biodiversity conservation status as a strategic approach towards identifying critical issues and future trends; deliver/facilitate conduct of capacity-building services and technology transfer through engaging relevant and appropriate expertise; enhance common understanding of biodiversity conservation issues, strengthening ASEAN regional positions in negotiations and in compliance with relevant multilateral environmental agreements; promote public and leadership awareness to develop champions and enhance support at different stakeholder levels on biodiversity concerns; and undertake innovative resource generation and mobilization measures to pursue impact activities that will enhance biodiversity conservation in the region.

ACB thematic concerns

ACB supports ASEAN Member States in the following biodiversity concerns that are of global and regional importance: access and benefit sharing, agro-biodiversity and biosafety, ASEAN Heritage Parks and protected area management, biodiversity information management, business and biodiversity, climate change and biodiversity, ecotourism and biodiversity conservation, Global Taxonomic Initiative, invasive alien species, payment for ecosystem services and valuation of biodiversity, peatlands and wetlands management and biodiversity, and wildlife protection and law enforcement.

Major ACB Projects

Biodiversity and Climate Change

Supported by Germany through GIZ, *The Biodiversity and Climate Change Project* is an initiative that aims to enhance the capacity of ACB in providing ASEAN Member States with advisory services on strategies and instruments for biodiversity conservation-related intervention measures on climate protection and adaptation to climate change.

Access and Benefit Sharing

The project on *Building Capacity for Regionally Harmonized National Processes for Implementing CBD Provisions on Access to Genetic Resources* seeks to strengthen ASEAN Member States' and Timor-Leste's capacity to implement the Convention on Biological Diversity (CBD) provisions on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) through the development of their national ABS frameworks. It aims to enhance stakeholders' understanding of ABS issues and improve public understanding of the contribution that ABS can make to biodiversity conservation. The project is being funded by the United Nations Environment Programme-Global Environment Facility with the ASEAN Secretariat and the United Nations University-Institute of Advanced Studies as co-executing partners.

Taxonomic Capacity Building

In support of the Global Taxonomy Initiative (GTI), the ACB has recently completed implementing the *Expanded Taxonomic Capacity Building and Governance for Conservation and the Sustainable Use of Biodiversity Project* in partnership with the East and Southeast Asia Biodiversity Information Initiative (ESABII) and Japan's Ministry of Environment. The project is developing and enhancing capacities of ASEAN Member States in taxonomic knowledge for strengthening scientific basis in decision making vital for environmental governance, business and technologies development.

ASEAN Heritage Parks Programme

ASEAN Heritage Parks (AHP) are protected areas of high conservation importance that preserve a complete spectrum of ecosystems representative of the ASEAN region. The ACB, as Secretariat of the ASEAN Heritage Parks Programme, evaluates applications for new AHPs; conducts capacity development activities for AHP managers and staff; organizes AHP conferences; holds promotional activities for the AHP Programme; and facilitates coordination among AHP managers to strengthen the parks as a regional network of protected areas.

Capacity Building on Protected Area Management

While protected areas and community conserved areas abound in the ASEAN region, park managers and workers still need to enhance their technical expertise to effectively manage these key environmental areas. To fill this gap, ACB conducts programmatic courses for enhancing management and conservation skills of protected area workers.

ASEAN Small Grants Programme

The objectives of the Programme are to improve biodiversity protection in line with the interest of the local population directly dependent on selected AHPs and adjacent areas; to improve the livelihood of local communities directly dependent on selected AHPs and adjacent areas; and to strengthen the role of ACB in promoting biodiversity protection among the ASEAN Member States. The programme is funded by the German Ministry for Economic Cooperation and Development (BMZ) through KfW.

Promoting the Economics of Ecosystems and Biodiversity (TEEB)

ACB and the British Foreign and Commonwealth Office (FCO) recently undertook a project on *Disseminating the Values of Ecosystems and Biodiversity to Enhance Climate Change and Biodiversity Strategies in Southeast Asia.* The project aims to engage policy and decision makers in recognizing the economic benefits and values of ecosystems and biodiversity, understanding the costs of biodiversity loss, and taking action towards incorporating these values into national plans and budgets.

Wildlife Protection and Law Enforcement

ACB is working with the ASEAN-Wildlife Enforcement Network (ASEAN-WEN) and Freeland Foundation to arrest illegal wildlife hunting in Southeast Asia. Under the collaboration, the partners are implementing a series of capacity building activities aimed at enhancing the understanding by ASEAN Member States of CITES policies, improving the skills of wildlife law enforcers, developing national regulations and policies on wildlife trafficking, and strengthening the capacity of the ASEAN-WEN Programme Coordination Unit in fulfilling its mandates.

Communicating Biodiversity

Biodiversity Information Sharing Service

ACB's *Biodiversity Information Sharing Service (BISS)* promotes biodiversity information sharing among the ASEAN Member States. The BISS contains an inventory of biological resources of the ASEAN region; houses its historical and current biodiversity metadata; and serves as a platform that presents a growing collection of knowledge products developed out of the biodiversity data made available by the ASEAN Member States. Additional biodiversity data are likewise sourced

from global repositories including the Catalogue of Life, FishBase, SeaLifeBase and the IUCN Red List.

Public Awareness

ACB promotes public awareness of the values of biodiversity by conducting communication, education and public awareness activities targeting a variety of audiences. The Centre produces and distributes various information materials and promotes linkage between media and government to develop a strong partnership in biodiversity conservation advocacy.

ASEAN Champions of Biodiversity

The *ASEAN Champions of Biodiversity* is a recognition programme for outstanding projects on biodiversity conservation and advocacy in the ASEAN region. The award is aimed at generating greater leadership, public and media awareness of the problems facing the region's rich but highly threatened biodiversity and the need a concerted effort in biodiversity conservation and advocacy.

Partnerships

ACB has partnership arrangements with strategic international institutions like the ASEAN Foundation, ASEAN-Wildlife Enforcement Network, Asia-Pacific Biodiversity Observation Network, East and South East Asia Biodiversity Information Initiative, FREELAND Foundation, GIZ and KfW of the Federal Republic of Germany, Global Biodiversity Information Facility, Institute of Southeast Asian Studies, International Union for the Conservation of Nature, Japan Business Initiative for Conservation and Sustainable Use of Biodiversity, Partnerships in Environmental Management for the Seas of East Asia, Secretariat of the Convention on Biological Diversity, Secretariat of the Ramsar Convention, Sirindhorn International Environmental Park Foundation, United Nations

Educational, Scientific and Cultural Organization, United Nations Environment Programme-World Conservation Monitoring Centre, and United Nations University-Institute of Advanced Studies, among other institutions.

Managing ACB

The Centre is managed by a Governing Board, which is composed of the ASEAN Senior Officials on the Environment (ASOEN) and the ASEAN Secretary General. Headed by the Chairman of the ASOEN, the Governing Board has overall responsibility and accountability for the operations of ACB.

The ASEAN Working Group on Nature Conservation and Biodiversity provides technical guidance to ACB by recommending the key areas of focus for its work. The Centre works with National Contact Points from each ASEAN Member State to facilitate collaboration in project implementation at the country level.

ACB is headed by an Executive Director who is assisted by highly skilled professionals with international and national experiences in the areas of environment and biodiversity conservation, policy and programme development and coordination, finance and administration, information and knowledge management, and communication. For more details, log on to *www.aseanbiodiversity.org*

PROFILE

UNITED NATIONS UNIVERSITY
UNU-IAS
Institute of Advanced Studies

United Nations University Institute of Advanced Studies (UNU-IAS)

As part of the United Nations University, a global think tank for the UN, the United Nations University Institute of Advanced Studies (UNU-IAS) is committed to contributing creative solutions to key emerging issues of global concern, particularly those on the UN agenda. The Institute applies a policy-oriented research programme designed to promote strategic approaches to sustainable development. Research consists of advanced and multidisciplinary methodologies accompanied by postgraduate education and capacity development activities, particularly for developing countries.

Bringing together international expertise at local, regional, and global levels, UNU-IAS engages experts from multiple disciplines in the natural, social, and life sciences. The Institute's research projects are carried out by an academic community made up of faculty and staff, administrative personnel, visiting professors, PhD and postdoctoral fellows, augmented by a global network of scholars and academic institutions.

UNU-IAS hosts a number of research initiatives, including: The Biodiplomacy Initiative, The Satoyama Initiative, Sustainable Development Governance, Education for Sustainable Development, Marine Governance, The Traditional Knowledge Initiative, Operating Unit Ishikawa/Kanazawa, Science and Technology for Sustainable Societies and Sustainable Urban Futures.

Education for Sustainable Development

The UN General Assembly adopted a resolution on the Decade of Education for Sustainable Development (DESD) in 2002. Following the resolution, UNU-IAS launched the Education for Sustainable Development Programme with funding support from the Ministry of the Environment-Japan, to contribute to the UN DESD.

The goal of the programme is to help in the creation of a Global Learning Space for sustainable development. The programme promotes research and actions to advance partnerships for ESD across geographic, knowledge and sectoral boundaries.

ESD programme initiatives contribute to building broad ownership of DESD through articulation of the value added by each partner—especially higher education institutions and local ESD stakeholders. These initiatives build momentum and participation through building dynamic networks and expanding those networks throughout the DESD.

The programme develops and implements research and development agendas through its two flagship initiatives: the global network of Regional Centres of Expertise on ESD and its network of higher education institutions for ESD, ProSPER.Net (Promotion of Sustainability in Postgraduate Education and Research Network).

For more information on the ESD Initiatives, see *www.ias.unu.edu/efsd* or contact at *rceservicentre@ias.unu.edu*

Capacity Development

Capacity Development at UNU-IAS aims at providing young researchers, scholars and policymakers, particularly those from developing countries, with an opportunity to experience a unique international academic environment and to expand their intellectual vision beyond a single scientific field. UNU-IAS offers the following opportunities:

- Postdoctoral Fellowship
- Doctoral Fellowship
- Internships
- Advanced Training and Seminars/ Workshops

For more information on the UNU-IAS fellowships and internships, see *www.ias.unu.edu/fellowships* or *www.ias.unu.edu/vacancy*

Events

UNU-IAS hosts dialogues, seminars, and lectures by in-house and visiting faculty members and academics on a range of issues within the broad spectrum of UNU-IAS research programmes. These events are open to the public and gratis.

For more information on the latest UNU-IAS events, see *www.ias.unu.edu/events*

Publications

The Institute's research and findings are published through UNU Press books, policy reports, working papers, articles, and other publications.

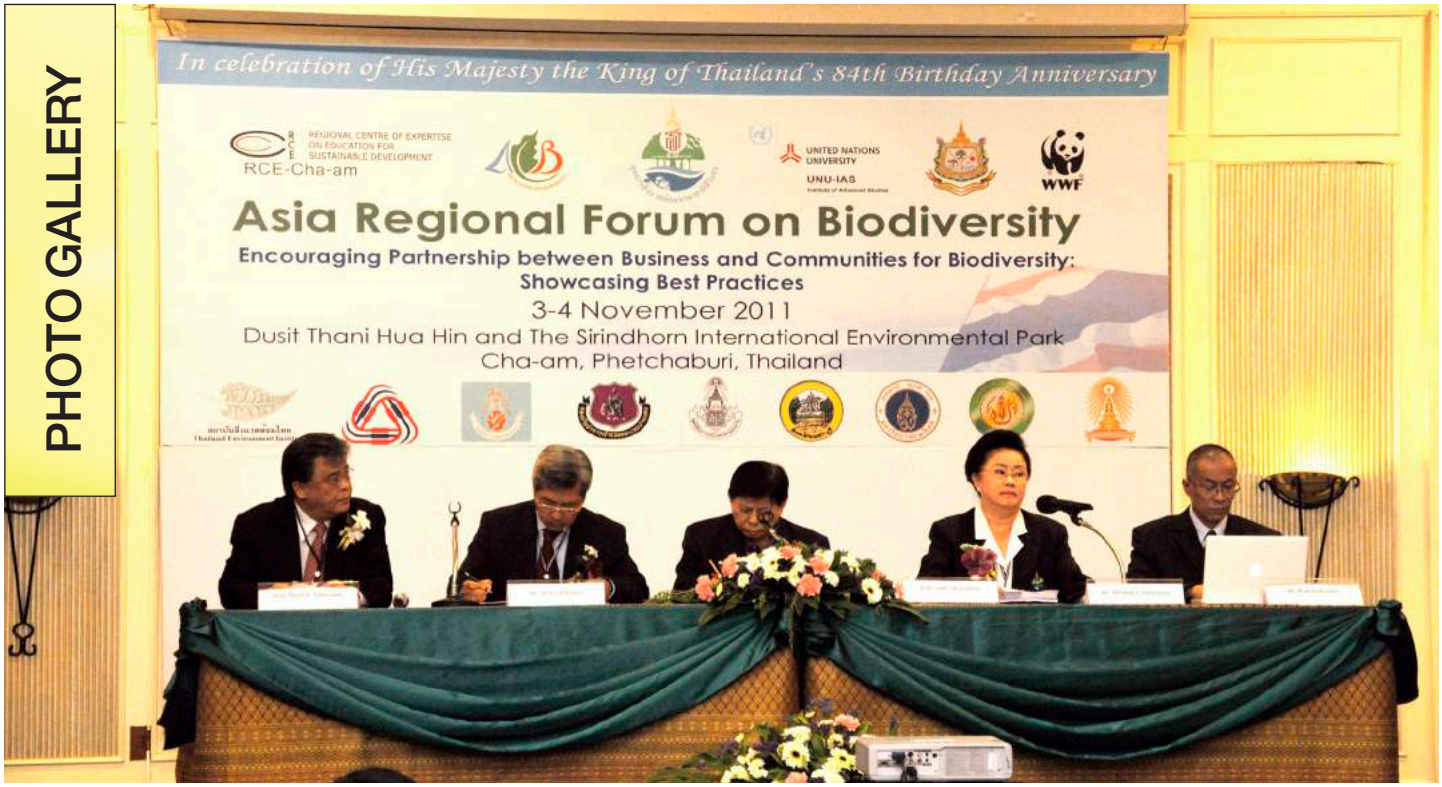
For information on the latest UNU-IAS publications, see *www.ias.unu.edu/publications*

Contact information

UNU-IAS
6F International Organizations Center
Pacifico-Yokohama
1-1-1 Minato Mirai, Nishi-ku
Yokohama 220-8502 Japan
Tel: +81-45-221-2300
Fax: +81-45-221-2302
Email: unuias@ias.unu.edu
Web: www.ias.unu.edu

"Consolation Prize" for General Participant
The Sirindhorn International Environmental Park Photo Contest 2011
Photo by : Prapan Kraisakdawat
Mangrove planting activity at Princess Sirindhorn Mangrove.
Photo taken at the Sirindhorn International Environmental Park, in 2011

PHOTO GALLERY



Opening and plenary sessions at Asia Regional Forum on Biodiversity, Dusit Thani Hotel, Cha-am, Phetchaburi, Thailand on 3rd November 2011.








Plenary session and plaque presentation by Prof. Sanit Aksornkoae (Chairman, Executive Board of the Sirindhorn International Environmental Park Foundation) to sponsors of Asia Regional Forum on Biodiversity.

Plenary session and certificate presentation by Prof. Mario T. Tabucanon to speakers at Asia Regional Forum on Biodiversity.

Registration and exhibitions at Asia Regional Forum on Biodiversity, Cha-am, Phetchaburi on 3rd – 4th November 2011.













Thematic sessions : Case presentations on biodiversity conservation efforts with multi-stakeholders at Asia Regional Forum on Biodiversity.

Welcome Dinner organized by Mrigadayavan Palace Foundation for participants and guests of Asia Regional Forum on Biodiversity at the Chao Phraya Ramrakop Residence, Rama VI Camp, Border Patrol Police Bureau, Cha-am, Phetchaburi on 3rd November 2011.









Presentation and discussion of recommendations from the thematic sessions and Cha-am Declaration on Business and Biodiversity at Asia Regional Forum on Biodiversity, Dusit Thani Hotel, Cha-am, Phetchaburi on 4th November 2011.







Field visit to Huay Sai Royal Development Study Center, Cha-am, Phetchaburi on 4th November 2011.

Participants of Asia Regional Forum on Biodiversity visit to Mrigadayavan Palace, Princess Sirindhorn Mangrove and Education for Sustainable Development Center (ESDC) at the Sirindhorn International Environmental Park, Cha-am, Phetchaburi on 4th November 2011.

Joined activities by Suan Somdej Prasinakarinthara Baromrajachonnanee, Hup Krapong Royal Project and closing ceremony of Asia Regional Forum on Biodiversity at Energy for Environment Center, the Sirindhorn International Environmental Park on 4th November 2011.

In Celebration of His Majesty the King of Thailand's 84th Birthday Anniversary

Asia Regional Forum on Biodiversity

Encouraging Partnership between Business and Communities for Biodiversity: Showcasing Best Practices

3-4 November 2011

The Sirindhorn International Environmental Park, Cha-am, Phetchaburi, Thailand

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Advisors : Prof. Dr. Sanit Aksornkoae
Prof. Dr. Mario T. Tabucanon
Prof. Dr. Somsak Panha
Prof. Dr. Sansanee Chaiyaroj
Dr. Sonjai Havanond
Dr. Sirin Kaewla-aid
Prof. Dr. Yongyut Trisurat

Editor-in-Chief : Rolando Inciong

Editor/ Writers : Sahlee Bugna-Barrer and Leslie Jose Castillo

Design and Layout Artists : Nanie Gonzales and Phuriphan Graphic Design

Coordinator : Areeporn Sittiyanpaiboon

Publisher : The Sirindhorn International Environmental Park Foundation
under the Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn
1281 Rama VI Camp, Cha-am, Phetchaburi 76120 Thailand
Tel. +66 3250 8405-10, +66 3250 8379, +66 3250 8352, +66 3250 8396
Fax. +66 3250 8396-7, +66 3250 8411
Website : www.sirindhornpark.or.th Email : siep@sirindhornpark.or.th

Printed by : Phuriphan Printing Co.,Ltd.
1/16-17 Moo 7, Bangkruai-Sainoi Road,
Bangkruai, Nonthaburi 11130 Thailand
Tel. +66 2879 5839, +66 2879 5177 Fax. +66 2879 5177
E-mail : phuriphan_p@yahoo.com

The Sirindhorn International Environmental Park Foundation
under the Patronage of HRH Princess Maha Chakri Sirindhorn
1281 Rama VI Camp, Cha-am, Phetchaburi 76120 Thailand
Tel. +66 3250 8405-10, +66 3250 8379, +66 3250 8352, +66 3250 8396 Fax. +66 3250 8396-7, +66 3250 8411
Website : www.sirindhornpark.or.th E-mail : siep@sirindhornpark.or.th