

# PROGRAM

The 9<sup>th</sup> GMSARN International Conference 2014 on

## Connectivity and Sustainability in GMS: Energy, Environmental & Social Issues

12-14 November 2014  
@ Palace Hotel Saigon  
Ho Chi Minh City, Vietnam

### Organized by



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# About GMSARN



The Greater Mekong Subregion (GMS) consists of Cambodia, China (Yunnan & Guangxi Provinces), Laos, Myanmar, Thailand and Vietnam.

The Greater Mekong Subregion Academic and Research Network (GMSARN) is composed of sixteen of the region's top-ranking academic and research institutions. GMSARN carries out activities in the following areas: human resources development, joint research, and

dissemination of information and intellectual assets generated in the GMS. GMSARN seeks to ensure that the holistic intellectual knowledge and assets generated, developed and maintained are shared by organizations within the region. Primary emphasis is placed on complementary linkages between technological and socio-economic development issues.

The GMSARN current member institutions are the Asian Institute of Technology, Pathumthani, Thailand; The Institute of Technology of Cambodia, Phnom Penh, Cambodia; Kunming University of Science and Technology, Yunnan Province, China; National University of Laos, Vientiane, Laos PDR; Yangon Technological University, Yangon, Myanmar; Khon Kaen University, Khon Kaen Province, Thailand; Thammasat University, Bangkok, Thailand; Hanoi University of Technology, Hanoi, Vietnam; Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam; The Royal University of Phnom Penh, Phnom Penh, Cambodia; Yunnan University, Yunnan Province and Guangxi University, Guangxi Province, China; Nakhon Phanom University, Nakhon Phanom Province, Thailand; and Ubon Ratchathani University, Ubon Ratchathani Province, Thailand and another associate member is Mekong River Commission, Vientiane, Laos PDR. These institutions together with the Asian Development Bank are being represented in the GMSARN Board by their respective Rectors, Presidents and Representatives.

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# Greetings from Conference Chair

It is my great pleasure to chair the 9th GMSARN International Conference 2014 on “*Connectivity and Sustainability in GMS: Energy, Environmental & Social Issues*”. On behalf of organizing committee, I take this opportunity to welcome you all to this prestigious international conference.

GMS region is a natural and economical area bound together by the Mekong river with an area of 2.6 million square meters and combined population of about 326 million. Presently, all GMS countries are facing the challenges how to transform GMS connectivity or transport corridors into genuine economic corridors which include energy trading, logistics, and trade facilitation. Thus, infrastructure is the priority to address the aspects of functioning GMS region particularly those that enhance competitiveness, and ensure sustainability of development. The aim of this GMSARN 2014 is to focus on connectivity and sustainability in the GMS countries to transform its future.

The conference is organized by Greater Mekong Subregion Academic and Research Network (GMSARN) and co-organized by Asian Institute of Technology (AIT), Ho Chi Minh City University of Technology (HCMUT). In organizing this conference, GMSARN has been assisted and guided by our International Advisory Committee. The cooperation has been given by our co-organizers, colleagues, and friends from institutions in GMS and beyond words of appreciation.

I take this great honor to thank the co-organizers, sponsors, for their esteemed support and cooperation. Finally, I would like to thank once again the participants of the conference and wish that you enjoy the conference, your stay in Ho Chi Minh City.

Prof. Worsak Kanok-Nukulchai  
President  
Asian Institute of Technology  
P.O. Box 4, Klong Luang,  
Pathumthani 12120, Thailand

# Organizing Committee

## Chair

**Prof. Worsak Kanok-Nukulchai**  
President, Asian Institute of Technology

## Co-Chair

**Assoc. Prof. Dr. Vu Dinh Thanh**  
Rector, Ho Chi Minh City University of Technology

## Members

**Dr. Nguyen Danh Thao**  
Director, External Relation Office, Ho Chi Minh City University of Technology

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Director, Division of International Cooperation,  
Kunming University of Science and Technology

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**Dr. Sirintip Boonmee**  
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**Assoc. Prof. Dr. Worasit UChai**  
Acting Vice President on Academic Affairs, Nakhon Phanom University

## Secretary

**Assoc. Prof. Dr. Weerakorn Ongsakul**  
GMSARN Secretary General and Conference Coordinator

**Dr. Clemens Grunbuhel**  
**Assoc. Prof. Dr. Vilas Nitivattananon**

**Dr. Vo Ngoc Dieu**  
Technical Program Co-Organizers

# International Advisory Panel

Country	Name	Affiliation
Australia	Deepak Sharma	University of Technology, Sydney
Australia	Robert Fisher	Australian Mekong Resource Center
China	Zhang Wentao	Chinese Society of Electrical Engineers (CSEE)
Denmark	Soren Lund	Roskilde University
Germany	H.-J. Haubrich	Institute of Power Systems and Power Economics, RWTH Aachen University
Hong Kong	Kit Po Wong	Hong Kong Polytechnic University
India	S. C. Srivastava	Indian Institute of Technology
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Thailand	Subin Pinkayan	GMS Power Public Company Limited
Thailand	Vladimir I. Kouprianov	Sirindhorn International Institute of Technology, Thammasat University
Thailand	Worsak Kanok-Nukulchai	Asian Institute of Technology
Thailand	Wanpen Wirojanagud	Khon Kaen University
Thailand	Andrew Ingles	IUCN Asia Regional Office
UK	Jonathan Rigg	Durham University
USA	Dennis Ray	University of Wisconsin-Madison
USA	Jefferson Fox	East-West Center, Honolulu

# Conference Purposes



GMS region is a natural and economical area bound together by the Mekong river with an area of 2.6 million square meters and combined population of about 326 million. Presently, all GMS countries are facing the challenges how to transform GMS connectivity or transport corridors into genuine economic corridors which include energy trading, logistics, and trade facilitation. Thus, infrastructure is the priority to address the aspects of functioning GMS region particularly those that enhance competitiveness, and ensure sustainability of development. The aim of this GMSARN 2014 is to focus on connectivity and sustainability in the GMS countries to transform its future. To address these critical issues, the International Conference 2014 on “**Connectivity and Sustainability in GMS: Energy, Environment and Social Issues**” is a three-day platform for knowledge dissemination by a diverse group of researchers and participants.

The rationale of the GMSARN 2014 is to initiate and stimulate international discussion and enhance research networking. The conference can be used as a platform on a regional and global level. Thus, it can contribute to sustainable development, and solve trans-boundary issues related to energy, environment and social development. The GMSARN International Conference is a multi-disciplinary conference which is problem oriented focus. In this aspect, GMSARN Conference is unique hosting a wide range of disciplines that would generate shared solutions to existing problems, regionally and globally. In addition, the conference aim is to provide a forum to disseminate the research and development findings on various sustainable developments in the GMS. It is also envisaged that the conference will be able to generate shared solutions beneficial to the GMS and the findings and recommendations should also be useful for GMSARN education and research programs.

## Contact Address



The 9th GMSARN International Conference 2014 on “**Connectivity and Sustainability in GMS: Energy, Environment and Social Issues**”.

Assoc. Prof. Dr. Weerakorn Ongsakul  
GMSARN Secretary General and Conference Coordinator  
Asian Institute of Technology  
P. O. Box 4, Klong Luang, Pathumthani 12120, Thailand  
Office Tel: +66-2-524-6537  
E-mail: [gmsarn@ait.ac.th](mailto:gmsarn@ait.ac.th); Website: <http://www.gmsarn.com>

## Venue



The conference venue will be held at **Palace Hotel Saigon, Ho Chi Minh City, Vietnam.**

# Keynote Address I

## “Thailand Mega Project for GMS Connectivity”



**Mr. Athibhu Chitranukroh**

*Chief of Transport Logistic, Planning Bureau, Office of Transport and Traffic Policy and Planning, Ministry of Transport (MOT)  
Bangkok, Thailand*

In this session, Thailand’s Infrastructure development strategies, \$67 billion, will be discussed. The strategies include promoting modal shift, improving connectivity to GMS & ASEAN, and increasing mobility by upgrading transport facilities. At the end of the strategy plan implementation, Logistic to GDP ratio is expected to be reduced from 15.2% to 13.2%. Also, energy consumption in transport sector will be decreased from 16,250 to 13,400 ktoe or energy cost saving \$957 million per annual.

It is estimated that the Thailand’s Infrastructure development strategies not only generate economic growth in the country, but also impact on overall GMS and ASEAN member about \$11,973 USD or +0.16% AEC’s GDP.

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*Mr. Athibhu Chitranukroh received B.Eng. from Assumption University, Bangkok, Thailand in 1999, M.Eng. in Engineering Management and System Engineer from George Washington University, Washington DC, USA in 2002, and Master of Economics from Indiana University, Bloomington, Indiana, USA. Furthermore, in 2005, he got award in Government Official of the Year, Office of Civil Service Commission, Office of the Prime Minister. Currently, he is a chief of transport logistics, planning Bureau, Office of Transport and Traffic Policy and Planning, Ministry of Transport (MOT). He plays an active role in several projects such as Truck rest area development master plan, Railway development master plan and high speed train, Mass rapid transit master plan for Bangkok and Metropolitan, Feasibility study and detailed design freight terminal, NongKhai province.*



# Keynote Address II

## “Renewable Energy Plan in Thailand”



**Dr. Karnnalin Theerarattananoon**

*Engineer at Energy Research Bureau, Department of Alternative Energy Development and Efficiency, Ministry of Energy, Bangkok, Thailand*

Final energy consumption in Thailand has been growing at about 2.4% per year since 2009. The major energy consumers are transportation and industrial sectors, which accounted for greater than 60% share of total energy consumption. As Thailand is highly dependent on energy import and thus affects energy security of the country, there is a need for Thailand to develop domestic energy sources in a sustainably and environmentally way. Renewable energy becomes the potential solution.

Thailand has abundant renewable energy sources such as solar, biomass, MSW, etc. The development of renewable energy in Thailand, whether in the forms of power generation, heat production or biofuel production, has been started since 2008. At present, the development and promotion of renewable energy in Thailand has been done under framework of “The 10-year Alternative Energy Development Plan (AEDP)”. The AEDP plan covers the period from year 2012-2021, with the target to increase the share of renewable energy in total energy consumption to 25% by 2021. The current achievement of this AEDP plan is at 11.3% renewable energy share (as of the first quarter of 2014).

Several tools have been employed by the government to incentivize renewable energy development. Those supporting tools include imported duty exemption of equipments/machines, the Feed-in Tariff scheme, ESCO Fund, investment grant, and data support. The successful achievement of the AEDP plan will contribute to the country’s benefits in various aspects such as reduction of fossil fuel import, enhancement of energy security, abatement of greenhouse gas emission, and job creation.

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*Dr. Karnnalin Theerarattananoon received Bachelor of Applied Science in Chemical Engineering from University of Toronto, Canada in 2003, M.Sc. in Chemical Engineering from University of Saskatchewan, Canada in 2006, and Ph.D. in Biological and Agricultural Engineering, University, Kansas State University, USA in 2012. Since 2003, she has started working as Research Assistant at Thermodynamic Laboratory, Department of Chemical Engineering, University of Saskatchewan, Canada. Other than that, she was a Graduate Research Assistant at Bioprocessing Laboratory, Department of Biological and Agricultural Engineering, Kansas State University, U.S.A. during 2009-2011. From 2006 to present, she is currently an engineer at Energy Research Bureau, Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (MOE), Bangkok, Thailand. Her areas of interest are renewable energy development, climate change issue, and cellulosic ethanol production.*

# Keynote Address III

## “Economic Cooperation and Strategy in GMS”



**Ms. Sumittra Pooltong**

*Strategic Planning Expert, National Economic and Social Development Board of Thailand,  
Bangkok, Thailand*

GMS, initiated in 1992 comprises six member countries in the Mekong Region, namely Cambodia, PRC (only Yunnan Province and the autonomous region of Guangxi), Myanmar, Lao PDR, Thailand and Vietnam. With the assistance of the Asian Development Bank (ADB), the National Economic and Social Development Board of Thailand serves as Secretariat in collaboration with member countries' national planning agencies. The main objectives are economic and social enhancement through multi-dimensional development along GMS economic corridors or the so-called 3Cs strategy aiming to build Connectivity, enhance Competitiveness, and strengthen Community development. The nine sectors of cooperation are agriculture, energy, environment, human resources development, investment, telecommunications, tourism, trade, transport, and creation of multi-sector, economic development corridors.

The focus is on economic and social partnerships aimed to narrow economic and social development disparities between Thailand and neighbouring countries, with emphasis on integrated development along the border areas by promoting the development of “sister cities”, together with co-production activities in agriculture, contract farming and industry. Eight cooperation sectors include trade and investment facilitation, agriculture, energy and industry, tourism, transportation, human resource development, public health and environment. The corridor concept is indeed the main strategic thrust of GMS implementation. The basic idea is to stimulate economic activities along the major routes or transport corridors. Concrete examples include the establishment of industrial estates on the borders, and the construction of telecommunication and electricity transmission lines and natural gas pipelines, and the promotion of tourism activities along the corridors.

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*Ms. Sumittra Pooltong is a Strategic Planning Expert of the Office of the National Economic and Social Development Board (NESDB), in the Office of the Prime Minister. She graduated from Kasetsart University with the Bachelor Degree in Geography (major) and Watershed Management (minor). She completed her Master Degree in Regional Planning from Chulalongkorn University. She also got certificates of training for high level officials on Public Policy and Planning from Ecole Nationale d'Administration (ENA) in Paris, France, Development Clusters and Competitiveness (Harvard Business School Program) from Lee Kuan Yew School of Public Policy in Singapore, and on Macroeconomic Development from the Academy of Macroeconomic Research of National Development and Reform Commission in Beijing, People's Republic of China. Her responsibility at NESDB is the Executive Director of the International Coordination Office (ICO) which is the national coordinator/secretariat office to various key subregional and regional cooperation programs i.e. the Greater Mekong Subregion (GMS) Economic Cooperation Program; the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT), and the Economic Committee under the Asia-Pacific Economic Cooperation (APEC). The ICO is also responsible to the Neighboring Countries Development Cooperation Committee that oversees the policy and implementation of programs and projects including screens and allocates the budget for the programs and projects which are in line with the national and regional development agenda under the major subregional cooperation programs.*

Three main transport corridors have been developed, with the future plan to expand to cover all nine corridors. The East-West Economic Corridor (EWEC) extends from Danang in Vietnam, on the coast of the Pacific Ocean, to Mawlamyine in Myanmar, on the Indian Ocean Coast. The North-South Economic Corridor (NSEC) is a corridor connecting Bangkok with Kunming comprising two routes, one through the Lao PDR and another through Myanmar. The Southern Economic Corridor (SEC) comprises three routes connecting Thailand through Cambodia to the southern part of Vietnam. These three GMS economic corridors are considered transport corridors as most of the key infrastructure was upgraded to the common regional standard that will facilitate cross-border traffic. A regional rail network has also been prepared for future development.

To maximize benefits of sub-regional transport connectivity, GMS member countries will put more efforts to transform the three transport corridors into logistics corridors and, at the later stage, economic corridors. The cross-border transport agreement (CBTA), one of the major policies of GMS, will serve as regional trade and transport facilitation framework for expediting the improvement on the cross-border procedures and other related software. CBTA is an agreement on facilitation of cross-border movement of goods and vehicles. It has been approved by the six member countries of GMS and is in the ratification process. The Economic Corridor Forum (ECF) has also been established representing various stakeholders, especially at the provincial level, to voice their concerns, address key issues and formulate proposals for corridor development.

Thailand is in a position to act as a centre for technical assistance in terms of equitable economic and social development planning to integrate the hinterland with the main GMS economic corridors.

# Program at a Glance (1)

<b>Day One: 12 November 2014 (Wednesday)</b>			
<b>08:00 - 08:30</b>	<b>Registration</b>		
<b>Opening Ceremony &amp; Keynote Session</b>			
<b>08:30 - 08:40</b>	<b>Introductory Speech by</b> <i>Assoc. Prof. Dr. Weerakorn Ongsakul, GMSARN Secretary General</i>	Ballroom	
<b>08:40 - 08:50</b>	<b>Opening &amp; Welcome Address by</b> <i>Assoc. Prof. Dr. Vu Dinh Thanh, Rector, Ho Chi Minh University of Technology, Vietnam</i>		
<b>09:00 - 09:30</b>	<b>Keynote Address I: “Thailand Mega Project for GMS Connectivity”</b> <i>Mr. Athibhu Chitranukroh, Chief of Transport Logistic, Planning Bureau, Ministry of Transport (MOT), Bangkok, Thailand</i>		
<b>09:30 - 10:15</b>	<b>Keynote Address II: “Renewable Energy Plan in Thailand”</b> <i>Dr. Karnnalin Theerarattananoon, Energy Research Bureau, DEDE, Ministry of Energy (MOE), Bangkok, Thailand</i>		
<b>10:15 - 10:30</b>	<b>Coffee / Tea Break</b>		
<b>Morning Parallel Sessions</b>			
<b>10:30 - 12:00</b>	<b>Parallel Session</b> Energy I:	E01 – E05, E20	Ballroom
	Sustainable Development I:	SD02 – SD05, SD07	Boardroom 1
<b>12:00 - 13:15</b>	<b>Lunch</b>		
<b>Afternoon Parallel Sessions</b>			
<b>13:15 - 15:00</b>	<b>Parallel Sessions</b> Energy II:	E06 – E10, E21	Ballroom
	Sustainable Development II:	SD01, SD06, SD08 – SD10, SD12	Boardroom 1
<b>15:00 - 15:15</b>	<b>Coffee / Tea Break</b>		
<b>15:15 - 17:30</b>	<b>Parallel Sessions</b> Energy III:	E11– E14, E16, E23	Ballroom
	Environment I:	Env01, Env05 – Env10	Boardroom 1
<b>18:30 - 20:30</b>	<b>Reception Dinner at Palace Hotel Saigon</b>		

## Program at a Glance (2)

### Day Two: 13 November 2014 (Thursday)

07:30 - 20:30	<b>One Day Field Visit to Mekong Delta (My Tho - Ben Tre)</b> (Meeting Point is at Palace Hotel Saigon)
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### Day Three: 14 November 2014 (Friday)

#### Keynote & Morning Parallel Sessions

09:00 - 09:45	<b>Keynote Address III: “Economic Cooperation and Strategy in GMS”</b> <i>Ms. Sumitra Pooltong, Strategic Planning Expert, NESDB, Bangkok, Thailand</i>		Ballroom
09:45 - 10:00	<b>Coffee / Tea Break</b>		
10:00 - 11:45	<b>Parallel Session</b> Energy IV:	E15, E17 – E19, E22	Ballroom
	Sustainable Development III & Environment II:	SD13, Env02 – Env04	Boardroom 1
11:45 - 12:00	<b>Recap and Closing Remark by</b> <i>Assoc. Prof. Dr. Weerakorn Ongsakul, GMSARN Secretary General</i>		
12:00 - 13:00	<b>Lunch</b>		

# Detailed Program

## DAY ONE: 12 November 2014

08:30 – 10:15 **Opening Ceremony & Keynote Session** **Ballroom**

- 08:30 – 08:40 **Introductory speech by**  
Assoc. Prof. Dr. Weerakorn Ongsakul, GMSARN Secretary General
- 08:40 – 08:50 **Opening & Welcome address by**  
Assoc. Prof. Dr. Vu Dinh Thanh, Rector, Ho Chi Minh University of Technology, Vietnam
- 08:50 – 09:30 **Keynote Speaker I: “Thailand Mega Project for GMS Connectivity” by**  
Mr. Athibhu Chitranukroh, Chief of Transport Logistic, Planning Bureau, Ministry of Transport (MOT), Bangkok, Thailand
- 09:30 – 10:15 **Keynote Speaker II: “Renewable Energy Plan in Thailand” by**  
Dr. Karnnaln Theerarattananoon, Energy Research Bureau, DEDE, Ministry of Energy (MOE), Bangkok, Thailand

10:15– 10:30 **Coffee / Tea Break**

10:30– 12:00 **Day One Parallel Sessions in the Morning**

10:15 – 12:00 **ENERGY I** **Ballroom**

**Session Chairman: Dr. Rikke Lybæk, Roskilde University, Denmark**

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|------|--|-----------------|
| E-01 | Solar Farms Energy and Solar Roof Currently Located in Region of Thailand<br><i>C. Suphahitanukool, I. Hunsacharonroj, and S. Teekasap</i>                                       | <i>Thailand</i> |
| E-02 | New Distribution Options for Biogas in Denmark – Experiences from Case Studies Conducted on Zealand<br><i>Rikke Lybæk, Tyge Kjær, and Regin Gaarsmand</i>                        | <i>Denmark</i>  |
| E-03 | A Preliminary Study of Glucose Conversion from Oil Palm Residues<br><i>Tanakorn Wongwuttanasatian, and Kittichai Jookjantra</i>  | <i>Thailand</i> |
| E-04 | An Experimental Study of Lignocellulosic (Oil Palm Residues) Pretreatments for Cellulose Extraction<br><i>Tanakorn Wongwuttanasatian, Amnat Suksri, and Kittichai Jookjantra</i> | <i>Thailand</i> |
| E-05 | Application of Heat Insulation Solar Glass for Glass Buildings<br><i>Tran Thi Bich Quyen, Chin-Huai Young, Bui Le Anh Tuan, and Ching-Sung Hsu</i>                               | <i>Taiwan</i>   |
| E-20 | Evaluation of Carbon Equivalences in Ethanol Production from Energy Crops in Thailand<br><i>Thanakrit Neamhom, Withida Patthanaissaranukool, and Chongchin Polprasert</i>        | <i>Thailand</i> |

10:15 – 12:00 **SUSTAINABLE DEVELOPMENT I** **Board Room 1**

**Session Chairman: Dr. Pensri Jaroenwanit, Khon Kaen University, Thailand**

- |       |   |                 |
|-------|---|-----------------|
| SD-02 | Changing in Agricultural Activities and the Influences of the | <i>Thailand</i> |
|-------|---|-----------------|

	ASEAN Economic Community (AEC) in Changing Land Use of Farmers in Phatthalung Province <i>Anisara Pensuk Tibkaew, Supaluk Sujatanond, and Will Shattuck</i>	
SD-03	Development of e-Commerce Competencies among Community Enterprise and SMEs in the Northeastern Region of Thailand <i>Pensri Jaroenwanit, and Supot Deeboonmee</i>	Thailand
SD-04	Application and Advantages of PA's Precise Rice Cultivation Method in Chaiyaphum Province and Sisaket Province, Thailand <i>Pensri Jaroenwanit, Sangdeun Bussabongpriwal, and Ananya Soikum</i>	Thailand
SD-05	Capacity Building and People's Participation in Protection and Conservation Community Forestry and Bio-Diversity in Amnatcharoen Province <i>Romanee Thongdara, and Anisara Pensuk Tibkaew</i>	Thailand
SD-07	Khao Huai MaHad Biodiversity Restoration Project <i>Sujitra Phongcharoen, and Savanit Boonyasuwat</i>	Thailand

**12:00 – 13:15 Lunch**

**13:15 – 17:30 Day One Parallel Sessions in the Afternoon**

**13:15 – 15:00 ENERGY II Ballroom**  
**Session Chairman: Dr. Pornrapeepat Bhasaputra, Thammasat University, Thailand**

E-06	Solar Power Alternative in Cellular Mobile Networks <i>Kreingkrai Chongkhanpond, Pornrapeepat Bhasaputra, Woraratana Pattaraprakorn, and Chokeychai Sansilah</i>	Thailand
E-07	Improved Particle Swarm Optimization Method for Optimal Power Flow with FACTS Devices <i>Dinh Luong Le, Dac Loc Ho, and Ngoc Dieu Vo</i>	Vietnam
E-08	Methodology to Configure Optimal Inner Grid of Offshore Wind Farm <i>Je-Seok Shin, Yong-Seung Lee, and Jin-O Kim</i>	South Korea
E-09	On-line and Off-line Diagnostic Methods for Power System Facilities in Smart Grid <i>Yun-Seong Lee, Yong-Seung Lee, and Jin-O Kim</i>	South Korea
E-10	Application of Cuckoo Search Algorithm for Optimization Power Flow in Power Systems <i>Le Anh Dung, Vo Ngoc Dieu, and Dinh Hoang Bach</i>	Vietnam
E-21	Contribution of Green Garbage to Energy Production in Municipal Solid Waste Management <i>Bussarakam Thitanuwat, and Chongchin Polprasert</i>	Thailand

**13:15 – 15:00 SUSTAINABLE DEVELOPMENT II Board Room 1**  
**Session Chairman: Assoc. Prof. Dr. Vilas Nitivattananon, Asian Institute of Technology, Thailand**

SD-01	The Influence of Sound Material Society in Thailand <i>Vilas Nitivattananon, Laksiri Chomchuen, Claudius Gabinete,</i>	Thailand
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SD-06	<i>Amornpong Thongbhakdi, and Guilberto Borongan</i> Self Help Groups (SHGs) as a Tool of Socioeconomic Development of Rural People in the Mekong Region (A Case Study with Special Reference to the Kratie and Stung Treng Provinces of Cambodia) <i>V. Manjunatha, and Theo Ebbers</i>	<i>Thailand</i>
SD-08	North Korean Views on Vietnam: From Fraternal Friendship to Economic Development Model <i>Sitthiphon Kruarattikan</i>	<i>Thailand</i>
SD-09	Challenges for Thai OTOP Community Enterprises: Experiences from Thailand and Japan, a Comparative Study <i>Saifon Suindramedhi</i>	<i>Thailand</i>
SD-10	Assessment of Land-use Change and Urban Growth in Phuket Province, Thailand <i>Potjamas Chuangchang, and Phattrawan Tongkumchum</i>	<i>Thailand</i>
SD-12	Prediction of Mass Landslides of River Banks Subjected to Variations of the Water Level <i>Chhun Soksan, Ky Sambath, Martinez Juan, and Huynh Thanh Son</i>	<i>Cambodia</i>

**15:00– 15:15 Coffee / Tea Break**

**15:15 – 17:30**

**ENERGY III**

**Ballroom**

**Session Chairman: Prof. Young-Do Choi, Mokpo National University, South Korea**

E-11	Performance of an Open Ducted Type Very Low Head Cross-Flow Turbine <i>Zhenmu Chen, Van Thanh Tien Nguyen, and Young-Do Choi</i>	<i>South Korea</i>
E-12	Numerical Investigation and Optimization of Vertical-Axis Wind Turbine Using Kriging Metamodel and Genetic Algorithm <i>Woo-Seok Cho, Seok Heum Baek, Seung-Chan Kim, Kyoung-Tea Han, Young-Gun Heo, Jong-Hyun Jeong, Dong-Hwa Lee, Dong-Hee Yoon, and Kyoung Ho Choi</i>	<i>South Korea</i>
E-13	Augmented Lagrangian Hopfield Network Applications for Direct Current Optimal Power Flow <i>Vo Ngoc Dieu, and Le Quoc uy</i>	<i>Vietnam</i>
E-14	Optimal Reactive Power Dispatch Using Artificial Bee Colony Method <i>Vo Ngoc Dieu, Nguyen Huu Thien An, and Vo Trung Kien</i>	<i>Vietnam</i>
E-16	The Energy Performance Index for Commercial Building in Thailand <i>Vivat Chutiprapat, Chokechai Sansilah, Pornrapeepat Bhasaputra, and WoraratanaPattarakorn</i>	<i>Thailand</i>
E-23	Energy Efficiency Improvement Opportunities in “New Modern Energy Consumers” in the Greater Mekong Sub-region <i>Gabrial Anandarajah, and Julia Tomei</i>	<i>United Kingdom</i>

**15:15 – 17:30**

**ENVIRONMENT I**

**Board Room 1**

**Session Chairman: Asst. Prof. Dr. Chongchin Polprasert, Mahidol University, Thailand**

Env-01	The Study Of Odor Treatment Of Digested Organic Wastes <i>Áu thị Kim Oanh, Đặng Minh Tâm, and Nguyễn Thị Thanh</i>	<i>Vietnam</i>
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	<i>Phurong</i>	
Env-05	Effect of Cleansing Water and the Amount of Allowed Air on Efficiency of Microwave Radiation for Decentralized Wastewater Treatment <i>Tu Anh Nguyen, Sandhya Babel, and Siwarutt Boonyarattanakalin</i>	<i>Thailand</i>
Env-06	Use of Wastewater as a Substrate for Sugary Kefir Growth and Value Added Products Formation <i>Phattaraporn Sarikkha, Siwarutt Boonyarattanakalin, and Rachnarin Nitorisoravut</i>	<i>Thailand</i>
Env-07	Phosphorus recovery from co-composting of faecal sludge and fresh food market waste <i>Weerapong Hanrinth, and Chongchin Polprasert</i>	<i>Thailand</i>
Env-08	A study on Screening of Floating Plants for Removal of Lead from Wastewater <i>Oley Phearkeo and Sandhya Babel</i>	<i>Thailand</i>
Env-09	Application of Magnetic Particles for Phosphorus Removal from Domestic Wastewater <i>Giang Truc Le Thi, and Paiboon Sreearunothai</i>	<i>Thailand</i>
Env-10	Reducing Waste to Landfill: A Multiple Regression Analysis <i>Olivier Gervais</i>	<i>Japan</i>

**18:30 – 20:30 Reception Dinner at Palace Hotel Saigon**

## DAY TWO: 13 November 2014

**07:30 – 20:30 One day trip to Mekong Delta (Meeting Point is at Palace Hotel Saigon)**

## DAY THREE: 14 November 2014

**09:00 – 09:45 Keynote Session Ballroom**

**09:00 – 09:45 Keynote Speaker III: “Economic Cooperation and Strategy in GMS” by Ms. Sumitra Pooltong, Strategic Planning Expert, NESDB, Bangkok, Thailand**

**09:45– 10:00 Coffee / Tea Break**

**10:30 – 11:45 Day Three Paralle Sessions in the Morning**

**10:30 – 11:45 ENERGY IV Ballroom**  
**Session Chairman: Dr. Vo Ngoc Dieu, Ho Chi Minh City University, Vietnam**

E-15	Renewable Energy for Rural Electrification in Thailand: A Case Study of Solar PV Rooftop Project <i>Wichit Krueasuk, Pornrapeepat Bhasaputra, Woraratana Pattaraprakorn, and Supattana Nirukkanaporn</i>	<i>Thailand</i>
E-17	Lead-Acid Battery Model in Electric Vehicles via Cuckoo Search Algorithm <i>Khai Phuc Nguyen, Goro Fujita, Horikoshi Yusuke, Kumagai</i>	<i>Vietnam</i>

E-18	<i>Kazuki, and Vo Ngoc Dieu</i> Frequency Response for Next Decade Solar Power Development Plan in Thailand Part 1: Frequency Response Model of Thailand Power System	<i>Thailand</i>
	<i>C. Sansilah, P. Bhasaputra, and W. Pattaraprakorn</i>	
E-19	Frequency Response for Next Decade Solar Power Development Plan in Thailand Part 2: A Case Study of PDP 2010 Version 3	<i>Thailand</i>
	<i>C. Sansilah, P. Bhasaputra, and W. Pattaraprakorn</i>	
E-22	Earthen-Membrane Fuel Cell (MFC) for Septage Treatment and Power Generation	<i>Thailand</i>
	<i>C.N.D.Thanh, and Rachnarin Nitisoravut</i>	

**10:00 – 11:45**

**SUSTAINABLE DEVELOPMENT III &  
ENVIRONMENT II**

**Board Room 1**

**Session Chairman: Mr. Cherid Kalayanamirt, EGAT, Thailand**

SD-13	Implementing DSSARM Tool for Land Use Change Monitoring and Area Analysis: A Case Study in Nakhon Phanom Province, Northeast Thailand	<i>Thailand</i>
	<i>Sorat Praweenwongwuthi, Tewin Kaewmuangmoon, Attachai Jintrawet, and A. Terry Rambo</i>	
Env-02	Optimal Condition to Remove Mercury in Yellowfin Tuna Protein Isolates and ACE-Inhibitory Property of Peptide Prepared using Commercial Proteases	<i>Thailand</i>
	<i>Hathaigan Kokkaew, and Supawan Thawornchisombut</i>	
Env-03	Astreus: Its Diversification and Ectomycorrhizal Formation	<i>Thailand</i>
	<i>Cherdchai Phosri, Thanita Arsawang, Roy Watling, Nuttika Suwannasai, Preeyaporn Dokmai, Rungpetch Khaengraeng, and María Martin</i>	
Env-04	Chromosome Banding of Two Litoria Species (Anura, Hylidae)	<i>Thailand</i>
	<i>Wanpen Kakampuy, Claus Steinlein, and Michael Schmid</i>	

**11:45 – 12:00**

**Recap and Closing Remark by**  
Assoc. Prof. Dr. Weerakorn Ongsakul, GMSARN Secretary General

**Ballroom**

**12:00 – 13:00**

**Lunch**

# Abstracts

## Energy

### **E-01: Solar Farms Energy and Solar Roof Currently Located in Region of Thailand**

*C. Suphahitanukool<sup>1</sup>, I. Hunsacharoonroj<sup>2</sup>, and S. Teekasap<sup>3</sup>*

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Solar energy is one of the renewable energy which recently suitable for new investment in Thailand and for alternative energy selection in the part of individual business or factory. According to the Energy Industry Act B.E.2550, a law issued in response to the Thailand Government policy on National Energy Industry Management Restructuring. Solar Farms register license in Thailand have been dramatically increased from year 2009 throughout year 2013. With correspondent to not only the new technologies have been developed but also the investment costs were reduced. Besides, the solar farms energy is the most attractive alternative energy in recently of Thailand. The data analysis in this research have summary the presently location of Solar Farms and Solar Roof in Thailand separately by four region of Thailand. The currently location of solar farms including solar roof (Thailand Policy involve since 2013) in Thailand updated on September 2013 are 175 locations with popular located in the central region of Thailand which is the highest capacity at 99.10 MW in Lobburi province. The on grid capacity updated on this September, 2013 is 595.41 MW with definitely increase from year 2011.

### **E-02: New Distribution Options for Biogas in Denmark – Experiences from Case Studies Conducted on Zealand**

*Rikke Lybæk, Tyge Kjær, and Regin Gaarsmand*

Department of Environment, Technology and Social Studies, Roskilde University (RU), House 9.2, P.O. Box 260, 4000 Roskilde, Denmark. E-Mail: [rbl@ruc.dk](mailto:rbl@ruc.dk), Phone: +45 46745857, Fax: +45 46743041.

This paper argues, among other things, that local biogas Combined Heat and Power plants (CHP) that distributes district heating should have first priority when selecting a distribution option, if a sufficient winter and summer heat market can be identified. In this way the energy will be produced and consumed locally with high energy efficiency and environmental benefits as a consequence. Due to long heat market distances, or due to an already saturated local heat market, this might not always be an opportunity. In such situations it is beneficial to look at other distribution options; The supply of e.g. non-upgraded city gas to households, and upgraded biogas to the natural gas (Ngas) network, were found to be feasible in such situations. It is further concluded that non-upgraded biogas distributed in separate gas networks is an option, primarily for industry, to cover process heat demands. To support such distribution options new stakeholders like Ngas and energy companies, as well as industry, are needed in the future. As far as governmental support is concerned, it is, for example, important to promote and investigate alternative heat markets to support the development of new gas

boosters and to provide funding for initial analysis of the possibilities for implementing biogas facilities within local communities, all of which would support a further development of the biogas sector.

**E-03:**

### **A Preliminary Study of Glucose Conversion from Oil Palm Residues**

*Tanakorn Wongwuttanasatian<sup>1</sup> and Kittichai Jookjantra<sup>2</sup>*

<sup>1</sup>Centers for Alternative Energy Research and Development (AERD), Khon Kaen University, Khon Kaen 4002, Thailand (corresponding author to provide phone: 66-4-320-2845; Fax:66-4-320-2849; e-mail: [tanwon@kku.ac.th](mailto:tanwon@kku.ac.th))

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This research preliminarily evaluated the amounts of glucose conversion of oil palm residues (oil palm seed meal, oil palm meal, oil palm leaf, and oil palm trunk) extracted by the two pretreatment methods: (1) steam explosion and (2) acid or alkaline digestion based on detergent analysis. The enzymatic hydrolysis of cellulose and the dinitrosalicylic acid (DNS) analysis were used to measure the amounts of percent yield of glucose of oil palm residues that were extracted by the two pretreatment methods. The results showed that oil palm trunk provided the highest amounts of percent yield of glucose (4.90% from the steam explosion pretreatment and 4.30% from the acid or alkaline digestion based on detergent analysis pretreatment). It was also found that the steam explosion pretreatment provided higher amounts of percent yield of glucose than those obtained by the acid or alkaline digestion based on detergent analysis pretreatment for all four types of oil palm residues. However, optimization in enzyme hydrolysis process has to be further carried out to obtain a maximum yield.

**E-04:**

### **An Experimental Study of Lignocellulosic (Oil Palm Residues) Pretreatments for Cellulose Extraction**

*Tanakorn Wongwuttanasatian<sup>1</sup>, Amnat Suksri<sup>2</sup>, Kittichai Jookjantra<sup>3</sup>*

<sup>1</sup>Centers for Alternative Energy Research and Development (AERD), Khon Kaen University, Khon Kaen 4002, Thailand (corresponding author to provide phone: 66-4-320-2845; Fax:66-4-320-2849; e-mail: [tanwon@kku.ac.th](mailto:tanwon@kku.ac.th))

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This research aimed to investigate the effectiveness of the pretreatments for cellulose extraction of oil palm residues. Steam explosion method and acid or alkaline digestion based on detergent analysis method were the pretreatments used in this research. Four types of oil palm residues were considered: oil palm seed meal, oil palm meal, oil palm leaf, and oil palm trunk. The effectiveness of the two pretreatments was determined by measuring the amounts of percent cellulose extracted from all four types of oil palm residues. The cases steam explosion pretreatment provided higher percent cellulose than the acid or alkaline digestion cases did for all cases. Oil palm seed meal showed the highest percent cellulose extracted compared to those of the other three oil palm residues for both pretreatments.

**E-05:**

### **Application of Heat Insulation Solar Glass for Glass Buildings**

*Tran Thi Bich Quyen<sup>1,2</sup>, Chin-Huai Young<sup>1</sup>, Bui Le Anh Tuan<sup>3</sup>, Ching-Sung Hsu<sup>1</sup>*

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To enhance electrical energy production and improve heat insulation of photovoltaic modules (original solar glass module), a simple method for installation and generation of heat insulation solar glass (HISG) modules from traditional transparent PV modules (original solar glass modules) using heat insulation materials, improving functions such as power generation, heat insulation, energy saving and greenhouse gas reducing. Interest in photovoltaics (PV) integration into buildings, as well as heat insulation solar glass (HISG) be used as curtain walls on the buildings has been developed, where the HISG curtain walls play the role of building exterior components as an integral part of buildings as well as of producing electricity and providing functions such as heat insulation and self-cleaning. Two experimental houses used normal glass and HISG as curtain walls on the Ordinary house and the HISG house were constructed in this study. Results show that the illuminative penetration on HISG curtain was quietly high with efficiency of 32%, block UV-rays to 100%, low solar radiation 40% as compared to normal glass curtain wall (~97%), greatly enhanced indoor lighting ~29.4% and high heat insulation efficiency ~28.2% as compared to normal glass curtain wall on the Ordinary house. In addition, the energy-saving efficiency of the HISG house for heating and cooling were greatly improved respective to ~40% and 48% for comparisons to the Ordinary house, and the power generation of HISG curtain wall on the HISG house was achieved 2.63 kWh of electricity per day. Our work offers a low-cost route to the application of HISG modules able to be used for monitoring progression of the greenhouse gas reduction, as well as evaluating their energy efficiency on buildings in the green buildings at the current and future.

## E-06:

### **Solar Power Alternative in Cellular Mobile Networks**

*Kreingkrai Chongkhanpond<sup>1</sup>, Pornrapeepat Bhasaputra<sup>1</sup>, Woraratana Pattaraprakorn<sup>2</sup>, and Chokechai Sansilah<sup>1</sup>*

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<sup>2</sup>Department of Chemical engineering, faculty of engineering,

Based on national disasters in Thailand year 2011 that has happened flooding in different regions, and other. It has affected communication of the general public as broad and long period of time. In this light, the disasters happened has affected the overall communication networks of both public and private sectors. The recall or recovery with the communication network could not be done abruptly due the various obstructions in nature. The major reason is the continuation of services and mobile communications, it is important for the lives of the general public; it is considered a public service. The project on mobile communication vehicle using solar or Solar Cell Systems for Cell on Truck has been formed to offer recovery services to communicate back instantly in areas that have been affected, and even in areas without power utilities.

## E-07:

### **Improved Particle Swarm Optimization Method for Optimal Power Flow with FACTS Devices**

*Dinh Luong Le<sup>1</sup>, Dac Loc Ho<sup>2</sup> and Ngoc Dieu Vo<sup>3</sup>*

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<sup>3</sup>Department of Power Systems, Ho Chi Minh City University of Technology, Ho Chi Minh City, Viet

This paper proposes an Improved Particle Swarm Optimization (IPSO) algorithm for solving optimal power flow with Facts devices problem. Two main types of FACTS devices, namely Static VAR Compensator (SVC) and Thyristor Controlled Series Compensator (TCSC) are applied to the OPF problem. In the new improved method, the conventional IPSO algorithm is used with the variance coefficients to speed up the convergence to the global solution in a fast manner regardless of the shape of the cost function. The proposed IPSO has been tested on various systems with FACTS devices to minimize the total generation fuel cost, investment costs of FACTS devices and keep the power flow within their security limits. The obtained numerical results have shown that the IPSO method is more efficient and faster than many other methods reported in the literature for finding the optimal solution of optimal power flow with Facts devices. Therefore, the proposed IPSO method can be a promising method for solving the practical optimal power flow with Facts devices problems.

### **E-08: Methodology to Configure Optimal Inner Grid of Offshore Wind Farm**

*Je-Seok Shin<sup>1</sup>, Yong-Seung Lee<sup>1</sup> and Jin-O Kim<sup>2</sup>*

<sup>1</sup>Electrical Engineering Department, Hanyang University, Seoul, Korea (e-mail: [kjboy@hanyang.ac.kr](mailto:kjboy@hanyang.ac.kr), [@hanyang.ac.kr](mailto:@hanyang.ac.kr))

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In recent years, a lot of offshore wind farms are being developed over the world. In Korea, the project for large scale offshore wind farm was planned. As the first step among total three steps for the project, 100MW offshore wind farm is being developed at southwest coast in Korea. Generally, offshore wind farm consists of four parts, which are wind turbines, inner grid, offshore substation and external grid. Among four parts, inner grid can have diverse configurations according to several factors. Therefore, this paper introduces a methodology to determine an optimal configuration for inner grid. The methodology consists of how to divide wind turbines into some groups and connect wind turbines in each group and how to evaluate alternatives and select an optimal alternative for inner grid. The proposed methodology was tested on a 100M offshore wind farm case. The results of the case study demonstrate that the methodology can be useful for offshore wind farm planners.

### **E-09: On-line and Off-line Diagnostic Methods for Power System Facilities in Smart Grid**

*Yun-Seong Lee<sup>1</sup>, Yong-Seung Lee<sup>1</sup> and Jin-O Kim<sup>2</sup>*

<sup>1</sup>Electrical Engineering Department, Hanyang University, Seoul, Korea (e-mail: [lypd@hanyang.ac.kr](mailto:lypd@hanyang.ac.kr), [moodefor@hanyang.ac.kr](mailto:moodefor@hanyang.ac.kr))

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Failure Mode Effects and Criticality Analysis (FMECA) is one of most widely used methods in modern engineering system to investigate potential failure modes and its severity upon the system. Although there are several FMECA standards, the most popular one is MIL-STD-1629A from U.S. department of defense. While carrying out FMECA, experts evaluate criticality and severity of each failure mode and visualize the risk level matrix putting those indices to column and row variable respectably. This kind of subjective evaluation inevitably brings ambiguousness on the result. In order to handle the ambiguousness, this paper proposes a new FMECA procedure using minimal cut set (MCS) and fuzzy theory. Severity is replaced with Birnbaum's Structural Importance (BSI) which is calculated by using number of MCS and its

order, while criticality is determined by proposed failure rate calculation. Finally, the risk level is compounded of these indices by fuzzy expert system.

## **E-10: Application of Cuckoo Search Algorithm for Optimization Power Flow in Power Systems**

*Le Anh Dung<sup>1</sup>, Vo Ngoc Dieu<sup>2</sup>, and Dinh Hoang Bach<sup>3</sup>*

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<sup>2</sup>Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam. He is now with the Department of Power Systems, E-mail: [vndieu@gmail.com](mailto:vndieu@gmail.com).

<sup>3</sup>Faculty of Electrical & Electronics Engineering, Ton Duc Thang University, HCMC, Vietnam

The Cuckoo search algorithm is applied in many scientific fields such as computer, mechanic and power system. Especially, the cuckoo search can solve and give results in optimization problems with many variables and constraints. A advance of cuckoo search algorithm is solving time which can solve the problems with short time and many iterations. This paper research and apply the algorithm for optimization power flow in power system operation. The research also test this algorithm by IEEE 30 bus system and use Matlab software to launch optimization program. The results of progress show that the cuckoo search algorithm has many advantages more than former particle swarm optimization methods.

## **E-11: Performance of an Open Ducted Type Very Low Head Cross-Flow Turbine**

*Zhenmu Chen<sup>1</sup>, Van Thanh Tien Nguyen<sup>2</sup>, and Young-Do Choi<sup>3</sup>*

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Cross Flow Turbine (CFT) known as a Banki turbine or an Ossberger turbine is usually used in the small hydropower, because of its economical and simple structure. This study develops a new kind of CFT suitable for very low head and remote rural region which turbine researched barely before. The new design of the turbine is with open duct inlet channel, without turbine guide vane and nozzle for a more simple structure. The open duct inlet channel can be also suitable in the remote rural region where there are some materials of sediment such as sand and pebble come with flow from upstream that can cause break down. However, the CFT with open duct inlet channel and low head show relatively low efficiency. Therefore, the purpose of this study is developing a new CFT and modifying the turbine inlet open duct bottom line (IODBL) location and angle to improve the performance. The internal flow is investigated to examine the influence of turbine shapes on the performance. The results show that an appropriate turbine IODBL location and angle play an important role on improving the turbine performance, and there is significantly efficiency improvement by optimizing turbine IODBL location.

## **E-12: Numerical Investigation and Optimization of Vertical-Axis Wind Turbine Using Kriging Metamodel and Genetic Algorithm**

*Woo-Seok Cho<sup>1</sup>, Seok Heum Baek<sup>2</sup>, Seung-Chan Kim<sup>2</sup>, Kyoung-Tea Han<sup>2</sup>, Young-Gun Heo<sup>2</sup>, Jong-Hyun Jeong<sup>2</sup>, Dong-Hwa Lee<sup>3</sup>, Dong-Hee Yoon<sup>2</sup>, and Kyoung Ho Choi<sup>3</sup>*

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The optimal layout of turbines in a wind farm is critical to the maximization of power energy production. During wind farm planning, the farm layout or turbine arrangement is generally optimized to minimize the wake losses. This study aims to determine the optimal layout of the wind turbines inside an wind farm in order to reduce the wake effects as much as possible. The optimization process for minimum wake flow and maximum power output is composed of two steps; (1) CFD simulation of the wind farm configuration with various combination of four design variables selected based on the optimization principle, and (2) applying a layout optimization approach based on the Kriging metamodel using the CFD data set to evaluate the maximum power output. According to the optimal solution, we confirm an effective design variable for wind farm layout design and explain the optimal solution as well as the usefulness of site evaluation and power output prediction.

**E-13:**

### **Augmented Lagrangian Hopfield Network Applications for Direct Current Optimal Power Flow**

*Vo Ngoc Dieu<sup>1</sup> and Le Quoc Uy<sup>2</sup>*

<sup>1</sup>Faculty of Electrical and Electronics Engineering, Ho Chi Minh University of Technology. Email:

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<sup>2</sup>Faculty of Power Systems, Ho Chi Minh City Electric Power College, Vietnam.

The Optimal Power Flow is one of the fundamental problems in power system analyses. Some essential studies in power system operation and planning typically require a large number of repetitive OPF solutions. In these analyses, the convergence speed of the OPF solutions beside their accuracy are two key objects. The full ACOPF is accurate, but takes long solution time. The DCOPF is a simple approximation of OPF that is very fast to solve. In this paper, an augmented Lagrange Hopfield network (ALHN) is proposed for solving the DCOPF problems. In the proposed ALHN method, the augmented Lagrange function is directly used as the energy function of continuous Hopfield neural network (HNN), thus this method can properly handle constraints by both augmented Lagrange function and sigmoid function of continuous neurons in HNN.

**E-14:**

### **Optimal Reactive Power Dispatch Using Artificial Bee Colony Method**

*Vo Ngoc Dieu, Nguyen Huu Thien An, and Vo Trung Kien*

Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam. Email:

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This paper proposes an artificial bee colony (ABC) algorithm for solving optimal reactive power dispatch (ORPD) problem. The proposed ABC can deal with different objectives of the problem such as minimizing the real power losses, improving the voltage profile, and enhancing the voltage stability and properly handle various constraints for reactive power limits of generators and switchable capacitor banks, bus voltage limits, tap changer limits for transformers, and transmission line limits. The proposed method has been tested on the IEEE 30-bus and IEEE 118-bus systems and the obtained results are compared to those from Particle Swarm Optimizer (PSO), Self-Organizing Hierarchical Particle Swarm Optimizer - Time Varying Acceleration Coefficients (HPSO-TVAC), Particle Swarm Optimization - Time Varying Acceleration Coefficients (PSO-TVAC), and other methods in the literature. The result comparison has shown that the proposed method can obtain total power loss, voltage deviation or voltage stability index less than the others for the considered cases. Therefore, the proposed



ABC can be a favorable method for implementation in the optimal reactive power optimization problems.

### **E-15: Renewable Energy for Rural Electrification in Thailand: A Case Study of Solar PV Rooftop Project**

*Wichit Krueasuk<sup>1</sup>, Pornrapeepat Bhasaputra<sup>2</sup>, Woraratana Pattaraprakorn<sup>2</sup>, and Supattana Nirukkanaporn*

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Rural electrification (RE) is still remained to be a challenge for Thailand due to its sparse electricity demand in the remote areas. Expansion of the electricity transmission and distribution service to such area is difficult and uneconomic. The use of renewable energy technologies not only offers an environmental friendly and economically viable for RE, but also aligns with the National Agenda to promote the use of renewable as alternative energy resources to reduce the dependency of imported fuel and increase fuel diversification. The Thai government is targeting 25% of the energy generation from renewable energy resources by the year 2021. The government has established and implemented several projects to promote the use of renewable energy, especially solar PV systems. This paper proposes an analysis of the problems encountered during the progress of this RE program, with the use of data obtained from Provincial Electricity Authority (PEA). The analysis takes into account of the uncertainty of PV generation and investment conditions. Under economic analysis, the levelized cost of electricity (LCOE) method is used to evaluate the designed system with a comprehensive way to find the LCOE optimized of RE in Thailand. The results provide a positive support to government investment in subsidy program for the implementation of solar PV system for RE

### **E-16: The Energy Performance Index for Commercial Building in Thailand**

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The commercial building in Thailand is many building, characteristic and property participants that are trend of increasing the amount of energy consumption. However, the big energy consumption in building is electricity that can be divided into 3 major electricity usages as air-conditioning, lighting and other system within 5 building types, which are office, retail stores, hotel, medical center and education institution buildings. Therefore, the energy saving options is concerned mainly in air-conditioning and lighting system. The information and Building type can simulate of existing equipment and Implementation result. The result of this study will show the possible of EPI that considerate with investment and payback period in term of kWh/m<sup>2</sup>/year. Finally, this EPI will can used to evaluate existing building and new building to moving forward to the nearly zero energy building which selected saving options on the commercial building.

### **E-17: Lead-Acid Battery Model in Electric Vehicles via Cuckoo Search Algorithm**

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This paper proposes a model of the lead-acid battery for vehicles. This model is based on the Thevenin circuit of battery, but all parameters are depended on state of charge of the battery. We apply Cuckoo search algorithm to identify the parameters. The optimal parameters give minimum error compared to measured voltage via an experimental circuit. The model is also evaluated in various initiative states of charge to obtain its performance. The results show that its accuracy is less than 5%. Thus, this model is favorable to develop simulation for electric vehicles.

### **E-18: Frequency Response for Next Decade Solar Power Development Plan in Thailand Part 1: Frequency Response Model of Thailand Power System**

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This paper proposes the appropriate frequency response model to analyze the frequency deviation of Thailand power system due to various size and location of solar power. Large installed capacity of uncertain solar power will affected power system stability in term of voltage stability and frequency deviation. Existing three types of power plants in Thailand with different automatic frequency control parameters are collected to develop real-time automatic individual power plant parameters tuning (RIPT) frequency response model that can represent frequency response of the whole Thailand power system in dynamic operating conditions. In addition, the RIPT frequency response model is simulated system responses at peaked load operating condition with instantaneous and ramp change in solar power generations. The simulation results show that frequency deviation of each case compare to standard control. Finally, the RIPT frequency response model can be applied to analyze effect of real power and load deviation to power system frequency response for protective planning.

### **E-19: Frequency Response for Next Decade Solar Power Development Plan in Thailand Part 2: A Case Study of PDP 2010 Version 3**

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This paper studies the impacts of large solar power installations on frequency responses of Thailand's power system according to the power development plan (PDP 2010 version 3) by considering three levels of electrical demand; light load, partial peaked load and peaked load; during available solar power generation. In addition, the selected actual solar power generation patterns from large solar power plant are collected to analyze the average solar power output and maximum deviation. The frequency responses are simulated by using the proposed real-time automatic individual power plant parameters tuning (RIPT) frequency response model to indicate the effect of installed solar power plants from PDP with various cases in term of the maximum frequency deviations for the next fifteen years. Furthermore the system frequency deviations of each cases are the results of combination of different power plant types and parameter settings, which are compared to each other and the frequency standard control. Finally, the outcomes can be utilized to make prevention plans in order to maintain power system reliability and security for sustainable power development plan with solar power plants.

## **E-20: Evaluation of Carbon Equivalences in Ethanol Production from Energy Crops in Thailand**

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The main objective of this study is to evaluate carbon equivalences occurring in the production of ethanol from sugar cane and cassava, starting from plant cultivation until production of alcohol. Following the concept of Carbon Balanced model, the carbon emission from resources and energy consumed were found to be  $1,025.41 \pm 31.18$ , and  $2,832.50 \pm 41.22$  g CE/L Ethanol for sugar cane and cassava, respectively. However, the use of ethanol produced from molasses helps reduce carbon emission to the atmosphere at the rate of  $25.93 \pm 17.05$  g CE/L ethanol, equivalent to a reduction flux (-)  $1.83 \pm 1.21$  kg CE/ha-y. Meanwhile, that produced from cassava still emits carbon of  $1,692.50 \pm 29.15$  g CE/L ethanol, corresponding to the emission flux of (+)  $36.02 \pm 0.62$  kg CE/ha-y.

## **E-21: Contribution of Green Garbage to Energy Production in Municipal Solid Waste Management**

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Green garbage is a potentially renewable resource which can be increased, following the greenery space expansion plan. Accordingly, it could be the alternative energy source for the Bangkok Metropolitan Administration (BMA) consumption. The aims of this paper are to quantify the renewable energy potentially produced from trimmings (yard wastes, fallen leaves, and cut branches) and to evaluate the efficiency of energy transfer per unit area from the primary producer to the electricity generation. The total potential renewable energy produced annually from green garbage was determined to be  $4.85 \times 10^8$  MJ. The quantity could be used to generate electricity of about  $5.73 \times 10^8$  kWh per year, earning 1.34 billion Bahts annually. The overall energy transfer efficiency was estimated 0.05%. Based on the results of this study, The BMA's trimmings, at present, could contribute to energy for electricity generation, which is equivalent to the amount of money spent on all the cost of fuel used to operate BMA's solid waste collection and transportation plus 35% of other operating costs.

## **E-22: Earthen-Membrane Fuel Cell (MFC) for Septage Treatment and Power Generation**

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Microbial fuel cells (MFC) is a promising technology which can be used for wastewater treatment and power generation. This study assures that earthen material can be utilized as an alternative proton exchange membrane for MFC. The findings provided a solid foundation for further development of MFC as a cost-effective technology for wastewater treatment. The internal resistance caused by the distance between anode and cathode is often main concerns for MFC system enhancement. In order to minimize the internal resistance, V-shape cathodic earthen membrane was used for two-chamber MFC. Internal resistance was determined by polarization curve at external resistor from 1-8200  $\Omega$ . Carbon graphite wires (GWs) were used as cathode and anode. Numbers of Cathode graphite wires were varied to evaluate the system performances namely 3W-MFC (3 wires), 4W-MFC (4 wires) and 5W-MFC (5 wires). After approximately 500h of operation at organic loading rate (OLR) of 0.15 kg COD·m<sup>-3</sup>·day, the open circuit voltage (OCV) for all reactors was over 700 mV. The 3W-MFC provided the highest current of  $17.87 \pm 2.9$  mA with maximum power density of  $6.7 \pm 1.3$  W·m<sup>-3</sup>. The 4W-MFC and 5W-MFC offered slightly lower current of  $6.56 \pm 2.91$  mA and  $6.97 \pm 1.92$  mA, respectively. Chemical oxygen demand (COD) removals ranged from 30.5 to 48.3%. The Coloumbic efficiency (CE) results were 39.7%, 46.9% and 15.0% for 3W-MFC, 4W-MFC and 5W-MFC, respectively. The connections of two reactors in series and parallel resulted in a loss of voltage of lower than 3%.

## **E-23: Energy Efficiency Improvement Opportunities in “New Modern Energy Consumers” in the Greater Mekong Sub-region**

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Energy efficiency improvements offer multiple benefits, such as reduced household energy expenditure and improved productivity, thus contributing to economic growth. For developing countries, energy efficiency could make modern energy services available at a faster pace and at lower cost to those who currently lack access to electricity. This research investigates energy efficiency improvement opportunities amongst “New Modern Energy Consumers” (MECON), defined as those who have access to electricity, but who are still poor with an income range of 2-5\$/person/day, in the Greater Mekong Sub-region (GMS: Cambodia, Laos, Myanmar, Thailand, and Vietnam) in order to improve policy design and implementation of energy efficiency measures. Analysis shows that there are potential for energy efficiency improvements especially in Cambodia, Laos and Vietnam, for example, at least 37%, 32% and 53% of the households surveyed use incandescent lamps in Cambodia, Laos and Vietnam respectively.

# Environment

## **Env-01: The Study Of Odor Treatment Of Digested Organic Wastes**

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Air pollution which offensive odors from organic waste digestion has always existed as a public concern. For the purpose of odor removal, this study was conducted by the combined method using wet scrubber and biofilter systems. The biomaterial mixtures proposed in this study should be the local available materials which included rice husk, perlite, limestone dust ( $\Phi$ :1-5mm). The study results in laboratory condition showed that the NH<sub>3</sub> and H<sub>2</sub>S removal efficiencies were over 90% and 45-49%, respectively. Watering regime was selected at 0.5 l/m. The biomaterials, such as rice husk, perlite, limestone dust ( $\Phi$ :1-5mm) were suggested to use for biofilter system at mixing ratio of 35:30:35. The biosystem operated stably with variety of pH values in neutral range of 6.8 to 7.5 after operating the system for three weeks. This technology satisfied the requirement for handling odor matters, low investment and operation cost as well as a fairly simple operation.

## **Env-02: Optimal Condition to Remove Mercury in Yellowfin Tuna Protein Isolates and ACE-Inhibitory Property of Peptide Prepared using Commercial Proteases**

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The objectives of this research were: (1) to determine the effect of Ca<sup>2+</sup> and citric acid on protein recovery, as well as removal of phospholipids (PLs) and mercury (Hg) from yellowfin tuna (*Thunnus albacore*) byproducts (YB) using alkali-aided extraction; (2) to evaluate angiotensin I-converting enzyme (ACE) inhibitory of hydrolysates from YB protein extracts digested by various commercial proteases; and (3) to investigate effects of simulated gastrointestinal (GI) digestion and ACE on bioactive property of YB protein hydrolysates with and without ultrafiltration. Response surface methodology (RSM) was performed to maximize mercury (Hg) reduction from yellowfin tuna byproducts (YB) protein isolates. The optimum condition to maximize Hg reduction (89.3%) was: 10.5 mM CaCl<sub>2</sub> and a Water:YB of 12.9:1, while other variables were fixed at 5 mM citric acid, 60 min incubation, pH 11 and 8,000 x g for 15 min of centrifugation. At these conditions, the significant phospholipids reduction (80.7%) and protein recovery (80.1%) were obtained. Hydrolysates prepared with sequential-two commercial proteases exhibited significantly higher the ACE-inhibitory property than those treated with single enzyme. Fractionated YBPHs increased in ACE-inhibitory activity when peptide size decreased. In-vitro GI digestion increased bioactive property (P<0.05). ACE-inhibitory property of YBPHs with and without simulated GI digestion significantly increased after incubating against ACE, demonstrating prodrug-type ACE-inhibitory peptides. Therefore, the abundant under-utilized tuna byproducts may be a good source for production of hydrolysate containing ACE-inhibitory peptides for applying as nutraceutical or functional ingredients in food products.

**Env-03:*****Astreaus: Its Diversification and Ectomycorrhizal Formation***  
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*Astraeus sirindhorniae*, one of the most prized ectomycorrhizal mushrooms, is shown to be associated with Dipterocarpaceae. In this study we focused on the ectomycorrhizal association with Thai dipterocarp seedlings. Fruit bodies of *A. Sirindhorniae* were sampled from one of the major hotspots of biodiversity in Thailand. Spore suspensions were inoculated into dipterocarp seedlings in the greenhouse for 5 months and the ectomycorrhizal tips were counted and examined, further molecular analyses undertaken for the first time.

**Env-04:*****Chromosome Banding of Two Litoria Species (Anura, Hylidae)***

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This research was the cytogenetic studies of *Litoria eucnemis* and *L. nannotis*. The mitotic chromosomes were prepared directly from bone marrow after *in vivo* colchicine treatment and analyzed following conventional, silver staining and C-banding techniques. These species showed similar karyotypes with  $2n=26$ , the fundamental number (NF) are 52 chromosomes and Ag-NOR positions located in the short arm near centromeres of chromosome pair 7 in *L. eucnemis* and in the long arm near telomeres of chromosome pair 11 in *L. nannotis*. The C-banded karyotypes showed heterochromatin bands at the centromeres and telomeres of all chromosomes. Both species were characterized by the number and position of constitutive heterochromatin in the karyotypes. The mitotic karyotypes of *L. eucnemis* exhibited greater amounts of C-band positive heterochromatin than *L. nannotis*.

**Env-05:*****Effect of Cleansing Water and the Amount of Allowed Air on Efficiency of Microwave Radiation for Decentralized Wastewater Treatment***

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Poor sanitation contributes to the spreading of waterborne diseases. It is not clear whether the conventional decentralized wastewater treatment, composed of cesspools and septic tanks, is efficient enough to treat human waste to the point where the treated waste can be discharged. This study evaluates the technical feasibility of using microwave radiation for treatment of human feces. The efficiency of the microwave treatment on human feces in relation to the

amount of water content in feces samples and the shape of the microwave container was evaluated by monitoring the physical and biological parameters of the feces, including moisture content, total solid, volatile solid and the numbers of bacteria, before and after treatments. The results suggest that up to 300 mL of additional water from flushing and cleansing can be left in the solid feces to allow for the effective microwave treatment. The microwave treatment can eliminate pathogens in the order of five logs and reduce the waste volume by 50%. Although the microwave container with glass cover reduced undesired smell from feces combustion, it greatly diminished the moisture removal efficiency and weight reduction. The microwave radiation can reduce waste volume and pathogen significantly making the end product safe for disposal/use.

## **Env-06: Use of Wastewater as a Substrate for Sugary Kefir Growth and Value Added Products Formation**

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Kefir is a microbial symbiotic mixture of lactic acid bacteria and yeasts. In this study, sucrose aqueous solutions and wastewaters were utilized as media for sugary kefir growth and metabolites formation. Both batch and repeated-batch conditions were explored and found the maximum kefir mass after 3 days of cultivation. For repeated-batch fermentations, the feeding cycles varied from 1-7 days and sucrose concentrations were between 1-10% (w/v). The maximum kefir mass gain was 0.47 g/100 mL in 3% (w/v) sucrose, 3-day repeated feeding cycle, and agitation rate of 90 rpm. For the maximum metabolite productions, the kefir was cultured in 10% (w/v) sucrose solution under repeated 3-day feeding cycle for 27 days. The metabolite concentrations of lactic acid, acetic acid, and ethanol were 25.91, 5.41, and 0.71 g/L, respectively. Sugary kefir was capable of utilizing molasses and cassava in synthetic wastewaters. Molasses gave the maximum kefir mass yield of 30.95 mg/g COD removed/d. Similarly, sugar, cassava, and daily mill wastewaters were utilized by sugary kefir. The finding offers a potential application for a preliminary treatment of food processing wastewaters as well as to convert organic matters into valuable metabolites.

## **Env-07: Phosphorus recovery from co-composting of faecal sludge and fresh food market waste**

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Fresh food market waste (FFMW), faecal sludge (FS), garden waste, and human urine are the potential sources for nutrients recycling due to its exponentially increasing amounts and containment of a varieties of plant minerals. The aim of this paper is to investigate the process of co-composting the above mentioned wastes, using the conventional in-vessel composter. Enhancing nutrients content; for example nitrogen, phosphorus, and potassium; has been found to achieve in this study. Applying human urine in both FFMW and FS co-composting processes has increased the level of phosphorus about 31.30 and 2.52%, respectively. The final products are suitable for use in plant growing, according to their physical and chemical properties.

## **Env-08: A study on Screening of Floating Plants for Removal of Lead from Wastewater**

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Heavy metals are persistent and non-perishable in the environment. Their toxicity has been increasing with the continued discharge of untreated or partially treated wastes affecting human, fauna, and flora systems. Phytoremediation is a process which is widely employed to remove these toxic chemicals in the environment. The process makes use of plants to remove heavy metals from the environment or to render them harmless. In this study, effectiveness of five floating plants Water hyacinth (*Echhornia crassipes*), Water lettuce (*Pistia stratiotes*), Creeping water primrose (*Jussiaea repens* L.), Floating moss (*Salvania cucullata*) and Common duckweed (*Lemna minor*) were tested for Lead (Pb) removal from artificial wastewater. Plants were screened to find best hyperaccumulator species. These floating plants were cultured in Hoagland's nutrient solution which was supplemented with 9.2 mg/L of Pb for a period of 8 days. The wastewater samples were collected at 1, 2, 3, 4, 6 and 8 day and analyzed for Pb by Inductively Couple Plasma-Optical Emission Spectrometer (ICP-OES). The results show that all floating plants were able to remove Pb from artificial wastewater and the removal efficiency was greater than 96 %. Water hyacinth was the most efficient plant for removal of Pb when compared to other plants studied with 99.95 % removal. During the experiment, based on the physical observation, Water hyacinth, Creeping waterprimrose and Floating moss were tolerant and survived in the wastewater but Common duckweed looked unhealthy with yellow leaves. Water lettuce was wilted within the third day of the experiment. Moreover, they could remove Pb from artificial wastewater on the first day of cultivation with the concentration in each reactor decreasing significantly within first day. The results of the study indicate that these floating plants can remove a significant amount of heavy metals through uptake processes and can also act as bio-indicator and can indicate quality of water.

## **Env-09: Application of Magnetic Particles for Phosphorus Removal from Domestic Wastewater**

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The management of phosphorus discharged from domestic wastewater is a significant factor to prevent eutrophication of receiving water bodies. Human waste, food residues, and consumer products, such as detergents, contribute phosphorus to sewage and lead to the leaching of phosphorus from wastewater drainage to groundwater, surface water and soil. Several treatment techniques such as biological uptake, chemical precipitation, or adsorption have been developed and investigated to enhance phosphorus removal and recovery. Phosphorus is a major nutrient which is generally presence in wastewater or concentrate in the sludge accumulated at the bottom of residential septic tanks. There are two major forms of phosphorus presence in water: organic and inorganic. Ortho-P is the most stable form and is also referred to as soluble reactive phosphorus (SRP), which has been identified as a main concern in septic tank effluent (Green, 2001). Normally, anaerobic environment of septic tank has suitable conditions to convert organic phosphorus and polyphosphates to the more reactive SRP (Gill et al., 2009).

In recent years, there has been an increasing use of engineered magnetic particles for environmental treatment, such as heavy metals, pesticide, and dye removal. Particles have been widely used in environmental applications and have shown promising performance in pollutant removal or toxicity mitigation. Among the most widely used particles, magnetic particles, mainly



nano zero-valent iron, magnetite (Fe<sub>3</sub>O<sub>4</sub>) and maghemite ( $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>) particles, have sparked an interest in research for engineering applications for treatment of polluted water or subsurface environments.

The present research was carried out to study the efficiency of employing magnetic particles (MP) in phosphorus removal from septic tank wastewater, the regeneration and also the feasibility of reuse these magnetic particles for heavy metals removal.

The wastewater in this experiment is obtained from the first chamber of the septic tank located at the main building of Sirindhorn International Institute of Technology, Thammasat University, Thailand with the COD level of around 150-200 mg/L. The level of the total phosphorus in the wastewater is about 10 mg/L. To determine the efficiency of phosphorus removal, MP were added into septic tank wastewater with various concentrations and incubated for 2 h (system reached equilibrium within 1h). At 10g/L of MP loading, it shows phosphorus removal efficiency of more than 90% at 10 ppm. The results of phosphorus adsorption onto magnetic particles are shown in Figure 1.1. Additionally, the wastewater has also become clearer with the turbidity reduced from 180 NTU to 60 NTU) at the MP loading of 20 g/L. This magnetic nanoparticle can be used at least 6-7 times until it cannot adsorb phosphorus any further (using P concentration of 10 ppm and at 0.5 g/L MP loading as benchmark).

The spent MP was also studied for reusability by regenerating the spent MP in sodium hydroxide solution 1M. The regenerated MP still showed more than 90% phosphorus removal efficiency after 5 cycles of regeneration, comparing with 98% of the fresh MP, which indicated high potential of this sorbent. It also showed that that MP had high feasibility in reuse and regeneration, which can decline the amount of unusable MP discharge to environment.

We also investigated another usage of this spent MP in heavymetal removal (Cd, As, Pb at 10 ppm concentration). The results show that the spent MP has almost the same potential as compared to the fresh MP in heavy metal removal.

Results from this study indicate that MP can be a potential absorbent for phosphorus and heavy metals in wastewater treatment. Further experiments need to be carried out to estimate reuse and regeneration ability of MP in order to reduce the cost and the amount of solid waste generated.

## Env-10:

### Reducing Waste to Landfill: A Multiple Regression Analysis

Olivier Gervais

School of Biochemical Engineering and Technology, Sirindhorn International Institute of Technology, Thammasat University, Pathum Thani, Thailand

The years of growth which have made Southeast Asia a key economic player have also made the major urban centers of the Greater Mekong Subregion vulnerable to deteriorating environmental problems, as illustrated by landfill congestion. In order to be able to create efficient countermeasures, it is essential to understand how other cities, which have managed to reduce the amount of waste sent to landfill significantly, could succeed. Through a multiple regression analysis of the case of the city of Yokohama, Japan, this paper intends to examine what parameter played the most significant role in reducing landfill congestion, between efforts to reduce the total amount of domestic waste generated, and incentives to increase the proportion of waste recycled. The results of the study show that in general, the amount of waste recycled appears to have a greater impact on the total amount of waste that ends up in landfills, in comparison with the total amount of waste generated. According to the model presented in this paper, a potential implication of this result is that, in order to minimize landfill congestion, it may be more efficient to encourage recycling activities rather than promoting efforts to decrease the total amount of waste produced.

# Sustainable Development

## SD-01:

### **The Influence of Sound Material Society in Thailand**

*Vilas Nitivattananon<sup>1</sup>, Laksiri Chomchuen<sup>2</sup>, Claudius Gabinete<sup>3</sup>, Amornpong Thongbhakdi<sup>4</sup>, and Guilberto Borongan<sup>5</sup>*

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The concept of sound material cycle society (SMS) has influenced waste management technologies and 3Rs in Thailand. However, there is limited understanding on the profound impact and cultural transference of SMS on the mainstreaming of 3Rs into policies and practices in the country. This study aims to present evidence of the influence of Japan's SMS to the mainstream solid waste management (SWM) practices in Thailand. The research applied a combination of exploratory and descriptive type of research - key informant, questionnaire survey, expert judgment and case study approach. During the last ten years, influences of SMS from Japan have reached to all levels of Thailand's administrative system. From national government policies; local administration's practices; and through project initiatives, there are clear evidences of financial, knowledge, and technology transfer in waste management, supported by the private and public organizations the research engaged with. However, limitations in institutional and technical capacities at the local level undermined the financial support and technology infrastructure from Japan, and subsequently led to ineffective projects. The study recommends that, in order to impact a sustainable 3R and SWM, further initiatives on knowledge and skills transfer based on Japan's SMS practices should be supported and enhanced in Thailand through its policies and practices.

## SD-02:

### **Changing in Agricultural Activities and the Influences of the ASEAN Economic Community (AEC) in Changing Land Use of Farmers in Phatthalung Province**

*Anisara Pensuk Tibkaew<sup>1</sup>, Supaluk Sujatanond<sup>2</sup> and Will Shattuck<sup>3</sup>*

<sup>1</sup>Lecturer at Faculty of Technology and Community Development, Thaksin University, Thailand

<sup>2</sup>Master Student at Sustainable Agricultural Resources Management Program, Thaksin University, Thailand

<sup>3</sup>Ph.D. Student at Department of Geography, University of Wisconsin-Madison, USA

This paper presents reasons for changing agricultural land use patterns and the influence of activating the ASEAN Economic Community (AEC) on farmers' decisions to change their agricultural activities and land use in Phatthalung Province. Secondary data from various official and trustable sources was used to investigate the trends of land use change during the last decade (2003-2012). Household surveys were then conducted to understand farmers' reasons for changing their agricultural and land uses. Two groups of farmers were categorized from the household survey results: 1) no change in agricultural activities and land use patterns and 2) changing agricultural activities and land use patterns. Approximately 31% of rice farmers have remained in their activities, whereas a higher number of rice farmers (52.81%) have changed their agricultural activities to rubber plantations, and 15.93% has changed to oil palm

plantations. Almost all rubber farmers were found to maintain their rubber plantations; only 1.25% of rubber farmers have changed to oil palm plantations. Reasons for changing agricultural activities and land use patterns of the respondents were investigated during household surveys. It was found that the non-change in agricultural activities and land use patterns group perceived that their current agricultural activities were suitable to their livelihoods, while reasons for changing agricultural activities and land use patterns group was mainly about insufficient income and the supports from the government sectors. The group discussion about the AEC was conducted during the household surveys, and it was found that one rice farmer would change from rice cultivation to rubber plantation and one would change from oil palm plantation to rubber plantation due to reasons related to the AEC. According to the household survey results, it can be concluded that the provincial or government policies and projects have more influence on farmers' decisions than activating the AEC for the farmers in Phatthalung Province.

**SD-03: Development of e-Commerce Competencies among Community Enterprise and SMEs in the Northeastern Region of Thailand**

*Pensri Jaroenwanit<sup>1</sup> and Supot Deeboonmee<sup>2</sup>*

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<sup>2</sup>Manager of Business Strategy Center at the Faculty of Management

This research aimed to investigate the understanding, the needs, and the development of e-Commerce competencies among the community enterprise and the SMEs in the Northeastern region of Thailand. Research was conducted by Mixed-Method approach and Participatory Research approach also. Sample was 53 of community entrepreneurs and SMEs in Roi Et, Khon Kaen, Mahasarakham, Kalasin, and Udon Thani provinces.

Research results found that most of community enterprises and the SMEs had not experienced in the e-Commerce business. They needed to take the training course on e-Commerce. Based on the pre-test of e-Commerce training course, found that participant's knowledge on the e-Commerce was at low level ( = 2.15) After providing e-Commerce training course to participants, their knowledge was at high level ( = 3.79) Average score of knowledge on e-Commerce, transportation and billing in e-Commerce, basic computer skill for e-Commerce business and social network, business administration and marketing, and public relation and advertisement through an internet were at high level also. The satisfaction of participants on the training course was at high level ( = 4.06). In addition, e-Commerce competencies developing course gave a chance to entrepreneurs to practice after the 8th week of the course based on intensively suggestion from the experts. Output of the practice showed that every participated entrepreneur could operate E-Commerce business by themselves better. They could understand e-Commerce concept, and had more sales volume through e-Commerce. For instant, number of person who visited the online shop was totally 78,821 times or averaged 1,392.85 times/ enterprise. Number of person who contacted the shop through telephone and online channels was 5,323 persons or averaged 100.43 / enterprise. Total purchase order was 2,316,400 THB or averaged 43,705.66 THB / enterprise.

**SD-04: Application and Advantages of PA's Precise Rice Cultivation Method in Chaiyaphum Province and Sisaket Province, Thailand**

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A research aimed to analyze 1) the data comparison on physical growth rate, rice quality, quality of rice milling, and satisfaction of farmers on the PA's precise rice cultivation method and the broadcasting rice cultivation method. Observation and in-depth interview were used to 22 of farmers in Chaiyaphum and Srisaket provinces. Independent Sample t-Test was applied to test the differences between the PA's precise rice cultivation method and the broadcasting rice cultivation method by using rice "RD31" in Chaiyaphum province and rice "KDML105" in Sisaket province. Research results found that there were differences at a significance level of 0.05 on physical growth. The PA's precise rice cultivation method had physical growth rate higher than broadcasting rice cultivation method. 2) There were differences at a significance level of 0.05 on rice quality and rice milling. The PA's precise rice cultivation method had the rate of rice quality and rice milling higher than broadcasting rice cultivation method, and 3) 90% of farmers satisfied on the PA's precise rice cultivation method more than the broadcasting rice cultivation method because the PA's precise rice cultivation method gave higher rice quantity, and saved time and cost of cultivation.

**SD-05: Capacity Building and People's Participation in Protection and Conservation Community Forestry and Bio-Diversity in Amnatcharoen Province**

*Romane Thongdara<sup>1</sup> and Anisara Pensuk Tibkaew<sup>2</sup>*

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The forest Amnatcharoen forest has been encroached due to many factors, such as expansion of agricultural land and illegal logging. The *Plant Genetic Conservation Project* has many activities to explore, conserve, utilize and create awareness of plant, animal genetic and indigenous knowledge for the development to be advantageous for every communities. The aim of research is forest protection in their communities by using social mechanism, learning process with the social institutions concept and the network of three age groups. The learning and practicing process are the main methodology to capacity building the local people and their communities. The existing boundary of their community forestry is determined and investigated then collected the biodiversity of their community forestry to understand their natural resources. The network of three age groups learned this process together as local researchers. The collaboration among project researchers and local researchers made change of the Amnatcharoen community forestry's conservation and protection. The participation of people in community can help the Royal Forestry Department in both management and conservation. The improving of forest management through learning by practicing increased number of people's participation in forest conservation concern.

**SD-06: Self Help Groups (SHGs) as a Tool of Socioeconomic Development of Rural People in the Mekong Region (A Case Study with Special Reference to the Kratie and Stung Treng Provinces of Cambodia)**

*V. Manjunatha<sup>1</sup> and Theo Ebbbers<sup>2</sup>*

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Despite the global trend of urbanization, in many countries the majority of people continue to live in rural areas. Largely depending on agriculture related activities and lacking alternative employment and income generating activities, often these rural populations remain among the countries' poorest, amongst which the most disadvantageous group usually are the women. Over the last two to three decades women-focused efforts that aim at facilitating income and job creation through the provision of Micro-Finance (MFI) to Self Help Groups (SHGs) have emerged as a potentially vital tool for meeting the financial requirement of those poorer sections of the society living in the rural areas. Considering this, in 2012 the Wetlands Alliance (WA), through Asian Institute of Technology (AIT), started engaging with Hand in Hand India (HiH) to use and build on their experience from India in establishing Self Help Groups (SHGs) and microfinance as a tool for job creation in Cambodia. The programme is being implemented in Kratie and Stung Treng, two provinces with poverty rates higher than national average in northern part of Cambodia. The present study analyses the role of MFI and SHGs for the socio-economic development of the poor people in northern provinces of Cambodia. For collecting the primary data a total of 176 SHGs and nine to twelve members from each SHG were randomly selected. The study showed that as of September 2014, 176 SHGs were formed with a total of 1995 members, 1079 members (54%) commenced internal lending and 145 members were began external lending and more than 200 Family Based Enterprises (FBE) were created. While still early in the process, the study indicates that SHG members can increase their income and improve their standard of living by performing economic activities independently.

**SD-07:**

### **Khao Huai MaHad Biodiversity Restoration Project**

*Sujitra Phongcharoen and Savanit Boonyasuwat*

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Huay Ma Haad Mountain in Rayong province was on the verge of complete deforestation, leading to water scarcity which widely affected both agricultural and industrial sectors in the area and further created conflict between them. As one of Thailand's leading corporation and a major employer in Rayong province, PTT Global Chemical (PTTGC) has taken the lead in a regional sustainability initiative, the "reforestation and water conservation at Huay Ma Haad Mountain" project, to strengthen community-led forest conservation, biodiversity restoration as well as community development.

Together with local communities and environmental experts, we conducted a study on local species and available natural resources in the area in order to set proper restoration and development plans. Aiming to sustain this conservation effort, we also established a database to record knowledge and best practices for the benefit of the future generations and the wider society.

We are focusing on the quantitative impacts of our actions by putting measurement systems in place to ensure that the Huay Ma Haad Mountain project truly bring about positive impact to the region. With traceable quantitative and qualitative measurement system in place, the project demonstrated that it has led to the expansion of reforested area and the improvement of water conservation through the construction of check dams. This indirectly led to the prevention of wildfire and the increase of plants and animals.

For PTTGC, the project gave the company the opportunity to demonstrate its commitments to its stakeholders and the society at large. It also contributed to the better relationship and trust between the company and local communities.

**SD-08:**

### **North Korean Views on Vietnam: From Fraternal Friendship to Economic Development Model**

*Sitthiphon Kruarattikan*

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During the Cold War, North Vietnam was regarded by North Korea as socialist ally, sharing the mentality of divided nation. Pyongyang not only supported the struggle of the Vietnamese people against American imperialism and for the liberty and independence verbally, but also provided economic and military assistances to Hanoi during the Vietnam War. In the view of Kim Il Sung, the founder of North Korea, socialist countries should reconcile their conflicting views and unequivocally become a united front against the Americans. For him, the prospect of Korean unification depended to a large degree on the outcome of the war in Vietnam.

After the unification of Vietnam in 1975, Pyongyang's relations with Hanoi deteriorated because of the latter's tilt towards the Soviet Union and pursuit of regional hegemony by invading Cambodia in 1978, while the former adhered to the principle of non-alignment. Furthermore, Hanoi's institution of Doi Moi reforms in 1986 led to the rise of Vietnam's economic ties with South Korea, which eventually resulted in the establishment of diplomatic relations between the two countries in 1992. By the early 2010s, North Korea regained her interests in Vietnam as economic development model. However, there are some constraints preventing North Korea from becoming the next Vietnam.

**SD-09:**

### **Challenges for Thai OTOP Community Enterprises: Experiences from Thailand and Japan, a Comparative Study**

*Saifon Suindramedhi*

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This paper is to study the ways in which Thai OTOP community enterprises follow Japanese OVOP community enterprises, with the understanding that Thailand adopted the OVOP concept for use in its own community economic development. A comparative study of community enterprise experiences from Thailand and Japan on the development, policy, government subsidization, and business development of small communities finds a variety of factors such as: (1) The Thai community entrepreneur does not have a culture of entrepreneurship, while in Japan community entrepreneurs adhere to their production contracts; (2) OTOP entrepreneurs make products that don't use local capital, natural resources, or local culture, and instead copy products, while at OVOP in Japan, the focus is on "only one" product of locality; (3) Thai community entrepreneurs don't distribute their products directly to the end-consumer, while OVOP entrepreneurs promote their products directly to restaurants or launch their products directly to consumers; (4) the Thai government maintains an OTOP fund, which leads to non-productive loans, while the Japanese government helps to provide technical guidance and support for promotion and sales; (5) In Japan, local government subsidy money is provided to community enterprises. The central government puts subsidies into the budget of the local government. In Thailand, local government lacks an OTOP budget and resources, which are held by the central government.

**SD-10: Assessment of Land-use Change and Urban Growth in Phuket Province, Thailand**

*Potjamas Chuangchang and Phattrawan Tongkumchum*

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The present study aims to predict change of urban land in Phuket Province for surveys in 1975, 1985, 2000 and 2009. The data of land-use plots were recorded using a digitized-grid method. Land-use was classified broadly into three main groups comprising forest (forest and grassland), agriculture (agriculture and fish farming) and urban (village, city and other developed land including mines). Logistic regression model of urban growth with a combination of location (north or south) and land-use at a previous survey as a determinant was used to explain the patterns. Most of land was used for agriculture, especially in the north of Phuket. More areas of urban land were in the south. Urban land was increasing and average percentages were 14.49% in 1975, 18.76% in 1985, 21.38% in 2000 and 27.52% in 2009. Agricultural land became urban land more than forest whereas urban land tended to remain the same in the south more than in the north. The exception was in period 1985-2000 more urban land in the north than the south. This occurred because of mining activity.

**SD-12: Prediction of Mass Landslides of River Banks Subjected to Variations of the Water Level**

*Chhun Soksan<sup>1</sup>, Ky Sambath<sup>2</sup>, Martinez Juan<sup>3</sup>, and Huynh Thanh Son<sup>4</sup>*

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River bank stability is very sensitive to the variation of the water level (WL) of the river. This is the case along the Lower Mekong River which WL change between dry and wet seasons is about 10m. This paper presents a study of river bank stability subjected to variations of the water level. Dupuit assumption is supposed to find the variation of WL in the soil using a numerical solution by an explicit finite difference method. The mass sliding Safety Factor (SF) predicted by the simplified slices equilibrium method varies significantly as a function of WL variation and the risk of land slide is high when the SFs are minimums. By using different hydrographs we can demonstrate that the maximum risk of mass slide appears to occur after a rapid drop of the WL and is worse if the permeability of soil is small. Furthermore, by imposing different distances between the slip surfaces and the top of the bank, a safety zone is determined, that results useful for local risk management.

**SD-13: Implementing DSSARM Tool for Land Use Change Monitoring and Area Analysis: A Case Study in Nakhon Phanom Province, Northeast Thailand**

*Sorat Praweenwongwuthi<sup>1</sup>, Tewin Kaewmuangmoon<sup>2</sup>, Attachai Jintrawet<sup>2</sup>, and A. Terry Rambo<sup>3</sup>*

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<sup>3</sup>Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University

In order to examine changing patterns of land use in this area, we have made a spatial analysis of two districts of Nakhon Phanom province by using the DSSARM (Decision Support System Research and Development Network for Agricultural and Natural Resource Management) Program as a tool for area analysis. It was found that a great deal of land use change occurred in the 5 years between 2006 and 2010. In Mueang District, almost one-quarter of the area was in different uses in 2010 than in 2006 while in That Phanom District the magnitude of change was even greater, with more than one-third of the area changing uses between 2006 and 2010. Much of the land use change in both districts has resulted from the conversion of land from other uses, especially natural forest and rice paddies, to rubber. Rapid urbanization has led to conversion of large areas of paddy fields, forest, and orchards into housing estates in the peri-urban zone around Nakhon Phanom City and, to a lesser extent, around That Phanom district town. Land use changes resulted in increased diversity of agroecosystems with 5 new land uses appearing in Mueang District and 3 new uses appearing in That Phanom District. All of these land use changes, especially the loss of agricultural land to urbanization and the expansion of the area of rubber, eucalyptus, and upland crops at the expense of forest, rice paddies, and orchards, may have major implications for agroecosystem diversity. Although the total number of different agroecosystems has increased, the new systems cover only a relatively small area, compared to the vast amount of land converted to mono-cultural rubber and eucalyptus plantations. Conversion of land formerly used to grow food crops consumed by local people to growing of cash crops may also have negative implications for their livelihoods and threaten their food security.



## Guidelines for Paper Presentation

This guideline gives some instructions to authors for their presentation of papers in the *9<sup>th</sup> GMSARN International Conference 2014* sections. Please be advised that the authors should carefully follow these instructions in order to make the best of your presentation.

- ❖ The total presentation time including questions and answers for each paper at the GMSARN International Conference 2013 should be limited to less than 20 minutes.
- ❖ The maximum number of slides for your presentation should be limited to around 15 slides. Do not overload your figures with text and make sure that the figures are clarity in a big audience. It is recommended that you should use font size of 20pt or bigger for all texts and formulae so that the audience can read them clearly.
- ❖ Make sure that you use international standard fonts like Times New Roman or Arial in your PowerPoint (ppt.) file to avoid corrupted presentations due to incompatible font to the local computers.
- ❖ Should not use dark color as background in your PowerPoint slides and should use a color of font sharply contrasting with the background.
- ❖ Use spelling and grammar available in PowerPoint to check the errors you might have made.
- ❖ The use of overhead transparencies is strongly discouraged. A PowerPoint file is the most convenient for both you and the organizers.
- ❖ Feel free to include your latest research results in your presentation even if they are not included in your paper before.
- ❖ Speak clearly and slowly when presenting. Please remember that most of the persons in the audience are non-native English speakers.
- ❖ Computers and beamers are available in each conference room providing PowerPoint and Acrobat Reader software installed on Windows operating system. If you need any other software for your presentation, please contact the Secretary General by email at [gmsarn@ait.ac.th](mailto:gmsarn@ait.ac.th) to check the availability of the software in advance.
- ❖ Please try to be presence in the room around 5 minutes in advance of the session in order to copy your file onto the local computer and fill in a presentation form. Staffs will be available to assist you.
- ❖ In each session, there will be a Chairperson who will be in charge for introduction of presenters and discussion time for each presentation.
- ❖ Please feel free to contact assistant staffs in your presentation room if you need any help for your presentation.

Thank you for your cooperation and we hope you will have your good presentation at the conference.

## Itinerary for Visiting Mekong Delta

**Thursday 13 November 2014**

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07.30 hour *Pick up at Palace Hotel Saigon's Lobby*

09.00 hour *Visit Vinh Trang Pagoda which is well-known for its special architecture by the combination between Western and Eastern Art.*



10.00 hour *Arrive My Tho City and then go to Pier,*

- *Cruising on TIEN River and seeing four islands: Dragon, Unicorn, Tortoise, Phoenix. Enjoy fresh coconut juice.*
- *Boat runs along fish farm to learn about local people how to feed fishes.*
- *Stop at Thoi Son Island, go walking around country lane and seeing orchards, visit honey-bee farm, enjoy honey tea and banana wine.*
- *And then, you can walk on fruit garden and enjoying tropical fruits, listen to traditional music.*
- *Take Rowing Boat on small canal with beautiful scenery of countryside.*
- *To sail up TIEN River, Boat take you to Tân Thach Canal to visit Coconut Candy workshop of Ben Tre Province. Have lunch at local restaurant with local foods.*
- *After that ride horse-drawn carriages along country lane in Tân Thach Village to seeing orchards and local people's life.*
- *Come back boat to go to Phoenix Island, to visit coconut Monk Temple crocodile farm.*
- *Come back to Boat and return to My Tho.*

15.30 hour *Arrive Pier and leave to Ho Chi Minh City*

18.00 hour *Dinner at Nha hang TAN LAC VIEN (Chinese Restaurant)*

20.30 hour *Go back to Hotel*

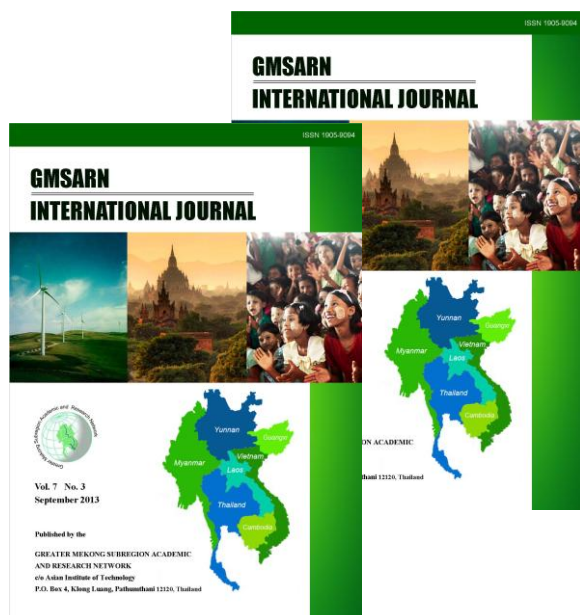
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**Remark:** *English-speaking tour guide service & transportation (Bus & Boat) are provided. The programs maybe change without prior notice.*

# GMSARN International Journal

The GMSARN International Journal is dedicated to advance knowledge in energy, environment, natural resource management and economical development by the vigorous examination and analysis of theories and good practices along with encouraging innovations needed to establish a successful approach to solve an identified problem.

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