ABSTRACT PROGRAM BOOK

The 19th GMSARN International Conference 2024 *on*

"Towards to Sustainability in GMS: Empowering Energy, Environment, and Development"

November 21-22, 2024 | Sihanoukville City, Cambodia

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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, Nakon Phanom Province, Thailand; and Ubon Ratchathani University, Ubon Ratchathani Province, Thailand; Naresuan University, Phitsanulok Province, Thailand; Chitralada Technology Institute, Bangkok, Thailand; and Suratthani Rajabhat University, Thailand.

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Welcome Message from Conference Chair

It is my great honor to chair the 19th GMSARN International Conference 2024 on "*Towards Sustainability in the GMS: Empowering Energy, Environment, and Development*". On behalf of the organizing committee, I warmly welcome you all to this distinguished international conference.

The Greater Mekong Subregion (GMS) is a region of immense diversity in cultures, landscapes, and opportunities, while also facing complex challenges in energy, environment, and sustainable development. As the world seeks solutions to mitigate climate change, promote responsible resource management, and drive inclusive economic growth, it is essential for us to come together, share knowledge, and establish partnerships for a more sustainable future. This conference convenes experts, scholars, policymakers, and industry leaders from across the GMS and beyond to discuss the most pressing issues in our region. Our primary objective is to foster dialogue and collaboration around three key themes: Sustainable Energy, Environmental Preservation, and Sustainable Development. GMSARN 2024 aims to advance energy, environmental, and sustainable development initiatives across the GMS countries, contributing to a transformative future.

This conference is organized by the Greater Mekong Subregion Academic and Research Network (GMSARN) and the Asian Institute of Technology (AIT), in partnership with the Institute of Technology of Cambodia (ITC) and the Royal University of Phnom Penh (RUPP). We are also grateful to our International Advisory Committee for their guidance and support. Collaboration from our co-organizers, colleagues, and friends in the GMS and beyond has been invaluable.

I would like to extend my heartfelt thanks to all the organizers and the dedicated team whose tireless efforts have made this event possible. Your support is invaluable in our collective endeavor to address the critical challenges of our region. Finally, I thank each of you, our participants, and wish you a rewarding conference experience and an enjoyable stay in Sihanoukville City.

Prof. Pai-Chi Li
President
Asian Institute of Technology

Welcome Message from ITC Conference Co-Chair

It is my distinct honor to welcome you to The 19th GMSARN International Conference 2024. This year, we unite under the theme "*Towards Sustainability in the GMS: Empowering Energy, Environment, and Development.*" This theme reflects the vital need for strategic, collaborative efforts that will drive sustainable growth across the Greater Mekong Subregion (GMS) and create lasting impacts in the realms of energy, environmental preservation, and socioeconomic advancement.

As Director General of the Institute of Technology of Phnom Penh, I am particularly pleased to see such a diverse assembly of professionals and scholars gathered here, each bringing their insights, innovations, and vision for a sustainable future. The GMSARN Conference has long served as a platform for cross-border dialogue, and this year is no exception. Together, we will explore forward-thinking approaches to complex challenges, aiming to foster solutions that are resilient, adaptable, and rooted in the unique contexts of our communities.

I would like to extend my sincere appreciation to all those who have worked tirelessly to make this event possible. To our speakers, presenters, and participants, your dedication to sustainable development is truly inspiring, and I am confident that our shared exchanges here will forge new paths toward a greener and more equitable future in the GMS.

Thank you all for joining us, and I wish you a productive and rewarding conference.

Dr. Po Kimtho
Director General, Institute of Technology of Phnom Penh
Conference Co-Chair, GMSARN 2024

Welcome Message from RUPP Conference Co-Chair

It is my great pleasure to extend a warm welcome to each of you at The 19th GMSARN International Conference 2024. This year's theme, *"Towards Sustainability in the GMS: Empowering Energy, Environment, and Development,"* speaks to our collective responsibility to foster sustainable and inclusive growth throughout the Greater Mekong Subregion (GMS). As we convene, we are reminded of the critical need for innovative solutions that address the intersection of energy, environmental preservation, and social development, ensuring a resilient future for all.

As Rector of the Royal University of Phnom Penh, I am deeply honored to be part of this important gathering, where esteemed academics, industry experts, policymakers, and thought leaders come together to exchange knowledge and insights. GMSARN has long been a beacon of regional collaboration, and this year's conference offers us an exceptional platform to share our research, discuss challenges, and envision strategies that will drive sustainable development across borders.

I would like to express my gratitude to all speakers, participants, and organizers for their hard work and dedication in bringing this conference to life. I am confident that our discussions will inspire meaningful progress and lay the foundation for initiatives that uplift our communities and protect our environment.

Thank you for being here, and I wish you all a fruitful and inspiring conference.

H.E. Dr. Chet Chealy
Rector, Royal University of Phnom Penh
Conference Co-Chair, GMSARN 2024

Organizing Committee

International Advisory Panel

Country	Name	Affiliation
Australia	Robert Fisher	Australian Mekong Resource Center
China	Zhang Wentao	Chinese Society of Electrical Engineers (CSEE)
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UK	Jonathan Rigg	Durham University
USA	Dennis Ray	University of Wisconsin-Madison
USA	Jefferson Fox	East-West Center, Honolulu

Conference Purposes

The 19th GMSARN International Conference 2024 (GMSARN 2024), held from November 21-22, 2024, is proudly organized with technical support from the Institute of Technology of Cambodia (ITC) and the Royal University of Phnom Penh (RUPP). The theme is on *"Towards Sustainability in the GMS: Empowering Energy, Environment, and Development"*. This year's conference focuses on advancing sustainable practices in energy, environment, and development within the Greater Mekong Subregion (GMS), with a mission to shape a more resilient and sustainable future.

GMSARN 2024 offers a dynamic, two-day platform for researchers, experts, and participants from diverse fields to disseminate knowledge, share innovative ideas, and engage in meaningful dialogue on critical issues impacting the GMS. The conference aims to stimulate international discourse and provide a collaborative platform for exchanging the latest advancements and interdisciplinary research. With a focus on regional and cross-border perspectives, GMSARN 2024 aspires to contribute to sustainable development solutions that address energy, environmental, and developmental challenges in the region.

This unique event brings together a broad array of disciplines, fostering an environment for collaborative problem-solving and shared innovations. Beyond providing a space for intellectual exchange, GMSARN 2024 serves as an ecosystem for sharing research findings and development insights, supporting the growth of sustainable initiatives across the GMS. This conference also seeks to advance educational and research programs within the region, driving a lasting impact on sustainable development in energy, environment, and beyond.

Contact Address

The 19th GMSARN International Conference 2024 on
"Towards Sustainability in the GMS: Empowering Energy, Environment, and Development".
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Conference Venue
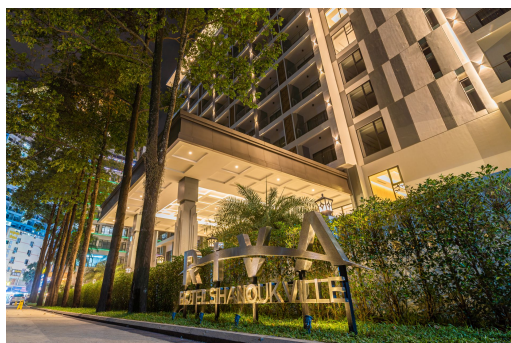
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Keynote Speaker

"Thailand-Cambodia OCA Economic Study"

Dr. Nguyen Duc Tuyen
Senior Business Development Advisor
ConocoPhillips, Singapore

The Thailand-Cambodia Overlapping Claims Area (TCOCA) is a 27,000 square kilometer section of the Gulf of Thailand that is claimed by both countries.

The TCOCA is highly prospective for oil and gas resources and both countries have awarded contracts over the area for exploration and production. However, the overlapping claims must be resolved before any activity can take place.

In 2023, energy analytics company Wood Mackenzie conducted a study of the tangible and intangible benefits that could be realized by Thailand and Cambodia from the development of the TCOCA resources.

This presentation will highlight the study results. It will utilize the work product and summary slides developed by Wood Mackenzie.

William (Bill) Lafferrandre is a Senior Business Development Advisor for ConocoPhillips in Singapore with responsibility for commercial negotiations and for identifying, evaluating and capturing new upstream opportunities for the company in the Asia Pacific region. Prior to re-joining ConocoPhillips in October 2018, Bill spent 2 years as the CEO and founder of SEA Dragon Resources, a Singapore based start-up company seeking to build a balanced portfolio of E&P assets in Southeast Asia. Before founding SEA Dragon, Bill worked for ConocoPhillips for 31 years and has been actively involved in the E&P business in Asia for more than 25 years. Through his ConocoPhillips career, he held various regional business development positions for Conoco and ConocoPhillips in Singapore, Malaysia and Vietnam. He retired from ConocoPhillips in 2016 after serving as Vice President of Global Business Development for ConocoPhillips in Houston, Texas but returned to the company in 2018. Bill is a council member and Treasurer of the Southeast Asia Petroleum Exploration Society in Singapore, chair of the Cambodia Committee of the US-ASEAN Business Council and was a board member and former President of the Association of International Petroleum Negotiators (AIPN). He holds an undergraduate degree in Petroleum Land Management from the University of Oklahoma and a Master of Business Administration degree from the University of Houston.

Extended Remark

"Generative Artificial Intelligence in the Energy Sector"

Prof. Dr. Weerakorn Ongsakul, CFA, ERP
Chair and Professor of Sustainable Energy Transition
Dept. of Energy and Climate Change, School of Environment,
Resources and Development
Asian Institute of Technology, Thailand

Generative Artificial Intelligence (GenAI) enhances productivity across various sectors by creating data, forecasting, optimizing, understanding human language, and adapting efficiently to new data types. Its application in the energy sector is projected to have a global economic impact of $240 billion. AI autonomous systems can operate intelligently in various tasks. The current state of GenAI research in the energy sector is examined, focusing on its benefits, challenges, and research gaps, while aligning with efforts to address climate change. A literature review based on PRISMA-SCR principles was conducted, focusing on articles from January 2022 to May 2024 sourced from IEEE Xplore, ScienceDirect, ACM Digital Library, and Google Scholar. The analysis of relevant papers reveals that GenAI excels in integrating existing knowledge and in prediction using Generative Adversarial Networks (GANs), which consist of competing neural networks, making it more effective than traditional deep learning models. Also, transformers, which are widely used in natural language processing, have shown significant promise in handling time-series data for forecasting in energy systems.

GenAI also writes control codes to connect to other systems automatically, provides recommendations, explains results in human-understandable language, and adapts efficiently to new data types. In the energy sector, GenAI is used for generating synthetic electricity demand data, managing grids, forecasting energy demand, and optimizing renewable energy systems. Additionally, it supports climate change efforts by developing accurate carbon footprint models and optimizing energy systems to reduce emissions. However, key challenges include hallucination, data biases, privacy and security concerns, misuse, and system errors. Proposed solutions involve improving training data quality, system fine-tuning, human oversight, and enhancing security measures. In terms of research gaps, these include improving the realism of synthetic data, establishing model evaluation standards, and integrating GenAI with emerging technologies such as Blockchain and IoT. In summary, continuous research and development, along with addressing GenAI challenges, can significantly enhance efficiency and sustainability in the energy sector, supporting climate change mitigation efforts.

Serving as an academician for over 25 years, Prof. Weerakorn Ongsakul has dedicated his efforts to developing qualified and committed power and energy professionals in the region. He is a Chartered Financial Analyst Charterholder and Certified Energy Risk Professional. He is serving as a Board of Directors of PEA and PEA Encom International Co. Ltd., and as the RTG Faculty Representative at AIT. He has also been serving as the Secretary General for GMSARN since 2006. He is an IEEE Senior Member, and for his contributions to IEEE PES Thailand Chapter he was presented with Outstanding Engineer Award in 2019. He has authored 2 books and 10 book chapters alongside 95 international refereed journals and more than 150 international conference proceedings. His areas of interest include Intelligent System Applications to Energy Systems, Power System Operation & Control, Power System Restructuring and Deregulation, Smart Grid, and Energy & Financial Risk Management.

Program at a Glance

Time	Day 1: November 21, 2024 (Thursday)	
08:00 – 08:30	**Registration & Opening Session** at Conference Room, M. Floor.	
08:30 – 08:40	**Welcome Address** **by H.E. Dr. Subin Pinkayan** *Former Chairperson of The Board of Trustees, AIT, Thailand*	
08:40 – 08:50	**Opening Remark** **by Dr. Po Kimtho** *Director General, the Institute of Technology of Cambodia (ITC)*	
08:50 – 09:30	**Keynote Address "Thailand-Cambodia OCA Economic Study"** **by Mr. William (Bill) Lafferrandre** *Senior Business Development Advisor, ConocoPhillips, Singapore*	
09:30 – 10:00	**Group Photo Session & Coffee/Tea Break**	
10:00 – 12:00	**Break out Session 1**	
	Conference Room	Energy 1
	Business Meeting Room	Environment 1 & Development 1
12:00 – 13:00	**Lunch Break**	
13:00 – 21:00	**Excursion Trip to Koh Rong Island (Optional) &** **Reception Dinner at Sky Bar, 10th Floor, RIVA Hotel, SHV**	

Time	Day 2: November 22, 2024 (Friday)	
09:00 – 09:30	**Extended Remark by** **Prof. Dr. Weerakorn Ongsakul** *GMSARN Secretary General & Conference Executive Director*	
09:30 – 12:00	**Break out Session 2 & Coffee/Tea Break**	
	Conference Room	Energy 2
	Business Meeting Room	Environment 2 & Development 2
12:00 – 12:15	**GMSARN2024 Recap** **by Prof. Dr. Weerakorn Ongsakul** *GMSARN Secretary General & Conference Executive Director*	
12:15– 12:30	**GMSARN2024 Closing Remarks** **by Prof. Kean Tak** *Vice Rector, the Royal University of Phnom Penh*	
12:30 – 13:30	**Lunch Break**	
13:30 – 16:00	**Break out Session 3 & Coffee/Tea Break**	
	Conference Room	Energy 3 & Development 3
End of Conference		

Presentation Schedule

10:00 – 12:00	ENERGY 1	Conference Room
Session Chairperson: *Asst.Prof.Dr. Piyadanai Pachanapan* *Faculty of Engineering, Naresuan University*		*Floor M.*

E-01 *CETE*	Power Management for V2G and V2H Operation Modes in Single-Phase PV/Battery/EV Hybrid Energy System *Chayakarn Saeseiw,* **Piyadanai Pachanapan**, *Kosit Pongpri, Tanakorn kaewchum, and Sakda Somkun*	*Thailand*
E-02 *RMUTL*	A Bidirectional V2G (Vehicle to Grid) Electric Vehicle Charging System Operator Management with Model Predictive Control *Ekawat SiriBoonpanich, Jeerawan Patcharaprakiti, Kittinun Srasauy, Teerasak Somsak, Worrajak Muengjai, and* **Nopporn Patcharaprakiti**	*Thailand*
E-03 *MEA*	The Case Study of BIM and GIS integration for MEA's Under Ground Cable System *Jaroanchai Thawee-Apiradeesena, Sermwut Kanjanasak, and Kan Phruksavanasaka*	*Thailand*
E-04 *MEA*	Change Management of AMI Deployment in MEA *Kanita Ongkasin, and Nattanont Chotiheerunyasakaya*	*Thailand*
E-05 *MEA*	A Study of Enhancing Electricity Load Forecast with GIS *Paphawee Tungduangdee*	*Thailand*
E-06 *MEA*	Case Study of SF6 Gas Load Break Switch Failure in Thailand *Pornchai Sestasombut, and Pakhin Khiriwan*	*Thailand*
E-07 *PSRU*	A New Concept of Energy Conservation of Building to Net Zero Energy Building in Thailand **Sorawit Sonsaree**, *and Somchai Jiajitsawat*	*Thailand*
E-08 *KPRU*	The Assessment in Reducing Greenhouse Gas Emission of Floating Solar in Energy Garden Kamphaeng Phet Rajabhat University **Nivadee Klungsida**, *Narut Butploy, Pakin Maneechot, Thep Kueathaweekun, and Pobphorn Iamsai*	*Thailand*

10:00 – 12:00	ENVIRONMENT 1 & DEVELOPMENT 1	Business Meeting
Session Chairperson: *Mr. Cherid Kalayanamitr, Former Scientist level 11,* *EGAT Electricity Authority Generating of Thailand*		*Floor M.*

Env-02 *TU*	Antioxidant activity and bioactive compounds from true mangroves (Avicennia alba Blume. and A. marina (Forssk.) Vierh.) and mangrove associate plants (Suaeda maritima (L.) Dumort. and Sesuvium portulacastrum (L.) L.) **Vanida Khunnachaiphun**, *Tritep Vichkovitten, and Marut Suksomjit*	*Thailand*

Env-04 *CETE*	The behavior of modified asphalt binder from recycled polyurethane foam and Reclaimed Asphalt Pavement **Noppawan motong**, *Theerapat Ruansorn, Peerapong piyapanyaporn, and Wongsakorn paosawat*	*Thailand*
Env-05 *SUT*	Using vetiver planted in constructed wetland systems with basalt substrate for the treatment of municipal wastewater **Supattra Jiawkok**, *Siraporn Potivichayanon, and Phirun Sirithongkham*	*Thailand*
SD-01 *RMUTT*	Community Networks' Participation for Municipal Solid Waste Management Sustainability: An Empirical Study of Nan Province, Thailand **Chalermsak Raksa**, *Surasak Jotawon, Issara Siramaneerat, Pimnapat Bhumkittipich, Nuttakit Iamsomboon, and Wanjai Lamprom*	*Thailand*
SD-02 *RMUTT*	Implication of Socioeconomic Factors for the Guidelines on Sustainable Carbon Neutrality Development **Chatuporn Mueangmin**, *Nuttakit Iamsomboon, Pimnapat Bhumkittipich, Issara Siramaneerat, and Surasak Jotaworn*	*Thailand*
SD-05 *RUMTT*	Exercise Skills for Muscle Rehabilitation in the Thai Elderly: A Pathway to Sustainable Quality of Life **Intra Tubklay**, *Issara Siramaneerat, Surasak Jotaworn, Wanjai Lamprom, Nuttakit Iamsomboon, and Pimnapat Bhumkittipich*	*Thailand*
SD-08 *TU*	Sustainable Aggregate Production Planning for Seasonal Products in Thailand **Tonnam Tachawatanawisal**, *and Pisal Yenradee*	*Thailand*

DAY TWO: 22 November 2024

09.30 – 12.00 Session Chairperson:	ENERGY 2 *Assoc.Prof.Dr. Nattadon Pannucharoenwong Faculty of Engineering, Thammasat University*	Conference Room Floor M.
E-10 *PEA*	Generative AI for Detecting Electricity Theft in Provincial Electricity Authority Distribution Systems *Phakdee Ruksasaup , Somjai Busabong , Surasak Surathunmanun, and Kornthip Whanchaaim*	*Thailand*
E-11 *TU*	Development of GIS-Based Model for Site Selection of EVCs in Smart Cities *Suwipong hemathulin,* **Nattadon Pannucharoenwong**, *Wachirathorn Janchomphu, and Kamonpad Munsilp*	*Thailand*
E-12 *CDTI*	Development of Efficiency Evaluation of Plate Heat Exchanger for Predictive Maintenance Using Regression Analysis with Artificial Neural Networks for Reactor **Udomsak Keawmorakot**, *Lapus Poolperm, and Suvimol Rattanodom*	*Thailand*
E-13 *RRI*	The Impact of Ethanol Additives on Reducing NOx Emissions in Biodiesel Blends *Cheng fang Mao, Sattaya yimprasert, Wang sheng Lan, Hai ping Luo and* **Ananchai Ukaew**	*Thailand*

E-14 RRI	Estimated Energy Consumption in Utility Equipments for Manufacturer	*Thailand*
	Sittichoke Pookpunt, *Choopong Chuaypen, and Pittawat Jenjob*	
E-15 CETE	Identification of faults in a solar photovoltaic system under partial shading	*Thailand*
	Sarocha Deevijit, Sithisirin Komkueng, Phaphat Rattanaklangmueang, Jirawadee Polprasert, Praditpong Suksirithawornkul, Akaraphunt Vongkunghae, and ***Somporn Ruangsinchaiwanich***	
E-16 KKU	Enhancing energy efficiency and reducing the energy storage size of the VSG control based on the state-feedback-droop control strategy ***Jonggrist Jongudomkarn***	*Thailand*

09.30 – 12.00 **ENVIRONMENT 2 & DEVELOPMENT 2** Session Chairperson: *Dr. Mohd Faheem* *Pridi Banomyong International College, Thammasat University*		*Business Meeting* *Floor M.*
Env-06 TU	Bringing Equity into the Multi-Scalar Governance Approach to Urban Water Management: Some Insights from the Case of Bangkok Metropolitan Administration (BMA) ***Wasin Punthong***	*Thailand*
Env-07 CDTI	A study of Aluminum contamination in fish by irradiating neutrons from a reactor *Udomsak Keawmorakot,* ***Lapus Poolperm***, *and Kokiat Sukrod*	*Thailand*
Env-08 CDTI	Study of the appropriate amount of salt combined with irradiation in Salted Indo-Pacific mackerel fish (Scomberomorus guttatus) Process ***Nattapong Veeerataveeporn***, *Chatchai Charoenlekuthai, and Sirilak Chookaew*	*Thailand*
Env-09 WRRC	Utilizing spatial analysis of hotspots to enhance reconnaissance UAV technology for PM2.5 mitigation in Phitsanulok province, Thailand ***Polpreecha Chidburee***, *Settha Thangkawanit, Kamonchat Seejata, Pasura Srisura, Worarit Prasert, and Wayan Suparta*	*Thailand*
Env-10 CETE	Spatial analysis of the relationship between PM2.5 emission inventories and satellite monitoring data in northeastern and eastern Thailand and neighboring countries *Polpreecha Chidburee,* ***Korakod Nusit***, *Kamonchat Seejata, and Sarintip Tantanee*	*Thailand*
SD-03	Rama VI house style: A hidden heritage in Bangkok ***Thanisda Tidanun***, *and Ross King*	*Thailand*
SD-04 WRRC	Risk Analysis of the Coffee Shop Supply Chain under the COVID-19 Pandemic Situation ***Panu Buranajarukorn***, *and Itsariyaporn Luanghan*	*Thailand*
SD-06 NU	Estimation and reduction of food loss in the upstream broiler industry supply chain in Thailand ***Somsakul Thongtab***, *S. Kumar, and Po-ngarm Somkun*	*Thailand*

SD-07 *CETE*	Organizational Carbon Footprint Assessment: A Case Study of a Coffee Shop in the Engineering Faculty at Naresuan University	*Thailand*
	Suchada Ukaew, *Nantakran Sancomlue, Sunisa Suwan, Onpairin Pliawyard, Virin Kittithammavong, and* *Weerawun Weerachaipichasgul*	
SD-09 *TU*	Potentials of the Greater Mekong Subregion (GMS): Striving towards a Regional Economic Integration	*Thailand*
	Mohd Faheem	

13.30 – 16.00	ENVIRONMENT 3 & DEVELOPMENT 3	*Conference Room*
Session Chairperson:	***Assoc.Prof.Dr. Pisit Maneechot*** ***SGTech, Naresuan University***	*Floor M.*
Env-11 *SGTech*	Development of water bills management platform in suburban areas of Thailand ***Nichapa Amphiar***, *and Pisit Maneechot*	*Thailand*
Env-12 *RMUTL* *Chiangrai*	The Relation between land used – landcover and Fire Hotspot: A comparative study in Laos, Myanmar and Thailand *W. Prommee, P. Latthachack, P. Phapaphanh,* *S. Phengsicomboun, and* ***N. Sirimongkonlertkul***	*Thailand*
SD-10 *WRRC*	Improving Construction Planning through the Repetitive Scheduling Method for the Sustainability of Small Housing Development Project ***Perapong Kaewpoonsuk***, *Kumpon Subsomboon, and* *Sutthichai Prasatketkarn*	*Thailand*
SD-11 *KKU*	Khon Kaen University's Strategic Transformation: Empowering Sustainable Development and Innovation in the Greater Mekong Subregion ***Chiranut Sa-ngiamsak***, *Kritikar Dangrat, and* *Pewpan Maleewong*	*Thailand*
SD-12 *KKU*	What stimulates Generation Z event attendees to engage in environmentally responsible behaviour for special events? ***Supawat Meeprom***	*Thailand*

ABSTRACT

Energy

E-01: **Power Management for V2G and V2H Operation Modes in Single-Phase PV/Battery/EV Hybrid Energy System**

Chayakarn Saeseiw, Piyadanai Pachanapan, Kosit Pongpri, Tanakorn kaewchum, and Sakda Somkun[2]*
CETE, Deparrtment of Electrical and Computer Engineering, Faculty of Engineering, Naresuan University, Thailand
E-mail: piyadanip@nu.ac.th

A multi-port conversion system that connects photovoltaic (PV) arrays, battery energy storage (BES), and electric vehicle (EV) to a single-phase electrical grid offers a promising flexible infrastructure for future smart homes. This system integrates Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) technologies in considerable improvements in energy management and EV utilization. V2G and V2H technologies enable bidirectional energy flow between EV and the electrical grid or home, thus optimizing energy consumption, enhancing grid stability, and providing backup power.

The proposed four port converter consists of 1) Interleaved Bidirectional DC-DC Converter for high-voltage BES, 2) Buck-boost Bidirectional DC-DC Converter for EV charger, 3) DC-DC Boost Converter with MPPT for PV arrays, and 4) Grid-tied DC-AC Inverter to integrate with the single-phase electrical grid. It has a non-isolated design that provides various benefits, including high power density, improved efficiency, fewer switches, and a compact design, making it suited for residential use.

The state-of-charge (SoC) based power management is introduced to ensure the power among PV, BES and EV can sufficiently support grid or home during on- and off-grid operations, while PV and BES can lower the amount of energy pulled from EV storage when supporting V2G and V2H. In addition, the power sharing between BES and EV is considered based on the level of their SoC, in order to enhance lifetime and reduce the current stress on the storages.

A 7.5 kVA single-phase four-port power conversion system was simulated in MATLAB/Simulink to ensure that the proposed power management strategies were feasible and effective. Two scenarios were examined: 1) PV, BES and EV with V2G give grid support during on-grid operation, and 2) PV, BES and EV with V2H offer backup power during off-grid operation. Furthermore, various conditions are addressed in each scenario such as variations in PV output and load changes.

E-02:

A Bidirectional V2G (Vehicle to Grid) Electric Vehicle Charging System Operator Management with Model Predictive Control

Ekawat SiriBoonpanich, Jeerawan Patcharaprakiti, Kittinun Srasauy, Teerasak Somsak, Worrajak Muengjai, Anon Namin, Kasem Treepak, and
Nopporn Patcharaprakiti
Rajamangala University of Technology Lanna 50300, Thailand
(corresponding author 66830094349 ; e-mail: pnopporn@rmutl.ac.th)

This paper propose a Bidirectional V2G charging system Operator management with Model Predictive Control. This management system will control bidirectional charging station to absorb excessive energy from PV Stationin the same grid and return such energy to another G2V charging station in the suitable period to avoid the load current not to over grid limitation through MQTT protocol. The Operator management system has developed in Node Red Platform with specific constraint and calculate optimum charging current by MPC Algorithm with communication MQTT Protocol through internet network to charging station. In this paper, the system have been developed the 400 V 3 Phases 15 KW bidirectional charging station and modified electric vehicle with 17.39 kW battery capacity with capability to perform V2G mode. The testing result found that the Bidirectional V2G charging system Operator management can control the bidirectional charging station to absorb power form PV Station and return such power to other G2V charging station in the suitable time effectively. The grid with Bidirectional V2G charging system Operator managementhave more stability in overload protectionthan the grid without any charging station control.

E-03:   **The Case Study of BIM and GIS integration for MEA's Under Ground Cable System**

Jaroanchai Thawee-Apiradeesena, Karn Phruksavanasaka, and
Sermwut Kanjanasak
Metropolitan Electricity Authority
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The Metropolitan Electricity Authority (MEA) plans to convert overhead power lines to underground cable systems, intends to lay over 200 kilometers of underground cables in the coming years. Consequently, optimizing the design, construction control, and maintenance processes is very important. Currently, BIM (Building Information Modeling) technology is being applied to transform the workflow of underground cable projects from 2D to 3D. This allows for a clearly design of underground cable systems, encompassing conduits, manholes, and various electrical component.

Additionally, it facilitates the details recording of model attributes and the ability to update, modify, and enhance these attributes. Integrating the advantages of BIM technology, which provides detail 3D models with comprehensive equipment details, with Geographic Information Systems (GIS) that offer precise physical location coordinates, enhances the clarity of structural visualization. This integration also improves the ease of future structural modifications. Moreover, incorporating GIS data aids practical applications by identifying the coordinates and positions of BIM models in real-world locations for accurate on-site visualization.

This study on developing a prototype for the combined use of BIM and GIS technologies offers a framework for agencies involved in underground cable projects. It aims to establish standards for data management within the BIM system for the future underground cable projects. Developing these standards will enhance operational efficiency and data management accuracy, ensuring the project's success in meeting its objectives.

E-04:

Change Management of AMI Deployment in MEA

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MEA prioritizes the modernization of power distribution systems through the strategic integration of state-of-the-art technology to fortify stability and reliability. MEA has initiated the Smart Metro Grid project, which will deploy Advanced metering infrastructure (AMI) technology equipped with 33,265 smart meters, streamline data interaction with the online system of MEA, thus accelerating efficient management of power systems. AMI is a foundational enabling technology for smart grids. AMI is more than a technology implementation. It is a change to the enterprise. MEA needs to weave it into existing structures to take advantage of the capabilities the system has to offer. This paper discusses the lessons learned for Change Management in two parts: employee readiness and customer support. To prepare internally, it will be important that MEA document current processes, conduct a change impact assessment on internal stakeholders, and identify targeted communications. For external stakeholders and customers, it is important to prepare customers in advance and be prepared to answer all questions through multiple channels.

E-05

A Study of Enhancing Electricity Load Forecast with GIS

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Metropolitan Electricity Authority (MEA) is the organization, which provides electricity for three responsibility areas such as Bangkok, Nonthaburi, and Samut Prakan in Thailand. In this past 5 years, MEA has transformed to a data-driven organization. One of the important operations that MEA has to work on for sustainability of electric distribution systems is "Electricity Load Forecasting". It uses data in many dimensions to inform its decision-making processes to identify areas for improvement.

MEA owns a geographic information system (GIS) for asset management at the beginning. But now, GIS can create, manage, analyze, and map all types of data. Besides, MEA also has the data platform that contains data from every department for a centralized repository. Unfortunately, combining data from GIS and the data platform was so hard in the past, so MEA staff basically only used data from the data platform to forecast electricity load.

Nowadays, there is software that provides big data processing and analysis capability for GIS. MEA can visualize, understand, and work with both GIS and the data platform. So, MEA decided to use this software to enhance "Electricity Load Forecasting". This paper represented what MEA found out to improve MEA electric distribution systems sustainably.

| E-06 | **Case Study of SF6 Gas Load Break Switch Failure in Thailand** |

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The Metropolitan Electricity Authority (MEA), a state enterprise responsible for electricity distribution in Thailand's capital area, is enhancing the reliability of the 24 kV distribution lines. The initiative replaces traditional disconnecting switches with Load Break Switches (LBS). LBS equipment switches power over long distances using fiber optic cables or radio waves. However, an increasing failure rate is noted in the newly replaced LBS units. This paper analyzes the causes of the rising failure rate and proposes solutions.

| E-07 | **A New Concept of Energy Conservation of Building to Net Zero Energy Building in Thailand** |

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This research will propose a new approach to use as an alternative energy conservation technology in buildings. This study aims to help the building go to Net Zero Energy Building (NZEB) or close to Net Zero Energy Building (near-NZEB). The study proposes two new approaches: (1) Reducing heat entering the building envelope by installing a simple heat sink in the concrete wall, and (2) increasing the efficiency of air conditioning by using waste heat to produce hot water. The results found that, Case-1, Concrete walls with a simple heat sink installed will reduce heat passing into the building envelope. The low-temperature hot water that is obtained from cooling can be used in daily life. An electricity consumption, the wall has a cooling unit installed the electricity consumption will be lower as compared to uninstalling a cooling unit. Case-2, The amount of hot water that the system produces. It depends on the operating time. Moreover, when the water flow rate through the heat exchanger is 1 LPM, the system can produce maximum usable heat is 11.2 MJ. And the usable hot water temperature is 44.1 °C.

E-08	**The Assessment in Reducing Greenhouse Gas Emission of Floating Solar in Energy Garden Kamphaeng Phet Rajabhat University**

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This study aims to evaluate the reduction of greenhouse gas emissions from the installation of a 29.7 KW floating solar system at the Zero Energy Building located within the Energy Garden at Kamphaeng Phet Rajabhat University. The assessment adheres to the standards of the Thailand Voluntary Emission Reduction Program (T-VER-S-METH-01-01 Version 02), established by the Thailand Greenhouse Gas Management Organization (Public Organization) (TGO). The findings indicate that the photovoltaic (PV) system generates 27.39 MWh The Emission Factor for the demand side ($EF_{EC,PJ,y}$) is calculated at 0.4758 tCO_2/MWh. The total reduction in greenhouse gas emissions is approximately 13.03 tCO_2/year.

E-10	**Generative AI for Detecting Electricity Theft in Provincial Electricity Authority Distribution Systems**

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The Provincial Electricity Authority (PEA) of Thailand is leading the fight against electricity theft, particularly unauthorized Bitcoin mining, which causes damage exceeding 4 billion THB annually, not to mention other forms of illegal electricity use. PEA plans to utilize Generative AI (GenAI) to enhance its ability to detect fraud by analyzing complex patterns and data. Electricity fraud significantly impacts PEA's finances and national governance, leading to increased electricity costs for consumers and posing safety risks such as fires and electric shocks. PEA's strategy includes leveraging diverse data sources, such as customer information and transaction records, to identify potential fraud targets. Research demonstrates the potential of GenAI to improve operational efficiency, data synthesis capabilities, and program coding, with customizations for secure and reliable internal data queries. Although there are challenges in data management and privacy, PEA's GenAI project represents a significant advancement in AI application, aiming to reduce financial losses, ensure load stability, and reliability of Thailand's electricity distribution system.

| E-11 | Development of GIS-Based Model for Site Selection of EVCs in Smart Cities |

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This study aims to develop a Geographic Information System (GIS)-based model for the site selection of electric vehicle charging stations in smart cities, using Chonburi, Thailand as a case study. The research entails collecting and analyzing geographic, demographic, and electric vehicle usage data from various sources to create an efficient site selection model. Critical factors incorporated into the model include topography, water sources, slope, population density, road network accessibility, proximity to power sources, and economic data in GIS spatial format. The findings reveal that the GIS model effectively identifies suitable locations for electric vehicle charging stations in Chonburi, categorizing areas as highly suitable, moderately suitable, or unsuitable. Furthermore, the study illustrates the model's applicability to other smart cities in Thailand, highlighting the essential role of GIS technology in urban planning and development to enhance transportation and energy efficiency and sustainability. Future research should integrate additional data, such as projected energy consumption and electric vehicle usage patterns, to improve the model's accuracy. Comparative studies of the model's application in various urban contexts are also recommended to provide further insights for future urban development planning.

| E-12 | Development of Efficiency Evaluation of Plate Heat Exchanger for Predictive Maintenance Using Regression Analysis with Artificial Neural Networks for Reactor |

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This research aims to 1) study the operation of plate heat exchanger for Nuclear Reactor, 2) develop a system for evaluating the efficiency of plate heat exchanger using Regression Analysis with Artificial Neural Networks, 3) to test the predictive system's efficiency and 4) to apply the plate heat exchanger's efficiency evaluation system in a real workplace with the development of user interfaces. Regarding the efficiency evaluation of the predictive model, it was found that the Absolute Average Relative Deviation (AARD) (%) = 0.065, the Mean Square Errors (MSE) = 2.168×10^{-11}, the Root Mean Square Errors (RMSE) = 0.984×10^{-6}, and the Correlation Coefficient ($r2$) = 0.988. After trialing the system in a food industry for eight months, it was shown that the system was able to be used for evaluation to determine the maintenance of plate heat exchangers, and the developed model could be applied to the evaluation of plate heat exchangers in related industries.

E-13 The Impact of Ethanol Additives on Reducing NOx Emissions in Biodiesel Blends

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Amid increasing global energy demand and growing concerns about oil scarcity, researchers are exploring renewable energy sources. Biodiesel is considered a promising alternative, but its use can lead to increased nitrogen oxide (NOx) emissions. Scientists are investigating the formation mechanisms, control strategies, and methods to mitigate NOx emissions in biodiesel engines. The study investigates simulated experiments on a four-cylinder, water-cooled, turbocharged diesel engine (DE) under four different loads with 5%, 10%, and 20% ternary blends. The results indicate that at 75% load, the 70% diesel, 10% biodiesel, and 20% ethanol blend exhibit a 5.56% reduction in emissions compared to pure diesel. generation events.

E-14 Estimated Energy Consumption in Utility Equipments for Manufacturer

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This paper presents an investigated electrical power model for utility equipment in a general manufacturing industry, including air compressors, air conditioners, chillers, air handling units, and cooling towers. The productivity of each machine is influenced by its energy consumption. Technical data were gathered by evaluating power capacity, workload, and machine output. Here, workload represents the percentage of output relative to full load, which correlates with the ratio of load time to total operation cycle time. Average power consumption was derived based on workload as a percentage of full capacity, while total energy consumption was calculated from average power and operation time. The Specific Energy Consumption (SEC) metric was defined as the ratio of machine output to average power at a specified workload percentage. The comparison between machine productivity and power usage at varying load levels reveals that, as workload increases, SEC declines across all machine capacities due to a reduction in standby or idle loss. This model aids in operational planning by identifying optimal workload ranges for efficient energy use.

| E-15 | **Identification of faults in a solar photovoltaic system under partial shading** |

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The increasing consumption of solar photovoltaic (PV) in grid-connected power systems has gradually transformed the electricity system' resources and operating circumstances. Furthermore, faults in solar PV systems can raise significant questions regarding reliability and efficiency at the utility and household levels. One of the PV failure scenarios that can reduce the maximum available power is partial shading obstruction. This study recommends using MATLAB to forecast solar photovoltaic system' partial shading problem under two main conditions: local irradiance and weather conditions. For this analysis, the primary electrical characteristics, for example voltage, current, and power, for the shading defective PV array and the healthy PV array are compared in various settings. The outcomes also demonstrate the effectiveness and legitimacy of the suggested method for classifying and comprehending the PV system issue.

| E-16 | **Enhancing energy efficiency and reducing the energy storage size of the VSG control based on the state-feedback-droop control strategy** |

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By utilizing virtual synchronous generator (VSG) control, distributed generators (DGs) caneffectively mitigate frequency deviations in the power grid by managing the inertial and droop power exchange between the battery energy storage system (BESS) and the grid. Previous proposals, however, have commonly assumed that the BESS can provide limitless power to DGs. Consequently, these VSG control schemes draw power from the BESS more than necessary and for prolonged durations. As a result, implementing such VSG strategies necessitates a relatively large BESS, which significantly hinders the practical use of VSGs. This study proposes a state-feedback-droop control strategy to realize a VSG-BESS system with a reduced energy storage size. The controller restricts power consumption compared to the conventional control by gradually reducing the DGpower output during steady-state conditions.

Environment

Env-02:

Antioxidant activity and bioactive compounds from true mangroves (Avicennia alba Blume. and A. marina (Forssk.) Vierh.) and mangrove associate plants (Suaeda maritima (L.) Dumort. and Sesuvium portulacastrum (L.) L.)

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The present study aims to examine the antioxidant ability of mangroves Avicennia alba (AA) and A. marina (AM) and mangrove associate plants Suaeda maritima (SM) and Sesuvium portulacastrum (SP). The major constituent of bioactive compounds including phenolic and flavonoid compounds are also quantified. Leaves of four mangroves and mangrove associate plant species were collected in April 2020 from Chonburi coastal wetland of Thailand. The leaf extracts from selected mangroves and mangrove associate plants reveal the presence of antioxidant activity and bioactive compounds. All extracts showed variation in DPPH scavenging activity in term of IC50. Both true mangroves (AA and AM) have higher antioxidant activity compare to associate mangrove plants (SM and SP). The antioxidant activity efficiency then can be arranged in decreasing order as AM>AA>SP>SM. The phenolic acids were clarified to seven derivatives which commonly found including gallic acid, protocatechic acid, vanilic acid, caffeic acid, p-coumaric acid, ferulic acid and sinapic acid. Total phenolic acids content expressed in decreasing order as SP>SM>AA>AM. Flavonoids were categorized into catechin, rutin and quercetin, exhibited in decreasing order as AM>AA>SP>SM. High antioxidant activity detected in both true mangrove plants are in accordance with the amount of flavonoids which is one of the importance bioactive compounds. However, there are not the case for phenolic acids, where SP and SM exhibit higher concentration of phenolic acids than those AA and AM. This study proves that mangroves and mangrove associate plants have potential for development of pharmaceutical and therapeutic uses but different plant species could provide the variation on antioxidant activity and bioactive compounds.

Env-04: **The behavior of modified asphalt binder from recycled polyurethane foam and Reclaimed Asphalt Pavement**

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Reclaimed Asphalt Pavement (RAP) reduces the amount of virgin asphalt binder required in the production of asphalt paving mixtures. The use of waste plastic for asphalt modification is also a promising option for sustainable environmental protection. Polyurethane (PU) is one of the most widely used thermosets in the world. Among these, polyurethane foam is the largest variety of synthetic polyurethane materials, leading to the production of a large amount of polyurethane foam waste. This study aims to evaluate the possibility of using recycled polyurethane (PU) foams in Reclaimed Asphalt Pavement (RAP)-modified asphalt binder. For this purpose, conventional tests such as penetration value, softening point temperature, and ductility were conducted. An unaged type AC60/70 asphalt binder was selected as the reference binder. Dichloromethane was used as the asphalt extraction solvent, and the PU foam was chemically decomposed via the glycolysis method. The results showed that the penetration values of the modified asphalt binder decreased with the addition of RAP. The percentage of RAP added to the binder is limited due to stiffness issues. When recycled PU foam is added, a reduction in the softening point temperature can be observed, indicating that the modified binder tends to show less brittle behavior. The 10% RAP with 5% recycled PU foams modified binder demonstrated improved workability and passed all the conventional tests.

Env-05: **Using vetiver planted in constructed wetland systems with basalt substrate for the treatment of municipal wastewater**

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This study aimed to investigate the capacity of vetiver grass and basalt substrates in full-scale horizontal subsurface flow-constructed wetlands (HSSFCWs) for the treatment of municipal wastewater in rural areas. A preliminary on-site investigation was performed to evaluate the municipal wastewater flow rate for the design and construction of wetland systems within the community. HSSFCWs, composed of basalt and cultivated with vetiver, had been operational for nearly one year. Monthly influent and effluent samples were collected and analyzed to assess the effectiveness of the treatment process. The findings indicated that the wastewater flow rate was appropriate for HSSFCWs. HSSFCWs had the capacity to reduce a wide range of organic and inorganic compounds. Most effluent pollutants, including BOD, COD, pathogens, TSS, TKN, TP, TDS, cadmium, lead, mercury, copper, zinc, chromium, and arsenic, remained within the regulatory limits. Vetiver and basalt exhibited remarkable efficacy in HSSFCWs for municipal wastewater treatment.

Env-06: **Bringing Equity into the Multi-Scalar Governance Approach to Urban Water Management: Some Insights from the Case of Bangkok Metropolitan Administration (BMA)**

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Equitable urban water management is a complex urban governance issue because it is concerned with multiple sets of actors, resultant constellations of actions, and wide disparity in the geographical-administrative conditions. At the same time, this issue has been rearticulated into the context of urban sustainability and adaptation as myriad cities are trying to achieve sustainability (Tosun & Leopold, 2019). A body of scholarship on multi-scalar governance attempts to understand the complex interactions between networks of various actors and their actions at different governance levels and geographical scales that entail a new form of governance arrangement (Leck & Simon, 2013; Dowling, McGuirk & Maalsen, 2018). Particular emphasis is placed on cities as an enabler in the multi-scalar adaptation processes (Traill & Cumbers, 2023). The growing literature on sustainability-oriented urban adaptation similarly emphasises multi-scalar connections between international, national, local (including local communities) adaptation dynamics (Archer et al., 2014). In this respect, it is of massive importance to attend to 'inequity issues underlying adaptation' (Moser, 2019: 313), i.e., the distribution of urban water policy benefits between the privileged vis-à-vis deprived communities. Against this backdrop, cross-sector, multilevel, multi-scalar adaptation to align different agendas, priorities, and demands are essential in achieving equitable governance outcomes.

Env-07: **A study of Aluminum contamination in fish by irradiating neutrons from a reactor**

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This research is to determine the concentration of aluminum in various parts of fish by using the radiochemical neutron activation analysis (NAA) method by comparing with aluminum in standard samples. This research is analyzed aluminum (Al-28) at an energy of 1779 keV using a gamma-ray spectrometer (GRS) high purity germanium probe (HpGe) with a multichannel analyzer (MCA), which this analysis able to evaluate the aluminum levels with a low concentration. The research evaluation starts with prepared fish samples in polyethylene containers and uses the standard relative method of analysis by counting the sample and the standard sample in the same geometry. The research result from 30 samples found that the aluminum concentration in various parts of fish vary approximately 5-10 mg per kilogram with an uncertainty value of ± 2-5%. However, this research require repeated measurements to find the average and analyze Al-28 to be more accurate and accurate.

Env-08: # Study of the appropriate amount of salt combined with irradiation in Salted Indo-Pacific mackerel fish (Scomberomorus guttatus) Process

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Salted Indo-Pacific mackerel fish (Scomberomorus guttatus) is considered a food preservation method that is the wisdom of the Thai people. The Salted Indo-Pacific mackerel fish are many production sources depending on the area. However, the main process is taking salted Indo-Pacific mackerel fish with all the fish intestines removed. It is fermented with sea salt for about 3-4 days. This process takes place on a fishing boat. At present, the production process for salted Indo-Pacific mackerel fish has changed greatly easy to be degraded by disease-causing microorganisms and histamine that occurs during the fermentation process. There is affecting the current consumer disapproval. Moreover, at present there is a high amount of salt added (approximately 16 percent) that it is affecting the health of consumers. Radiation is a technology that has been applied to a variety of applications, including medicine and food preservation. Radiation is using the source from the cobalt-60 machine which emits gamma rays food irradiation. It is a type of food processing process that can be used to destroy microorganisms that cause disease. Therefore, the Faculty of Business Administration has developed organic fish By reducing the amount of salt used in the fermentation process of salted fish together with the irradiation process.

Env-09: **Utilizing spatial analysis of hotspots to enhance reconnaissance UAV technology for PM2.5 mitigation in Phitsanulok province, Thailand**

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Open biomass burning, including forest fires and the burning of agricultural waste, is a significant contributor to air pollution, particularly in Phitsanulok Province, where the issue peaks between January and April each year. Data from 2016 to 2020 reveals that over 7,600 square meter of land was damaged by forest fires, leading to severe environmental degradation, economic loss, and social disruption. These fires release large amounts of particulate matter (PM2.5) and other pollutants into the atmosphere, exacerbating air quality issues and posing serious public health risks. Efficient monitoring and surveillance of these fire-prone areas are essential for mitigating the impact of such events. This study aims to address these challenges by developing a forest fire monitoring and surveillance system that leverages advanced geospatial technologies. By integrating remote sensing with reconnaissance unmanned aerial vehicles (UAVs), the system employs to improve the accuracy and timeliness of fire detection, enabling more effective and proactive management of fire risks. The proposed system provides real-time geospatial data through maps that outline flight paths, coordinates, and elevation information, which can be used by UAVs for fire reconnaissance and suppression operations. This system also tracks the location and density of hotspots over specified time periods, providing critical insights into the spatial and temporal patterns of fire occurrences. By offering this level of detail, the system enables rapid and informed decision-making, allowing authorities to prioritize high-risk areas and allocate resources more effectively. Moreover, the system's data can be exported to guide UAVs in performing aerial surveys and fire suppression tasks, ultimately helping to reduce fire damage and its associated environmental, economic, and social impacts. Future system development will integrate artificial intelligence (AI) and advanced data analytics to improve fire event forecasting, creating a comprehensive monitoring framework that both addresses current fires and anticipates future risks. This will enhance air pollution control and support appropriate technology for pollution management in Phitsanulok Province.

Env-10:   **Spatial analysis of the relationship between PM2.5 emission inventories and satellite monitoring data in northeastern and eastern Thailand and neighboring countries**

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Air pollution, particularly fine particulate matter (PM2.5), is a major public health concern in Thailand. This study examines the spatial relationship between PM2.5 concentrations and emissions from open biomass burning in northeastern and eastern Thailand, integrating meteorological factors such as Planetary Boundary Layer Height (PBLH), humidity, air pressure, and wind speed. The Geographically Weighted Regression (GWR) model was used to assess how these variables affect PM2.5 dispersion and concentrations based on satellite data. Results indicate that meteorological factors significantly influence PM2.5 levels, with lower PBLH associated with higher surface-level concentrations, and higher humidity linked to increased PM2.5 due to secondary aerosol formation. Wind speed and air pressure also impact pollutant dispersion, with stagnant conditions exacerbating pollution. However, no significant correlation was found between biomass burning emissions and satellite-observed PM2.5 during the peak dry season (January–April), suggesting that current emission models may underestimate cross-border pollution from neighboring countries like Laos and Cambodia. These findings underscore the complexity of air pollution modeling in transboundary areas and the need for more accurate regional emission inventories and improved international collaboration. Furthermore, the influence of meteorological conditions highlights the importance of incorporating local weather data into air quality management strategies and public health warnings. In summary, while meteorological factors are crucial in determining PM2.5 levels, discrepancies between predicted emissions and satellite data need to be refined models to better account for transboundary pollution, ensuring more effective air quality management in Thailand and neighboring regions. In future work, emphasis should be placed on developing more effective pollution prevention strategies by improving emission control measures for open biomass burning and incorporating stricter regulations on cross-border pollution.

Env-11:

Development of water bills management platform in suburban areas of Thailand

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Managing water utilities in municipalities faces challenges from high operational costs, inefficiencies, and limited transparency, often stemming from manual data processes. This study compares three billing methods—traditional, Water Management Platform (WMP), and Smart Meter—on cost, efficiency, and transparency. The traditional system, requiring 28 days per billing cycle, incurs annual costs and risks frequent errors. WMP, integrating NFC, QR codes, and OCR, reduces costs by 57.1%, shortens billing to 10 days, and enhances transparency via LINE Official Account notifications and digital payments. While Smart Meters offer real-time accuracy and eliminate fieldwork, high setup costs limit their feasibility. WMP emerges as a balanced, scalable solution, providing cost-effective accuracy and improved service transparency for municipalities.

Env-12:

The Relation between land used – landcover and Fire Hotspot: A comparative study in Laos, Myanmar and Thailand

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This study investigates the relationship between land use, land cover, and fire hotspots through comparative analysis across Laos, Myanmar, and Thailand, with a focused case study in Chomphet district, Luang Prabang province, Laos. Utilizing geographical mapping and satellite imagery, the research identifies specific locations where burning activities are concentrated, emitting smoke that contributes to regional air quality concerns. Through qualitative and quantitative methodologies, the study examines land use practices that drive these burning activities, including deforestation for agriculture, land clearing, and other related processes. Additionally, the research delves into how these practices influence the livelihoods of local farmers by assessing crop cultivation, livestock rearing, and resource extraction, and explores the potential socioeconomic and food security implications of burning practices. Findings from this research are expected to enhance understanding of the complex relationship between land use and fire hotspots, offering insights into sustainable land management strategies and regional policy interventions aimed at mitigating environmental impacts while supporting rural livelihoods.

Development

SD-01: Community Networks' Participation for Municipal Solid Waste Management Sustainability: An Empirical Study of Nan Province, Thailand

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In recent years, several efforts have been carried out to discover an effective solution to the worldwide wasteproblem. One of the most important aspects nowadays is the role of the community in waste management. Several examples ofcommunity engagement have reinforced the perception of government that the community cannot isolate functioning and planning for municipal solid waste management and also require active participation for environmental protection from waste. Thisresearch aims to contribute a better quality of life in Yod Sub-district by fostering improved waste management practices,promoting environmental sustainability, and mitigating health risks associated with improper waste disposal. This study employs a mixed research methodology combining both quantitative and qualitative approaches. Data were gathered through interviews and questionnaire survey utilized descriptive statistics, including measures such as frequency, percentage, mean, standard deviation, correlation, regression, and content analysis. The study's results revealed several key findings such as more than 50 percent of all respondents had previous work experience in management roles related to community waste management 4 to 6 years. They were mostly willing to participate the community waste management efforts. Age (X1) (r = .491) had a moderatelypositive and statistically significant relationship with participation in community waste management at the .01 level. Multiple regression analysis indicated that age (X2) significantly affects participation in community waste management (Y). Together,these variables predict 61.30% of the variation in community waste management participation among residents of Yod Subdistrict,Song Kwae District, Nan Province, with statistical significance at the .05 level. During the interviews, participants emphasized the importance of increasing opportunities for citizen participation in waste management policy-making and management processes. This finding light up the community policy to enhancing community networks' participation in municipal solid waste management sustainability.

SD-02:

Attaining Sustainability and Carbon Neutrality via Socioeconomic Factors in Higher Education within the Framework of Commitment to SDG 13

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Global climate action under SDG 13 has placed higher education institutions at the vanguard of carbon neutrality efforts. This study examines the impact of socioeconomic factors on the implementation of sustainable carbon neutrality at universities, concentrating on three primary dimensions: knowledge, attitudes, and involvement. Data were gathered from 420 university staff members at Rajamangala University of Technology Thanyaburi (RMUTT) using stratified random selection. The study tool exhibited robust content validity (0.70-1.00) and reliability (0.89). Statistical analyses comprised descriptive statistics, t-tests, and one-way ANOVA with Scheffe's post-hoc comparisons ($\alpha = 0.05$). The study findings indicated elevated levels of carbon neutrality knowledge, with 46.19% attaining excellent grades, favorable views (Mean=3.82, SD=0.54), and engaged participation (Mean=3.53, SD=0.72). Key socioeconomic factors comprised gender, age, educational attainment, work experience, and prior carbon literacy ($p < 0.05$), however marital status exhibited no significant impact. Male employees displayed elevated engagement levels, younger employees (ages 25-34) shown superior knowledge and participation, and individuals with advanced educational qualifications exhibited enhanced comprehension of carbon neutrality. These findings offer evidence-based insights for formulating focused strategies to improve institutional carbon neutrality initiatives, hence advancing the broader application of SDG 13 in higher education settings.

SD-03: Rama VI house style: A hidden heritage in Bangkok

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Heritage is always described as valuable object or cultural feature passed to the next generation. However, heritage in the city is now being deteriorated due to urbanization process. It is necessary to safeguard the cultural heritage by documenting the hidden heritage in urban context. A house is an identifying ground for transmitting non-verbal messages and meanings of the dwellers' identities and it has long been recognized as tangible heritage that encompasses various socio-political aspects of a specific time frame and a reflection of the essential character of the dwellers and the place to which it belongs. Each country has developed its own distinctive styles of houses according to environment and culture. In Thailand, geography and tradition are preeminent factors of house design and construction. Nevertheless, once the country had opened her door to welcome the new civilization from Western societies in the first two decades of the nineteenth century, the ways of lives of Thai people had changed in various aspects including the architectural design of residential buildings.

The construction of skyscrapers along the skytrain corridors seems to be ubiquitous in Bangkok. Day by day, the numbers of condominiums and commercial buildings are increasing replacing old communities in downtown areas. Therefore, the advance of urbanization gradually destroys the heritage of the cities. The present Phaya Thai, Sukhumvit, Ploenchit, Wireless, Silom and Sathorn roads have been known as the core business areas of Bangkok since their first construction in the King Rama VI period. Increasing business and diversifying industrial sectors effected change to the character and usage of Rama VI houses in these areas. The study of the remnants heritage houses along Phaya Thai, Sukhumvit, Ploenchit, Wireless, Silom and Sathorn roads is significance since it will raise awareness of heritage conservation in the public mind as well as of processes of change in that heritage.

The present study chooses the houses built in the period of King Rama VI during 1910-1925 A.D., which is considered a transitional period of the country from a traditional state to be a modern one. The importance of the Rama VI house style is the integration of Western principles and Thai local styles to produce the contemporary Thai house which reflects the intellectual aspect of the people at that time.

The purpose of this research is to examine and document the Rama VI house style or the houses which were built during the reign of King Rama VI in Bangkok and to study the impacts of urbanization on the remnant Rama VI houses. The area of study encompasses the roads in business area of Bangkok which have been constructed since the reign of King Rama VI. The research basically takes a descriptive and historical approach. The method using in this research is based on diverse data sources including the in depth interviews.

SD-04: **Risk Analysis of the Coffee Shop Supply Chain under the COVID-19 Pandemic Situation**

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This study aims to investigate the problems and analyze the risks of the coffee shop supply chain under the COVID-19 pandemic situation. The fishbone diagram technique is used for analyzing the causes of problems, and a five-level risk assessment is conducted with a case study of a coffee shop in Phitsanulok province. The results indicate that the majority of issues stem from employees lacking skills and improper use of equipment. When assessing supply chain risks, it is found that the improper reception of coffee beans and storage in the warehouse, as well as the lack of safety standards in customer service within the shop before brewing coffee, are significant issues. The risk level score stands at 20. Consequently, the researcher has proposed guidelines by developing an operations manual and appropriate in-store safety standards. However, this study can also be applied to the supply chain of agricultural products or other food and beverage businesses to formulate further business strategies.

SD-05:

Exercise Skills for Muscle Rehabilitation in the Thai Elderly :A Pathway to Sustainable Quality of Life

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This study aimed to develop and evaluate a structured exercise program tailored for muscle rehabilitation in elderly individuals .The program emphasized resistance training, aerobic exercises, and flexibility routines, each customized to meet the unique needs of participants . By targeting improvements in muscle strength and endurance, the program aimed to enhance mobility, mitigate fall risks, and ultimately enhance overall quality of life among older adults . A cohort of 100 Thai elderly participants, aged 60 and above, presenting varying degrees of muscle weakness yet without severe mobility impairments, was recruited for this investigation .Participants were randomly assigned to either an intervention group, engaging in a 12-week exercise regimen, or a control group without specific exercise protocols .Muscle strength was quantified using handgrip dynamometry, while mobility and balance were assessed through the Timed Up and Go (TUG)test and the Berg Balance Scale (BBS). Quality of life was evaluated using the Short Form Health Survey (SF-36) the results indicated significant improvements in the intervention group compared to the control group .Participants who completed the exercise program demonstrated increased muscle strength, improved mobility and balance, and enhanced overall well-being .Specifically, handgrip strength increased by an average of 15%, TUG test times decreased by 20% , and BBS scores improved by 25 %. SF-36 results showed better physical health and reduced limitations in daily activities .These findings suggest that structured exercise programs can play a critical role in maintaining and improving the quality of life for the elderly, offering a sustainable pathway to enhanced physical and mental health.

SD-06:

Estimation and Reduction of Food Loss in the Upstream Small Broiler

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Food loss in the broiler supply chain occurs at every stage, from raising chicks to killing and processing, leading to economic and environmental impacts. However, the physical and economic data regarding the food loss of these broiler chickens are not readily available, making it urgent to understand these details for the growth and sustainability of this important food industrial sector. This study focuses on small broilers weighing less than 2 kilograms for domestic consumption, which is processed into specialized fried and grilled chicken. We explain the process/activities in the upstream side supply chain and present details of potential food loss that occur in this supply chain.

We also investigated and collected data from several farms and a slaughterhouse in two provinces of northeastern Thailand. The results of the data analysis show that the overall food losses in the upstream side of small broiler supply chain (farm – transport – slaughterhouse) is about 9.91 percent of the total, with an estimated yearly economic small broiler losses value of about 100 million baht at country level. The causes include inappropriate conditions in raising, transport, and storage, non-conforming production, and size grading. We present practical suggestions for reducing the losses.

SD-07: Organizational Carbon Footprint Assessment: A Case Study of a Coffee Shop in the Engineering Faculty at Naresuan University

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The assessment of an organizational carbon footprint has become increasingly important due to the growing concerns over global climate change and the need for environmental sustainability. This study evaluated the carbon footprint of a coffee shop located in the engineering faculty at Naresuan university. The operational boundaries of the study were calculated based on three scopes: 1, 2, and 3, which included energy consumption, waste generation, and supply chain activities. The results showed that the carbon footprint of the coffee shop was 240.6 ton CO_2 eq per year. The major contributor to the carbon footprint of the coffee shop was from scope 3, at 220.22 ton CO_2 eq per year (92%), followed by scope 2, at 12.14 ton CO_2 eq per year (5%), and scope 1, at 8.24 ton CO_2 eq per year (3%). The strategies to reduce carbon footprint of the coffee shop included switching from plastic containers to paper containers, setting air conditioners to 25-28 °C to reduce energy consumption, closing doors and windows tightly to reduce energy loss, and turning off electrical appliances when not in use, and using electricity from solar panels or switching to a hybrid grid mixed with solar energy. This case study demonstrates the importance of regular carbon footprint assessments for small businesses within educational institutions and serves as a model for similar assessments in other sectors and institutions.

SD-08:

Sustainable Aggregate Production Planning for Seasonal Products in Thailand

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This research involves the development of a sustainable production plan that offers a well-balanced profit to the company, good income for employees, job security without laying off, a safe workplace using fewer toxic chemicals, and a healthy environment using recycled packaging. This study compares multiple factors such as working days and wage per day, and applies a mathematical model to evaluate discrepancies, benefits, and drawbacks. In response, three interconnected goals of profit, social impact, and environmental responsibility are optimized by the proposed multi-objectives linear programming (MOLP) model. This model provides a workable solution for striking a balance between these conflicting goals, providing fair compensation to all workers, supporting environmental sustainability, and ensuring that they feel secure in their jobs while the business makes a healthy profit.

SD-09:

Potentials of the Greater Mekong Subregion (GMS): Striving towards a Regional Economic Integration

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The Greater Mekong Subregion (GMS) has abundant natural and cultural richness and is considered one of the world's most significant biodiversity hotspots. The region is an important food provider and the site of many large-scale construction projects, with social and economic implications. Mekong nations are increasingly shifting from subsistence farming to more diversified economies and open market-based systems. In parallel with this trend are the growing commercial relations among the six GMS countries, particularly in terms of cross-border trade, investment, and labor mobility. Natural resources, including water for hydropower, agriculture, and fisheries, as well as timber, petroleum, and minerals, continue to contribute significantly to the growth of the subregion. For regional economic integration, connectivity is a key factor in the GMS. This study aims to understand and explore the potential of the Greater Mekong Subregion in terms of economic activities for regional economic growth. This study provides an analysis of the economic potential of the GMS towards building regional economic integration by means of economic enablers such as infrastructure, trade, and market. The challenges ahead in terms of utilizing the potentiality of GMS include cooperation among the nations for economic growth scale in the region.

SD-10: **Improving Construction Planning through the Repetitive Scheduling Method for the Sustainability of Small Housing Development Project**

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This research presents an improvement in construction planning through the application of the Repetitive Scheduling Method to support sustainable project management in a small housing development project, demonstrated through a case study in Phitsanulok Province, Thailand. The approach integrates 4D Building Information Modeling (BIM) to simulate workflows before implementation, facilitating better coordination among team members. The revised strategy involves reorganizing work teams and restructuring the construction sequence, shifting from building two houses at a time to three while adhering to resource and financial constraints. The new plan was tested in actual construction, demonstrating enhanced project management efficiency, particularly by accelerating the completion timeline and increasing overall productivity with minimal changes to labor input. The results indicate improved utilization of labor and machinery compared to the previous planning method. The optimal construction is shown to be building three houses per cycle; however, constructing more than six houses at once could negatively impact the project's working capital. This study highlights the benefits of repetitive scheduling for resource optimization and sustainable project execution.

SD-11: **Khon Kaen University's Strategic Transformation: Empowering Sustainable Development and Innovation in the Greater Mekong Subregion**

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Khon Kaen University (KKU), a leading institution in Thailand's Northeastern region, is undergoing a comprehensive strategic transformation to advance sustainable development, environmental stewardship, and community resilience. Aligned with the Greater Mekong Subregion's (GMS) goals of promoting regional sustainability, economic growth, and cross-border collaboration, KKU has embedded a strong commitment to social sustainability within its institutional mission, embracing a core value of social devotion and societal contributions. This commitment is further highlighted by KKU's achievements in supporting the United Nations Sustainable Development Goals (UNSDGs), as evidenced by its prominent standing in the Times Higher Education (THE) Impact Rankings.

SD-12: **What stimulates Generation Z event attendees to engage in environmentally responsible behaviour for special events?**

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The hospitality and tourism industry such as special events are those that occur at a specific time and place and have a particular set of themes. Such events may be range in size from mega-events to small community festivals (Getz & Page, 2016; Goldblatt, 2002). Industry Although the rapid growth of tourism and special events boosts global economic development and contributes to the global gross domestic product, event-related activities have a number of negative impacts on a destination's ecological health, including its carbon footprint, waste generation, resource consumption and biodiversity (Mair & Smith, 2022; Su et al., 2020). Improving event attendees' environmental engagement can help mitigate these negative environmental impacts and have a positive influence on the long-term success of host destinations.

Guidelines for GMSARN 2024 Paper Presentation

This guideline gives some instructions to authors for their presentation of papers in the *19th GMSARN International Conference 2024* 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 19th GMSARN International Conference 2024 should be limited to less than 12-15 minutes.

❖ The maximum number of slides for your presentation should be limited to around 15-20 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 Power Point (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* 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.

Excursion Trip to Koh Rong Island (Optional)

Thursday 21 November 2024

13.00 hour: Pick up GMSARN Group at Lobby, RIVA Hotel, Sihanoukville City
                      (Take ~20 mins)
13.30 hour: Arrive Pier and Go to Koh Rong by Speed Boat (Take ~45 mins)
14.15 hour: Arrive Koh Rong Island and take Tuk-Tuk to:-
                      - Visit Long Beach
                      - Visit Prek Ta Sok Eco-Tourism
17.00 hour: Leave to Sihanoukville City (Take ~ 45 mins)
18.00 hour: Arrive Pier and Go back to hotel
18.30 hour: BBQ Dinner at RIVA Hotel (roof top)

Located just off the coast of Sihanoukville, Cambodia, Koh Rong is famous for its serene beauty. Often described as an 'island paradise' by visiting tourists, the island boasts pristine white sandy beaches, warm crystal-clear ocean waters, and a hot tropical climate. Here's all the latest information on Koh Rong's beaches, tourism, history, geography, villages, and celebrity status.

Remark: *The programs may change without prior notice.*

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GMSARN International Journal

The GMSARN International Journal is dedicated to advance knowledge in energy, environment, and sustainable 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.

GMSARN International Journal (ISSN 1905-9094) is a quarterly journal currently publishing four issues per year which is open-access through www.gmsarnjournal.com. Editor-in-Chief of the Journal is Prof. Dr. Weerakorn Ongsakul (AIT). Associate Editors are Assoc. Prof. Dr. Vo Ngoc Dieu (HCMUT), and Asst.Porf.Dr. Jirawadee Polprasert (NU). Some high quality GMSARN conference papers will be selected for peer review before publishing in GMSARN International Journal. Paper submission could also be sent directly to gmsarn@ait.ac.th.

GMSARN International Journal is in Thailand Citation Index (Group 1), ASEAN Citation Index (ACI), Google Scholar, and SCOPUS Database since 2017 (Q4).

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