



AIT
Asian Institute of Technology

Annual Report 2017

**Department of Energy,
Environment and Climate Change**



School of Environment, Resources and Development

Creating leaders for sustainable Asia and beyond



Welcome to the Department of Energy, Environment and Climate Change (EECC)

Energy, Environment and Climate Change are the key pressing issues of the 21st century. Addressing these challenges requires both systematic and multidisciplinary perspectives. To this end, the formerly 'Field of Study' have been combined under the new departments to efficiently develop integrated programs and curriculum, and pool all administrative workloads from the field level to the departmental level, freeing faculty members with more time for teaching and research while also allowing the students to enjoy a more multidisciplinary setting and flexibility in learning.

Hence, the Department of Energy, Environment and Climate Change (EECC) is formed under the School of Energy, Resources and Development (SERD) at the Asian Institute of Technology (AIT).

As a year has passed, we like to present to you our accomplishments over the year. We also like to take this opportunity to thank you for your support, goodwills, collaborations and advices in making 2017 a success. We strive for new types of academic programs, new ways of teaching, fostering skills and innovation, developing next generation leaders to lead sustainable Asia and beyond, and carry out solutions oriented research and outreach activities.

We look forward to your continued support as always.

Thank you



Dr. Shobhakar Dhakal

Associate Professor & Head
Department of Energy, Environment and Climate Change
School of Environment Resources and Development
Asian Institute of Technology, Thailand.



Highlights

Dr. Ekbordin Winijkul



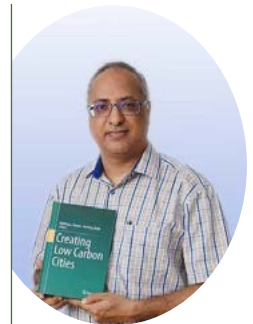
Dr. Ekbordin Winijkul has joined as Assistant Professor in the Department of Energy, Environment and Climate Change at AIT's School of Environment, Resources and Development (SERD).

Dr. Ekbordin received his Bachelor's in Environmental Engineering from Chiang Mai University, and a Master's in Environmental Technology and Management from AIT. He received his Ph.D. in Environmental Engineering from the University of Illinois at Urbana-Champaign (UIUC), USA. Prior to joining AIT, Dr. Ekbordin worked as an Emission Scientist at the Atmospheric and Environmental Research (AER), Inc., Massachusetts, USA, and as Assistant Environmental Engineer at Argonne National Laboratory, Illinois, USA.

Dr. Shobhakar Dhakal

Dr. Shobhakar Dhakal have been appointed as the head of the Department of Energy, Environment and Climate Change. As part of the major academic administrative restructuring, six faculty members were appointed as Heads of the departments at AIT.

Dr. Shobhakar Dhakal joined AIT as Associate Professor in August 2012. Dr. Dhakal was Executive Director of the Global Carbon Project, an international scientific program hosted by the National Institute for Environmental Studies (NIES) in Japan (2006-2012) and a Senior Policy Researcher and the Project Manager of Urban Project of the Institute for Global Environmental Strategies (IGES) Japan (2001-2006).



Prof. Weerakorn Ongsakul

Dr. Weerakorn Ongsakul has been promoted to the rank of Professor. His elevation was confirmed at the meeting of the AIT Board of Trustees held on 16th February 2017.

Dr. Weerakorn joined AIT as an Assistant Professor in the Energy Program of the School of Environment, Resources and Development (SERD) in January 2001. He obtained both his Ph.D. and Master's degrees in Electrical Engineering from Texas A&M University, College Station, Texas, U.S.A. in 1994, and 1991, respectively. Dr. Weerakorn graduated from Chulalongkorn University, Thailand with the degree of Bachelor of Engineering in Electrical Engineering in 1988.

He has served as Dean of the School of Environment, Resources and Development (SERD) from September 2009 to June 2013.





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Overview

For 58 years, AIT has been serving the public as a premier institution that offers quality education in a wide range of career and technical education programs. Today, AIT is one of the leading regional postgraduate institution and actively works with public and private sector partners throughout the region and with some of the top universities in the world. Located 40 km north of Bangkok, AIT is proud to celebrate its history educating diverse student population and is committed to continuing the tradition of delivering excellence in higher education, research and outreach promoting technological change and sustainable development in the Asian-Pacific region.

EECC Department has distinctive academic and research programs with degrees offered in Energy, Environmental Engineering and Management, Climate Change and Sustainable Development, and Double Degree Programs.

- **Energy Academic Program (E)**
 - ↳ Energy Technology
 - ↳ Energy Policy, Planning and Economics
 - ↳ Electric Power System Management
 - ↳ MBA and PhD in Energy Business

- **Environmental Engineering and Management (EEM)**
 - ↳ Environmental Technology and Management
 - ↳ Water and Wastewater Engineering

- **Climate Change and Sustainable Development (CCSD)**

- **Double Degree Programs (AIT-IHE Water Institute for Water Education, the Netherlands)**
 - ↳ Environmental Technology for Sustainable Development
 - ↳ Urban Water Engineering and Management

At EECC, students will gain exposure to a mix of courses and independent study. In addition, students are encouraged to carry out experiments, surveys, analysis or even spending time abroad gathering information. Our courses are designed to produce distinctive leaders who can shape tomorrow and foreseeable future.

For more information, please visit our website at www.eecc.ait.ac.th



The Department in Numbers

Year 2017	January	Intersem	August
Total Students	226	164	224
New Enrollment			
Doctoral	1	-	7
Master	34	-	49
Special Program	4	2	3
Certificate Program	1	-	3
Certificate of Advanced Studies	-	-	2
Graduates			
Doctoral	3	-	3
Master	45	1	19
Special Program	1	-	-
Students Per Program			
Climate Change and Sustainable Development	15	14	21
Energy	100	80	108
Environmental Engineering and Management	103	62	91
Number of Courses Offered	22	7	23
Number of Faculty and Staff			
Regular Faculty	12		
Visiting Faculty/Emeritus	4		
Laboratory Staff	6		
Administrative Staff	5		
Project Staff	47		
Grants and Sponsored Research Projects			
Research Projects in 2017	Number of Projects	Value of Projects (THB)	
Completed Projects	18	43,643,295	
Ongoing Projects	10	242,226,579	
Initiated projects	22	119,072,330	



Courses Offered

January Semester 2017

Code	Course Title	Credits	Instructor
Climate Change and Sustainable Development			
ED82.07	Climate Change Mitigation	2(30-0)	Dr. P. Abdul Salam
ED82.08	Economics of Climate Change	2(30-0)	Dr. Shobhakar Dhakal
ED82.09	Climate Change Seminar	1(0-45)	Prof. Jayant Kumar Routray
ED82.10	Climate Change, Agriculture and Food Security	3(45-0)	Dr. Abha Mishra
ED82.12	Climate Change Impacts and Adaptation in Fisheries and Aquaculture	2(30-0)	Dr. Krishna. R. Salin
ED82.13	Analytical Tools for Climate Change Adaptation at Local Level	3(30-45)	Dr. Nicolas Faysse
Energy Academic Program			
ED72.13	Development and Evaluation of Energy Projects	3(30-45)	Dr. Shobhakar Dhakal
ED72.19	Biomass Conversion	3(30-45)	Dr. P. Abdul Salam
ED72.21	Power System Dynamics and Stability	3(30-45)	Dr. Jai Govind Singh
ED72.22	Power Sector Management Under Deregulation	3(45-0)	Prof. Weerakorn Ongsakul Dr. Jai Govind Singh
ED72.23	Optimization and AI Applications in Power System	3(30-45)	Prof. Weerakorn Ongsakul
ED72.25	Energy Economic Modeling and Policy Analysis	3(30-45)	Dr. Shobhakar Dhakal
ED72.28	Solar Energy	3(30-45)	Prof. Sivanappan Kumar Dr. Anis Zaman
ED72.39	Clean Coal Technologies and Carbon Capture and Sequestration	3(45-0)	Dr. P. Abdul Salam
ED72.48	Workshop on Energy Issues and Communication	1(0-45)	Dr. Jai Govind Singh
Environmental Engineering and Management			
ED78.08	Environmental Quality Management	3(45-0)	Prof. Ajit P. Annachhatre
ED78.10	Environmental Health and Sanitation	3(45-0)	Dr. Thammarat Koottatep
ED78.16	Applied Microbiology and Laboratory	3(30-45)	Dr. Oleg Shipin
ED78.17	Advanced Processes for Wastewater Treatment, Reuse and Recycling	2(30-0)	Prof. Ajit P. Annachhatre
ED78.19	Environmental Impact Assessment	3(45-0)	Dr. Oleg Shipin
ED78.20	Industrial Waste Abatement and Management	3(45-0)	Prof. Chettiyappan Visvanathan
ED78.24	Design of Air Pollution Control Systems	3(45-0)	Prof. Nguyen Thi Kim Oanh Dr. Ekbordin Winijkul

Intersem 2017

Climate Change and Sustainable Development			
ED82.03	Principles and Practices of Sustainable Development	2(15-30)	Prof. Sivanappan Kumar Mr. Robert Doddridge Steele
ED82.14	Adaptation to Climate Change: Policies and Practices	2(30-0)	Dr. Mokbul Morshed Ahmad
Energy Academic Program			
ED72.47	Smart Grid and Electrical Energy Management Systems	2(30-0)	Dr. Jai Govind Singh
ED72.9028	Selected Topic: Renewable Energy Integration and DC Microgrid	1(15-0)	Dr. Jai Govind Singh
Environmental Engineering and Management			
ED78.14	Membrane Technology in Water and Wastewater Treatment	2(30-0)	Prof. Chettiyappan Visvanathan
ED78.39	Design of Water Supply and Wastewater Systems	2(15-45)	Dr. Thammarat Koottatep
ED78.9029	Selected Topic: Sustainable Consumption and Production	1(15-0)	Prof. Chettiyappan Visvanathan

Code	Course Title	Credits	Instructor
Climate Change and Sustainable Development			
ED82.02	Science of Climate Change and Impacts	2(30-0)	Dr. Avishek Datta
ED82.04	Climate Compatible and Sustainable Infrastructure Development	3(45-0)	Dr. Vilas Nitivattananon
ED82.05	Land Use and Climate Change	2(30-0)	Prof. Rajendra Prasad Shrestha
ED82.06	Climate Change Impacts, Vulnerability and Adaptation: Concepts, Tools and Practices	3(45-0)	Dr. Sangam Shrestha
ED82.11	Climate Change Adaptation and Disaster Risk	3(45-0)	Dr. Indrajit Pal
Energy Academic Program			
ED72.01	Energy Resources and Technologies	2(30-0)	Dr. P. Abdul Salam
ED72.06	Design and Management of Energy Systems	3(30-45)	Dr. P. Abdul Salam
ED72.07	Power System Design and Operation	3(30-45)	Dr. Jai Govind Singh Prof. Weerakorn Ongsakul
ED72.08	Power Distribution Systems	3(45-0)	Dr. Jai Govind Singh
ED72.10	Computer Aided Power System Analysis	3(30-45)	Prof. Weerakorn Ongsakul
ED72.12	Energy Statistics and Energy Demand Forecasting	3(30-45)	Dr. Aumnad Phdungsilp
ED72.30	Energy, Environment and Climate Change: Issues and Strategies	2(30-0)	Prof. Sivanappan Kumar Dr. Shobhakar Dhakal
ED72.37	Integrated Approach to Energy Auditing	3(30-45)	Dr. Brahmanand Mohanty
ED72.44	Rational Use of Energy in Buildings	3(30-45)	Dr. P. Abdul Salam Dr. Brahmanand Mohanty
ED72.46	Carbon Markets and Carbon Finance	3(45-0)	Dr. Shobhakar Dhakal
ED72.51	Environmental Policy and Management of Energy Systems	3(45-0)	Prof. Ravi Prakash
Environmental Engineering and Management			
ED78.01	Environmental Chemistry & Laboratory	3(30-45)	Dr. Oleg Shipin
ED78.07	Solid Waste Management	3(45-0)	Dr. Thammarat Koottatep
ED78.22	Air Pollution Modeling and Applications	3(45-0)	Dr. Ekbordin Winijkul
ED78.23	Hazardous Waste Technology and Management	2(30-0)	Prof. Ajit P. Annachatre
ED78.35	Wastewater Treatment	3(45-0)	Prof. Ajit P. Annachatre
ED78.36	Drinking Water Treatment	3(45-0)	Prof. Chettiyappan Visvanathan
ED78.37	Air Pollution Engineering and Management	3(45-0)	Prof. Nguyen Thi Kim Oanh Dr. Ekbordin Winijkul



Special Lectures



Dr. Nawa Raj Khatiwada, Associate Professor, Department of Environmental Science and Engineering, Kathmandu University, Nepal, delivered a special lecture on “Sanitation Challenges in Nepal and Ways Forward”

Date: Tuesday, 14th February 2017

Time: 13.00 - 14.00 hrs.

Room: E222, Academic Building

Mr. Andrew Parker, Research Fellow, Institute for Advanced Sustainability Studies, Germany delivered a special Lecture on “Solar Radiation Management (SRM) Geoengineering”

Date: Friday, 3rd March 2017

Time: 10.00 - 11.00 hrs.

Room: E222, Academic Building



Dr. Christa Hasenkopf, CEO and co-founder of OpenAQ (the first open-source, open air-quality data platform for the world), New York, USA, delivered a special Lecture on “Open AQ: An Open Data Platform and Community Fighting Air Inequality”

Date: Monday, 6th March 2017

Time: 14.30 - 15.30 hrs.

Room: S101, SERD Meeting Room

Dr. Keith Bettinger, Team Leader for Capacity Building, USAID Adapt Asia-Pacific Project, based in Bangkok delivered a special lecture on “Economic Justification and Cost-Benefit Analysis for Climate Change Adaptation Projects”

Date: Monday, 6th March 2017

Time: 08:00 - 10:00 hrs.

Room: ET108, Energy Building



Dr. Ramunė Albrektienė, Lecturer, Department of Chemistry and Bioengineering, Vilnius Gediminas Technical University, Lithuania, delivered special lecture on “Technologies of Drinking Water Treatment”

Date: Tuesday, 7th March 2017

Time: 9.00 - 10.00 hrs.

Room: E222, Academic Building

Dr. Ramunė Albrektienė, Lecturer, Department of Chemistry and Bioengineering, Vilnius Gediminas Technical University, Lithuania, delivered special lecture on “The Quality of Drinking Water in Lithuania and Europe”

Date: Wednesday, 8th March 2017

Time: 9.00 - 10.00 hrs.

Room: E222, Academic Building



Prof. Dominique LAFFLY, University of Toulouse, France delivered a special lecture on “What is it a GIS?”

Date: Tuesday, 11th April 2017

Time: 13.30 - 15.30 hrs.

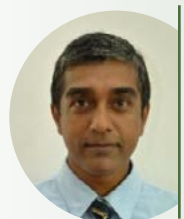
Room: S101, SERD Meeting Room

Prof. Matthias Ruth, Professor at the School of Public Policy and Urban Affairs and Department of Civil and Environmental Engineering, Northeastern University, Boston delivered a special lecture on “Robust Strategies for Urban and Regional Energy System Resilience”

Date: Monday, 24th April 2017

Time: 10.30 - 12.00 hrs.

Room: ET238, Energy Building



Dr. Kazi Sarwar Hasan, Managing Director, Innosep Company Ltd., Bangkok delivered a special lecture on “Working with Membrane: A Carrier Development”

Date: Friday, 14th July 2017

Time: 11.00 – 12.00 hrs.

Room: E222, Academic Building

Prof. Selahattin Incecik, Atmospheric Science, Department of Meteorology, Istanbul Technical University, Turkey delivered a special lecture on “The LOCLIM3 ERAfrica EU Project - Project Groups: the Cairo University, Free University of Berlin, Istanbul Technical University and Jomo Kenyatta University”

Date: Friday, 4th August 2017

Time: 13.30 – 14.30 hrs.

Room: E222, Academic Building



Mr. Hang Dal, Project Engineer at the Infra Capital Myanmar delivered a special lecture on “Wind Resource Analysis and Wind Farm Development in Myanmar”

Date: Saturday, 26th August 2017

Time: 11.00 - 12.00 hrs.

Room: ET108, Energy Building



Dr. Prapat Pongkiatkul, Head, Department of Environmental Engineering, King Mongkut's University of Technology Thonburi (KMUTT), Bangkok, Thailand delivered a special lecture on “Receptor modeling application (i.e. CMB and PMF model demonstration)”

Date: Thursday, 14th September 2017

Time: 10.00 - 12.00 hrs.

Room: E222, Academic Building

Dr. Samir Kumar Khanal, Associate Professor, Bioengineering Bioenergy and Environment Research Group, Department of Molecular Biosciences and Bioengineering, Collaborating Professor, Iowa State University, University of Hawaii at Manoa, Honolulu, Hawaii, USA delivered a special lecture on “Research Interfacing Energy and Environment: Linking Fundamentals to Applications”

Date: Wednesday, 6th December 2017

Time: 10.30 - 11.30 hrs.

Room: S101, SERD Meeting Room



Dr. Amimul Ahsan, Associate Professor, Department of Civil Engineering, Uttara University, Dhaka, Bangladesh delivered a special lecture on “Development of Panel Heater-Triangular Solar Still to produce pure water from saline water”

Date: Thursday, 7th December 2017

Time: 13.00 – 14.00 hrs.

Room: S101, SERD Meeting Room

Dr. Li Cong, Associate Professor, Zhejiang University, PR China delivered a special lecture on “Disinfection by products of EDCs chlorination in water distribution systems”

Date: Thursday, 7th December 2017

Time: 15.00 – 16.00 hrs.

Room: S101, SERD Meeting Room



Doctoral Student Seminars

Mr. Atthavute Ruenruengjai, a doctoral student in Energy program specialising in Energy Technology delivered a doctoral seminar on;

Date: Thursday, 20th April 2017
Time: 11.00 – 12.00 hrs.
Room: ET111, Energy Building



Mr. Atthavute has worked for several years at the Energy and Environmental Engineering Center, Kasetsart University, Kamphaeng Saen campus. His doctoral research topic is “Rice straw utilization via thermochemical process” in Department of Energy, Environment, and Climate Change, School of Environmental Engineering and Management at Asian Institute of Technology.

Mr. Sittichoke Pookpunt, a doctoral student in Energy program delivered a doctoral seminar on;



Date: Monday, 29th May 2017
Time: 12.00 – 13.00 hrs.
Room: ET238, Energy Building

Mr. Sittichoke is also a faculty member at Naresuan University Thailand. His expertise includes Optimization, Renewable Energy, Energy Conversion, Energy Conservation, and Engine Calibration. His doctoral research topic is “Optimal wind turbine placement using PSO-TVAC”. He is working under supervision of Prof. Weerakorn Ongsakul.

Ms. Lu Li, a doctoral student in Environmental Engineering and Management program delivered a doctoral seminar on;

Date: Thursday, 22nd June 2017
Time: 14.00 – 15.00 hrs.
Room: S101, SERD Meeting Room

Ms. Lu Li is an advisee of Prof. Chettiyappan Visvanathan. Her PhD dissertation is titled, “Development of A Membrane Bioreactor for the Treatment of Polluted Surface Water”. Considering that surface water is the major source of water in many developing countries, her thesis relates to the global challenge of treating polluted water, mostly comprising organic pollutants. Her studies concentrate on utilizing these organic matters as substrates for microbial growth. As such, she is working to develop an attached growth membrane bioreactor (aMBR) for treating the polluted surface water with CODMn around 10 mg/L. Her research concern includes topics such as, but not limited to, bio carrier type and filling ratio, membrane fouling, bio-kinetic coefficients and endogenous respiration, mathematical modelling, resin fraction, UF fraction, FEEM analysis, Orbitrap FT-MS for DOM molecular characterization and advanced oxidation integrated into aMBR process.



Mrs. Onicha Meangbua, a doctoral student in Energy program delivered a doctoral seminar on;

Date: Thursday, 31st August 2017

Time: 13.00 – 14.00 hrs.

Room: S101, SERD Meeting Room



Mrs. Onicha is also a faculty member at College of Interdisciplinary Studies, Thammasat University Thailand. Her previous research includes topics from Agriculture Economics and International Trade & Economics. Her doctoral research topic at AIT is “Impact of Consumption and Trade on Energy Requirements and CO₂ Emissions in Thailand”. She is working under supervision of Dr. Shobhakar Dhakal.

Mr. Satya Swarup Nanda, a doctoral student in Environmental Engineering and Management program delivered a doctoral seminar on “Sustainability evaluation for the eucalyptus based agroforestry in Thailand”.

Date: Thursday, 9th November 2017

Time: 13.00 – 14.00 hrs.

Room: S101, SERD Meeting Room



Mr. Satya Swarup Nanda, is also working as Chief Researcher (Environmental Development) at D.A. Research Center Co., Ltd. (Double A Group), Thailand. His research interests include; Environmental Planning, Strategy and Resource Development, Environmental Footprints, Life Cycle Assessments, GHG Emission and Climate Change Impact, Sustainability Roadmap Development, Industrial Emission Control, Sustainable Consumption and Production, Agricultural Land Use, Development and Agroforestry. He is working under supervision of Dr. Oleg Shipin at Department of Energy, Environment and Climate Change.

Mr. Pasapong Gamonwet, a doctoral student in Energy program, delivered a doctoral seminar on “The impact of renewable energy pricing incentive policies in Thailand”.

Date: Wednesday, 13th December 2017

Time: 09.00 – 10.00 hrs.

Room: S101, SERD Meeting Room



Mr. Pasapong Gamonwet, is also an economist at Provincial Electricity Authority (PEA), Thailand. At AIT, he studies Energy Economics, Planning and Policy. His research interests include electricity tariff, distributed generation, renewable energy, and pricing incentive policy. He is working under supervision of Dr. Shobhakar Dhakal at Department of Energy, Environment and Climate Change.

Student Field Trips

Energy Resources and Technologies Field Trip

To supplement the classroom lessons and to provide clearer practical understanding and application of the energy technologies, Energy Resources and Technologies arranged a field trip to the Northern Thailand from 2nd - 6th October 2017.

Dr. P. Abdul Salam, the course instructor, led the team of over 50 students with assistance of Dr. Vu Duc Hien, Senior Laboratory Supervisor and Ms. Phornsinee Thanara, Administrative Secretary. The 5 days field trip covered nine energy establishments including seven power plants, one coal mine, and an oilfield.

1. PV Power Plant, Bang Pa-in, Ayutthaya

Objective:

- To study about how to produce electricity from solar energy using PV system
- To study the different pros and cons of using of solar PV technology

Impression and Conclusion:

This is renewable source of energy using solar radiation to

produce energy. Extraction of solar energy is weather dependent and cannot be operated at night. 11AM to 2 PM is the only peak hour to generate electricity. Winter is the best season to produce electricity as there is no cloud and weather is not hot. If there is temperature rise then losses are high.

The overall efficiency of the solar plant is quite low. Apart from its low capacity production and weather dependent, it is clean, quiet and is useful to rural household areas, especially for those areas which do not have electricity connected to the grid.



2. Geothermal Power Plant, Fang, Chiang Mai

Objective:

- To study about the power generation from geothermal plant

Impression and Conclusion:

This is the first geothermal power plant in Thailand and the first binary cycle geothermal plant in South East Asia. The plant is a demonstration project but they are planning it to expand and feasibility study is going on. The energy source for the binary cycle system is hot water from wells reaching approximately 160 meters below ground surface into a shallow hot water reservoir (formed in the fractured rock). Thus, the geothermal power

plant is renewable energy resource. Plant may have high investment to drill or excavate hot water spring but on long run the plant is sustainable. This can operate in isolated mode supplying power in small local area. Moreover, the hot water coming out from evaporator has temperature at 80°C and the same flow rate as that in inlet which can be used on various sectors such as drying fruits, air conditioning system, spa for tourism etc. At very low cost, we can have optimum advantages.

Cost of generation = 6 baht/unit
 Selling price = 2 baht/unit to PEA
 No financial benefit expected and no government subsidy because EGAT is a state enterprise.



3. Micro Hydro Power Plant, Fang, Chiang Mai

Objective:

To study generation of electricity from hydro resource



Impression and Conclusion:

Since the plant was shut down for maintenance we could not visualize the operation but got the information via demonstration and presentation.



4. Biogas Power Plant, Chiang Mai University

Objective:

To understand the bio gas power technology in detail
To study about the process of producing Compressed Biomethane Gas

Impression and Conclusion:

The main purpose of the plant is waste water treatment and

biogas is produced as a byproduct. Equalization tank is used to collect waste water from pig farm which is then pumped to digester and anaerobic digestion is done there. Since this plant is a demonstration plant so the bio fuel is used for transportation within the university. Storage tank made up of ceramic and fiber is used for storing CBG. 20 kg of CBG can be used to drive 200 km. The composition of CBG basically consists of methane (84%). CO_2 emission per day during full operation is 60 kg. Calorific value of gas (40.33-40.57) is maintained within the standard value of NGV.



5. Mae Moh Coal Mine, Lampang

Objective:

To study about the process of electricity generation from coal mine power plant
To study about the way of reducing environmental hazards from this plant

Impression and Conclusion:

Mae Moh power plant has maintained air pollution (SO_2 ,

NO_x , TSP) under the regulation value by using different technologies such as FGD, ESP, etc. Sulfur dioxide emission is around 50-100 ppm, but the regulation standard is 320 ppm. Nitrogen oxide is 250-400 ppm but the regulation standard is 500 ppm. Dust particles out of stack are about 20 mg/m_3 , while standard is 180 mg/m_3 . In addition to this it has also adopted ash management system. Fly ash (about 60%) is used as construction materials whereas dry ash (about 40%) is transported to ash dump pit. In conclusion, EGAT is also very conscious about the environment around the plant rather than only generating the electricity.



6. Transmission substation (230/115 kV), Phitsanulok 2

Objective:

To study different components of a substation

Impression and Conclusion:

Electricity Generation Authority of Thailand (EGAT) is the main body that manages and monitors Thailand's energy system. It does so through different Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA). EGAT has

control over the Generation, Transmission and Distribution System. Phitsanulok substation is a part of EGAT. It also owns different substations. It serves for Power system control, Transmission line maintenance, Substation equipment maintenance and Communication system maintenance. EGAT transmits electrical power through this substation to two groups of customer: Direct customer (Industries) and Provincial Electricity Authority (PEA). The transmission line is of different voltage level i.e.500 kV, 230 kV and 115 kV.



7. Sirikit Oilfield, Lankrabue, Kampaengphet

Objective:

To understand the process of oil exploration, production and refining

Impression and Conclusion:

Fang Oil field is the oldest oil field in Thailand and is still

producing oil. The first oil seepage was found on the ground surface in the dense jungle over a hundred years ago by local inhabitants. The oilfield has been investigated by pioneer explorers from different government sectors involved in oil exploration and production. When the Defense Energy Department (DED) took responsibility for the site in 1956, a new era of modern technologies of geological survey, 3-D seismic survey, and directional drilling wells have been seriously applied.



8. Rice Husk Power Plant, Phichit

Objective:

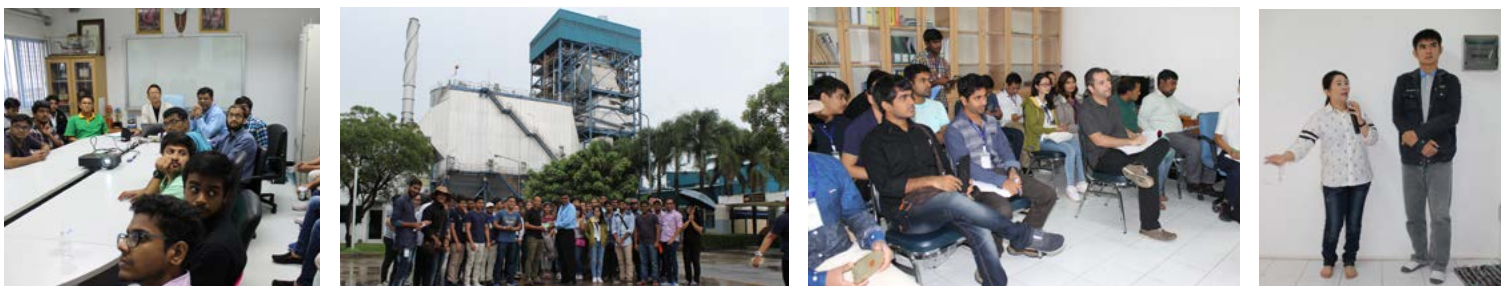
To study the overall biomass power plant process by using rice husk as fuel

To know how each equipment in each part of process doing

Impression and Conclusion:

This plant using a new technology of furnace, separate a rich husk

at the top and hard husk at the bottom. Old technology is convey rice husk on the conveyor into furnace and then burn directly. Using a very high efficiency of ESP, the efficiency is up to 99%. There is no waste water discharge. Biomass power plant use the bioplant such as rice husk or sugarcane as a fuel and produce much electricity to selling to grid in the MV line of EGAT. Biomass power plant takes long time for establish, install and completion for around 2 years, then plant can be started up.



9. Wind-turbine (EGAT), Lamtakhong, Nakhon Ratchasima

Objective:

*To learn how wind turbine works
To know the advantages and disadvantages of wind turbine*

Impression and Conclusion:

Wind turbine has no pollution to environment, except noise when

the blade against wind but it is not too loud. Properly design of wind turbine is 3 blade, it looks very suitable with column and beautiful. Producing a clean electricity by using clean source or renewable source. The wind turbine power plant can produce very much of electricity unit per each turbine by using the free energy or renewable energy and can distribute electricity to household in province area or selling back to EGAT.



Ms. Aagya Niraula, Masters in Energy (Nepal)

The above field trip report is contributed by Ms. Aagya Niraula, a Masters degree student in Energy program specializing in EPSM(Electric Power System Management). She joined AIT in August 2017. She received her Bachelor's degree in Electrical Engineering from Khwopa college of Engineering, Tribhuvan University, in Nepal. She is the first recipient of the President Robert B. Banks Scholarship.

Environmental Engineering and Management Field Trips



ED78.20:
Industrial Waste Abatement and Management, field visit to Bang Pa-In Industrial Estate, Ayudhya.

February 17, 2017

ED78.24: Design of Air Pollution Control Systems, field visit to Akkhie Prakarn Co., Ltd., Samut Prakarn.

March 10, 2017





ED78.20:
Industrial Waste
Abatement and
Management,
field visit to Green
Spot Co., Ltd.,
Pathumthani.

March 14, 2017

ED78.10:
Environmental
Health and
Sanitation, field
visit to Night Soil
Treatment Plant,
Thong Thawill
Co., Ltd., Rayong.

March 24, 2017



ED78.08:
Environmental Quality
Management, field visit
to The King's Royally
Initiated Laem Phak
Bia Environmental
Research and
Development Project,
Phetchaburi.

March 31, 2017

ED78.36:
Drinking Water
Treatment, field
visit to MWA-
Bangkhen Water
Treatment Plant,
Bangkok.

October 6, 2017



ED78.07:
Solid Waste
Management, field
visit to Sikhio
Municipality
Sanitary
Landfill, Nakorn
Ratchasima.

October 11, 2017



ED78.22: Air Pollution
Modeling and
Applications, and
ED78.37: Air Pollution
Engineering and
Management, field
visit to Automotive
Emissions Laboratory
Bangkok.

October 18, 2017

ED78.23:
Hazardous Waste
Technology and
Management,
field visit to Better
World Green Co.,
Ltd., Saraburi.

October 20, 2017



ED78.35:
Wastewater
Treatment, field
visit to Nongkhaem
Wastewater
Treatment Plant,
Bangkok.

November 03, 2017

Completed Master's Research Studies

Production of Refuse Derived Fuel and Its Effectiveness: A Case Study of India

By: Mr. Varun Gonemadata (India)
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Dr. Loc Thai Nguyen

Sustainability of Household Water Treatment Methods for Arsenic Removal in Developing Countries

By: Mr. Abdul Wahed Ahmadi (Afghanistan)
Supervisor: Prof. Ajit P. Annachhatre
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A Techno-Economic Feasibility Study of a Microgrid on the Coastal Area of Bangladesh: St. Martin's Island

By: Mr. Hasan Masrur (Bangladesh)
Supervisor: Prof. Weerakorn Ongsakul
Members: Dr. Jai Govind Singh
Dr. Shobhakar Dhakal

A Study on the Geothermal Energy Utilization in Thailand

By: Mr. Piriya Paokorkeatikul (Thailand)
Supervisor: Prof. Sivanappan Kumar
Members: Dr. P. Abdul Salam
Dr. Jai Govind Singh

Socio-Economic of Solar Home System in Rural Myanmar

By: Mr. Wai Yan Aung (Myanmar)
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Status and Potential of Biogas from Selected Waste Sources in Andhra Pradesh, India

By: Mr. Naga Srikanth Midde (India)
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Coconut Residues to Energy and Valur-Added Materials in Andhra Pradesh, India

By: Mr. Nedunuri Vankata Rajesh (India)
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Hybrid Electricity Generation Systems: A Case Study of Mandaipalle Village, Telangana, India

By: Ms. Raagalipi Kattunga (India)
Supervisor: Dr. P. Abdul Salam
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Dew point evaporative cooling system

By: Mr. Phyto Khaw (Myanmar)
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CO₂ Emissions: A Clustering Analysis and Benchmarking of Global Cities

By: Mr. Mohaimin Sadat Samanoden (Philippines)
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Barriers and Opportunities for Off-grid Solar Home System in Afghanistan Based on Stakeholders Perception: A SWOT-AHP Analysis

By: Mr. Wahidullah Kharotai (Afghanistan)
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Evaluation of the Benefits of a Solar Home System in Laos: A Case Study of Phoukoud District in Xienkhouang Province

By: Ms. Laphongngern Thepphavong (Lao PDR)
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Policy Effectiveness and Upscaling Challenges: The Case of Renewable Energy Subsidy Policy in Nepal

By: Mr. Raunak Thapa (Nepal)
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Completed Master's Thesis

A Study on the Environmental Impacts of Online Shopping and Consumer Behavior

By: Ms. Kunyarat Chueamuangphan (Thailand)
 Supervisor: Prof. Chettiyappan Visvanathan
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An Assessment of Emission from Vehicle Fleets in the Bangkok Metropolitan Region under Various Scenarios

By: Ms. Rungtiwa Buadee (Thailand)
 Supervisor: Prof. Nguyen Thi Kim Oanh
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An Assessment of Exposure to Biomass Burning Smoke for School Children in Chiangrai Province, Thailand

By: Ms. Sararat Nontachai (Thailand)
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An Evaluation of Pre-concentration Technologies for Domestic Sewage to Enhance the Performance of Anaerobic Digestion

By: Mr. Thusitha Dilruwan Wijewardhana Rathnayake (Sri Lanka)
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Anaerobic Digestion of Press-Mud from the Sugar Industry

By: Mr. Wattanapong Sangchun (Thailand)
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Anaerobic Digestion of *Spirulina platensis* Using Cassava Pulp as Co-Substrate

By: Ms. Suparat Jampathong (Thailand)
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Analyzing Particulate Matter Air Quality in Bangkok Metropolitan Region Using a 3-Dimensional Modeling Tool

By: Ms. Pornsiri Rucksunchart (Thailand)
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Analyzing the Opportunities and Barriers of Circular Economy in the Rice Milling Industry of Myanmar

By: Ms. June Khaing Wint Tun (Myanmar)
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Assessment of Climate Change Impacts on the Performance of Bang Khen Water Treatment Plant in Bangkok

By: Mr. Theesit Mesomsup (Thailand)
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Biosorption of Arsenic (III) from Aqueous Solutions by Blue-Green Algae *Spirulina sp.*

By: Ms. Kannikar Khamstot (Thailand)
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Assessment of Dry and Wet Deposition of Acidic Compounds in the Bangkok Metropolitan Region and the Potential Impacts on the Terrestrial Ecosystem in Pathumthani Province

By: Ms. Metta Mettasitthikorn (Thailand)
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Assessment of Emissions and Treatment Cost of Different Control Technologies for VOCs Released from Petroleum Refinery Activities: A Case Study

By: Ms. Nattaphan Suksri (Thailand)
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Assessment of Factors Influencing the Performance of Electrochemical Disinfection in Treating Liquid Effluent from On-site Sanitation Systems

By: Mr. Sittichok Tepin (Thailand)
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Assessment of the Potential Health Effects of Biomass Burning Emission in Chiang Rai Province, Thailand

By: Ms. Jutamas Kunphan (Thailand)
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Development of a Novel Multi-soil Layering Based Constructed Wetland Treating Solar Septic Tank Effluent

By: Ms. Prattana Suksiri (Thailand)
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Development of Emission Inventory for Major Anthropogenic Source Categories in Greater Yangon Area, Myanmar

By: Ms. Khine Mar Kyaw (Myanmar)
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Development of Fibrous and Non-Fibrous Micro-Nanostructured Superhydrophobic Surface Using ZnO Nanoparticles for Anti-Biofouling Application in Marine Environment

By: Ms. Astha Upadhyay (India)
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***E. Coli* Inactivation by Using Streptomycin Producing Organisms**

By: Mr. Thanarat Theppharak (Thailand)
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Eco-Service Quantification of Ecologically Engineered Urban Wetlands on the AIT Campus, Thailand

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Environmental Sustainability of Aerated Lagoons Treatment Processes for Community Wastewater

By: Ms. Lai Lai Win (Myanmar)
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Evaluation of Low-Cost Air Quality Sensors for Monitoring Biomass Burning - Induced Air Pollution

By: Ms. Sathita Fakprapai (Thailand)
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Evaluation of the Hydrochar Pellet Produced from the Hydrothermal Carbonization Treating Fecal Sludge

By: Ms. Suttinee Jairuang (Thailand)
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High Solid Anaerobic Digestion of Food Waste

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Hybrid Constructed Wetland for Phosphorus Removal in Eutrophicated Pond Water

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Hybrid Constructed Wetlands for Phosphorus Removal and Purifications of Eutrophic Pond Water

By: Mr. Sakkarin Meephon (Thailand)
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Identifying the Water Footprint Reduction Opportunities in a Canned Pineapple Factory

By: Ms. Parichaya Sangworakan (Thailand)
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Improvement of Methods for Dissolving Pulp and Nanofiber Production from Bamboo Biomass with regard to Environmental Friendliness

By: Ms. Shubhuti Kiran Ghimire (Nepal)
 Supervisor: Dr. Oleg Shipin
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Improving Biogas Production from *Spirulina platensis* by Using Fungal Pre-Treatment and Co-Digestion with Cassava Pulp

By: Ms. Rattanasri Khajeefa (Thailand)
 Supervisor: Prof. Ajit P. Annachhatre
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Integrating the UV/O₃ Process into Attached Growth Membrane Bioreactors to Treat Polluted Surface Water

By: Ms. Thanwarat Chan (Thailand)
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Management of Nitrogen Losses in Co-composting of Anaerobically Digested Faecal Sludge with Vegetable Wastes

By: Ms. Faith Muthoni Marekia (Kenya)
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 Prof. Mukand S. Babel

Monitoring and Source Apportionment of Particulate Matter Pollution in Bangkok Metropolitan Region by Receptor Modeling

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Nutrient Recovery from Process Water of Hydrothermal Carbonization Process

By: Ms. Sama Suwal (Nepal)
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Performance Assessment of Continuous-Feeding UV-LED Disinfection Process Treating Domestic Wastewater

By: Ms. Nguyen Thi Minh Hong (Vietnam)
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Phosphorus Removal Using Algae Bacterial Consortia in Photo Sequencing Batch Reactor (PSBR)

By: Mr. Joseph Mathew (India)
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 Dr. Nico Pieter Van Der Steen
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Strengthening the Water Treatment System in the Paisadao Water Treatment Plant, Ratchaburi, Thailand by Incorporating a High-Rate Sedimentation Filtration System and a Water Safety Plan

By: Mr. Kiangdan Sripanya (Thailand)
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Sustainability of Constructed Wetlands in the Treatment of Domestic Wastewater

By: Ms. Judith Kiende Mugambi (Kenya)
 Supervisor: Prof. Ajit P. Annachhatre
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 Prof. Nguyen Kim Thi Oanh

Sustainable Food Waste Management in Thailand Using Anaerobic Digestion

By: Ms. Nanthiya Saeteaw (Thailand)
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 Dr. P. Abdul Salam

The Carbon Footprint of Golf Courses: A Case Study of AIT

By: Ms. Batsuren Sundui (Mongolia)
 Supervisor: Prof. Ajit P. Annachhatre
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 Dr. Vilas Nitivattananon



Zinc (II) Removal Through Adsorption Using Activated Carbon Produced from Agricultural Residue

By: Ms. Kittiya Tamrongterakul (Thailand)
 Supervisor: Prof. Ajit P. Annachatre
 Members: Prof. Chettiyappan Visvanathan
 Dr. Peeyush Soni

An Assessment of Potential Synergies and Conflicts in Climate Mitigation and Adaptation Policies of Nepal

By: Ms. Subina Shrestha (Nepal)
 Supervisor: Dr. Shobhakar Dhakal
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Analysis of Drought under Climate Change in the Upper Mun River Basin, Thailand

By: Mr. Lam Tin Yin Timothy (Hongkong)
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Short-Run Electricity Generation Scheduling Considering Different Fossil and Renewable Supply Constraints

By: Mr. Pawarong Thepparat (Thailand)
 Supervisor: Dr. Jai Govind Singh
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Probabilistic and Combinatorial Approaches for Power Loss Minimization in Distribution Systems

By: Mr. Sk. Md. Golam Mostafa (Bangladesh)
 Supervisor: Dr. Jai Govind Singh
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The Cost of Electricity Not Served: An Analysis for the Industrial Sector in Nepal

By: Ms. Shreeya Rana (Nepal)
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Sustainable Energy Assessment: A Case of Rural Mon State, Myanmar

By: Mr. La Pyae (Myanmar)
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 Prof. Kyoko Kusakabe

An Approach to Enhance the Life of Transformer and the Battery of Gridable Vehicles in Active Distribution Systems

By: Ms. Menaka Karki (Nepal)
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Wind Speed Forecasting Using Deep Learning Algorithm

By: Mr. Danupol Wetchasirikul (Thailand)
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Community Scale Food Waste-based Anaerobic Digester with Centralized Monitoring System

By: Mr. Ravipati Aditya Srinivas (India)
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CO₂ Capture and Storage in Saline Aquifers in Andhra Pradesh, India

By: Mr. Ganji Manoj Kumar (India)
Supervisor: Dr. P. Abdul Salam
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Microalgae Based Biodiesel Production Using Coal Thermal Flue Gas and Wastewater in West Bengal: A Techno-Financial Analysis

By: Mr. Sitav Bhadra (India)
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Optional Scheduling of Customers' Demand by using Availability of Power and its Price in Smart Grid

By: Mr. Srikanth Reddy Mukkamalla (India)
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Prof. Weerakorn Ongsakul

Modeling and Placement of an Electric Spring in a Distribution System

By: Mr. Mrutyunjaya Nanda (India)
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Life Cycle Assessment of a Residential Building: The Habitech Center

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Optimal Day-Ahead Generation Scheduling with Independent Slack Bus Loss Sensitivity in Vietnam's Wholesale Electricity Market

By: Mr. Ngueyen Huy Phuoc (Vietnam)
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Active Power Loss Reduction and Voltage Profile Enhancement in a Radial Distribution System

By: Mr. Soeun Sophanith (Cambodia)
Supervisor: Prof. Weerakorn Ongsakul
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A Study on the Performance of the Air Conditioning System at the Asian Institute of Technology

By: Mr. Chiranjeevi Chalamalasetty (India)
Supervisor: Prof. Sivanappan Kumar
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Barriers and Opportunity in Cross-border Electricity Trading for Nepal: A SWOT-AHP Analysis

By: Mr. Pratik Karki (Nepal)
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Biodiesel Production from Jatropha in Kakinada, India

By: Mr. Gatti Chaitanya Mourya (India)
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Assessment of Agricultural Residues and Electricity Generation Potential of Rice Husk in Andhra, India

By: Mr. Atmakuri Hari Hara Venkata Viswanath (India)
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Completed Doctoral Dissertations



Sustainable Municipal Solid Waste Management Systems for Small and Medium Sized Cities in Thailand

By: Ms. Rotchana Intharathirat (Thailand)
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 Dr. Shobhakar Dhakal, Committee Member
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Abstract

Municipal solid waste management (MSWM) has become a crucial issue worldwide, not only because of the increase of waste generation, but also due to its improper disposal. Improper management of MSW, typically through landfills and open dumping, has caused serious environmental impacts. To evaluate the most appropriate MSWM system, several models have been developed to support a decision making process. These models were mostly practiced for large cities, while only a few were found for medium and small cities. It is, therefore, vital to evaluate the most suitable MSWM system for medium and small cities, as decisions made at an early stage can have significant impacts to MSWM in later phases as cities grow. Selecting the most effective MSWM requires consideration of various parameters. For instance, it is complicated for developing countries, such as Thailand, due to the lack of reliable data, including the status of MSWM, characteristics of technologies used and applied, and present and future MSW generation and composition.

Firstly, this study aims to assess the status of MSWM systems in Thailand to clarify existing decision making processes and to propose appropriate alternatives. Secondly, this study attempts to fill a gap where traditional forecasting models of MSW quantity (i.e., regression analysis, time-series analysis, and econometric models) are challenging to implement given their data requirements. The innovative models, grey models (GM), are developed by using limited data and consider influencing factors to achieve greatest accuracy. Thirdly, based on the outcomes obtained above, the MSWM systems for medium and small cities were evaluated involving relevant participatory stakeholders.

The dissertation deals with an assessment of Municipal Solid Waste Management (MSWM) Systems in Thailand and analysis of appropriate alternatives based on literature review, interviews, site visits, Analytical Hierarchy Process Evaluation. Eight systems consisting of composting, recycling, anaerobic digestion, incineration, gasification, landfill gas and refuse derived fuel (RDF) and landfilling were considered for evaluation. The study has revealed that the most suitable MSWM system is the mechanical biological treatment combined with composting for medium city and mechanical treatment combined with RDF for small city, while both landfilling and landfill gas were identified as the worst options. Stakeholders prefer the waste-to-resource (WTR) scheme than waste-to-energy (WTE) to achieve sustainable MSW management in Thailand. This also resulted that public acceptance is the most important criteria for sustainability of MSWM, followed by environmental impacts and diversion from landfills. The study has presented a systematic methodology for addressing the limited data in a developing municipal solid waste management, sustainability, MSW Forecasting, Analytic Hierarchy Process, Thailand SWM related issues in a systematic manner.

Keywords: *municipal solid waste management, sustainability, MSW Forecasting, Analytic Hierarchy Process, Thailand*

Technical and Financial Analysis of an Optimally Placed Wind Farm Project Using a Binary PSO Program

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Abstract

This dissertation presents a technical and financial analysis of optimally placed wind turbines within a wind farm project. The analysis was done using the Binary PSO program: the BPSO-TVAC, which was developed for calculating the maximum turbine power output possible with the minimum investment cost for the wind farm. The test site was divided into square areas, referred to as cells. Three specific wind characteristics: uniform wind speed, non-uniform wind speed and direction, were applied to all of the cells for uniformity of measurement. The Linear Wake Model was used to calculate downstream wind speed and the power was calculated using the turbine power curve.

The test results indicate that the investment cost per generated power for both uniform and non-uniform wind speed with variable wind direction using BPSO-TVAC are lower than those obtained from the Genetic Algorithm, the Evolutive Algorithm, BPSO-TVIW (time-varying inertia weight factor), BPSO-RANDIW (random inertia weight factor) and BPSO-RTVIWAC (random time-varying inertia weight and acceleration coefficients).

BPSO-TVAC was developed to maximize net present value (NPV) subject to simultaneously optimal turbine position, turbine sizing and hub height. The design constraints of the optimal wind farm configuration were included in the actual data at a particular site, the specified initial investment cost within a fixed area and turbine spacing. The Component Cost Model and learning curve is used to express the initial investment cost and the levelized cost of energy.

The annual energy production cost of a wind farm depended on the number of wind turbines, the installed sizing, hub height and wake loss within a wind farm. BPSO-TVAC simultaneously determines the optimal wind turbine placement directly facing the frequent high wind speed and direction. As well, BPSO-TVAC optimally reduces the number of turbines and installs the larger sizing leading to a higher profit than the conventional wind farm layout. Finally, sensitivity analysis, Monte Carlo simulation and hypothesis testing are presented to gain a better insight into the uncertainties including wind speed and discount rate, and how they affect the financial risk of wind farm projects. The scenario analysis showing the positive NPV for the worst case scenario is useful for wind farm developers to make investment decisions.

Keywords: Binary Particle Swarm Optimization, Optimal wind farm configuration, Financial risk management



Anaerobic Co-digestion of Cassava Pulp and Pig Manure

By: Ms. Naraporn Glanpracha (Thailand)
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Abstract

Anaerobic co-digestion (AcoD) of cyanide-containing cassava pulp (CP) with pig manure (PM) was evaluated through laboratory scale mesophilic process. The overall research aim was to enhance AcoD performance of CP with nitrogen rich co-substrate PM. The performance of AcoD and cyanide content during the operation at various organic loading rates (OLRs) were investigated. Furthermore, the most suitable mathematical model was selected for estimating substrate treatment efficiency in term of effluent volatile solid (VS) concentration. The digester was operated in a semi-continuous mode with the mixed feedstock having C/N ratio of 35:1. Digester startup was accomplished in 60 days with loading of 0.5-1 kgVS/m³.d. Subsequently, the loading to digester was increased step-wise from 2 to 9 kgVS/m³.d. Digester performance was stable at loading between 2 to 6 kgVS/m³.d with an average volatile solid removal and methane yield of 82% and 0.38 m³/kgVS added, respectively.

However, beyond loading of 7 kgVS/m³.d, solubilization of particulate matter did not take place efficiently. The digester became unstable at OLR of 9 m³/kgVS added since volatile fatty acid (VFA) concentration reached the inhibition level leading to system failure. The average total cyanide content in fresh CP was 9.8 mg/(kg wet basis) which existed in the form of cyanohydrins (about 80%) and free hydrocyanic acid (HCN) (about 15%). In anaerobic digestion (AD) system, the cyanide content in digester mainly in the form of HCN. Cyanide present in CP was successfully degraded indicating that anaerobic sludge in the digester was well acclimatized to cyanide. Cyanide degradation in AD followed first-order kinetics with the rate constant of 0.0939 d⁻¹.

Thus, it can be concluded that CP can be successfully digested anaerobically with PM as co-substrate without any inhibitory effect of cyanide present in the CP. The Monod kinetic model was selected as the suitable model for predicting substrate treatment efficiency in AcoD of CP and PM. The model and the proposed kinetic parameters demonstrated satisfactory fitting results with the high R² value of 0.9841 and no significant difference between predicted and experimental values. Verification of the model and the proposed kinetic parameters with the literature data showed satisfactory fitting results with the high R² value of 0.9345 when the system was operated at sufficient hydraulic retention time (HRT) and not overloaded.

Keywords: Anaerobic co-digestion, Organic loading rate, Cassava pulp, Particulate solubilization, Cyanide, Monod kinetic model.

Eco-Industrial Development Indicators for Assessing an Eco Industrial Estate in Thailand

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External Examiner: Prof. Hung-Suck Park



Abstract

Since the introduction of the Eco-Industrial Park (EIP) concept to Thailand, developers were keen on having clear guidelines about how to achieve EIP status. With new concepts of green industries, other countries have already been commenced developing indicators to cater Eco Industrial concepts, and Korea, Japan and China are among them. In order to achieve Thai Industrial goals it was important to initiate EIDs and to certify them as Eco-Industries. This research focuses on establishment of EID indicators that can be simply used to evaluate Eco-Industrial Estates or industrial parks using the concepts of sustainable development and industrial ecology.

The research was conducted by consulting expertise opinion. Delphi technique was used for preliminary indicators development. Initially, EID indicators were developed by applying the available and sustainable indicator systems. The data analysis stage produced median, mode and interquartile range values for each questions using the SPSS program. The developed indicators were distributed to selected stakeholders for analysis of further potential issues and areas of concern. Initially there were 46 indicators with 186 components and reduced to 43 indicators with 138 components. The study was continued with system testing process and conducted at the Map Ta Phut Petrochemical complex in Rayong including Map Ta Phut and Asia Industrial Estate. Statistical analysis to compare the stakeholder opinions about the significance of EID indicators using one-way ANOVA (Analysis of Variance) showed differences and identified three major groups. Finally, all EID indicators were verified and tested at both industrial estates.

The results are shown that most of the EID indicators are able to use for EIE assessment. Forty three (43) indicators were identified and ranked considering their importance and the complexity. The significance levels of the indicators were used to rank the concerns of EIE/EIP stakeholders whereas the complexity levels of the indicators were used to identify the step forward to achieve each level of all indicators. Furthermore, a three (3) tier system was developed to identify the level of eco-industrial development initiatives. It was revealed that environmental performance was the key to the success of Eco-industrial estates/parks. The platinum tier was used to certify the environmental performance of an EIE/EIP. These insights are important in establishing trust among stakeholders and to serve as guidelines for policy makers and strategy planners. Important policy implications are also suggested. It also contributes to prioritization of the indicators. It is recommended that future research should be focused on practical guidance for criteria and measurement of EID indicators for EIE/EIP development and to expand the research to develop methodology software as well as transfer the knowledge to other countries.

Keywords: Eco-industrial park, Eco industrial estate, Sustainable development, Industrial ecology, Environmental performance.



Assessing Impact of Surface Ozone Exposure on Major Crops Production in Southern Vietnam and Mitigation Strategies

By: Mr. Ngo Thanh Danh (Vietnam)
 Supervisor: Prof. Nguyen Thi Kim Oanh
 Members: Dr. Oleg Shipin, Committee Member
 Dr. Peeyush Soni, Committee Member
 External Examiner: Dr. Lisa Emberson

Abstract

An increasing trend of the surface ozone (O_3) has been observed over the last two decades in many large urban areas of Asian developing countries. The current high levels of this phytotoxic pollutant may already cause adverse effects on agricultural crops. In the scenario of climate change and higher emission of its precursors in the future, higher O_3 may occur in Asia hence would result in more loss of crop yields in the region.

This study aimed to test a hypothesis that it is possible to use suitable cropping systems to minimize O_3 effects in the future emission scenario. O_3 in the Eastern Region of Southern (ERS) of Vietnam were simulated using the WRF-CAMx model for the base year of 2010 (BY2010). The model evaluation was done using time series, scatter plots, spatial distribution as well as statistical criteria using available monitoring data in the domain and showed a moderate performance. The model was used to simulate O_3 in 2030 using the future emission following the RCP8.5 scenario. The simulated O_3 in 2010 and 2030 were used to assess the O_3 induced rice production loss (RPL) in the domain. Alternative cropping systems were proposed to avoid excessive crop production loss in the future high O_3 scenario, considering both the sensitivity of substitute crops for rice and phenology of rice plant.

CAMx model was run using the prepared emission input data of both anthropogenic and biogenic sources in 2010 and 2030 and the 2010 WRF simulated meteorology. The initial and boundary conditions of CAMx outer domain (Vietnam inland, resolution of $12 \times 12 \text{ km}^2$) for both 2010 and 2030 simulations were extracted from a previous Southeast Asia (SEA) simulation. O_3 in the inner domain of ERS ($4 \times 4 \text{ km}^2$) was simulated using the boundary conditions generated by the outer domain simulation.

There are three rice crop cycles in the study domain. Simulated O_3 was higher in January-February (largely overlaps the first rice crop) and September-December (third crop), and lower in March-June (second crop). Higher O_3 was simulated in Tay Ninh (TN) province located downwind of Ho Chi Minh City (HCMC) with high emission intensity and the lowest O_3 was simulated for Ba Ria-Vung Tau (BR-VT) province.



The rice yield loss (RYL) was assessed using the concentration-based metrics of AOT40 and M7, as well as the flux-based metrics of POD10 for each of six provinces in ERS. The highest RYL was produced by POD10 followed by AOT40 and the lowest by M7. RPL in ERS due to O_3 exposure in 2010 were the highest for the first crop of 25,800 tonnes (~ 5.7%) of the total rice production), the second highest for the third crop of 21,500 tonnes (~ 3.8%) and the least for the second crop of up to 6,800 tonnes (~ 1.7%). The highest RPL was found to occur in TN province while the lowest RPL was in BR-VT consistent to the simulated O_3 levels. Due to higher simulated O_3 in 2030 under RCP 8.5, the RPL of ERS was higher than that in 2010 with the highest RPL of 38,042 tonnes (~ 8.7%) for the first crop and 13,844 tonnes (~ 3.4%) for the second crop and 17,365 tonnes (~ 3.2%) for the third crop.

The potential production loss of other crops in ERS, i.e. soybean and maize, was also assessed using AOT40 which showed higher loss in 2030 (41 and 4,578 tonnes, respectively) as compared to 2010 (27 tonnes and 1,063 tonnes, respectively). Based on the land-use planning of different provinces in ERS, this study recommended an alternative cropping system for the domain by substituting rice by maize in water shortage areas into the period of high O_3 in the third rice crop. This could bring in least economic loss due to O_3 exposure in the future, i.e. 81,600 million VNĐ, as compared to the loss in 2030 using the existing cropping system 145,800 million VNĐ). The loss estimated for 2010 with the current cropping system in 2010 was 101,400 million VNĐ. Thus, considering the impacts of future O_3 on crops would minimize the loss. Another approach was suggested that links to earlier sowing (by 15 days) to avoid the excessive exposure to O_3 by rice plant during the accumulation period in the third crop. A combination of both approaches may be considered in the future crop planning.

Further studies of crop production loss should be based on multi-year simulated O_3 for future using future climate conditions. Different emission reduction scenarios as well as effects of other phytotoxic pollutants should also be considered. Relevant RYL functions should be developed for local cultivars of Vietnam using the experiment data. The alternative cropping systems could be developed for a large domain or the whole country to enhance a better land-use/crop planning process.

Keywords: O_3 exposure metrics, simulated ozone, stomatal flux, Rice yield loss, Vietnam.





Development of a Membrane Bioreactor for Polluted Surface Water Treatment

By: Ms. Li Lu (P.R. China)
 Supervisor: Prof. Chettiyappan Visvanathan
 Members: Prof. Kazuo Yamamoto, Committee Member
 Dr. Oleg Shipin, Committee Member
 External Examiner: Prof. Arumugam Sathasivan

Abstract

Water pollution has become a serious issue worldwide, especially in developing countries. Continuous discharge of domestic and industrial wastewater into surface water has led to an increase in organic pollution. This brought immense pressure to the conventional drinking water treatment plants, as surface water is one of the main water sources for human beings. Organic matters can be considered as substrates for microbes, thus biological process has the potential to be an effective technology. Membrane bioreactor (MBR) which integrated biodegradation and membrane rejection into one system could be an attractive method. Based on which, this study developed an attached growth membrane bioreactor (aMBR) system to treat polluted surface water.

In phase I of this study, aMBR system was built up, operated, optimized and analyzed. In preliminary test I, suitable bio carrier between APG and PVA-gel was selected. In preliminary test II, suitable filling ratio was selected. After that, aMBR system were operated and compared in various HRT and filling ratio. aMBR system with PVA-gel as bio carrier in 5 % filling ratio, with a HRT 2.5 h was selected as a best operation condition. It was able to provide over 50 % CODMn removal, 20 % UV254 removal, 97 % NH₃-N and Turbidity removal. It has lowest membrane fouling as compared to other operation conditions. Organic accumulation rate and nitrogen balance analysis between aMBR and MBR indicated that: (1) aMBR carrier side attributed to majority part of biodegradation in the system, (2) nitrification and denitrification has taken place in PVA-gel, (3) Membrane fouling was largely mitigated in aMBR system, (4) Modified Stover Kincaanon model was able to describe and predict CODMn removal in aMBR system.

aMBR system can remove 50 % of CODMn from polluted surface water with CODMn 10 mg/L, around 3-5 mg/L of CODMn was remaining, most of which were recalcitrant. To improve the organic matter removal, UV/O₃ reactor was integrated into aMBR system as a polishing step in recirculation stream. In phase II of this study, UV/O₃-aMBR system was operated, optimized and analyzed. O₃ concentration 1.5 mg/L and contact time 7 minutes was selected based on BDOC test. Removal performance under recirculation ratio varies from 20, 40, 60 and 80 % were compared. Results indicated that 60 % recirculation ratio was able to provide permeate water with CODMn less than 2 mg/L, UV254 around 0.04 cm⁻¹, color 0.002 cm⁻¹, and NH₃-N 0.2 mg/L. UV/O₃ integration has largely improved the organic matter removal in the system. FEEM analysis shown that higher amount of FDOM was removed in UV/O₃-aMBR as compared to aMBR system; UV/O₃ process can reduce recalcitrant and improve the treated water biodegradability. Biokinetic study results indicated that microbes on PVA-gel enter endogenous respiration after 0 h aeration in UV/O₃-aMBR and 6 h aeration in aMBR system. Orbitrap MS was used for molecular characterization of low molecular weight dissolved organic matter changes in parallel UV/O₃-aMBR and aMBR system. 2340 molecular formulae including CHO, CHON, CHOS and CHONS class out of total peaks 5743 were identified. UV/O₃-aMBR system has much higher formulae changes including formulae decreased, increased and newly formed, as compared to aMBR system. Highest CHO, CHON, CHONS and CHOS decrease were all occurred in the carrier side of both systems. The integration of UV/O₃ process has improved the reaction activity in the UV/O₃-aMBR system.

Keywords: attached growth membrane bioreactor (aMBR), polluted surface water, advanced oxidation processes, PVA-gel, UV/O₃-aMBR, mathematical modelling, bio kinetic coefficient, endogenous respiration, Orbitrap MS.

Grants and Sponsored Research Projects

Completed Projects

3R and Resource Efficiency towards Resilient Cities and Societies: Implications towards SDG

Duration: 1 September 2016 – 1 November 2017
Investigator: Prof. Chettiyappan Visvanathan
Sponsor: The United Nations Centre for Regional Development (UNCRD)
Amount: Baht 325,000

A Study on Urban Air Pollution Improvement in Asia

Duration: 31 March 2015 - 31 December 2017
Investigator: Prof. Nguyen Thi Kim Oanh
Sponsor: Japan International Cooperation Agency (JICA) Thailand Office
Amount: Baht 3,044,338.16

Climate Technology Center and Network (CTCN) Response Plan: Feasibility Study For Setting Up a Watch Observatory for Health and Environmental Risks in Pointe Noire, Republic of Congo (Brazzaville)

Duration: 1 June 2016 - February 2017
Investigator: Dr. Oleg Shipin
Sponsor: UNEP/CTCN (Copenhagen)
Amount: Baht 280,000

Climate Technology Center and Network (CTCN) Technical Assistance Response Plan For Nepal

Duration: 1 November 16 - 31 December 2017
Investigator: Dr. P. Abdul Salam
Dr. Shobhakar Dhakal
Sponsor: CTCN
Amount: Baht 207,000

Development of Innovative Technology and Integrate Management Systems for Sustainable Sanitation in ASEAN

Duration: 10 December 2013 – 31 August 2017
Investigator: Dr. Thammarat Koottatep
Sponsor: KIST-Korea Institute of Science & Technology
Amount: Baht 2,420,000

Development of Water Treatment Equipment for High-rate Sedimentation Filtration System Suitable for Thailand Water Quality Characteristics

Duration: 1 June 2015 – 30 November 2017
Investigator: Prof. Chettiyappan Visvanathan
Sponsor: NoxKorea, Co., Korea
Amount: Baht 990,000

Development of the Co-Benefit Action Plan for Bandung City

Duration: 1 July 2015 – 30 September 2017
Investigator: Prof. Nguyen Thi Kim Oanh
Sponsor: Institute of Global Environmental Strategies (IGES)
Amount: Baht 1,197,495

Development of the Co-Benefit Study in Semarang City

Duration: 1 July 2016 to 30 September 2017
Investigator: Prof. Nguyen Thi Kim Oanh
Sponsor: Institute of Global Environment Strategies (IGES)
Amount: Baht 1,217,287.50

Efficiency Improvement of Bangchak Solar Panels

Duration: 29 February 2016 - 31 March 2017
Investigator: Prof. Weerakorn Ongsakul
Sponsor: Bangchak Solar Energy Company Limited
Amount: Baht 130,625

Energy Environmental Data Analysis for Low Carbon Society (EEDA)

Duration: 12 January 2009 - 5 January 2017
Investigator: Prof. Sivanappan Kumar
Sponsor: MHIR Japan
Amount: Baht 717,000

Reports in Drinking Water Services and Technologies in Asian countries – Phase II

Duration: 1 April 2016 – 30 September 2017
 Investigator: Prof. Chettiyappan Visvanathan
 Sponsor: Japan Water Research Center (JWRC)
 Amount: Baht 295,728.82

Renewable Energy Technologies (RETs) for Integrated Community Farming Systems

Duration: 1 April 2015 - 8 June 2017
 Investigator: Prof. Sivanappan Kumar
 Prof. Kyoko Kusakabe
 Sponsor: Wisions of Sustainability
 Amount: Baht 495,651.60

South-South Technical Assistance Response Plan for Development of the National Low Carbon Strategy, Technology Needs Assessment, Finance in Central African Republic (C.A.R.)

Duration: 20 December 2016 - 19 December 2017
 Investigator: Dr. Oleg Shipin
 Sponsor: CTCN-PCA, UNEP
 Amount: Baht 210,000

Stimulating Local Innovation on Sanitation for the Urban Poor in Sub-Saharan and Southeast Asia

Duration: 8 February 2012 – 31 December 2017
 Investigator: Dr. Thammarat Koottatep
 Sponsor: Bill and Melinda Gates Foundation
 Amount: Baht 26,124,360

Strengthening Capacity of Policymakers in South-East Asia (SEA) to Promote Policies and Developing Plans for Improved Wastewater Treatment and Reuse in Urban and Peri-Urban Areas

Duration: 1 December 2014 – 30 June 2017
 Investigator: Dr. Thammarat Koottatep
 Sponsor: United Nations Economic and Social Commission for Asia and the Pacific (ESCAP)
 Amount: Baht 1,159,308.90

Sustainability Issues Due to Coal Ash from Coal Fired Power Plants

Duration: 1 September 2010 – 31 August 2017
 Investigator: Prof. Ajit P. Annachhatre
 Sponsor: SDCC/AIT France Network
 Amount: Baht 1,440,000

The Greater Mekong Sub Region Academic and Research network (GMSARN)

Duration: 30 June 2012 - June 2017
 Investigator: Prof. Weerakorn Ongsakul
 Sponsor: Registration Revenues
 Amount: Baht 1,400,000

Turning Rice Straw Into Cooking Fuel for Air Quality and Climate Co-benefit in Selected GMS Countries

Duration: 15 December 2014 – 30 September 2017
 Investigator: Prof. Nguyen Thi Kim Oanh
 Dr. P. Abdul Salam
 Sponsor: Stockholm Environment Institute (SEI) Asia Center
 Amount: Baht 1,989,500



Ongoing Projects**Community Scale, Decentralized Anaerobic Digestion for Energy and Resource Recovery**

Duration: 1 May 2016 - 31 October 2018
Investigator: Prof. Chettiyappan Visvanathan
Dr. P. Abdul Salam
Sponsor: British Council
Amount: Baht 12,430,000

Development and Dissemination of Fecal Sludge Management Toolkit for Investors, Planners and Consultants

Duration: 1 October 2014 – 30 June 2018
Investigator: Dr. Thammarat Koottatep
Sponsor: Bill & Melinda Gates Foundation
Amount: Baht 35,256,773.22

Developing an Operational Framework for River Health Assessment in the Mekong River Basin

Duration: 1 December 2014 – 1 December 2018
Investigator: Prof. Mukand S. Babel
Dr. Oleg Shipin
Dr. Sangam Shrestha
Dr. Victor Shinde
Sponsor: Consultative Group on International Agricultural Research (CGIAR)
Amount: Baht 12,899,700

Innovative Toilet City: From Reinventing to Realization at Scale

Duration: 1 September 2016 – 28 February 2019
Investigator: Dr. Thammarat Koottatep
Sponsor: The Thailand Research Fund (TRF)
Amount: Baht 5,044,150

Pea-AIT Scholarship Program

Duration: April 2016 - December 2020
Investigator: Prof. Weerakorn Ongsakul
Sponsor: Provincial Electricity Authority
Amount: Baht 20,212,000

Sustainable Decentralized Wastewater Management in Developing Countries

Duration: 15 October 2011 – 31 March 2018
Investigator: Dr. Thammarat Koottatep
Sponsor: Bill & Melinda Gates Foundation
Amount: Baht 149,991,660

Technology Needs Assessment (Phase II) for Asia and CS Region - Missions

Duration: 8 January 2015 - 28 February 2018
Investigator: Prof. Sivanappan Kumar
Prof. Rajendra Prasad Shrestha
Dr. P. Abdul Salam
Sponsor: UNEP-DTU Partnership, Denmark
Amount: Baht 320,000

Technology Needs Assessment (Phase II) for Asia and CS Region - Technical

Duration: 8 January 2015 - 28 February 2018
Investigator: Prof. Sivanappan Kumar
Prof. Rajendra Prasad Shrestha
Dr. P. Abdul Salam
Sponsor: UNEP-DTU Partnership, Denmark
Amount: Baht 2,514,000

Technology Needs Assessment (Phase II) for Asia and CS Region - Workshop

Duration: 8 January 2015 - 28 February 2018
Investigator: Prof. Sivanappan Kumar
Prof. Rajendra Prasad Shrestha
Dr. P. Abdul Salam
Sponsor: UNEP-DTU Partnership, Denmark
Amount: Baht 1,744,000

Toward an Open Resources Upon Services: Cloud Computing of Environmental Data TORUS

Duration: 15 October 2015 – 14 October 2018
Investigator: Prof. Nguyen Thi Kim Oanh
Sponsor: European Union (Erasmus + Capacity Building)
Amount: Baht 1,814,296



Initiated Projects

AIT BORDA Collaboration

Duration: 1 January 2017 - 30 December 2019
 Investigator: Dr. Thammarat Koottatep
 Sponsor: Bermen Overseas Research Association
 Amount: Baht 5,550,000

Assessment of Dioxin Emissions from Point Sources in Thailand

Duration: 1 November 2017 – 30 June 2018
 Investigator: Prof. Nguyen Thi Kim Oanh
 Dr. Ekbordin Winijkul
 Sponsor: Integrated Consultancy on Infrastructure Development and Environmental Conservation (IDEA Consultants, Inc.)
 Amount: Baht 865,500

Biogeochemical Changes and Adaptation Mechanisms in response to Anthropogenic Impacts in Watersheds: A Comparative Study between Jiulong River and Chao Praya River (Thailand)

Duration: 13 July 2017 - 12 June 2018
 Investigator: Dr. Thammarat Koottatep
 Prof. Rajendra Prasad Shrestha
 Sponsor: National Research Council of Thailand (NRCT)
 Amount: Baht 1,454,000

Creating Wider Impacts of Rice Straw Derived Fuel Use as Cooking

Duration: 1 July 2017 – 31 January 2018
 Investigator: Prof. Nguyen Thi Kim Oanh
 Sponsor: Stockholm Environment Institute (SEI) Asia Centre
 Amount: Baht 195,000

Current and Future Primary Particle Number Size Distribution Emission Inventory of On-road Vehicles in Southeast Asia

Duration: 1 May 2017 – 31 October 2017
 Investigator: Dr. Ekbordin Winijkul
 Sponsor: AIT Research Initiation Grant
 Amount: Baht 50,000

Develop a Comprehensive Background Paper on “Water Quality and Security in Asia-Pacific - What 3R and Circular Economy Can Offer?” and Substantive input to Eighth Regional 3R Forum in Asia and the Pacific

Duration: 1 August 2017 - 31 July 2018
 Investigator: Prof. Chettiyappan Visvanathan
 Sponsor: United Nations (UN)
 Amount: Baht 465,000

Development of a Thermophilic Anaerobic Membrane Bioreactor by Using PTFE Membrane for Wastewater Treatment and Biogas Production

Duration: 1 October 2017 - 30 September 2018
 Investigator: Prof. Chettiyappan Visvanathan
 Sponsor: Sumitomo Electric Industries, Ltd., Japan
 Amount: Baht 225,000

Establishment of Fecal Sludge Management Twining Program

Duration: 7 September 2017 - 31 December 2018
 Investigator: Dr. Thammarat Koottatep
 Sponsor: Bill and Melinda Gates Foundation
 Amount: Baht 29,975,970.61

Evaluating the Performance of Mitsubishi Membrane Aerated Biofilm Reactor (MABR) Lab Scale Membrane Modules

Duration: 1 June 2017 – 31 May 2018
 Investigator: Prof. Chettiyappan Visvanathan
 Sponsor: Mitsubishi Chemical Aqua Solutions Co., Ltd.
 Amount: Baht 148,185

Evidence to Action Supplement on PEER project entitled “Assessment of Impacts to the Emission Reduction Measures of Short-lived Climate Forcing Pollutants on Air Quality and Climate in Southeast Asia”

Duration: 1 September 2017 - 30 May 2018
 Investigator: Prof. Nguyen Thi Kim Oanh
 Sponsor: United States Agency for International Development (USAID)/ National Academy of Sciences (NAS)
 Amount: Baht 837,750

Exposure visit FSM in Thailand

Duration: 24 October 2017 – 30 April 2018
Investigator: Dr. Thammarat Koottatep
Sponsor: East Meets West Foundation
Amount: Baht 139,179

Foundations for Climate Resilient and Sustainable Growing Settlements (U-Res)

Duration: 1 March 2017 - 30 August 2017
Investigator: Dr. Shobhakar Dhakal
Sponsor: NERC/Tyndall Center
Amount: Baht 443,020

Global Science Technology and Innovation Conference Series

Duration: 1 May 2017 - 31 December 2017
Investigator: Prof. Sivanappan Kumar
Prof. Rajendra Prasad Shrestha
Dr. P. Abdul Salam
Sponsor: VITONV Belgium
Amount: Baht 383,400

International Forum on Education for Rural Transformation

Duration: 1 July - 31 December 2017
Investigator: Prof. Sivanappan Kumar
Dr. Mokbul Morshed Ahmad
Sponsor: ASEAN China Corporation Fund
Amount: Baht 7,160,400

Knowledge and Innovation Support for ADB's Water Financing Program

Duration: 17 July 2017 - 29 June 2018
Investigator: Dr. Thammarat Koottatep
Sponsor: Asian Development Bank (ADB)
Amount: Baht 2,038,634

Optimizing Decentralised Low-cost Wastewater Infrastructure by Managing the Microbes

Duration: 1 May 2017 - 30 April 2020
Investigator: Dr. Thammarat Koottatep
Sponsor: Engineering and Physical Sciences Research Council (EPSRC GCRF)
Amount: Baht 12,616,798.50

Reports on Drinking Water Services and Technologies in Asian Countries - Phase III

Duration: 1 April 2017 - 30 September 2018
Investigator: Prof. Chettiyappan Visvanathan
Sponsor: Japan Water Research Center (JWRC)
Amount: Baht 179,000

Short Term Actions 2017, BMGF project 106990

Duration: 22 November 2017 – 31 December 2018
Investigator: Dr. Thammarat Koottatep
Sponsor: Subgrant from UNESCO IHE - BMGF Grant
Amount: Baht 954,093.66

Solar Power Plugged in Hybrid Electric Vehicle

Duration: 31 August 2017 - 31 December 2018
Investigator: Prof. Weerakorn Ongsakul
Sponsor: GMS Power Public Company Limited
Amount: Baht 1,000,000

Standard Methods for the Analysis of Faecal Sludge

Duration: 30 June 2017 – 31 August 2018
Investigator: Dr. Thammarat Koottatep
Sponsor: University of KwaZulu-Natal (UKZN) - BMGF Grant
Amount: Baht 1,454,000

Technical Assistance for Technology transfer and commercialization support of the AIT Toilet Innovations

Duration: 7 November 2017 – 30 April 2019
Investigator: Dr. Thammarat Koottatep
Sponsor: Bill and Melinda Gates Foundation
Amount: Baht 51,283,398.95

Test the Efficacy of Electrochemical (EC) Control System

Duration: 1 April 2017 - 30 November 2017
Investigator: Dr. Thammarat Koottatep
Sponsor: Research Triangle Institute (RTI)
Amount: Baht 1,654,000

Publications

Journal

- Cai, B., Li, W., Dhakal, S., & Wang, J. (2018). Source data supported high resolution carbon emissions inventory for urban areas of the Beijing-Tianjin-Hebei region: Spatial patterns, decomposition and policy implications, *Journal of Environmental Management*, 206, 786-799.
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- Sasidharan, N., & Singh, J. G. (2017). A novel single stage single phase reconfigurable inverter topology for a solar powered hybrid AC/DC home in smart grid. *IEEE Transactions on Industrial Electronics*, 64(4), 2820-2828.
- Sasidharan, N., & Singh, J. G. (2017). A resilient DC community grid with real time ancillary services management. *Sustainable Cities and Society*, 28, 367-386.
- Tangwanichagapong, S., Nitivattananon, V., Mohanty, B., & C. Visvanathan, C. (2017). Greening of a campus through waste management initiatives: Experience from higher education institution in Thailand. *International Journal of Sustainability in Higher Education*, 18(2), 203-217.
- Wartana, I. M., Agustini, N. P., & Singh, J. G. (2017). Optimal integration of the renewable energy to the grid by considering small signal stability constraint. *International Journal of Electrical and Computer Engineering (IJECE)*, 7(5), 2329-2337.

Conference

Basnayake, B. F. A., Popuri, S., Visvanathan, C., Jayatilake, A., Weerasoori, & Ariyawansa, R. (2017). A concerted initiative for planned management of municipal solid waste in target provinces in Sri Lanka, presented at the 4th 3R International Scientific Conference on Material Cycles and Waste Management, New Delhi, India, 8-10 March 2017.

Chaweewat, P., & Singh, J. G. (2017). Effects of high penetration of solar rooftop PV on short-term electricity pricing forecasting by using ANN-ABC hybrid model; case study of South Australia, presented at the 1st International Conference on Large-Scale Grid Integration of Renewable Energy in India, New Delhi, India, 6-7 September 2017.

Chueamuangphan, K., Kashyap, P., & Visvanathan, C. (2017). Packaging waste from e-commerce: consumers' awareness and concern, presented at the 7th International Conference on Solid Waste Management (7th IconSWM 2017), pp. 75-86, Hyderabad, India, 15-17 December 2017.

Intharathirat, R., & Salam, P. A. (2017). Analytical hierarchy process based decision making for sustainable MSW management systems in small and medium cities, presented at the 7th International Conference on Solid Waste Management, Hyderabad, India, 15-17 December 2017.

Joshi, P., Do, D. T., Saeteaw, N., Jumpusri, Y., Salam, P. A., & Visvanathan, C. (2017). Development of a CSTR system for mesophilic wet anaerobic digestion of food waste in Thailand, presented at the 5th International Symposium on Environmental Analytical Chemistry (ISEAC 5 - Asia), Ho Chi Minh, Viet Nam, 16-20 May 2017.

Kumar, S. (2017). Energy Access: Solar technology applications using "Energy plus" approach for the bottom of the pyramid, presented at the International Conference on Intelligent and Efficient Electrical Systems (ICIEES'17), Coimbatore, India, 19- 21 January 2017.

Kumar, S. (2017). Off-grid sustainable rural electrification in the developing Greater Mekong sub-region, presented at the 2nd International Conference on New Energy and Future Energy System (NEFES 2017), Kunming, PR China, 23-25 September 2017.

Kumar, S., & Das, P. (2017). Towards sustainable energy development in the ASEAN, presented at the ASEAN Science Technology and Innovation Conference, Nay Pyi Taw, Myanmar, 19-20 October 2017.

Kyaw, A. P., Lwin, C. L., Neupane, S., Salam, P. A., & Kumar, S. (2017). Energy access and usage in peri-urban industries in Yangon, Myanmar, presented at the 10th AUN/SEED Net Regional Energy Engineering Conference, Yangon, Myanmar, 9-11 November 2017.

Li, L., Chan, T., & Visvanathan, C. (2017). Combining advanced oxidation processes in attached growth membrane bioreactor for treating polluted surface water, presented at the 5th International Symposium on Environmental Analytical Chemistry (ISEAC 5 - Asia), Ho Chi Minh, Vietnam, 16-20 May 2017.

Li, L., & Visvanathan, C. (2017). Performance study of UV-O₃/aMBR on treating polluted surface water, presented at the 8th IWA Membrane Technology Conference & Exhibition for Water and Wastewater Treatment and Reuse, Singapore, 5-9 September 2017.

Mohanty, B. (2017). Innovations supporting transition towards urban energy sustainability presented at the International Conference on Contemporary Topics in Power Engineering and Aiding Technologies, Pondicherry, Tamil Nadu, India, 25-26 February 2017.



Rathnayake, T., Saeteaw, N., Salam P. A., & Visvanathan, C. (2017). Characterization of food waste of Bangkok, Thailand as feedstock for mesophilic, wet anaerobic digestion, presented at the International Conference on the Challenges in Environmental Science and Engineering (CESE-2017), Kunming, P. R. China, 11-15 November 2017.

Rathnayake, T., & Visvanathan, C. (2017). Pre-concentration technology comparison of domestic sewage for enhancing the performance of anaerobic digestion, presented at the 8th IWA Membrane Technology Conference & Exhibition for Water and Wastewater Treatment and Reuse, Singapore, 5-9 September 2017.

Salam, P. A., Visvanathan C., Rahaman, S. A., Srinivas, R. A., & Radu, T. (2017). Food waste based anaerobic digestion with centralized monitoring system, presented at the 7th International Symposium on Energy Manchester, England, 13-17 August 2017.

Salam, P. A., & Rahaman, S. A. (2017). Renewable energy systems for sustainable development of rural Asia, presented at the International Forum on Education for Rural Transformation, Asian Institute of Technology, Thailand, 13-15 November 2017.

Takahashi, K., Sasaki, F., Ando, S., Ohgaki, S., & Visvanathan, C. (2017). Development of NewTap: Online information platform for water supplies in Asia and Pacific, presented at the 7th IWA- ASPIRE Conference, Kula Lumpur, Malaysia, 11-14 September 2017.

Winijkul, E. (2017). Current and future particle number size distribution emission inventory of on-road vehicles in Southeast Asia, presented at the 18th GEIA Conference on Emissions Science for Healthy Environment, Hamburg, Germany, 12-16 September 2017.

Worapipat, B., & and P. Abdul Salam, P. A. (2017). Assessment of energy consumption and GHG emissions of van fleet: case study of Plykeaw tour company, chonburi province, Thailand, presented at the 12th GMSARN International Conference on Energy Connectivity, Environment and Development in GMS, Danang, Vietnam, 28-30 November 2017.



Seminars, Workshops, Presentations, Invited Lectures & Keynote Addresses

Dhakal, S. (2017). Green growth framework covering both national and city levels, Workshop on Green Growth and Cities, Institute of Advanced Studies, Lehmkuhlenbusch 4, 27753 Delmenhorst, Germany, 16-18 January 2017.

Dhakal, S. (2017). Energy security, Lead Presentation and Panel Moderator at the symposium on Responding to Development Priorities of Nepal, Hotel Himalaya, Kathmandu, Nepal, 10 February 2017.

Dhakal, S. (2017). Workshop on Decoupling in Asia: An Infrastructure Transition Perspective, organized by China-ASEAN Environmental Cooperation Center (CAEC) and the UN Environment's International Resource Panel, Jintai Hotel, Beijing, P. R. China, 15-17 March 2017.

Dhakal, S. (2017). Human settlements: Overview of the 5th assessment report (AR5) synthesis report, International Conference on Understanding Climate Change and Enabling Climate Action in the Hindu Kush Himalaya, organized by ICIMOD, IPCC and Ministry of Population and Environment Nepal, Kathmandu, Nepal, 10-13 April 2017.

Dhakal, S. (2017). Invited Expert to prepare IPCC's AR6 Scoping Document, AR6 Scoping Meeting, Inter-Governmental Panel on Climate Change (IPCC), Addis Ababa, Ethiopia, 1-5 May 2017.

Dhakal, S. (2017). Panelist and Speaker, High Level Panel on Sustainable Cities and Communities, Vienna Energy Forum, organized by UNIDO, IIASA, Austria Development Agency, SEE4ALL and Europe Integration Foreign Affairs of Republic of Austria, Hofburg Palace, Vienna, Austria, 11-12 May 2017.

Dhakal, S. (2017). Workshop Panelist, Workshop on Coal in Asia: The Challenge for Policy and the Promise of Markets, organized by King Abdullah Petroleum Studies and Research Center of Kingdom of Saudi Arabia., Hilton Hotel, 581 Orchard Road, Singapore, 8 June 2017.

Dhakal, S. (2017). Urbanization, cities and GHG emissions, 16th Meeting of the Scientific Steering Committee, Global Carbon Project, Hotel City Oberland, Interkalen, Switzerland, 18-20 August 2017.

Dhakal, S. (2017). Plenary keynote on Deep De-carbonization in 1.5 Degree World: Why cities are crucial? Climate and Cities Conference 2017, Potsdam Institute for Climate Impacts Research, Potsdam, Germany, 19-21 September 2017.

Dhakal, S. (2017). Urban design and sustainable buildings, Global Science, Technology and Innovation Conference, Brussels, Belgium, 23 -25 October 2017.

Dhakal, S. (2017). Keynote Speech on Low Carbon Cities: Knowledge and Action Gaps and Opportunities for Asia, 6th Annual Meeting of Low Carbon Asia Research Network (LoCARNet), Century Park Hotel Bangkok, Thailand, 1-3 November 2017.

Dhakal, S. (2017). Energy situation in the HKH: Results from the HIMAP Assessment, Workshop on Hydropower-based collaboration in South Asia: Socio-economic development and electricity trade, organized by Institute of Water Policy (IWP) of Singapore National University and International Centre for Integrated Mountain Development (ICIMOD), ICIMOD, Kathmandu, Nepal, 21-22 November 2017.

Dhakal, S. (2017). Invited expert and discussants, Regional Partners Forum @Quito+1, Strategies and Priorities for the Implementation of the NUA in Asia and the Pacific, Bangkok, Thailand, Hosted by UNESCAP and UN-Habitat, 28-29 November 2017.

Faysse, N. (2017). Juries are generally out. A review of some recent studies on the impacts of initiatives to face groundwater depletion in India, presented at the Bonjour India Conference, Bangalore, India, 20-21 November 2017.

Faysse, N., Purotaganon, N. M., Aguilhon, L., & Phiboon, K. (2017). Understanding intertwined changes in water management, agricultural value chains and farming families: the Doubt project in Prachinburi province: presented at the International Conference on Sustainable Agriculture (ICSA) on System approach for sustainable livelihood and environment, Chiang Mai University, Chiang Mai, Thailand, 7-8 December 2017.

Joshi, P., & Visvanathan, C. (2017). Sustainable food waste management practices in Asia: Policy and technological drivers, keynote Lecture at the International Conference on Challenges in Environmental Science Engineering (CESE-2017), Kunming, P. R. China, 11-15 November 2017.

Kim Oanh, N. T. (2017). Emission Inventory Using IVE for Co-benefits Study of Various Emission Reduction Measures in Transportation Sector for Semarang City, presented at the workshop on Co-benefit Action Plan From Transport Sector in Semarang, Indonesia, 20-23 January 2017.

Kim Oanh, N. T. (2017). Sustainable Mekong Research Network (SUMERNET) Annual Meeting 2017, Sunway Hotel, Phnom Penh, Cambodia, 29-30 March 2017.

Kim Oanh, N. T. (2017). Capacity Building Workshop, Berkeley Air Monitoring Group, Bangkok, Thailand, 25-26 July 2017.

Kim Oanh, N. T. (2017). The 5th Toward an Open Resources Using Service (TORUS) project thematic workshop on Remote Sensing and Image Analysis in Environmental Science Applications, Nong Lam University, Ho Chi Minh, Vietnam, 4-9 September 2017.

Kim Oanh, N. T. (2017). Workshop on Alternative Non-burning Options For Rice Straw Management in Vietnam, Hanoi, Vietnam, 12 September 2017.

Kim Oanh, N. T., Chirasuda, T., Permadi, D. A., Pannawee, M., Hang, N. T., & Chow, J. (2017). Characterization and emission inventory of particulate matter, gaseous and semi-volatile organic compounds emitted from solid waste open burning in Southeast Asia, presented at the American Geophysical Union (AGU) Fall Meeting, New Orleans, USA, 11-15 December 2017.

Kim Oanh, N. T., Permadi, D. A., Huy, L. N., Chaichai, P., & Shim, S. (2017, June). Performances of two mesoscale meteorological models of WRF and MM5 in simulation of meteorology over Bangkok metropolitan region domain, presented at the 3rd ACAM Workshop, Guangzhou, P. R. China, 5-9 June 2017.

Kumar, S. (2017). Energy access: The 'Energy plus' approach in rural Myanmar, presented at the UNEP-Tongji Institute of Environment for Sustainable Development, Shanghai, P. R. China, 10 April 2017.

Mohanty, B. (2017). Current Trends and Innovative Approaches to Green Energy, AIT Tiger-Leong International Innovation Camp, Asian Institute of Technology, Thailand, 16-27 January 2017.

Mohanty, B. (2017). Sharing ADEME's experience in the framework of low energy in tropical climates for housing innovation (LETCHI), The Sun and Earth Festival, Associations CRAterre and SECMOL, Ladakh, Ladakh, India, 20-31 July 2017.

Mohanty, B. (2017). Access to affordable energy: key to sustainable rural development, International Forum on Education for Rural Transformation, Asian Institute of Technology, Thailand, 13-15 November 2017.



- Ongsakul, W. (2017). Distinguished lecture at the 2nd IEEE International Conference for Convergence in Technology (ICT 2017) at Hotel Courtyard by Marriott, Pune, India, 6-9 April 2017.
- Ongsakul, W. (2017). Workshop in the Faculty of Mechanical and Electrical Engineering at Kunming University of Science and Technology, Kunming, P. R. China, 23-25 April 2017.
- Ongsakul, W. (2017). IEEE Power & Energy Society General Meeting (PESGM) 2017 International Conference in Chicago, USA, 16-20 July 2017.
- Salam, P. A. (2017). Examples of WEF Nexus approach from different regions of the world, presented at the Regional Consultation on Innovation Strategies for Sustainable Development Through Water-Energy-Food Nexus, UNCC, Bangkok, Thailand, 28-29 June 2017.
- Shipin, O. (2017). International Training Workshop on Environmental Policy, Strategy and Management in Equatorial Regions, Ministry of Natural Resources and Environment of Thailand, Takua Pa, Phang Nga Province, Thailand, 19-24 March 2017.
- Shipin, O. (2017). International Training Seminar on Observation & Monitoring: Development World & Climate Change, Puerto Princesa, Philippines, 5-14 June 2017.
- Shipin, O. (2017). The scientific aspect of the project dealing with ecological river health parameters proposed for local communities in the lower Songkhkham river basin (NE Thailand), presented at the International WLE Greater Mekong Forum, Yangon, Myanmar, 24-30 October 2017.
- Singh, J. G. (2017). Scope and Challenges of Smart Grid in Renewable Energy Integration, Expert talk at the Malaviya Research Conclave 2017 (MRC-2017), MMMUT Gorakhpur, UP, India, 9-11 July 2017.
- Singh, J. G. (2017). Smart Grid and ICT, Keynote Address at the International Conference on Emerging Trends in Computing & Communication Technology, Department of Computer Science & Engineering, Graphic Era Hill University, Dehradun, India, 17-18 November 2017.
- Visvanathan, C. (2017). Resilient cities through resource efficiency: Implications towards SDG, presented at the International Workshop on Development of Energy, Environment and Ecosystems (3E) Nexus Initiatives for Sustainable Development in Asian Countries, University of Tokyo, Tokyo, Japan, 17-18 January 2017.
- Visvanathan, C. (2017). Building resilient cities through 3R principles and higher resource efficiency, Keynote address at the 5th International Symposium on Advances in Civil and Environmental Engineering Practices for Sustainable Development (ACEPS-2017), Department of Civil and Environmental Engineering, University of Ruhuna, Galle, Sri Lanka, 16 March 2017.
- Visvanathan, C. (2017). Wastewater treatment approaches for developing countries: AIT's Research Direction, presented at the International Workshop on Water, Sanitation and Resource Recovery Solutions for Sustainable Development, National University of Sciences and Technology (NUST), Islamabad, Pakistan, 6-7 April 2017.
- Visvanathan, C. (2017). Membrane based decentralized wastewater treatment: path to sustainable cities, Keynote address at the 5th International Symposium on Environmental Analytical Chemistry (ISEAC- Asia), Ho Chi Minh City, Vietnam, 17-20 May 2017.
- Visvanathan, C. (2017). Situation analysis of SCP related education at the international level, presented at the SWITCH-Asia Sustainable Consumption and Production (SCP), Ministry of Mahaweli Development and Environment of Sri Lanka, Colombo, Sri Lanka, 25-30 May 2017.



Visvanathan, C. (2017). Global economic transition of next evolutionary acts: Progress of circular economy in ASEAN, Special Talk at the University of Graz, Austria, Graz, Austria, 7-14 June 2017.

Visvanathan, C. (2017). The 2nd Validation Workshop of SWITCH-Asia Sustainable Consumption and Production (SCP), Ministry of Mahaweli Development and Environment of Sri Lanka, Colombo, Sri Lanka, 8-11 July 2017.

Visvanathan, C. (2017). Training Program on Environmental Management and Climate Change, Centre for Research and Development of Safety and Environment Petroleum (CPSE), Ho Chi Minh City, Vietnam, 20-22 September 2017.

Visvanathan, C. (2017). Academic curriculum on holistic waste management, presented at the Global Dialogue on Technology for Resilient Cities, UNEP, International Environmental Technology Centre, Osaka, Japan, 17-19 October 2017.

Visvanathan, C. (2017). Professional Training Program on Design, Operation and Maintenance of Reverse Osmosis, Institute of Environmental Science and Engineering (IESE), National University of Science and Technology (NUST), Islamabad, Pakistan, 24-25 October 2017.

Visvanathan, C. (2017). The business of waste management: Opportunities for (informal & formal) private sector, presented at the 7th International Conference on Solid Waste Management (7th IconSWM 2017) pp. 72-74, Hyderabad, India, 15-17 December 2017.

Winijkul, E. (2017). The 4th Toward an Open Resources Using Service (TORUS) Workshop on Cloud Computing for Water Science and Water Management, Vrije Universiteit Brussel, Belgium, 27-30 March 2017.

Reports and Others

Errahj M., Lejars C., Sellika I., Kuper M., Faysse N., Dugue P., Bekkar Y., El Ghassem Z., & Impiglia A. (2017). Étude sur l'agriculture familiale à petite échelle au Proche-Orient et Afrique du Nord. Pays focus: Maroc. Rabat: Organisation des Nations unies pour l'alimentation et l'agriculture, CIRAD. <http://www.fao.org/family-farming/detail/fr/c/471943/>

Faysse, N., & Raiss, I. (2017). La menthe: un laboratoire prometteur pour des filières de production raisonnée impliquant les agriculteurs familiaux. Annexe 6. In Errahj, Mostafa. Étude sur l'agriculture familiale à petite échelle au Proche-Orient et Afrique du Nord. Pays focus: Maroc. Rabat: Organisation des Nations unies pour l'alimentation et l'agriculture, CIRAD, p. 82-83.



Book and Book Chapters

Dhakal, S., & Ruth, M. (2017). *Creating low carbon cities*. Springer International Publishing AG. ISBN: 978-3-319-49730-3.

Dhakal, S., & Ruth, M. (2017). Challenges and opportunities for transition to low carbon cities. In S. Dhakal & M. Ruth (Eds.), *Creating low carbon cities* (pp. 1-4). Springer International Publishing AG. ISBN: 978-3-319-49730-3.

Dhakal, S., & Shrestha, A. (2017). Optimizing water-energy-carbon nexus in cities for low carbon development. In S. Dhakal & M. Ruth (Eds.), *Creating low carbon cities* (pp. 29-42). Springer International Publishing AG. ISBN: 978-3-319-49730-3.

Salam, A. P., Shrestha S., Pandey, P. V., & Anal, K. A. (2017). *Water-energy-food nexus: Principles and practices*. Wiley and American Geophysical Union. ISBN: 978-1-119-24313-7.

Salam, A. P., Shrestha S., Pandey, P. V., & Anal, K. A. (2017). The need for the nexus approach. In P. A. Salam, V. P. Pandey, S. Shrestha, & A. K. Anal (Eds.), *Water-Energy-Food Nexus: Principles and Practices* (pp. 1-10). Wiley and American Geophysical Union. ISBN: 978-1-119-24313-7.

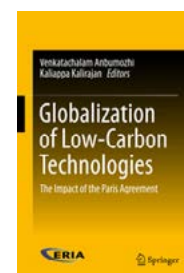
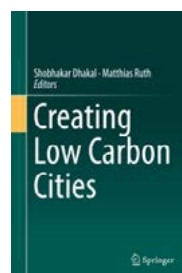
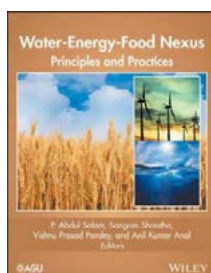
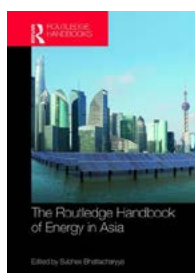
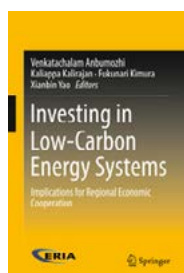
Kim Oanh, N. T., Permadi, D. A., Dong, N. P., & Nguyet, D. A. (2018). Emission of toxic air pollutants and greenhouse gases from crop residue open burning in Southeast Asia. In K. P. Vadrevu, C. Justice, & T. Ohara, (Eds.), *Land-atmospheric research application in Southeast Asia*. Springer International Publishing AG. ISBN: 978-3-319-67473-5

Kim Oanh, N. T., Permadi, D. A., Salam, P. A., Liew P. L., Hieu, D. V., Pongkirtkul, P., Sothea, K., Elyan, C., Hopke, P., & Hoanh, C. T. (2018). Assessment of co-benefits of using rice straw derived solid fuel for cooking to reduce emissions of agro-residue open burning in selected GMS countries. In *Sustainable Mekong Research Network (SUMERNET)*, Society for Inner Resources Development (SIRD), Malaysia.

Kumar, S. (2016). Low carbon energy systems and indicator framework for Cambodia, Lao PDR and Myanmar. In V. Anbumozhi, K. Kalirajan, F. Kimura, & X. Yao (Eds.), *Investing in low-carbon energy systems: Implications for regional economic cooperation* (pp. 215-249), Springer International Publishing AG. ISBN:978-981-10-0761-3.

Kumar, S., Anisuzaman, Md., & Das, P. (2017). Estimating the low-Carbon technology deployment costs and INDC targets. In V. Anbumozhi & K. Kalirajan (Eds.), *Globalization of low-carbon technologies: The impact of the Paris agreement* (pp. 335 - 365). Springer International Publishing AG. ISBN: 978-981-10-4901-9.

Kumar, S., & Urmee, T. (2018). On-grid solar energy in Asia. Status, policies and future prospects. In S. C. Bhattacharyya (Ed.), *Routledge handbook of energy in Asia* (pp. 173 - 188). Routledge.



Outreach

GMSARN International Conference 2017

The 12th Greater Mekong Subregion Academic and Research Network (GMSARN) International Conference 2017 on Energy Connectivity, Environment and Development in GMS Region was held from 28th - 30th November 2017 at the Muong Thanh Grand Danang Hotel, Vietnam. The Conference was jointly organised by GMSARN, Asian Institute of Technology (AIT) and Hanoi University of Science and Technology (HUST).

The conference organising committee was chaired by Prof. Worsak Kanok-Nukulchai, President of AIT and Co-chaired by Assoc. Prof. Dr. Hoang Monh Son, President of HUST. Prof. Weerakorn Ongsakul from the Department of the Energy, Environment and Climate Change (EECC) is the GMSARN Secretary General and Conference Executive Director. The 3 day conference saw participation from diverse academic as well as non academic backgrounds, including industry experts, seasoned professors & research fellow from various universities.

Conference Purpose

GMS region is a natural economic corridor bounded by the Mekong river with an area of 2.6 million square meters and a combined population of about 350 million. Presently, all GMS countries are facing the challenges how to transform GMS connectivity into genuine economic corridors which include energy trading, logistics, and trade facilitation.

Thus, infrastructure and human capital development are the priority to address the aspects of functioning GMS region particularly those that enhance competitiveness, and ensure sustainability. The aim of this GMSARN 2017 is to focus on energy connectivity and sustainability in the GMS countries. To address these critical issues, the International Conference 2017 on “Energy Connectivity, Environment, and Development in GMS” is a three-day platform for knowledge dissemination by a diverse group of researchers and participants. The rationale of the GMSARN 2017 is to initiate and stimulate international discussions and enhance research for exchanging the innovative ideas. The conference can be used as a platform on regional and trans-boundary perspectives. Therefore, it can contribute to sustainable development related to energy connectivity, environment and development.

In this aspect, GMSARN conference is a unique hosting, a wide range of various disciplines that would generate shared solutions and ideas to existing problems. In addition, this conference provides an ecosystem to disseminate the research and findings of development on various innovative and sustainable developments in GMS. It is also envisaged that the conference will benefit GMS education and research programs.

Read further at <http://eccc.ait.ac.th/wp-content/uploads/2017/12/e-newsletter-November-2017.pdf>



Regional Energy Resources Information Center (RERIC)

International Energy Journal (IEJ)

The center houses the publication arm of the Energy Academic Program at the Department of Energy, Environment and Climate Change, School of Environment, Resources and Development (SERD), Asian Institute of Technology (AIT). The IEJ, formerly known as RERIC International Energy Journal is published since 1979. It is dedicated to the advancement of knowledge in energy through vigorous examination and analysis of theories and good practices, and by encouraging innovations needed to establish a successful approach to solve identified energy-related problems. IEJ is a quarterly journal that publishes peer-reviewed papers on technical, socio-economic and environmental aspects of energy planning, energy conservation, renewable sources of energy, electric power transmission, generation and management. The papers are reviewed by renowned referees. IEJ also maintains an online journal system wherein not only current volumes are available but also archives containing past volumes and past special issues.

In 2017, the IEJ published four issues. IEJ is indexed in the SCOPUS and in the Scimago Journal Rank (0.212) and is the only Thailand-based journal focusing on energy-related issues. The journal is also honoured to be listed in the EI Compendex source list, which according to Elsevier, is the broadest and most complete engineering literature database available in the world with over 20 million indexed records from 77 countries across 190 engineering disciplines.

Those wishing to submit articles, communications, viewpoints and reviews should consult the Note for Authors on the inside back cover, before sending 3 copies and a soft copy contained in CD-ROM which should be sent to the Editor, International Energy Journal (IEJ), Regional Energy Resources Information Center (RERIC), Energy Academic Program, EECC Department, SERD, AIT, P.O. Box 4, Khlong Luang, Pathum Thani 12120 Thailand. Submission can also be made through the online journal system at www.rericjournal.ait.ac.th or by sending through email at rerjournal@ait.ac.th

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2017 Graduate Spotlight

Ayush Dhungel

Research Associate, Livelihoods, Energy

International Centre for Integrated Mountain Development (ICIMOD)



The most challenging aspect of studying in AIT under the Department of Energy, Environment and Climate Change (EECC) were meeting the deadlines for countless assignments and presentations on top of mid-term and final examination each semester. But now I realize, had I not been challenged then, I might have not been competent now. AIT has equipped me with necessary skills and ability to work effectively under time constraints. My supervisor at work often praises me for being efficient at work, for which the credit goes fully to AIT.

While lectures are delivered in every academic institution, AIT way of education ensures that every student fully participates in the courses being offered. Moreover, students also get opportunities to participate and showcase their hobbies and extracurricular skills during cultural show and mini Olympics, held at AIT every semester.

For me personally, along with the quality education, other aspects of AIT, specially, the quiet, green and scenic AIT campus, chance to play football every evening on the AIT ground, the swimming pool and the gym were huge factors which kept me motivated and happy during my two years stay here.

Shreeya Rana

Program Officer

Policy Entrepreneurs, Inc. Nepal



Energy Planning Policy and Economics at AIT is very relevant to the discourse of South Asian economies and its development strategies. In addition to having a rigorous theoretical framework, the course provides innovative learning of present day environmental and socio-political issues. Furthermore, AIT in itself provides a nurturing ground to work on your academic goals and for most acts as a launch-pad to further these goals to their work life. Personally, I am very grateful to have had the opportunity to be a part of AIT and consequently the doors it opened for me as I was able to apply my learning to evidence-based policy advocacy, an approach which is pertinent to shape the development of Nepal.

Facts and Figures

TRF Index

3rd Research Ratings 2014

54th

Global Ranking in Sustainable Development and Environmental Management



Energy

5.0



50

Sponsored Research Projects

Environmental Engineering and Management

5.0

405m Baht

Research Grants

272

Students from 25 countries



9

Areas of Specialization



70

Project Staffs

16

Faculty Members

4

Academic Programs

72

Graduates in 2017



QS World University Rankings by Subject 2017

#351-400

Mechanical Engineering

#101-150

Architecture/Built Environment

#151-200

Environmental Studies

#451-500

Computer Science Information Management

#151-200

Civil and Structural Engineering

#251-300

Business and Management Studies

#301-350

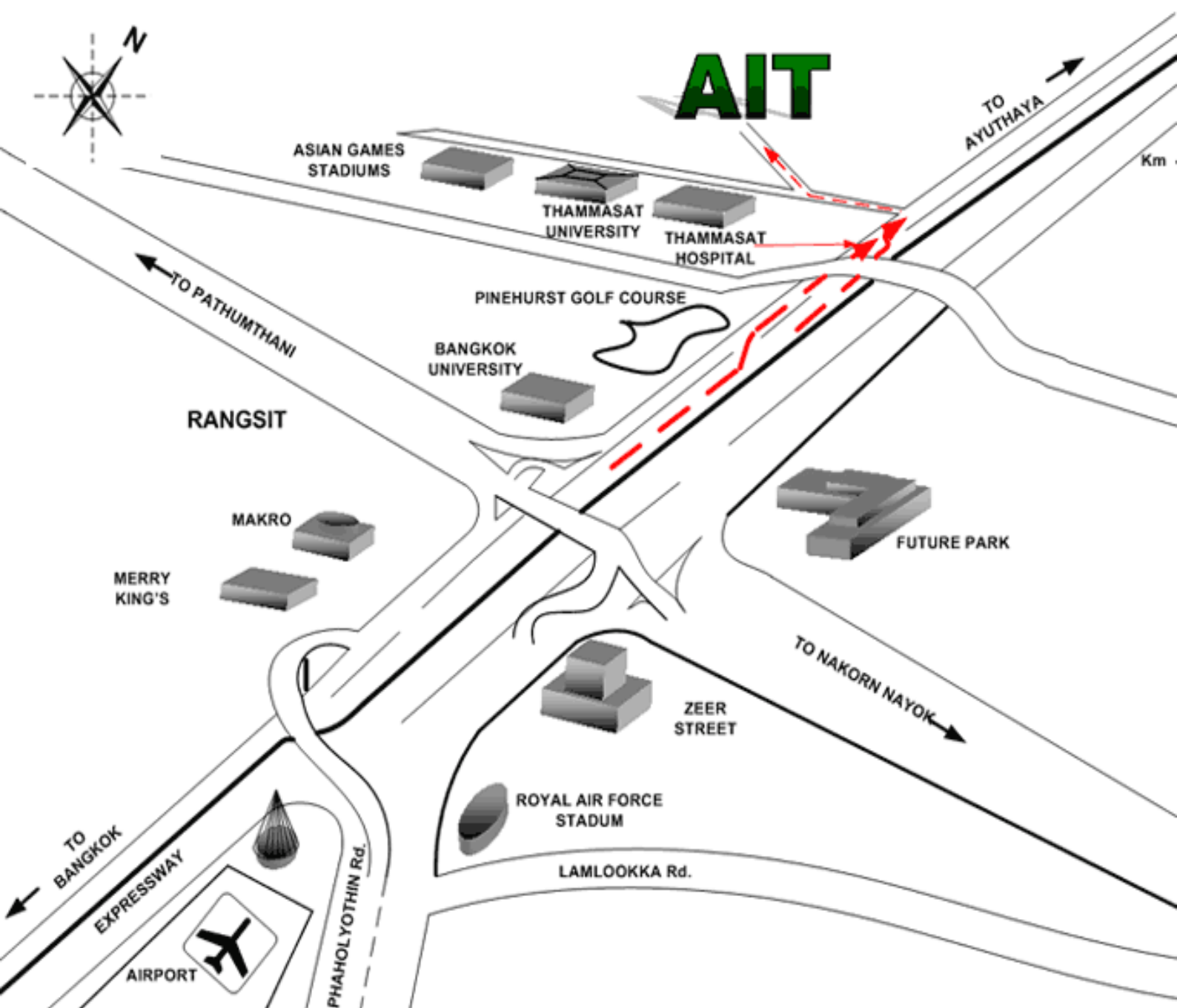
Electrical and Electronics

Road Map



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