



Course Outline

Online International Training Course via Zoom Meeting

1. Course Title:

Practical Sustainable Technology as a Tool to Tackle the Climate Change

2. Duration:

18-27 April 2022 (10 days)

3. Background and Rational:

TICA: Thailand International Cooperation Agency

TICA is a national focal point for Thailand's international development cooperation. TICA was established in 2004 to realize Thailand's aspiration to be a contributor of development cooperation. Believing that global challenges are best addressed by international cooperation and global partnership, today we continue to strengthen our contribution to achieve global development agenda through various capacity-building and human resources development programmes. In response to the recent changes in the global landscape of development cooperation, especially through the concept of South-South and Triangular Cooperation, TICA continues to realign our focuses in order to deliver Thailand's commitment to be a relevant partner in global agendas including the 2030 Agenda for Sustainable Development.

Organization/Institution

One of the most threatening environmental disasters human being has faced this century is the climate change. It is the consequence of, as most scientists suggested, human activities in forms of urbanisation and industrialisation. To mitigate the climate change, different causes contributing to this problem, e.g. fossil energy consumption, human attitude, natural resource over-consumption, need to be tackled. This, on the other way, can also be considered as a great opportunity for both developed and, in particular, developing countries to seize when environment is seriously brought into consideration with each country strategy in relation to economic progress.

Sustainable technology, especially the practical one, is such a very important tool to circumvent the climate change. This technology, which is based on the field of environmental engineering, involves methods for applying physical, chemical and biological theories into engineering practices focusing, particularly, on the appropriate means to solve environmental problems. Integrated with other disciplines, environmental engineering can also be used to evaluate impact of human activities on the environment. The non-environmentally friendly steps of any activities can be revealed leading to the sound and better measure being implemented. Due to the need of sustainable development, in the last decades, environmental engineering has been developed to find the way not only to treat wastes but also to transform wastes into usable products such as renewable energy, which is perfectly in line with how human should tackle the climate change.

The training course entitled “Practical Sustainable Technology as a Tool to Tackle the Climate Change” will be an important tool to disseminate knowledge to representatives from potential countries to learn how to apply different environmental engineering disciplines into the tangible measures to tackle the climate change. The content of this course is divided into six parts. In the first part, concept of the Life Cycle Assessment (LCA) and the way to assess carbon footprint of any products and activities will be presented. With this technique, the unequivocal “cradle-to-grave” impacts of each stage of a product or activity life on the environment can be measured. In the second part, principles of the biogas technology will be discussed, emphasising on the industry implementation. Participants will learn from examples how to change wastes into biogas which can subsequently be used as a supplementary fuel. Transformation of municipal solid wastes into the renewable energy and usable product in forms of biogas and compost will be illustrated in the third part. This can be considered as an unavoidable measure towards sustainable development, especially for the developing country, as municipal solid waste has become one of the most serious environmental issues. In the fourth part, utilisation of the wasted biomass for treating contaminated wastewater will be presented. Results from the research and techniques of using different kinds of the ubiquitously found wasted biomass in treating wastewater contaminated with some hazardous ions will be included. The biorefinery concept which aims to produce multiple products from various biomass components will be discussed in the fifth part of the course content. Various potential aspects to produce high value products along with biofuel/bioenergy production will also be presented. In the sixth part of the course, advances in the technology for producing and distributing the Compressed Biogas (CBG) for household using will be presented.

Moreover, people's attitude on the renewable energy utilisation will also be discussed. To provide the participants with the hands-on experience, each subject learnt will be put into practice by different workshops conducted in the lecture class. In addition, field trips will also be arranged to give the participants opportunities to see how the concept of each subject can be implemented in the real situation.

Faculty of Engineering, Chiang Mai University is one of the most renowned faculties in science and technology, concerning all aforementioned technologies and practice, in Thailand. The Environmental Engineering Department, Faculty of Engineering, has personnel with expertise in using different aspects of environmental engineering disciplines for supporting the sustainable development, which is a very important foundation to alleviate the climate change. We also have experiences in organising the training course at the international level. This claim has been strongly supported by the fact that we have been chosen by TICA to organise the international training courses entitled "Environmental Engineering Management for Wastewater" in the year 2012; "Towards Green Growth with Waste Utilisation" in 2014-2016 and also "Towards Low Carbon Society via Holistic Environmental Engineering Approach" in 2018 with remarkable success.

4. Objectives:

The program is designed to:

- 1.To exchange the situation in different countries in tackling the climate change.
- 2.To disseminate knowledge regarding techniques and technologies required for achieving sustainable development emphasising on using the environmental engineering approach.
- 3.To initiate a collaboration network across countries for circumventing impacts of the climate change.

5. Course Contents:

Practical sustainable technology for achieving sustainable development is the main content of this training course. Topics are included, life cycle assessment as a tool for measuring environmental impact; principles of biogas technology for industry; transformation of municipal solid waste into renewable energy and usable products; utilisation of wasted biomass in the permeable reactive barrier for remediation of contaminated groundwater; biorefinery in biofuel/bioenergy production; compressed biomethane gas production and applications.

6. Participants Criteria:

Applicants must fulfill the following requirement:

- Be nominated by their respective government;
- Education: All participants should have an understanding of an involvement in at least one of the following fields:
 - Environmental Engineering or Environmental Science
 - Waste or Solid Waste Management
 - Energy Conservation or Renewable Energy Production
- Language: proficiency in English (speaking, reading and writing)
- Participant's age must be under 50 years old.

7. Attendance and Evaluation

Participants who completed the online training will receive E-certificate base on:

- Real time Online Class (not less than 80%)
- Online class participation and discussion
- Online presentation and report
- Online evaluation

8. Venue:

The training course will be organized online via ZOOM from the Department of Environmental Engineering, Chiang Mai University, Thailand.

9. Expected Results:

- Participants gain awareness of the environmentally friendly practice, which will be one of the crucial actions to achieve the sustainable development.
- Participants can apply concept, technique and technology of environmental engineering approach learnt from the training course in solving problems or changing patterns of activities, e.g. industry manufacturing, waste/solid waste management.
- Initiation of a collaboration network across countries for the appropriate practice in different areas in order to alleviate the global warming and climate change crisis.
- Constructive image for Thailand as a country that fully aware and capable of making the measure towards sustainable development and strengthening Thai's university in a role of disseminating knowledge to the world society on this global issue.

10. Organization/ Institution:

▪ Implementing Agency;

Faculty of Engineering, Chiang Mai University, Thailand.

Faculty of engineering at Chiang Mai University creates and shares interdisciplinary knowledge about complex engineering systems through initiatives in education, research, and industry partnerships. Faculty of engineering consists of 7 departments (<http://www.eng.cmu.ac.th>). The training materials and equipment availability are also ready for this 20-participants training. All of the course coordinators and lecturers have very strong knowledge in their fields. They also have research interests and have strongly involved in the low carbon society supporting academic activities.

▪ Contact Person

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11. Expenditure/Funding:

Thailand International Cooperation Agency (TICA)

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Chaengwattana Rd. Laksi District, Bangkok 10210 THAILAND

Website: <https://tica-thaigov.mfa.go.th/en/index>

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12. Schedule for the Online Training Programme:

Date	Activity	Time (Thailand Time)	Coordinators/ Lecturers
Day 1: 18 April 2022 (Mon)	<ul style="list-style-type: none"> Registration, Orientation 	09.00 - 09.30	<ul style="list-style-type: none"> Staffs
	<ul style="list-style-type: none"> Open Ceremony 	09.30 - 10.00	<ul style="list-style-type: none"> Dean of Faculty of Engineering, Chiang Mai University Head of Environmental Engineering Department Staffs
	Lecture: <ul style="list-style-type: none"> How ChiangMai is tackling climate change? 	10.00 - 12.00	<ul style="list-style-type: none"> Representative from ChiangMai Municipality
Day 2: 19 April 2022 (Tue)	Lecture: <ul style="list-style-type: none"> Assessment of life cycle greenhouse gas emission/carbon footprint 	09.00 - 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Napat Jakrawatana
	Workshop: <ul style="list-style-type: none"> Measurement, Reporting and Verification (MRV) of greenhouse gas (GHG) mitigation in energy and waste management 	13.00 - 16.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Napat Jakrawatana and Dr.Sarunnoud Phuphisith
Day 3: 20 April 2022 (Wed)	Lecture: <ul style="list-style-type: none"> Principles of biogas technology: industrial application 	09.00 - 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Patiroop Pholchan
	1 st Virtual Field Trip: <ul style="list-style-type: none"> Biogas technology used in a factory 	13.00 - 15.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Patiroop Pholchan
Day 4: 21 April 2022 (Thu)	Lecture: <ul style="list-style-type: none"> Transformation of municipal solid waste into renewable energy and usable products 	09.00 - 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Aunnop Wongrueng Asst.Prof.Dr. Pharkphum Rakruam
	2 nd Virtual Field Trip: <ul style="list-style-type: none"> Hod District Landfill 	13.00 - 15.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Aunnop Wongrueng Asst.Prof.Dr. Pharkphum Rakruam
Day 5: 22 April 2022 (Fri)	Lecture: <ul style="list-style-type: none"> Utilisation of wasted biomass in the permeable reactive barrier for remediation of contaminated groundwater 	09.00 - 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Pimluck Kijjanapanich

	Lecture: <ul style="list-style-type: none"> Biorefinery in biofuel/bioenergy production 	13.00 – 16.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Saoharit Nitayavardhana
Day 6-7: 23-24 April 2022 (Sat, Sun)	Free day for participants		
Day 8: 25 April 2022 (Mon)	Lecture: <ul style="list-style-type: none"> Compressed biomethane gas production and applications 	09.00 – 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Sirichai Koonaphapdeelert
	3 rd Virtual Field Trip: <ul style="list-style-type: none"> CBG production and pipeline systems 	13.00 - 15.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Sirichai Koonaphapdeelert
Day 9: 26 April 2022 (Tue)	<ul style="list-style-type: none"> Group Presentation Preparation (1) 	09.00 – 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Aunnop Wongrueng Asst.Prof.Dr. Pimluck Kijjanapanich Asst.Prof.Dr. Pharkphum Rakruam Asst.Prof.Dr. Saoharit Nitayavardhana
	<ul style="list-style-type: none"> Group Presentation Preparation (2) 	13.00 - 16.00	
Day 10: 27 April 2022 (Wed)	<ul style="list-style-type: none"> Group Presentation: “How to enhance the country strategy in order to tackle climate change?” 	09.00 – 12.00	<ul style="list-style-type: none"> Asst.Prof.Dr. Patiroop Pholchan Asst.Prof.Dr. Sirichai Koonaphapdeelert Asst.Prof.Dr. Aunnop Wongrueng Asst.Prof.Dr. Pimluck Kijjanapanich Asst.Prof.Dr. Pharkphum Rakruam Asst.Prof.Dr. Saoharit Nitayavardhana
	<ul style="list-style-type: none"> Evaluation and Certification Ceremony 	13.00 – 15.00	Head of Environmental Engineering Department