# Narrative Report

## International Training Programme on Renewable Energy:
## BIOGAS ENERGY FOR COMMUNITY DEVELOPMENT

**held in cooperation of:**
**the Government of the Republic of Indonesia,**
**Centre on Integrated Rural Developnment for Asia and the Pacific (CIRDAP)**
**and Non-Aligned Movement**
**Centre for South-South Technical Cooperation (NAM CSSTC)**

**Yogyakarta, Indonesia, 24 - 29 November 2014**

Narrative Report

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**Biogas Energy for Community Development"**

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## I. Background

Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves and geothermal heat. Renewable energy replaces conventional fuels in four distinct areas: electricity generation, hot water/space heating, motor fuels, and rural (off-grid) energy services. Based on REN21's 2014 report, renewables contributed 19 percent to our energy consumption and 22 percent to our electricity generation in 2012 and 2013, respectively. Both, modern renewables, such as hydro, wind, solar and biofuels, as well as traditional biomass, contributed in about equal parts to the global energy supply. Worldwide investments in renewable technologies amounted to more than US$ 214 billion in 2013, with countries like China and the United States heavily investing in wind, hydro, solar and biofuels.

Renewable energy resources exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation, and economic benefits. In international public opinion surveys there is strong support for promoting renewable sources such as solar power and wind power. At the national level, at least 30 nations around the world already have renewable energy contributing more than 20 percent of energy supply. National renewable energy markets are projected to continue to grow strongly in the coming decade and beyond.

Rural development in developing countries has been given high priority. Programmes to empower rural communities have been in place. Infrastructure such as roads, bridges and electricity have been improved to support socio-economic activities. However, many people in many developing countries, have lack of access to economical and convenient energy sources. For various reasons, energy services provided by the government or the private sector are difficult to access by those living in remote areas. When accessible, the communities – mostly the poor – are burdened by the expensive price of the services, leading to an even more economically vulnerable state.

## II. Context

In many cultures - especially the poor - women and children are assigned to do the cooking and household chores. They become reliant on traditional forms of fossil fuels and natural resources such as coal and firewood and collecting them is a daily routine which isn't only time consuming but energy draining. The use of traditional fuel generating processes while being exposed to smoke on a daily basis, makes them susceptible to respiratorial tract infection and eye disease.

Individual biogas systems are already benefitting many households in developing countries, such as in Nepal, India, China, Indonesia and elsewhere. Biogas technology brings a lot of benefits, including contributing toward eradication of poverty and providing greater food security. The utilization of biogas will greatly affect health conditions of local communities, open new employment opportunities, and also affect the local economy. Although the Millennium Development Goals (MDGs) do not specifically target the energy sector, indirectly biogas technology undoubtedly has a positive impact on the fulfillment of MDGs in developing countries.

## III. Training Programme on Biogas Energy

The Government of Indonesia (Ministry of Foreign Affairs and Ministry of Energy & Mineral Resources) in cooperation with the Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP) and the Non-Aligned Movement Centre for South-South Technical Cooperation (NAM CSSTC) have successfully conducted an International Training Programme on Renewable Energy: Biogas Energy for Community Development.

The training programme was conducted from 24 to 29 November 2014 in Harper Mangkubumi Hotel, Yogyakarta. Field studies were conducted at the community-operated biogas unit plants in the Districts of Sleman and Kulonprogo, Special Territory of Yogyakarta..

The participants were requested to present their respective country papers on the separate sessions. The 9 (nine) Training Subjects were shared in the Class Session, namely: (1) Policy and Regulation of Renewable Energy; (2) Introduction to Biogas Energy Development: Characteristics of Biogas; (3) Biogas Unit Plant Development; (4) Review of Biogas Development in Indonesia; (5) Financial Aspect of Biogas Development; (6) Biogas Project: Issues of Sustainability; (7) Multi Stakeholder Approach for Biogas Project and Its Challenges; (8) Environmental Aspect of Biogas Development; and (9) Community Development (Social, Economic and Institutional). In addition, there were also field studies made in two villages of Sleman and Kulonprogo Districts. The basic difference of the two sites is on the feedstock type for the biogas digester. The biogas digester in Sleman is based on cow dung, while in Kulonprogo is based on liquid waste of tofu production process.

On the concluding session the participants also prepared and presented their Action Plans to be implemented in their respective countries when they are back home.

The series of evaluations were also made by using forms as the results described in the Chapter X, *pages 16-18.* Participants were also requested to express their expectations to be further discussed in the last session. In conclusion the training objective is satisfactorily achieved as shown on *pages 11-15*.

## IV. Programme Achievements

### *IV.1. Goal*

Goal of the project is that the trainees to achieve the following expectations:

a. Acquire a complete comprehension on basic knowledge and technical aspects of biogas;
b. Acquire necessary skills to develop biogas plant in his/her country;
c. Produce an action plan to be followed-up upon his/her return to his/her country/organization;
d. Learn from each other's relevant experiences across the country.

### *IV.2. Objective*

The main objective of the training is to provide an instant benefit to energy-related policy makers and renewable energy (especially biogas) practitioners. Upon completion of this training the trainee is expected to be aware of: (i) the importance of renewable energy; (ii) biogas energy development, including its feasibility and affordability; (iii) environmental aspect; (iv) technical construction, operational aspect and benefits of biogas; and (v) social, economic and institutional aspects of the biogas development process.

### *IV.3. Substance*

The training programme covered the following subjects:

a. Policy and regulation of renewable energy;
b. Introduction to biogas energy development: characteristics of biogas;
c. Biogas unit plant development;
d. Review of biogas development in Indonesia;
e. Financial aspect of biogas development;
f. Biogas project: issues of sustainability;
g. Multi stakeholder approach for biogas project and its challenges;
h. Environmental aspect of biogas development;
i. Community development (social, economic and institutional)
j. Field study at the community-operated biogas unit plant in Sleman District;
k. Field study at the community-operated biogas unit plant in Kulonprogo District.

*IV.4. Criteria of Successful Achievement*

Criteria of successful achievement is as follows:

a. Participant's expectations are met;
b. Training subjects delivered and discussed are relevant and clearly understood;
c. Methodology applied is appropriate;
d. Field studies enrich participants with technical aspects of the subjects concerned;
e. Participants prepare workable action plans.

*IV.5. Participant's Actual Inputs and Outputs*

The participant's actual inputs and outputs are: (1) provision of participant's countries situation; and (2) Action Plans prepared by participants on country basis.

## V. Methodology

The training programme was conducted through class session and field session.

*V.!. Class Session*

The training session is highly participatory and the teaching method is based on adult learning methodology that includes presentation on basic technical knowledge of biogas, case studies, group exercises and discussions. Least lecturing is used as this training is meant to be more practical and of immediate benefit to the participant.

*V.2. Field Session*

Field study to the best practice of biogas energy plant is an important part of the Training Programme. In this regard there are two sites of biogas plant were studied at Sleman and Kulonprogo Districts

*V.3. Country Report*

Country reports relating to problems and potentials of renewable energy development, especially of biogas energy, in the participant's respective countries were shared in the separate sessions.

*V.4. Language*

The official language of the Training Programme is English.

## VI. Key Implementing Strategy

Key strategies of the project implementation are as follows:

a. Sharing of knowledge and experiences between participants and trainers/resource persons;
b. Sharing of comparative experiences among participant of different countries;
c. Promotion of green development principles;
d. Transfer of knowledge and skills;
e. Promotion of green development works;
f. Application of appropriate and affordable technology.

## VII. Programme Activities

The Course Leader who successfully managed the programme activities is Rachmawan Budiarto, working at the Centre for Energy Studies of the University of Gadjah Mada, Yogyakarta, assisted by Achmad Rofi'ie of NAM CSSTC. The supporting officials for administration and logistics are Subandiyo of NAM CSSTC and Abigail Sihotang (Ms) of the Ministry of Foreign Affairs.

The Training Agenda was organized as follows:

| Date | Session | Agenda |
|---|---|---|
| Monday, 24 Nov 2014 | 08:00-09:30 | ***Opening Ceremony*** |
| | 09:30-09:45 | Coffee break |
| | 09:45-10:30 | Briefing on the Programme and Logistics (*Achmad Rofi'ie*) |
| | 10:30-12:00 | Policy and Regulation on Renewable Energy (*Edi Wibowo*) |
| | 12:00-13:00 | Lunch break |
| | 13:00-15.15 | Introduction to Biogas Energy Development: Characteristics of Biogas (*Agung Lenggono and Rachmawan Budiarto*) |
| | 15:15-15:30 | Coffee break |
| | 15:30-17:45 | Presentation of Country Papers (*Bangladesh, Thailand, Philippines*) |
| Tuesday, 25 Nov 2014 | 08:00-09:30 | Biogas Unit Plant Development (*Agung Lenggono and Rachmawan Budiarto*) |
| | 09:30-09:45 | Coffee break |
| | 09:45-11:15 | Biogas Plant Development (*Agung Lenggono and Rachmawan Budiarto*) *-continued* |
| | 11:15-12:00 | Review of Biogas Development in Indonesia (*Rachmawan Budiarto*) |
| | 12:00-13:00 | Lunch break |
| | 13:00-14:15 | Review of Biogas Development in Indonesia (*Rachmawan Budiarto*) *-continued* |
| | 14:15-15:15 | Financial Aspect of Biogas Development (*Agung Lenggono*) |
| | 15:15-15:30 | Coffee break |
| | 15:30-17:45 | Presentation of Country Papers (*Cambodia, Malaysia*) |
| Wednesday, 26 Nov 2014 | 08:00-08:45 | Biogas Project: Issues of Sustainability (*Suman Chandra*) |
| | 08:45-09:30 | Biogas Project: Issues of Sustainability (*Suman Chandra*) *-continued* |
| | 09:30-09:45 | Coffee break |
| | 09:45-12:00 | Multi Stakeholder Approach for Biogas Project and Its Challenges (*Suman Chandra*) |
| | 12:00-13:00 | Lunch break |
| | 13:00-15:15 | Multi Stakeholder Approach for Biogas Project and Its Challenges (*Suman Chandra*) *-continued* |

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|---|---|---|
| | 15:15-15:30 | Coffee break |
| | 15:30-16:15 | Environmental Aspect of Biogas Development (*Saifuddin Suaib*) |
| | 16:15-17:45 | Environmental Aspect of Biogas Development (*Saifuddin Suaib*) *-continued* |
| Thursday, 27 Nov 2014 | 08:00-09:30 | Community Development: Social, Economic and Institutional (*Suman Chandra*) |
| | 09:30-09:45 | Coffee break |
| | 09:45-12:00 | Presentation of Country Papers (South Africa, Lao PDR, Indonesia, *Vietnam*) |
| | 12:00-13:00 | Lunch break |
| | 13:00-15:15 | Preparation of Action Plan and Field Study<br>- Briefing on Field Study (*Abigail Sihotang*)<br>- Briefing on Action Plan (*Rachmawan Budiarto*)<br>Preparation of Action (*Participants*) |
| | 15:15-15:30 | Coffee break |
| | 15:30-17:45 | Preparation of Action Plan (*Participants) -continued* |
| Friday, 28 Nov 2014 | *Whole day* | Field Study to Sleman District and Kulonprogro District (*Facilitated by Local Government and Site Leader*) |
| Saturday, 29 Nov 2014 | 08:00-09:30 | Presentation of Action Plan by Country (*Facilitated by Rachmawan Budiarto)* |
| | 09:30-09:45 | Coffee break |
| | 09:45-10:30 | Presentation of Action Plan by Country (*Facilitated by Rachmawan Budiarto*) *-continued* |
| | 10:30-12:00 | Check Expectations and Overall Evaluation (*NAM CSSTC*) |
| | 12:00-13:00 | Lunch break |
| | 13:00-14:00 | ***Closing Ceremony*** (Certificate Awarding) |
| Sunday, 30 Nov 2014 | *Whole day* | Sightseeing to Borobudur Temple cum shopping (*Facilitated by the Committee*) |

## VIII. Participants

Total participant is 16 persons from Bangladesh, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, South Africa, Thailand and Vietnam.

They are from the governmental ministries, state energy institutions, bank, universities and non-governmental organization. Details are as follows:

| No. | COUNTRY | NAME | POSITION AND ORGANIZATION | CONTACT DETAILS |
|---|---|---|---|---|
| 1 | Bangladesh | S M Mohsin Hossain | Joint Director, SME & Special Programmes Department, Bangladesh Bank | SME & Special Programmes Department, Bangladesh Bank, Head Office, Dhaka-1000, Bangladesh<br>Ph: +88 02 9530220;<br>Cell: +8801711319559<br>email: smm.hossain@bb.org.bd |

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|---|---|---|---|---|
| 2 | Bangladesh | Md. Mohtahar Hossain | Deputy Director, Bangladesh Bank | SME & Special Programmes Department, Bangladesh Bank, Head Office, Dhaka-1000, Bangladesh<br>Ph: +88 02 9530220;<br>Cell: +8801911489659<br>Fax: +88-02-9512 991<br>email: motahar.hossain@bb.org.bd |
| 3 | Cambodia | So Bophakdey | Official, Hydroelectricity Department, General Department of Energy, Ministry of Mines and Energy | #79-89 Paster Street (51) Phnom Penh, Cambodia<br>Ph: (+855)-23-219-574, +855-12-659246<br>Fax:(855)-23-219-584<br>email: so.bophakdey@gmail.com |
| 4 | Indonesia | Muhammad Sigit Cahyono | Head of Petroleum Enginering Departement of University of Proklamasi 45 | Sawahan 09 Sidomoyo Godean, Sleman<br>Telp. +62-274-485517<br>Cell: +62-85232809931<br>Email: cgitk41@gmail.com |
| 5 | Indonesia | Siti Rachmawati | Lecturer of University of Proklamasi 45 | Jl. Proklamasi 1 Babarsari, Yogyakarta 55281<br>Ph: +62-274-485517<br>Cell:+62-852-54037346<br>Email: ct_rachma@yahoo.com.sg |
| 6 | Indonesia | Maria Darosari | Yayasan Bintang Firdaus | SMAK Syuradikara<br>Jl. Wirajaya Ende, Flores, NTT, Indonesia<br>Cell: +62-81252534502<br>Email: m.darosari@ymail.com |
| 7 | Indonesia | Widya Rosita | Lecturer of University of Gajah Mada (UGM) | Jl. Pandega Tamtama No. 4, Yogyakarta<br>Telp. +62-274-580882<br>Fax: +62-274-580882<br>Cell: +62-8122968426<br>Email: widyar@ugm.a.id; widyar@yahoo.com |
| 8 | Lao PDR | Amith Phomphimpha | Technical Officer, Ministry of Science and Technology, Renewable and New Materials Institute | Renewable Energy and New Materials Institute (REMI)<br>Ministry of Science and Technology (MOST) P.O.BOX: 2279, Vientiane Capital, Lao PDR<br>Telp. +856-21-739009<br>Fax: +856-21-739009<br>Cell: +85620 59096448<br>Email: amith.1988@hotmail.com |

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| 9 | Lao PDR | Lounny Sivannavong | Technical Officer, Institue of Renewable Energy Promotion, Ministry of Energy and Mines | Phonethan Village, Saysetha District, Vientiane Capital, Lao PDR<br>Telp. +856-20-55666042; +856-21-285144<br>Fax: +856-21-413013<br>Email: ninee_1510@yahoo.com |
| 10 | Malaysia | Frederick Wong Tsun Kiong | SEDA Malaysia (Sabah Branch) | Assistant Director,<br>Sustainable Energy Development Authority (SEDA) Malaysia<br>Lot 32, Likas Square Complex,<br>Jalan Istiadat, 88300, Kota Kinabalu, Sabah, Malaysia<br>Telp. +60-88-252101,<br>Fax: +60-88-250337<br>Cell: +60-13-881000<br>Email: Frederick@seda.gov.my |
| 11 | Philippines | Constantino Togan Sudaypan | Faculty, College of Agriculture, ; Director. Office of Extension Service Division Head, Affiliated Renewable Energy Center, Benguet State University | Office of Extension Services<br>Benguet State University, La Trinidad, Benguet 2601, Philippines<br>Telp. +63-074-4221877/+63-998261299<br>Fax: +63-074-4221877<br>Email: csudaypan@yahoo.com |
| 12 | Philippines | Elmar M. Villota | - Instructor. College of Engineering Central Luzon State University<br>- Technical Head. 2012-Present. Central Luzon State University – Affiliated Renewable Energy Center (CLSU AREC), CLSU, Philippines<br>- Technical Head**.** 2012-Present. Biogas Technology Unit, Philippine-Sino Center for Agricultural Technology (PhilSCAT), Central Luzon State University, Philippines. | College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Euja, Philippines<br>Ph: +63-9162785030;<br>Telefax: (044) 456-7208<br>Email: elmarvillota@yahoo.com |
| 13 | Philippines | Jeffrey Avilla Cotoner | Technical Staff, Department of Energy-Affiliated Renewable Energy Center for Region IV, Cavite State University AREC | Affiliated Renewable Energy Center for Region IV, Student Union Bldg., Cavite State University, Indang, Cavite<br>Ph: +63-906-240-8344; +63-46-6835591<br>Fax: +63-46-415-0011<br>Email: jeffrey.cotoner@gmail.com |

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| 14 | South Africa | Matlharhi Martin Baloyi | Energy Inspector: - Petroleum Inspectorate; Department: Petroleum Compliance, Monitoring and Enforcement National Department of Energy (Mpumalanga Region) | 192 Visagie, C/o PaKruger and Visagie Street, Pretoria, 0001<br>401 Moncumary Court<br>Plumar Street, Withbank, 1035<br>Telp. +013 653 0500/072 1891 664/082 308 0831;<br>Fax: +086 545 8511<br>Email: mathlharhi.baloyi@energy.gov.za/baloyi.martin@gmail.com |
| 15 | Thailand | Peera Changyao | Mechanical Technician, Agricultural Enginering Promotion Division, Department of Agricultural Extension, Ministry of Agriculture and Cooperatives | Department of Agricultural Extension Agricultural Engineering Promotion Division<br>2143/1 Phaholyothin Rd.,<br>Chatuchack, Bangkok 10900<br>Ph: +66-2-940-6176; +66-2-940-6177<br>Fax: +66-2-940-6185<br>Email: boybenzbank@yahoo.com |
| 16 | Vietnam | Tran Chi Trung | Deputy Director of Center for Participatory Irrigation Management, Vietnam Academy for Water Resources,<br>Ministry of Agriculture and Rural Development | Center for Participatory Irrigation Management-Vietnam Academy for Water Resources<br>No.171 Tayson Str.-Dong Da-Ha Noi-Vietnam<br>Tel: +84-915-166435; +84-4-35639746<br>Fax: +84-4-35642309<br>Email: trchitrung@yahoo.com |

## IX. Resource Persons

Resource persons are from the Indonesian Ministry of Energy and Mineral Resources, University of Gadjah Mada, the Dutch International Organization (HIVOS), National Institute of Rural Development (NIRD) of India and the Indonesia Clean Energy Development (USAID ICED). Details are as follows:

| No. | NAME | POSITION AND ORGANIZATION | CONTACT DETAILS |
|---|---|---|---|
| 1 | Ir. Edi Wibowo, M.T. | Head for Engineering and Environment of Bioenergy Division, Directorate General New, Renewable Energy & Energy Conservation, Ministry of Energy and Mineral Resources of Indonesia | Jl. Laladan Baru 42, Bogor, Indonesia<br>Tel: +62-812-810 3871<br>Email: edbowo@gmail.com |

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| 2 | Rachmawan Budiarto, S.T., M.T. | Centre for Energy Studies (PSE) UGM Dept. of Physics Engineering, Fac. of Engineering UGM Institute for Research and Community Service (LPPM) UGM | Centre for Energy Studies (PSE) UGM Dept. of Physics Engineering, Fac. of Engineering UGM Institute for Research and Community Service (LPPM) UGM<br>Yogyakarta, Indonesia<br>Cell: +62-813-92932566<br>Email: rachmawan@ugm.ac.id<br>Blog: sustainability-rachmawan.blogspot.com |
| 3 | Agung Lenggono, ST. | Biogas Technical Officer<br>Yayasan Rumah Energy/HIVOS | Jl. Ampera IV gg. H, Rais No. 1<br>Jakarta 12550, Indonesia<br>Tel: +62-21-7821090<br>Fax: +62-21-780-6746<br>Email: a.lenggono@rumahenergi.org |
| 4 | Dr. K. Suman Chandra | Professor & Head<br>NIRD, RNAGAR, HYD, India | National Institute of Rural Development<br>Ragendra Nagar, Hyderabad, India<br>Tel: +91-040-24008515<br>Cell: +91-09848997643<br>Email: sumanchandranird@gmail.com |
| 5 | Saifuddin Suaib Wittoeng, ST, M.Envs | Clean Energy Policy & Planning Analyst<br>USAID-Indonesia Clean Energy Development | Kota Wisata, Cluster Vancouver UA4/1 Cibubur, Jawa Barat, Indonesia<br>Cell: +62-82187455449<br>Email: saifuddin.suaib@iced.or.id; cipu.civil@gmail.com |
| 6 | Pradigdha Kumayan Jati | Staff of Planning Division<br>People Centered Business & Economic Institute<br>IBEKA | Jl. Madrasah II No. 10-B, Kelurahan Sukabumi Utara, Kecamatan Kebon Jeruk, Jakarta Barat, Indonesia<br>Tel: +62-21-53661517<br>Fax: +62-21-53661517<br>Email: pradygdha@ibeka.or.id |

## X. Expectations and Series of Evaluations

Prior to the starting session, all participants were requested to expres their expectations in written form using the form prepared by the Committee. Their expectations were compiled by subject of concerns and then discussed openly at the ending session. They all together checked whether their expectations were met or not. There were also series of post-class and post-field evaluations by subjects. Overall evaluation was also made before the Closing Session.

The results are as follows:

*X.1. Check Participant's Expectations:*

| EXPECTATIONS | MET | NOT |
|---|---|---|

| | | | | MET | | |
|---|---|---|---|---|---|---|
| | 10 | 8 | 6 | 4 | 2 | 0 |
| **ON THE GENERAL KNOWLEDGE RELATED WITH RENEWABLE ENERGY** | | | | | | |
| Easy enhancement system of renewable energy with some potential idea (e.i process and low cost - Bangladesh | V | | | | | |
| We want to know how the government of Indonesia is currently working to develop the renewable energy and biogas sector | V | | | | | |
| Renewable energy on Biogas<br>Renewable energy on Hydropower | V | | | | | |
| I wish to know the developments of Renewable Energy in global areas especially in rural area of participants countries | V | | | | | |
| 1. Hope in this Training can give a new knowledge about technical of the Biogas Energy<br>2. With the new knowledge on Renewable Energy, I can do it in my Pig Farms and my Countrys/ NTT | V | | | | | |
| I hope the meaning of Renewable Energy, the kind of Renewable Energy can be shared in this training. And then why the biogas is categorized as Renewable Energy | V | | | | | |
| About Biogas:<br>- Fundamental Aspect<br>- Financing Support<br>- Collaboration with another Department or Community<br>- Communication and Sustainability | V | | | | | |
| - Technology<br>- Development about Biogas Energy<br>- Skill Section Energy<br>- Skill Sustainable Agriculture\Using and Manage the Biogas Project | V | | | | | |
| - Technology<br>- Policy<br>- Financial System<br>- All of three section to be sustainable | V | | | | | |
| To see the many ways of using waste as "fuel" for biogas energy | | V | | | | |
| As to Philippines perspective on renewable energy, I believe that I am quite exposed and updated (to be enhanced from other countries) | V | | | | | |
| Compare Biogas Technology with other Renewable Energies Systems in terms of applicability and sustainability in Domestic Village Application | | V | | | | |
| Learn things which we can also share with my country | V | | | | | |
| It Is sustainable, accessible and affordable with minimum negative impacts both in health and environment | V | | | | | |
| Regulation and Renewable Energy | V | | | | | |
| Regulation to promote development of energy specially energy for rural development | V | | | | | |
| **ON THE BASIC TECHNICAL ASPECTS OF BUILDING AND DEVELOPING BIOGAS ENERGY** | | | | | | |
| Primary idea of technical aspect of building and developing biogas energy in the view of regulator of financial institution of a developing country e.i Bangladesh | V | | | | | |
| Technology that currently applied future plan for technology and | V | | | | | |

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|---|---|---|---|---|---|---|
| development | | | | | | |
| I am sorry, how to building and developing biogas<br>Because just have the project study | | V | | | | |
| I wish to know the new technological frame of biogas and story of its development, either success or failure story, especially in solid waste disposal to biogas technology | | | | V | | |
| I hope after follow this training I can repair the Biogas Energy in my place/ Pig Farm | V | | | | | |
| I hope the processing of building biogas energy can be explained clearly with the chemistriy reaction and also the safety management of a biogas energy center (biogas from the organic waste is prefer) | | V | | | | |
| How to make it user friendly to village people | | V | | | | |
| I would like technical of building biogas energy<br>I work about biogas energy and development | V | | | | | |
| I would like to gain from this course such as how to implement and manage the biogas energy project to be sustainable in case of policy and financing | V | | | | | |
| To learn technically what a biogas energy is and its type of application | V | | | | | |
| I am quite familiar with these designs common in the Philippines. However, I need to know more. | V | | | | | |
| 1) Different approach in building/designing domestic biogas systems to attain more effective, efficient and sustainable waste systems<br>2) Learn new technologies in designing and building biogas digesters, to attain more effective, efficient and sustainable waste systems | V | | | | | |
| Adopt technical design/ skills/techniques in the development of Biogas | V | | | | | |
| I have no practical and technical experience on the building and development of biogas | | V | | | | |
| 1. Fixed Dome Digester<br>2. Covered Lagoon<br>3. Bag Digester<br>4. Channel Digester | V | | | | | |
| New technology and skills for building Biogas Energy for Rural Areas | V | | | | | |
| **HOW YOU MAY RELATE THE SUBSTANCES (EITHER POLICY OR TECHNICAL ASPECTS) THAT WILL BE DELIVERED IN THE SESSION TO YOUR COUNTRY'S INTEREST** | | | | | | |
| Both the theory and technical aspects of renewable energy system required to know in really financial aspect low cost consume project | V | | | | | |
| We may get the idea of social development using renewable energy and share experience in policy making in the regarding matters | V | | | | | |
| When I knowledge about biogas, I will do action plan for my country's<br>• Goal<br>• Objective<br>• Conclusion | V | | | | | |
| I will analyse the theory to match with technical aspects and make an action plan to realize it in my country | V | | | | | |
| I can shared the knowledge I have in this training with the others pig farms in. NTT, specially in my home town. Ende | V | | | | | |

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|---|---|---|---|---|---|---|
| As we know, waste is still be a problem in Indonesia. I hope the biogas training can be realized in a solid disposal landfill | | | | V | | |
| Mixed it through community service project (e.g KKN) | V | | | | | |
| I will shared information to people and my friend in office interest for Biogas Energy in Indonesia | V | | | | | |
| In my country has a lot of feedstock to make biogas system and some rural area don't access electricity. So the biogas system will be interested in the area | | | V | | | |
| To see the many ways of using waste as "fuel" for biogas energy | V | | | | | |
| As a faculty member (teacher), I realize that it has relevance to our country much more that the Philippines is an Agricultural Country | V | | | | | |
| Because of some similarity (topography, climate etc)<br>I would guess that majority if not everything of the theoretical and applied information if applicable to the country | V | | | | | |
| Our experiences and challenges in the Development/ Promotion of the Technology | V | | | | | |
| In South Africa there is limited interest in biogas except in academic and research environment so practical knowledge and experience will be unavailable except to give and contribute my knowledge on coal and other petroleum projects | V | | | | | |
| - Biogas Construction Manual<br>- Biogas Plant Development | | V | | | | |
| Almost of the substance (theory and technical) may be shared in the served of my country interest | V | | | | | |
| **POSSIBLE APPLICATION OF KNOWLEDGE AND EXPERIENCES SHARED IN THE SESSION TO YOUR COUNTRY'S RENEWABLE ENERGY PROGRAMME** | | | | | | |
| Financial aspect in the view of regulator to make echo friendly and profitability | V | | | | | |
| We think we will be able to get ideas about establishment and maintenance costs of biogas/ renewable energy or how to develop this. This ideas may be adopted our own country | V | | | | | |
| Sorry, I don't have any idea about the plan for renewable energy for my country | V | | | | | |
| The new technology of biogas production from solid waste (organic) and the funding to realize that | | | | V | | |
| NTT need more to know about biogas energy and I think I can application the knowledge of biogas to people around me and shared my experiences | V | | | | | |
| The possible application of knowledge and experiences shared is about how to make a biogas energy center from organic waste material | | | | V | | |
| Through Community Services Project (KKN) | V | | | | | |
| I will shared knowledge about Biogas Energy | V | | | | | |
| I will shared the knowledge that I learned from the course in term of Policy and Regulation to control the Biogas programme and technology and financing system | | | | V | | |
| - To see ways to inform stakeholders/ companies intended in Biogas Energy to venture their business<br>- To see ways the government may want to improvement this knowledge in our country end my state sabah | | V | | | | |
| I will use my learnings from this training to enhance our curriculum on | V | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Agricultural particularly on extension education and rural development | | | | | | |
| Since I am directly involved in Renewable Energy Programmes, I think I can use knowledge I could learn from the program in project I am currently a part of. Also, these knowledge I can also share with my students in the University and through extension of activities we are doing | V | | | | | |
| I will adopt them and share it with my country as I continue promoting the use of Renewable Energy in our country | V | | | | | |
| Yes, I am planning to form a forum to advocate more needs and necessity on biogas, the importance of applying it in informal and rural communities as an alternative to reduce energy poverty and high depending on the national grid | V | | | | | |
| Environmental aspect of Biogas Development<br>Biogas Sustainability in Indonesia | V | | | | | |
| The knowledge and experiences shared in the sessions will be applied for promote rural community to develop Biogas energy suitable for the certain localities | V | | | | | |
| **OTHER EXPECTATIONS** | | | | | | |
| To gather knowledge to prepare an effective action plan for Bangladesh as a developing country | V | | | | | |
| My expectation from this program is that some core policy level and technical knowledge about biogas/renewable energy. How Biogas; Renewable Energy helping community development, for how can we use more efficiently to develop community as well as to conserve the global atmosphere` | V | | | | | |
| • Get knowledge about biogas<br>• Shared the knowledge to the people in the rural areas<br>• How to build and develop about biogas | V | | | | | |
| I wish to know the development of biogas technology and its perspective in global<br>I wish can get knowledge and relationship from another countries | V | | | | | |
| My first expectation is I can to repair the Biogas Energy in Pig Farms where I am place can do well. It will become a pilot project in my home town/Ende NTT | V | | | | | |
| As we know, the petroleum agency amount is decreasing every year. So we need an alternative energy to cover the lack of petroleum energy.<br>As we know, the waste in Indonesia is still be a problem.<br>Many ways that our government did still cannot solve the amount of waste that increasing every year.<br>I hope from this training I know the method and the knowledge to make biogas energy center in every province in Indonesia.<br>The knowledge is from every aspect, not only the processing but from the beginning until finishing. | | | | V | | |
| Biogas is a good alternative energy for village but the challenges is how to make it sustain (how to make it as a part of communities life)<br>I hope through this training I will get the answer | V | | | | | |
| I have knowledge about Biogas Energy. I will development Biogas for future | V | | | | | |
| I hope fully to learn from the course in case of technology, policy and financing to improve and develop Biogas Programme in Lao PDR | | | V | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| - To learn/ network with other colleaguesfrom other countrieson their knowledge/ expertise and experience in Renewable Energy<br>- To be able to bring back new knowledge in terms of technology knowledge / policy making to my country and to utilize/modify for use in my country<br>- A stepping stone to expose myself to biogas energy technology as I have no experience in it<br>- To show any knowledge/ expertise or experience with my fellow colleagues | V | | | | | |
| Basically, I hope to learn from the experiences and expertise of Indonesia and the other countries. I am very much interested to see the liquid waste biogas system during the field visit. I hope to gain a concept that we can use in our vegetable trading post | V | | | | | |
| - Learn more technically about anaerobic digestion – its basic principle and fundamental science<br>- Learn the different approaches at different countries but only the design and construction but more importantly their implementation and promotion<br>- Learn how the different stakeholders responsibility in the sustainability of Biogas Technology in respective countries. And probably select the best approaches to be applied inn my home country | V | | | | | |
| I hope that this would be a good chance to learn and share knowledge on the technology<br>I hope that my attendance here will help me enrich my knowledge in designing/paradigm, Techniques/Skills in Developing Biogas. Best practices of other countries and their experiences will be the best learning that I can bring home, I believe | V | | | | | |
| - The experience, I have in on alternative renewable energy and energy efficiency such as solar, wind power. So, my expectatives will be more on Air Quality and Environmental Management of Biogas<br>- Can this technology to applicable and sustainable in South Africa and the rest of Africa<br>- Can Biogas be an answer to energy poverty and energy needs for the people in rural and poor communities<br>- What can be the environmental, social and economic benefits of Biogas<br>- What is the cost of building and developing Biogas<br>- What are the technical and practical skills required to develop Biogas<br>- What are the medium and long term goals of having Biogas Projects in Communities | V | | | | | |
| The knowledge and experiences learned from the training may be also applied some relating guides such as:<br>- Promoting pig farm development<br>- Rural development programs<br>- Building new Rural Communes in the new rural Development Program in Vietmnam Energy Development for Rural Communities | V | | | | | |
| **Total** | **63** | **8** | **2** | **6** | **0** | **0** |

| Percentage | 84% | 16% |
|---|---|---|

Based on the percentage of met expectations (84%), it may conclude that the participants are satisfied with the training programmes that have met their expectations.

*As a reference, the scoring range is classified as follows: 81-100% met is Satisfied; 51-80% met is Good; 26-50% met is Sufficient; and 0-25% met is Failed.*

*X.2. Summary of Evaluation by Training Subjects:*

Participants were requested to fill up the Evaluation by Subject/Field Form right after the related subject/field was finished. The tabulation result of the filled up questionnaires shows the summary as follows:

| No | A1 | A2 | B1 | B2 | B3 | Score | Relevance | Efficiency |
|---|---|---|---|---|---|---|---|---|
| 1 | 3,7 | 3,4 | 3,4 | 3,5 | 4,0 | 3,59 | 3,5 | 3,6 |
| 2 | 4,4 | 4,3 | 4,3 | 4,5 | 4,4 | 4,36 | 4,3 | 4,4 |
| 3 | 4,4 | 4,5 | 4,4 | 4,6 | 4,6 | 4,50 | 4,5 | 4,5 |
| 4 | 4,6 | 4,4 | 4,4 | 4,6 | 4,7 | 4,53 | 4,5 | 4,6 |
| 5 | 4,3 | 4,4 | 4,1 | 4,5 | 4,6 | 4,36 | 4,3 | 4,4 |
| 6 | 4,4 | 4,3 | 4,4 | 4,6 | 4,3 | 4,40 | 4,4 | 4,4 |
| 7 | 4,3 | 4,4 | 4,4 | 4,4 | 4,4 | 4,41 | 4,4 | 4,4 |
| 8 | 4,6 | 4,8 | 4,8 | 4,8 | 4,6 | 4,71 | 4,7 | 4,7 |
| 9 | 4,5 | 4,5 | 4,7 | 4,6 | 4,3 | 4,51 | 4,5 | 4,5 |
| 10 | 4,8 | 4,8 | 4,6 | 4,7 | 4,6 | 4,69 | 4,8 | 4,6 |
| 11 | 4,6 | 4,9 | 4,5 | 4,6 | 4,6 | 4,63 | 4,7 | 4,6 |
| | 4,4 | 4,4 | 4,4 | 4,5 | 4,5 | 4,43 | 4,41 | 4,43 |

*The score range is from 1 to 5. [1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree]. The average score of all training subjects is closer to 5, it means that subjects delivered in the Class Session and/or Field Session are well understood by the participants and most appropriate for them.*

*[A1=level of understanding; A2=level of application; B1=training material; B2=professionalism of resource person; B3=time given; A1+A2=relevance; B1+B2+B3=efficiency].*

For reference, following is the number of subjects evaluated (left coloumn of the above table):

1. Policy and Regulation of Renewable Energy
2. Introduction to Biogas Energy Development: Characteristics of Biogas
3. Biogas Unit Plant Development
4. Review of Biogas Development in Indonesia
5. Financial Aspect of Biogas Development
6. Biogas Project: Issues of Sustainability

7. Multi Stakeholder Approach for Biogas Project and Its Challenges
8. Environmental Aspect of Biogas Development
9. Community Development (Social, Economic and Institutional)
10. Field Study in Sleman District
11. Field Study at Kulonprogo District

For reference, following is the name of resource person for the subject evaluated (related to the number of subjects):

1. Edi Wibowo
2. Agung Lenggono and Rachmawan Budiarto
3. Agung Lenggono and Rachmawan Budiarto
4. Rachmawan Budiarto
5. Agung Lenggono
6. Suman Chandra
7. Suman Chandra
8. Saifuddin Suaib
9. Suman Chandra
10. Community-operated Biogas Digester in Sleman District
11. Community-operated Biogas Digester in Kulonprogo District

Based on the evaluation result: the highest score of 4,71 belongs to Saifuddin Suaib, resource person for the Environmental Aspect of Biogas Development subject. While the lowest score of 3,59 belongs to Edi Wibowo, resource person for the Policy and Regulation of Renewable Energy subject.

Field study at Sleman District is better score (4,69) than Kulonprogo District (4,63). However the score of the respective field studies (nos.10 and 11) is higher than the score of the respective subjects discussed in the class session (nos.1 to 9).

Average of the total scores (4,43) is between 4 (agree) and 5 (strongly agree) with the related statements as described on *page 16.*

*X.3. Result of Overall Evaluation:*

Participants were requested to fill up the Overall Evaluation Form on the last session. The tabulation result of the filled up questionnaires shows the conclusion as follows:

1. <u>On Relevance of the Training</u>:
   - Workability of knowledge and practices: 75
   - Contents of the course: 76
   - Score: 4,72%

2. <u>On Effectiveness of the Training</u>:
   - Knowledge, practices and analysis: 77
   - Clear relation to present or future works: 75
   - Score: 4,77%

3. On Efficiency of the Training:
   - Expected subjects: 71
   - Field studies deepen understanding: 73
   - Timely implemeted to country's needs: 72
   - Appropriate time: 78
   - Score: 4,59%

The conclusion is based on the Table described below:

| No | A1 | A2 | B1a | B1b | B2 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 3 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 5 | 5 |
| 4 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 4 |
| 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 7 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 8 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 5 |
| 9 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 5 |
| 10 | 5 | 4 | 4 | 4 | 3 | 3 | 5 | 3 | 5 |
| 11 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 |
| 12 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 3 | 4 |
| 13 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 |
| 14 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 5 |
| 15 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 16 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | | | | | | | | | |
| Total | 75 | 76 | 77 | 77 | 75 | 71 | 73 | 72 | 78 |
| Score | 4,7 | 4,8 | 4,8 | 4,8 | 4,7 | 4,4 | 4,6 | 4,5 | 4,9 |
| | **4,72** | | **4,77** | | | **4,59** | | | |
| | | | | | | Total Score | | | 42,1 |
| | | | | | | Final Score | | | **4,68** |

*The score range is from 1 to 5. [1=strongly disagree/not satisfied/not beneficial/ not capable/not appropriate to 5=strongly agree/highly satisfied/very beneficial/very capable/very appropriate], and choice of No and Yes. The average score of all training subjects is closer to 5%, it means that overall subjects delivered in the Class Session and/or Field Session are well understood by the participants and most appropriate for them. Result of the tabulation is stated in percentage. It is also shown in the Final Score of 4,68%*

*[A1+A2=relevant; B1a+B1b+B2=effectiveness; C1+C2+C3+C4=efficiency].*

## XI. Action Plans

Summary of the action plans prepared by the country-based participants is as follows:

**1. Bangladesh**:

With the objective of developing and disseminating biogas technology in the rural areas with the ultimate objective of establishment of a sustainable and commercial biogas sector in the country, the government has been implementing the National Domestic Biogas and Manure Programme (NDBMP) from 2006.

Following is the development steps to be taken: (1) develop cooperative based bigger biogas plant for communities; (2) encourage establishing biogas plant for commercial use; (3) intensify 'One House One Farm' project; (4) arrange rigorous training for awareness and capacity building; and (5) include rural women in larger scale.

**2. Cambodia**:

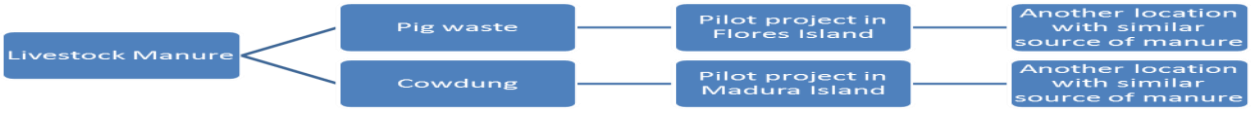
The action plan after training is: (1) to realize the benefits of animal dung; (2) to strengthen the capacity, skill focusing on the Biogas; (3) sharing of experiences to enhance and understanding the biogas plant development; (4) to promote awareness of rural people on biogas energy; and (5) to develop biogas plant in rural area.

**3. Indonesia**:

Aims of the action plan is:
- to improve the community knowledge about the importance of biogas system
- to improve community participation in existing biogas system management and operation

Target:
1. Community will get more information about biogas system
2. Community participation in biogas system management will increase
3. Forming locally management biogas system groups/cooperative
4. Get the local skilled technicians

The Scheme:




- Benefit for local people :

1. Free Organic fertilizer for their farming
2. Extra income from off farm product and surplus fertilizer
3. Capital for built another biogas system and maintenance through the cooperative

**4. Lao PDR**:

*Goal:*

- ❑ To develop of a sustainable energy supply industry in Lao PDR which enhances socio-economic development while ensuring environmental and social protection in energy sector development;
- ❑ To establish and demonstrate sustainable business and financing models for household biogas digesters in Lao PDR;
- ❑ To reduce LPG imported.

*Purposes:*

- ✓ To establish a sustainable financing scheme and business model for household and handicraft company biogas digesters in Lao PDR;
- ✓ To provide good quality affordable biogas units, in an economically sustainable way to users who need them at an affordable price.

*Target Location and Group:*

- ✓ Parklay District, Xayyabuly Province in Lao PDR*;*
- ✓ Households: 950 male; 1150 Female;
- ✓ ESCO's employees: Male 3; Female 3

**5. Malaysia**:

AIM:

✖ Build ONE biogas digester in my village house as a pilot project

TIMELINE:

✖ Within 6 months

SUPPORTING ORGANIZATIONS/INSTITUTIONS:

✚ NAM CSSTC
✚ HIVOS
✚ Local village council

**6. Philippines**:

A. Capacity building:

This involves activities that will raise awareness in key industries, improve local expertise and knowledge, identify possible collaborative projects, identify cost-effective opportunities to recover methane emissions for energy production as well as potential financing mechanisms to encourage investments. The capacity building can be in the form of workshops, technical assistance, conferences, consultations, meetings and other activities.

B. Create a register of biogas inputs:

To establish public/online and dynamic Biogas Portal with database of all the installation of biogas in the country with function of calculation of how much biogas could be produced from inputs owned by small-medium-large farms. Coordinating agencies to supply the data needed in the database for consolidation. This can be done through uploading their data with uniform format. The Center will be the one to maintain the dyamic website and will constantly update the database from the data submitted by other institutions periodically. (Partially On-going)
Online registration of interested and potential farm owner.

C. Implementing/Cooperating Agencies:
Department of Environment and Natural Resources (DENR) The primary government agency responsible for the conservation, management, development, and proper use of the country's environment and natural resources. DENR is the country's Designated National Authority (DNA) for the Clean Development Mechanism (CDM), Department of Science and Technology (DOST) The primary science and technology (S&T) body that provides central direction, leadership and coordination of S&T programs. It formulates policies, programs and projects in support of national development priorities in energy and environment. Department of Agriculture – Bureau of Animal Industry. The government agency that formulates and implements long and short-term programs to develop and expand the livestock, pultry and dairy industries. Department of Energy (DOE) Responsible for implementation of the energy development plan for the country, regulates all petroleum companies and is now promoting the shift to cleaner fuels. 5. Department of Trade and Industry (DTI) In-charge of promoting industrial development of the country, provides incentive to encourage industries to adopt cleaner technologies and sets standards of products manufactured, imported and sold in the country. Local Government Units (LGUs) Prepare and implement waste management programs in their respective jurisdiction in coordination with other government agencies. Responsible for solid waste management. Affiliated Renewable Energy Centers (ARECs)

**7. South Africa**:

Renewable energy sources, other than biomass (the energy from plants and plant-derived materials), have not yet been exploited optimally in South Africa. The DoE has strengthened international relationships in this area via partnerships established during the World Summit on Sustainable Development (WSSD) in 2002. Such partnerships will overcome market barriers and promote widespread use of sustainable energy solutions. These include the Global Village Energy Partnership and the Renewable Energy and Energy Efficiency Partnership.

The 2003 study also highlighted the technologies to be implemented first, based on the level of commercialisation of the technology and natural resource availability. These technologies include:

- Sugar-cane bagasse (the fibre that comes from crushing the sugar cane) for cogeneration;
- Landfill gas extraction;
- Mini-hydroelectric schemes;

- Commercial and domestic solar water heaters;

These technologies are to be deployed in the first phase of the target period, from 2005 to 2007. The Department has introduced nominal, once-off capital subsidies to assist project developers in implementing economically sound projects that are readily financed by financial institutions.

The DoE in partnership with the Development Bank of Southern Africa (DBSA) and Southern Africa Biogas Association (SABIA) hosted a National Biogas Conference on 30-31 October 2014 at Midrand.
*The conference's aims were as follow:*

- To market the multiple social and environmental benefits of biogas as a renewable energy resource options;
- To bring together all major biogas stakeholders to share views and experience on the benefits of biogas technologies and the challenges facing the industry;
- To showcase pilot biogas projects undertaken by both the private and public sectors;
- To act as a platform to foster active discussions between all stakeholders, especially relevant government departments and associated agencies for the removal of barriers to biogas projects and the development of pro-poor and job intensive industry support programs;
- To identify key research gaps and needs that have to be addressed to mainstream biogas solutions in the private sector, municipalities, rural areas and other low-income human settlement.

**8. Thailand**:

Background:
Bangna village located in Samutprakan Province having population of about 500 people and cattle about 40 cattles. They would like to develop biogas that was to be used for cooking and electric generator around 5 KW.

Project:
The project started in January 2015 funded by the Ministry of Energy, Thailand. The overall budget for the system was 1 mill Bath *(*30,500 USD*)*. The size of digester was to be 50 cubic meters of fixed dome digester construction was completed in July 2015.

The action plan is to encourage local people to be aware of the benefits using biogas energy and how to properly operate and manage the existing digester.

**9. Vietnam**:

The objective is:

1. Development of Biogas energy for large pig farms that allows a harmonious combination between power supply and reducing environmental pollution in rural area
2. Promote to apply modern technologies on building the integrated biogas plants for gas production, electricity generation and also for fertilizer production.

3. To improve income for farmers.

Stakeholders:
1. Department of economy and cooperative
2. Local Department of agriculture and rural development
3. Local authorities
4. Large pig farmers
5. Supporters, such as ADB, WB, SNV etc.

Location:
Provinces in the Red river and Mekong river

**XII. Conclusion and Recommendation**

Following is the conclusion and recommendation from the participants:

The overall implementation of the training programme on renewable energy: biogas energy for community development has been well implemented, both substantially and logistically.

However, there are some feedbacks from the participants expressed during the series of evaluations that should be taken into account in future similar training, as follows:

1. Despite the training subjects have been considered appropriate, it could be enriched with supporting references from other countries that have similar cases for comparative purposes. Cases of China, India, Nepal or Bangladesh could be included in the training handouts as comparative references.

2. Technical explanation at fieldsite(s) which are not complicated could be exercised as well.

3. Since the field study is not merely on technical matters, it is suggested to extend more days at feldsite(s) to observe and exercise relevant field works related to social and economic benefits by observing the beneficiaries.

4. Since the trainng programme is limited to use the biogas energy for cooking and lighting, it is suggested to study another use of biogas such as to generate electricity. There might be a good case available in Indonesia to be shared.

5. The field study could be enriched with variety of different feedstocks, such as cow dung, pig waste, liquid waste of tofu production process, human feces and other wastes.

6. The training programme that has been prepared beforehand, and distributed to participants, it should be referred as the basic guideline for time management. Possible

change of any subject and its time allocation due to some reasons it should be appropriately and reasonably informed sooner.

There is also strong recommendation to conduct another similar training with considering the feedbacks from participants. In this regard, NAM CSSTC and the Ministry of Energy and Mineral Resources will identify other best practices of biogas energy development that generate more value added to local community. Potential plants that will be observed sooner could be located in Java or outer islands.

## XIII. Selected Photos

Group photo of participants


Welcoming Remarks by H.E. Ambassador Dato Paduka Mahmud Hj Saidin,
Member of the Governing Council of NAM CSSTC

Opening Remarks by Hasril Nuzahar,
Head of the Education and Training Centre for Electricity, New Energy, Renewable and Energy Conservation, Ministry of Energy and Mineral Resources of Indonesia


Brieifng on the Pogramme and Logistics by Achmad Rofi'ie,
Assistant Director for Programme of NAM CSSTC


Rachmawan Budiarto, Centre of Energy Studies, University of Gadjah Mada,
the Training Coordinator


Dr. Suman Chandra, Guest Resource Person from NIRD India, in the Class Session
at the Harper Mangkubumi Hotel, Yogyakarta

Group Discussion

Discussion at the Field-site in Sleman District, Special Territory of Yogyakarta


Observing Cow Dung-based Biogas Plant in Sleman District


Checking Manometer that Indicates the Condition of Biogas Supply

Discussion on the Energy Power by Different Electromagnetic Sources

Group Photo with the Owner of the Biogas Digester in Sleman District

Another Field Session at Kulonprogo District


Observing Tofu Processing Activities

Discussion on the Liquid Waste of Tofu Production Process-based Biogas Digester in Kulonprogo District, Special Territory of Yogyakarta


Cooking with Using Biogas-supplied Stove

Group Photo with the Owner of the Biogas Digester in Kulonprogo District

Presentation of Action Plan

Elmar M. Villota from the Philippines, as the Participants' Representative, delivering Vote of Thanks to the Training Committee on the Closing Session

Upik Jamil, Representative of the Ministry of Energy and Mineral Resources of Indonesia delivering speech on the Closing Session

Certificate Awarding on the Closing Session


Certificate Awarding on the Closing Session

H.E. Ambassador Esti Andayani, Director General of Information and Public Diplomacy of the Ministry of Foreign Affairs of Indonesia, Director of NAM CSSTC delivering official Closing Remarks

Group Photo after Closing Session

Visiting Borobudur Temple

Visiting Borobudur Temple