CASINDO

Capacity development and strengthening for energy policy formulation and implementation of sustainable energy projects in Indonesia

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DELIVERABLE NO. 8:

Report on general competency trainings (basic level) by TEDC for SMK teachers from the five CASINDO regions

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Preface

This report is deliverable no.8 of the project 'Capacity development and strengthening for energy policy formulation and implementation of Sustainable energy projects in INDOnesia (CASINDO)'. The CASINDO project aims to establish a self-sustaining and self-developing structure at both the national and regional level to build and strengthen human capacity to enable the provinces of North Sumatra, Yogyakarta, Central Java, West Nusa Tenggara and Papua to formulate sound energy policies and to develop and implement renewable energy and energy efficiency projects. Information on upcoming events, the presentations and meeting minutes of project team meetings and completed project reports can be found on the CASINDO website: www.casindo.info

The CASINDO project is funded by NL Agency and implemented by a consortium co-ordinated jointly by the Indonesian Ministry of Energy and Mineral Resources and the Energy research Centre of the Netherlands (ECN), comprising the following organisations:

- Indonesian Ministry of Energy and Mineral Recourses, Jakarta.
- Muhammadiyah University of Yogyakarta, Yogyakarta.
- Diponegoro University, Semarang.
- University of Sumatra Utara, Medan.
- University of Mataram, Mataram.
- University of Cenderawasih, Jayapura.
- Institute of Technology of Bandung (ITB), Bandung.
- PPPPTK BMTI, Technical Education Development Centre (TEDC), Bandung.
- Eindhoven University of Technology, Eindhoven.
- ETC-Nederland, Leusden.
- Energy research Centre of the Netherlands ECN, Petten.

In the course of the preparation of this progress report the authors consulted extensively with the technical teams in North Sumatra, Yogyakarta, Central Java, West Nusa Tenggara and Papua and with the Ministry of Energy and Mineral Resources. The contributions provided by these organisations are greatly appreciated.

Abstract

This report presents an overview of the training activities on general renewable energy technologies competencies conducted by TEDC Bandung, for the teachers of the 11 SMKs involved in the CASINDO project. The report also contains a description of the Training of Trainers activities conducted by the CASINDO consortium for TEDC staff in the renewable energy technologies micro hydro power, solar photovoltaic, wind energy, biomass , biogas and energy efficiency.

Contents

List of abbreviations and organisations

BM	Biomass
BG	Biogas
DGEEU	Directorate General of Electricity and Energy Utilization
EE	Energy efficiency
ETCERE	Education and Training Agency of the MEMR
EWG	Indonesia–Netherlands Energy Working Group
MEMR	Ministry of Energy and Mineral Resources
MHP	Micro Hydro Power
RE	Renewable Energy
REP	Renewable Energy Program
RET	Renewable Energy Technology
SMK	Sekolah Menengah Kejuruan -Vocational and Technical School
PV	Photovoltaic
TEDC	Technical Education Development Centre
WP	Work Package
WE	Wind Energy

1. Introduction

This report on Delivery 8 describes the trainings on general RET competencies for the teachers of the 11 SMK involved in CASINDO and upgrading trainings for TEDC staff in the renewable energy technologies (RET) Micro Hydro Power (MHP), solar photovoltaic (PV), wind energy (WE), biomass (BM), biogas (BG) and Energy Efficiency (EE) within the framework of the implementation of WP3: 'Development of skilled manpower for renewable energy and energy efficiency'.

According to CASINDO's project document Delivery D8 was originally focused on: 'Province-specific adapted curriculae, syllabi and lesson modules on MHP and solar PV for SMK teachers and students for the provinces of Yogyakarta and Nusa Tenggarra Barat'. In the same document Delivery D9 was focused on: 'Province-specific adapted curriculae, syllabi and lesson modules on MHP/PV/BM/BG/WE/EE for SMK teachers and students for the provinces of Central Java, North Sumatra and Papua'.

After the selection of the 11 SMK as pilot schools for the CASINDO project (see report D7), it was decided in consultation with these SMK by TEDC, to change the strategy for years 2010 and 2011 and to redefine the content of D8, D9, D10, and D11 accordingly. Firstly SMK Teachers had to be trained in the MHP, PV, WE, BM, BG and EE for upgrading their knowledge required for proper RET integration in the schools (D8, D9). Secondly in 2011 at SMK level operational curriculum development and development of related modules for narrow linkage between theory and practice will take place (D10, D11).

The reasons for the change in strategy were the following:

1. SMK Teachers needed firstly to acquire knowledge on RET before they could contribute to operational curriculum development at school level;
2. In the curriculum development the focus will lie on operational curricula at SMK school level
3. Basis for these operational curricula will be the national curriculum. TEDC is engaged in discussions with and the final submission of this national curriculum to the SPEKTRUM programme of the Ministry of National Education proposal on RET to be done in March 2011

With a national curriculum on RET well established the 11 SMK will be in a better position (in terms of curriculum space and budgetary means) to work on the concretization of their operational curricula and related first teaching in RET.

On the redefinition of the deliverables D8, D9, D10, and D11 and their deadlines was reported in CASINDO's 1st Progress Report -June 2009 to February 2010- (issued in June 2010) in Annex C: 'Revised list of deliverables and schedule'. The Deliverables D8 and D9 regard the training of SMK teachers. Distinction is made between the training in general RET competencies and the training in specific RET. D8 contains: 'Report on general competency training conducted by TEDC for 1-2 SMK teachers from each of the five CASINDO regions, and D9: 'Report on training on specific RE technologies conducted by TEDC for SMK teachers from five CASINDO regions'. All teacher trainings in D8 are still at basic level. This means TEDC Bandung has advanced training plans for them after the capacity of TEDC Bandung staff is developed further.

This report on D8 is closely related to the report on D9: they will be submitted at the same date. This document on Deliverable D8 reports also on the RET trainings TEDC staff members followed under CASINDO. These were needed for a proper implementation of the teachers trainings.

2. Training of SMK Teachers in general RET competencies

2.1 Introduction

In this report on D8 factual information about the trainings delivered by TEDC will be given. This information is based on detailed dossiers put up and maintained by TEDC per each delivered training. These dossiers contain the following elements: training brochure containing the target group, approach and content of the training, reporting by each SMK participating in the training on learning experiences (theoretical and practical), personal appreciation of each trainee of the training followed, and TEDC's reporting, including the learning materials used.

With respect to each training the distinction was made between the general programme related to the definition of the competencies to be catered in the training and the main programme of the training itself. Under the general programme separate and distinct attention was given to the issue of energy conservation in each training. In the main programme of the training itself attention is given to the learning process on practical competencies (how to teach) geared to the transfer of the learning contents to the SMK students. Related to this the development of the operational curricula at SMK level have gotten attention. After the completion of the main programme the trainees get a practical field assignment that has to be completed at SMK level after the training at TEDC and that is concentrated on the application of the learning contents in school practice.

The report on D8 will contain general remarks and observations on the way the trainings were carried out and what first outcomes they have generated. It should however be noted that this report does not aim at giving a comprehensive evaluation of the training activities carried out and the generated outcomes thereof: outcome can only be determined after the termination of the year 2011, when the learnt training contents were applied in the teaching practice at SMK level and in the development of SMK-based operational curricula.

In this report outputs per training will be indicated. Referred is then to the following types of tangible outputs:

- Training Certificates issued to the training participants after the successful completion of the general programme and the main programme
- Completion letter issued by TEDC after termination field assignment with remarks about the implementation of the learning modules for the SMK students
- In MHP trainings competency certificates for MHP operation signed by specific MHP assessors were issued

2.2 Summary teacher trainings general competencies

2.2.1 Teacher Training general competencies PV

Period/place: 24 – 31 May 2010, TEDC Bandung
Duration: 50 hours (without field assignment)
Participants: 10 teachers from 5 SMK

Content:

- *Main programme:* Introduction PV technology, solar PV operation (10 -150 W peak), solar PV maintenance, assembling solar PV system (including distinction solar home systems and applications for water pumping)
- *Teaching assignment (17 hours):* Teaching of selected learning modules to SMK students and socialisation on PV in SMK

Output:

- 10 certified SMK teachers for PV general competencies
- 10 completion letters with remarks after assignment to SMK teachers from TEDC

2.2.2 Teacher Training general competencies WE

Period/place: 8 – 16 June 2010, TEDC Bandung
Duration: 65 hours
Participants: 9 teachers from 9 SMK
Content:

- *Main programme:* Introduction wind energy technology, wind energy application plan (for 80 WE system), construction small wind turbine (practice lessons in construction wooden blades coated by fiberglass)
- *Teaching assignment (20 hours):* Teaching of selected learning contents to SMK students and socialisation on wind energy in SMK

Output:

- 9 certified SMK teachers for wind energy general competencies
- 9 completion letters with remarks after assignment to SMK teachers from TEDC

2.2.3 Teacher Training general competencies MHP

Period/place: 20 April – 3 May 2010, TEDC Bandung
Duration: 100 hours
Participants: 12 teachers from 4 SMK
Content:

- *General programme:* in addition to common general programme (see 2.1), development of MHP operational curriculum was given attention
- *Main programme:* Introduction of MHP (less than 100 Kw), Basic MHP calculations (water head, debit, power conversion), Basic plan for MHP construction (feasibility, initial plan), Operation and Management MHP plant (monitoring key values about electricity produced, cleaning schedules, shut down, switch on), competency test by MHP assessors Small Hydro Power Association Bandung and PT Entec Bandung for MHP operation
- *Teaching assignment (34 hours):* Teaching of selected learning modules to SMK students and socialisation on MHP energy in SMK

Output:

- 12 certified SMK teachers for MHP general competencies
- 12 competency certificates for MHP operation signed by MHP assessors
- 12 completion letters with remarks after assignment to SMK teachers from TEDC

2.2.4 Teacher Training general competencies BM (in cooperation with BPPTK)

Period/place: 11 – 15 October 2010, Kulonprogo, Yogyakarta

Duration: 50 hours
Participants: 22 teachers from 11 SMK
Content:

- *General programme:* within general programme (see 2.1) national curriculum was given attention; energy conservation was not separately treated
- *Main programme:* Practical applications: Production bio-briquettes (pyrolysis for production charcoal from coconut shells, pressing briquettes, 25 kg inputs for 10 kg output); Production bio-ethanol (from cassava, 25 kg input for 2 liter ethanol); Production of biodiesel (from used frying oil, 2 liter input for 1.5 liter biodiesel)
- *Teaching assignment (17 hours):* Teaching of selected learning contents to SMK students and socialisation on biomass in SMK

Output:

- 22 certified SMK teachers for biomass general competencies
- 22 completion letters with remarks after assignment to SMK teachers from TEDC

2.3 Qualitative aspects of the teacher trainings and first perceived outcomes

In the dossiers of each training trainees have given their personal appreciation about the trainings followed. The comment was made that in trainings, where one teacher per SMK that these teachers had to work too much in isolation when returned to their schools. In the other cases the place and function of the practical SMK level assignments was assessed positively and did give good suggestions on how to go forward with the formulation of operational SMK level curricula later.

TEDC carried out monitoring during the different trainings; in general the motivation of the trainees proved to be high. In-school TEDC monitoring after the trainings of the trainees' in school practice was limited to the visits paid by TEDC and ETC/TTP in June 2010 to the SMK in Yogyakarta and Central Java. In these visits was clearly shown that the schools did share the importance of RET integration in their curricula, but that the conditions for practical implementation were differing. All visited schools and their teachers that followed the trainings thus far, acknowledged the importance of the sequence training in general RET competencies – trainings in specific competencies, as useful.

The reports on the practical field assignment at SMK level after completion teacher training at TEDC proved to be useful for giving a first impression of how teachers put the learnt training contents in practice. These field assignments mostly served the socialisation of RET in the respective SMK.

In the TWGVII meeting (meeting with 11 CASINDO SMK in October 2010) more detailed feedback was given on the general effects of the delivered teacher trainings: awareness raising on the importance of RET clearly improved in all schools. Moreover: 3 SMK started with complete new RET programme for 30+ students per school, and one SMK has put a complete RET curriculum under the existing school programme of power generation.

In conclusion can be stated that the teachers trainings served well general knowledge dissemination about RET in SMK, stimulated the further search for solutions of RET integration within the existing framework (through local content, multi disciplinary, or extracurricular solutions), or even induced the setup of new RET programmes.

3. Additional training to TEDC staff

3.1 Introduction

For a proper realisation of the planned deliverable under D8, TEDC staff members followed themselves trainings in specific RET under CASINDO. This concerned those RET that were not touched upon before CASINDO. In the three EWG projects TEDC staff was only trained in the RET MHP, PV, WE, and BG. Under CASINDO TEDC staff participated in a training on EE in 2009 with few staff members. In 2010 two general trainings in BM for TEDC staff were carried by BTG and BPPTK Kulonprogo Yogyakarta. Also did TEDC organise an internal workshop on the development of a national RET curriculum.

3.2 Summary trainings to TEDC staff

3.2.1 TEDC staff training in biomass by BTG Enschede (Netherlands)

Period/place: 15 – 25 February 2010, TEDC Bandung
Duration: 100 hours
Participants: 17 TEDC staff members
Content:

- *Main programme:* Module 1: Biomass and Bio-energy (biomass characteristics, biomass pre-treatment, biomass to energy chain, municipal solid waste, and biofuels); Module 2: Primary conversion technology to biofuels, Carbonisation and agglomeration, Biomass gasification, Anaerobic digestion, Biomass pyrolysis, and Biomass combustion); Module 3: Secondary conversion of biofuels (Household energy, End-use and applications, Transportation fuels and bio-refineries); Module 4: General issues (Need for biomass energy strategies, Competing us of biomass, CDM and portfolio projects, Sustainability and policy issues, The project cycle, Example of developing a national bio-energy strategy, Biomass CHP – Example from Czech Republic, and CHP Best Practise).

Output:

- Certificate for 17 TEDC staff members
- Planning to get local practice BM training

3.2.2 Internal TEDC workshop on RET curriculum development

Period/place: 17 March – 1 April 2011
Duration: 100 hours
Participants: 12 TEDC staff
Content:

- Main programme: Process of RET curriculum development for SMK with reference to all produced RET curricula for Career Centre
    - Demand for RET SMK graduates
    - Valuing relative weight for the SMK of different RET curricula and modules (number of hours, selection of standard competencies);
    - Selection of RET learning contents;
    - Determination of number of hours for general and specific competencies;
    - Determination of content for general and specific RET programmes

Output:

- Draft academic script of RET expertise programme
- Draft academic script of RET expertise programme
- Competency standards basic competencies of RET for SMK
- Draft description of RET operational curriculum
- List of RET modules
- List of the teachers already trained
- List of RET equipment (including demonstration equipment)
- Capacity of a SMK RET workshop

3.2.3 TEDC staff training in biomass BPPTK Kulonprogo

Period/place: 11- 15 October 2010, Kulonprogo, Yogyakarta
Duration: 50 hours
Participants: 8 staff members TEDC
Content:

- *General programme:* within general programme (see 2.1) national curriculum was given attention; energy conservation was not separately treated
- *Main programme:* Practical applications: Production bio-briquettes (pyrolysis for production charcoal from coconut shells, pressing briquettes, 25 kg inputs for 10 kg output); Production bio-ethanol (from cassava, 25 kg input for 2 liter ethanol); Production of biodiesel (from used frying oil, 2 liter input for 1.5 liter biodiesel)

Output:

- Certificate for 8 TEDC staff members

3.2.4 TEDC staff training biogas 2nd level (in cooperation with BIRU)

Period/place: 4 – 7 May 2010, TEDC Bandung
Duration: 33 hours
Participants: 8 TEDC staff members
Content:

- *Main programme:* Introduction to biogas; Design of bio-digester for Indonesia; Detailed picture biogas digester; Construction material and biogas equipment; Construction technique of biogas digester; Some mistakes in construction and the consequences to functioning digester; General problems and alternative solutions in biogas digester development; Operation and maintenance biogas digester; Skills in facilitating and conducting biogas training; Field visit

Output:

- Certificate for 8 TEDC staff members

3.3 Qualitative aspects of trainings TEDC staff and first perceived outcomes

All trainings provided to TEDC staff under the EWG projects and under CASINDO made the development of a national RET curriculum for the SPEKTRUM programme (Ministry of National Education, Department for Vocational training) possible. In case the national RET curriculum is approved, the impact of these trainings can be called maximal. In spite of that TEDC staff members feel that for an adequate support to the process of RET integration in the SMK, further training

especially in BM and BG is still needed. This counts especially for BM with its different technologies and aspects; thus far BM trainings just served a basic knowledge level, whereas more in-depth training is needed.

For the other RET additional staff trainings are needed as well; here it concerns the broadening of knowledge about the different RET applications (i.e. grid connection of PV/WE systems, larger scale biogas applications, deepening EE knowledge).

The trainings provided to TEDC staff had also a refreshing impact on the character of its teaching practices: new theory and practice connections could be formulated.

4. Final remarks

The teachers trainings and TEDC staff trainings have taken place within a tight schedule. In spite of this, it was possible to meet the original planned targets.

The TEDC staff trainings and teacher trainings made it possible to compile the proposal for SPEKTRUM on RET. Official approval of the national RET curriculum would be a major outcome (and achievement) of the CASINDO SMK programme.