



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

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

## CASINDO DRAFT

### DELIVERABLE NO. 10:

### Report on the in-house trainings by TEDC

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## Preface

This report is deliverable no.10 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](http://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 Resources, 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.
- 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.

The sole responsibility for the content of this report lies with the authors. It does not represent the opinion of NL Agency and NL Agency is not responsible for any use that may be made of the information contained herein.

## Abstract

This report describes the in-house trainings given by TEDC to 4 SMK that are currently involved in CASINDO regarding the background of, the approach to and the steps taken for the development of operational curricula at SMK level. The report also explains also the results of the in-house trainings.

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## List of abbreviations and organisations

BG	Biogas
BM	Biomass
BSNP	Board for National Standards in Education
DGEEU	Directorate General of Electricity and Energy Utilization
EE	Energy efficiency
ETCERE	Education and Training Agency of the MEMR
ETCENEREC	Education and Training Centre for Electricity, New Energy, Renewable and Energy Conservation of the MEMR (former ETCERE)
EWG	Indonesia–Netherlands Energy Working Group
HYCOM	ASEAN Hydropower Competence Centre
IDBP	Indonesian Domestic Biogas Programme (BIRU)
KBK	Competency Based Curriculum (Kurikulum Berbasis Kompetensi)
KD	Basic competence (Kompetensi Dasar)
KTSP	School Level Curriculum (Kurikulum Tingkat Satuan Pendidikan)
MEMR	Ministry of Energy and Mineral Resources
MHP	Micro Hydro Power
RE	Renewable Energy
REP	Renewable Energy Program
RET/TET	Renewable Energy Technology (Teknologi Energi Terbarukan)
RPP	School level learning implementation plan (Rencana Pelaksanaan Pembelajaran)
SMK	Vocational and Technical School (Sekolah Menengah Kejuruan)
STTPP	Graduate Certificate of Education and Training (Surat Tanda Tamat Pendidikan dan Pelatihan)
PV	Photovoltaic
SK	Competency standards (Standar Kompetensi)
TEDC	Technical Education Development Centre
WP	Work Package
WE	Wind Energy

## 1. Introduction

This report on Delivery 10 describes the in-house trainings delivered by TEDC in 4 CASINDO SMK that are considered as the most advanced schools with respect to the integration RET in their educational practice. The concentration on 4 SMK instead of 11, as was envisaged in WP3, was chosen on purpose and was also a consequence of the circumstance that firstly assignments coming from the different teachers trainings had to be finished. This report does not only provide information on the results the in-house trainings yielded, but also highlights the general background of this kind of trainings and the educational approach to curriculum development at school level. Therefore will be attended to the following aspects:

1. The context for school level curriculum development
2. The central place of the school level syllabus, in which content standards and basic plus specialised competencies are defined
3. The support by TEDC to SMK to elaborate and handle the school level syllabus
4. The application of lesson modules in school practice
5. The putting up of school level Implementation Learning Plans related to the school level syllabus and lesson modules.

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).

This change in strategy did change the intended content of D10, as envisaged in the CASINDO project document. The new deadline for the submission of the D10 report was fixed on September 2011; the delay was due to a longer processing of TEDC's in-house training reports.

## 2. Approach to school level curriculum development

### 2.1 Introduction

The information given in this report is a reflection of accumulated experiences gathered in the course of the implementation of WP3 and the changes in strategy already mentioned in the previous chapter. In this respect the position of TEDC and the roles of the CASINDO SMK, the regional educational offices (Dinas Pendidikan), and the central Ministry of National Education, and ETC/TTP will be highlighted.

This information is based on discussions with/between different stakeholders working under WP3 and the observations made in the monitoring visits carried out by TEDC and ETC/TTP joint meetings with the 11 CASINDO SMK in the course of the CASINDO programme<sup>1</sup>. Also the detailed dossiers put up

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<sup>1</sup> Initial visits and subsequent monitoring visits have been carried out in respectively June 2009, July 2010, and May 2011. Aside these visits meetings with the 11 CASINDO SMK have taken place in October 2009, October 2010, and October 2011.

and maintained by TEDC per each in-house training workshop to the SMK were a source for clarifying the content and the results of these workshops. These dossiers contain the following elements: approach and content of the training, reporting by each SMK participating in the training on learning experiences (theoretical and practical), TEDC's reporting on the training, including the recording of the knowledge and skills acquired by the trainees. Based on the level of acquired knowledge and skills certificates were issued to the participants in the trainings.

## 2.2 Context of school level curriculum development

In competency-based education the objectives for teaching or lessons are to be expressed in terms behavioral skills students have to acquire. In the competency-based curriculum, the students acquire the ability to know, demonstrate, comprehend, apply, analyze, synthesize and evaluate as a result of the teaching-learning process.

The first competency based curriculum (KBK- Kurikulum Berbasis Kompetensi) was designed in 2000 and had to be implemented by all schools in Indonesia in 2004. The new KBK got a legal basis from the National Education Law No. 20, 2003, in which the establishment of a new curriculum according to new educational standards was envisaged. Another important legal provision for the national curriculum concerns the Government Regulation nr. 19, 2005, on the National Standards of Education. As part of this regulation, the original Curriculum 2004 was redesigned. Within this framework also the Board for National Standards in Education (BSNP) was created in May 2005.

BSNP is an independent institution that has the task to develop, monitor and evaluate the implementation of national education standards; it covers all educational sectors at all levels in Indonesia. BSNP is responsible for the development of national educational standards and the organization of national examinations, for advising central and local governments on quality assurance, and the assessment of textbooks (content, language, presentation). The assessment of teaching subjects relevant for basic competences is stated in the Standard of Competence Graduates / SKL (No. Permendiknas. 23, 2006). Herein the sequence of learning elements should be in line with the structures the subject disciplines offer; to be acquired competences should always be rooted in the established competency standards per learning subject. Besides that the availability of proper textbooks plays an important role in the concretisation of the official curriculum: they should offer content and contexts, they should propose activities and suggest learning materials/tools.

## 2.3 The central place of the school level syllabus

According to BSNP documents the Competency Based Curriculum should be understood as a guide for teachers. At school level teachers have to develop the syllabus, which is a summary of each school subject with the competencies linked to it. The syllabus is the point of departure for the development of learning plans based on the guidelines by the BSNP and under the supervision of the district education department and the department of religion. A syllabus should be the basis of the following elements:

- Main subjects matters
- Teaching steps including methods per subject
- Time allocated per step
- Learning resources/tools
- Assessment/Evaluation methods and criteria

At school level assistance is needed to properly develop syllabi and related textbooks. Schools and teachers often don't have sufficient experience and capacity to put syllabi together. For this the Ministry of National Education makes model syllabi for all subjects at all levels available for schools, that are intended to give instructional support to the curriculum users. Schools will require this support, as these syllabi are generic and not relevant to the local context of the school. The national curriculum offers the school free space for the Local Content curriculum for vocational competencies and local culture of local art (2 – 6 hours per week out of a total 38 hours a week).

## 2.4 TEDC's support to the elaboration of school level syllabus

TEDC's support to the elaboration of school related level syllabus was carried out in 4 CASINDO SMK that were the most advanced in the process of RET integration in their learning practices. For each school the support has taken place in two parts:

- a. A general training/workshop of 36 hours in the development of the school's RET related KTSP (school level curriculum)
- b. A specific RET related training/workshop (Enrichment training) of 33 hours oriented on the concentration RET of the SMK concerned<sup>2</sup>

The dates, number of participants and TEDC lecturers/instructors are given in the next table.

School	General training/ Workshop		Enrichment Training/ Workshop		TEDC Lecturer/instructor
	Dates	Number participants	Dates	Number participants	
SMKN 3 Merauke	24 - 27 May 2011	25	28 May – 3 June 2011	10	Drs. Tatang Sukendar MT
SMKN 2 Dolosanggul	15 – 18 June 2011	11	19 - 24 June 2011	9	Muhammad Fatori
SMKN 1 Balige	16 – 20 June 2011	18	21 – 23 June 2011	18	Juhari
SMKN 3 Jayapura	15 – 18 June 2011	9	19 – 24 June 2011	7	Niamul Huda, StT., MPd

TEDC prepared for each SMK the Terms of Reference for the school level trainings/workshops; based on an agreement with the school a contract was signed that fell within the general agreement between each SMK and CASINDO. After the completion of all trainings certificates were issued to the participants, based on the results of a final test on knowledge and participation.

In the General Trainings/Workshops not only subject matter RET teachers were participating, but also the school director and the head curriculum development. In the Enrichment Trainings/Workshops only the subject matter RET teachers participated in 3 of the 4 workshops. This explains the difference between the number of participants in both types of trainings/workshops. Only in SMKN 1 Balige the

<sup>2</sup> Per each training/workshop report have been issued by TEDC. The report have been drawn up by the TEDC moderators of each training/workshop

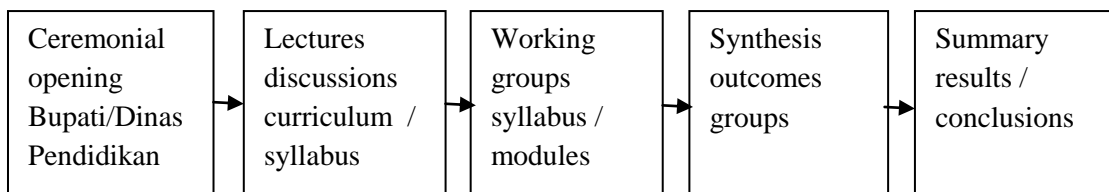
same groups participated in both trainings. All lecturers/instructors were part of the TEDC core group for RET development in SMK.; this core group fell under the general guidance and coordination of drs. Iman Permana.

For the opening of all Trainings/Workshops relevant local authorities have been invited. This resulted in the official opening of the SMKN 3 Merauke Training/Workshop by the Bupati of Kabupaten Merauke and the presence of representatives of the regional educational bureaus of Merauke, Jayapura, Doloksanggul and Balige.

The goals of the General and Enrichment Trainings/Workshops were for all schools the same:

1. Guidance to the preparation of the School Level Curriculum (KTSP) for Renewable Energy Technologies (RET) in general and for the two concentration RET per each school
2. Guidance to the preparation of the syllabus for RET in general and the two concentration RET per each school
3. Guidance to the assessment of the RET modules in general and for the two concentration RET per each school
4. Guidance to the preparation of the school level Learning Implementation Plan for RET in general and the two concentration RET per each school

Each General Training/Workshop had the following sequence of activities:



For attaining these goals a general overview was given of the general principles leading of the national level curriculum for all subjects in line with the guidelines of Board for National Standards in Education (BSNP). According to these principles the curriculum should be:

1. Oriented on the potential, development, needs and interests of the students and their environment.
2. Diverse and coherent
3. Responsive to the developments in science and technology.
4. Relevant to the needs of life
5. Comprehensive and sustainable
6. In service of lifelong learning
7. Oriented to balance the national and regional interests

Within the framework of the principles of national level curriculum, the syllabus is the place to elaborate the standards of competence in the learning subjects and the ways of assessing the achievement of the competencies by the student. In the training/workshop the RET related competencies were specially highlighted, as they were completely new to the actual school practice. Thus far RET got attention in the schools in relation to the existing curricula and syllabi for the existing subject under Technology and Engineering. TEDC provided the syllabi for the RET MHP,



PV, WE, BG and BM, which were developed in the previous years. These syllabi served as examples for further fine-tuning in accordance with the specific requirements of each school.

TEDC also provided the modules per each RET, after a general introduction on the main characteristics of modules. In the learning modules the leaning contents are described in detail (for example: the different components of a micro hydro power plant i.e.: penstock, turbines, powerhouse, electrical connections, etc., and their operation). This description goes hand in hand with the indication how the student can learn (for acquisition of knowledge, motivation and skills), and what learning tools can be mobilised (texts, demonstration equipment, practical exercises, outside visits). So each module gives an indication of learning contents, learning strategies, and learning means. Attention to the school's environment is important for making the module directly relevant; the development of each module should always be in line with the standards of competence, as defined in the syllabus. In the process of module development each module should meet the following main features:

- It is a source for self-instruction
- It contains a consistent set of knowledge and skills elements
- It is an unit on its own
- It is adaptive to external developments
- It is user friendly and accessible

## 2.5 Application of lesson modules in school practice

All 4 SMK produced a document with the definition of the specific RET standard competencies (KD) as part of the general competency standards (SK), and the syllabi on MHP, PV, WE, BG, and BM. This was mainly done in the Trainings/Workshops as the 2<sup>nd</sup> part of the Enrichment trainings for SMK. The different RET modules, as firstly developed by TEDC, were examined in detail. In SMKN 3 Merauke and SMKN 3 Jayapura in total 18 lesson modules have been studied in 4 groups:

- Energy Conservation and Environmental Aspects
- Financial and Economic Analysis RET applications
- The introduction of MHP
- Main components of a MHP plant
- Operation of the MHP plant
- Maintenance of MHP plant
- The introduction of solar PV
- Components of PV solar home system
- Installation of PV solar home system
- Operation of PV solar home system
- Maintenance of PV solar home system
- Legal inspection of PV solar home system
- Application Model PV solar home system
- The introduction of Wind Energy Technology
- Wind Manpower Planning Applications
- Wind energy Power Design Technology
- Utilization of biomass/biogas

Out of 18 Modules, the modules on the Utilization of biomass needs further development; for the other 17 modules was concluded that they were in principle fit for being used in the putting up of the school level Learning Implementation Plan. It was foreseen that in course of the use of the 17 modules adaptations would be needed: for now the adaptation with respect to regional needs appeared not to be

the most urgent. The main question now was: how to create space within the existing boundaries of the national curriculum for teaching RET contents?

In the Enrichment Trainings/workshops in SMN 1 Balige and SMKN 2 Doloksanggul was focused on the competencies related to the RET MHP, PV, WE and BM. This was especially in small groups, where teachers were divided per each RET.

#### Micro Hydro Power (MHP)

Basic Vocational Competencies MHP:

- Identifying technology MHP
- Drawing basic techniques.
- Using hand tools and measuring instruments related to MHP

Civil Engineering Vocational Competency MHP:

- Applying basic concepts regarding MHP infrastructures
- Maintaining MHP infrastructures
- Carry out feasibility studies and preliminary planning MHP
- Planning construction infrastructures MHP

Mechanical Engineering Vocational Competence MHP:

- Applying basic concepts of water turbines for MHP
- Operating basic equipment for mechanical work MHP
- Maintaining mechanical systems MHP
- Installing mechanical systems MHP
- Applying Cross flow Turbine Model

Electrical Engineering Vocational Competency MHP:

- Applying basic concepts of electricity MHP
- Maintaining Electrical System MHP
- Installing Electrical System MHP
- Operating Electrical System MHP

#### Solar PV (PV)

Basic Vocational Competencies solar home PV system:

- Installing PV solar home system
- Operating PV solar home system
- Maintaining PV solar home system
- Applying Model PV solar home system

#### Wind Energy (WE)

Basic Vocational Competencies WE:

- Conducting potential wind study
- Designing WE Unit
- Installing WE unit
- Maintain WE Unit
- Operating WE unit

#### Biomass (BM)

Basic Vocational Competencies BM:

- Manufacturing parts of the treatment plant BM
- Installing treatment BM
- Operating treatment plant BM

Concrete experiences with carrying out RET learning activities (theory and practice lessons), in the schools will make short-term adaptations in learning strategies needed. Adaptations with respect to regional needs are only expected after the first cycle of learning practices (i.e. the first school year with RET education) with the existing RET modules. The options for adaptation of lesson modules to regional needs were discussed in procedural terms. The need for adaptations was confirmed , but

further surveying for this purpose was deemed needed. The trainings/workshops did not provide the time/space to look into each module separately in this respect.

Regarding BM was noted that in the module the choice was made for the carbonisation of agricultural waste (pyrolysis) and briquetting afterwards. In the workshops was observed that the module on BM should be more elaborate and contain more different BM applications (bio-ethanol production, biogas). The reason to focus on carbonisation/briquetting stemmed from the priority given to this BM application by those CASINDO SMK, that have chosen BM as concentration RET.

In the training/workshops for all 4 SMK Energy Efficiency (EE) was approached as an overarching subject that should be kept in mind in all RET applications. Herein was mainly focused on giving attention to changing behavioural patterns that result in energy saving (new mentality to energy use). The vast area of different technical solutions related to EE were not given explicit attention, aside what was being treated in all RET modules under analysis.

## 2.6 Conclusions

The trainings/workshop to the 4 SMK did have a multi-purpose character. In the first place the schools have been updated and further capacitated on the development of school level syllabi and lesson modules in general. In the second place this process was solely focused on the integration of RET in the learning practices of these schools. For this the joint study and assessment of the RET lesson modules recently produced by TEDC, provided a platform for taking concrete steps for organising RET related lessons, and for giving feedback on the way the modules had to be used and what modifications/adaptations would be needed. Moreover: the knowledge of the RET teachers acquired in TEDC's teachers trainings was deepened and has become more practical, concretely geared to the day-by-day educational practices. Regarding the adaptation of the content of the modules to regional needs can be concluded that this concerns a gradual process that can really take off after the first cycle of handling the lesson modules.

## 3. Implementation Learning Plans

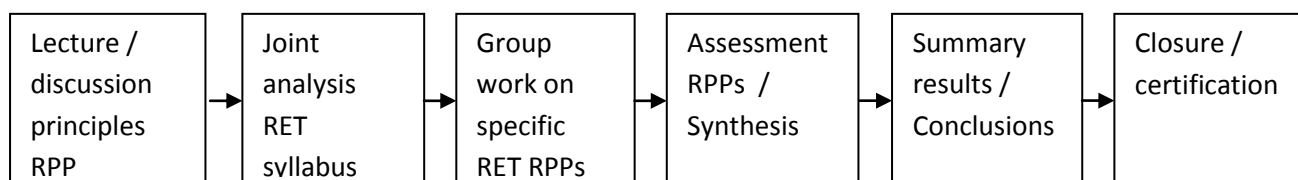
### 3.1 Introduction

In the last part of the trainings/workshops to the 4 SMK attention was given to the putting up school-level implementation learning plans (RPP-School level learning implementation plan (Rencana Pelaksanaan Pembelajaran) regarding RET education. These plans were the most tangible outcomes of the trainings/workshops and provide each school with a roadmap for the RET learning activities in the next future.

### 3.2 RPP: Function and steps followed

The RPP is derived from the syllabus and has to guide the learning activities of the students, in order that they can achieve meeting the Competency Standards (KD) within the planned period. The RET RPP's are based on the RET syllabus; the RPP means to be a further description and concretization of the syllabus. It contains a description of the sequence of learning activities, the identification of learning materials/tools, and the allocation of time. In general the learning activities that are designed in the RPP, are expected to facilitate interactive learning, and should be inspiring, exciting, challenging, and motivating students to actively participate in the learning process. And also should the RPP provide enough space for innovation, creativity, and independence in accordance with the talents, interests, and physical and psychological development of participant learners. This ambition is applicable to RPP's of all school subjects, thus not only to RET related learning.

The Enrichment trainings/workshops were mainly focused on putting together the different RET RPPs. The sequence of activities in these enrichment trainings/workshops was the following.



The question was whether a separate RPP has to be developed for every RET in accordance with the RET specific Basic Competencies to be achieved related, or a cluster of RET. When strictly following the character of a RPP, every RET should teacher prepare a complete and systematic lesson plan and apply them in their learning activities for each specific RET. The process of RPP development was not followed equally in the different trainings/workshops: per school this elaboration of RPP's was done differently, depending on the space each school could create for RET education.

The enrichment trainings/workshops for the 4 SMK did not serve only the integration of RET in the school practice, but also showed teachers of other school subjects how could be dealt with putting up RPP's. This took place in the internal dissemination activities (sosialisasi) on RET education after the trainings/workshops were carried out in each school.

In the enrichment trainings/workshops the following steps in the development of a RPP were distinguished.

1. Assessment of the standard competencies (SK) and the competency standards (KD) as stated in the syllabus for a particular RET, taking into account:
  - The linkage between the standard competencies and the competency standards, as formulated in the syllabus.
  - The range of rating in measuring the competency standards.
2. Definition of the indicators measuring SK and KD.
3. Formulation of the learning objectives based on the SK, KD, and indicators determined.
4. Identification of teaching materials based on the subject to be learned in accordance to the syllabus.
5. Specification of the learning method in accordance with the learning steps envisaged for the achievement of learning objectives.

6. Formulation of the steps in learning consisting of initial, core, and final activities. Initial activities are learning activities aiming at raising the motivation and focus on the attention of students to participate actively in the learning process.
7. Determine the equipment / materials / learning resources used.
8. Develop assessment tools include observation sheets, sample questions, and scoring techniques

Each SMK formulated RPPs per each RET; there were differing in number. For example: one school formulated 5 RPPs (2 for MHP and 1 for PV, WE, and BG), whereas another school opted for 8 RPPs (2 for MHP, 2 for PV, 2 for WE, and 2 for BM). The differences can be explained from the way the syllabus was interpreted and the specific preference and abilities teachers had. Also the way the school was using the free curriculum space (from local content or through extracurricular activities) played a role. In all trainings/workshops was very much looked forward to the materialisation of the integration of RET education in the National Curriculum under SPEKTRUM.

At the end of all trainings/workshops an evaluation was done of the knowledge acquired by the participants, the character of participation, the discipline/attitude displayed. When a participant passed a Graduate Certificate of Education and Training (STTPP - Surat Tanda Tamat Pendidikan dan Pelatihan) was issued; two participants did not get a certificate. The participants stated in the evaluation that further teacher trainings by TEDC would be necessary (especially in biomass and biogas, as well as schools that had only one teacher trained in a certain RET), as also coaching for guiding the opening of a special RET study discipline as soon as SPEKTRUM provides space for this.

### 3.3 RET syllabus and RPP in the next future

After the trainings/workshops decisions have been taken by all schools to establish special groups of teachers (sometimes called action committees) that will, in cooperation with the Vice Director Curriculum, take on contacts with the private sector in the school's environment as part of the RPP. Furthermore regular internal meetings will be organised to discuss experiences with RET related learning activities amongst the members of the special group, and also with students. The group aims at further internal information dissemination RET. Based on all this feedback the groups will adapt specific RPP for the school year 2011/2012, as well as the use and the content of the RET lesson modules in use. This process will go on up to end of the school year 2011/2012. After the school year feedback on the RET syllabus will be provided. The character of this feedback very much depends on how fast the RET curriculum is integrated in SPEKTRUM.

## 4. Final remarks

From the content of this report on Delivery 10 can be learned that activities geared to the integration of RET in SMK at the same time served the broader objective of renewing educational practices that were started from 2004 onwards. This explains that SMK involved in RET integration had to attend to interlinked processes at the same time. Out of the 11 CASINDO SMK, 4 SMK could face this double challenge. With the experience gathered in the 4 SMK, the other remaining SMK have later taken up the in-school trainings curriculum, syllabus, and module development. On these experiences will be reported in the Report on Delivery 11.

TEDC has succeeded in meeting the double challenge in its facilitation the trainings/workshops. The different moderators (for each school another moderator) were able to cater the different character and environment of the SMK involved. From their reports can also be learned that the process of handling the syllabus, modules, and the RPP is much requiring for every school. These made it difficult for these schools to be intensively involved in externally promoting RET integration to other schools in their provinces. The report on D11 elaborates more on this issue.