External Mid-term Evaluation and outlook of Renewable Energy Skills Development (RESD) in Indonesia

Evaluation Report

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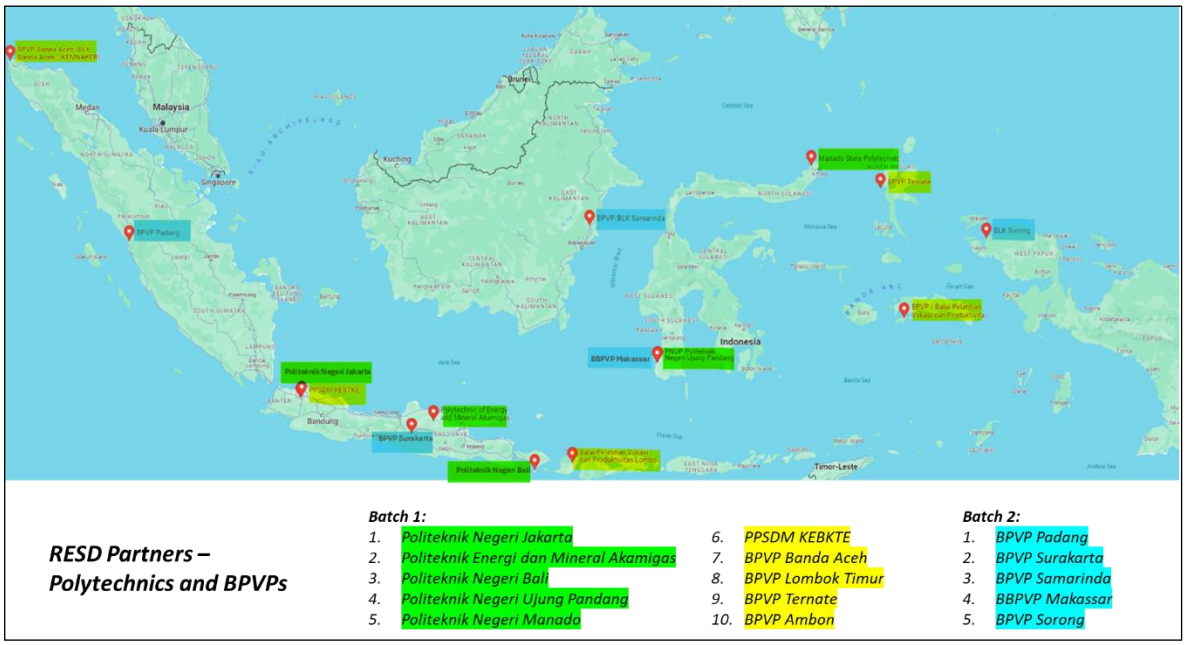
BAPPENAS	Ministry of National Development Planning
BPSDM ESDM	Human Resource Development Agency of the MoEMR *(Badan Pengembangan Sumber Daya Manusia Energi dan Sumber Daya Mineral)*
BPVP	Vocational and Productivity Training Center (*Badan Pelatihan Vokasi dan Produktivitas*)
CFPP	Coal-Fired Power Plant
DACUM	Developing a Curriculum (standardised curriculum development process)
D-4	Diploma 4, Education level in Vocational Higher Education (Indonesian Qualification Framework 6)
EET	In Employment, Education and Training
EHB	Eidgenössische Hochschule für Berufsbildung
f2f	face-to-face (physical presence)
FGD	Focus Group Discussion
FHNW	Fachhochschule (*UAS*) Nordwest
FHOst	Fachhochschule (*UAS*) Ost
GESIT	Green Jobs for Social Inclusion and Sustainable Transformation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoI	Government of Indonesia
GW	Gigawatt (1,000 MW)
ISED	Inclusive Sustainable Economic Development
MoEMR	Ministry of Energy and Mineral Resources
MoECRT	Ministry of Education, Culture, Research and Technology
MoM	Ministry of Manpower
MoU	Memorandum of Understanding
MTE	Mid-Term Evaluation
MW	Megawatt
OECD/ DAC	Organisation for Economic Co-operation and Development / Development Assistance Committee
OJT	On the Job Training
O&M	Operation & Maintenance
PLN	State Electricity Company (*Perusahaan Listrik Negara*)
PLTS	Solar Power Plants *(Pembangkit Listrik Tenaga Surya)*
PIU	Project Implementation Unit (lead is with PPSDM KEBTKE, MoEMR)
PPSDM KEBTKE	Training Center under BPSDM KEBTKE (*Pusat Pengembangan Sumberdaya Manusia Ketenagalistrikan, Energi Baru, Terbarukan, dan Konservasi Energi*)
PSU	Project Support Unit (GFA Consulting)
PV	Photovoltaic
RE	Renewable Energy
REI	Renewable Energy Indonesia (website)
RESD	Renewable Energy Skills Development
SC	Steering Committee
SCO	Swiss Cooperation Office
SECO	State Secretariat for Economic Affairs
STEM	Science, Technology, Engineering, and Mathematics
WEIN	Infrastructure Financing Division of SECO

ToT	Training of Trainers
TVET	Technical Vocational Education and Training
TW	Terawatt (1,000 GW)
UAS	University of Applied Science
ZHAW	Zürcher Hochschule für Angewandte Wissenschaften (*UAS*)

Figure 1: Location of the RESD training institutes



Source: RESD project

Acknowledgement

We would like to extend our heartfelt thanks to the representatives of the Ministry of Energy and Mineral Resources (MoEMR), Ministry of Manpower (MoM), and Ministry of Education, Culture, Research, and Technology (MoECRT) for their invaluable participation and sharing their insights. Our gratitude also goes to the staff, teachers, students, and alumni of the Polytechnics in Jakarta, Bali, and Makassar, as well as the BPVP in Lombok, for sharing their observations on the RESD project and renewable energy issues in an open and constructive manner.

We are especially grateful to the RESD staff for their exceptional support, making the mission and field visits possible. Additionally, we appreciate the private companies for sharing their invaluable insights into the renewable energy market dynamics.

Thank you and best wishes,

Terima kasih banyak and good luck!

Executive Summary

Background: The Renewable Energy Skills Development (RESD) project aims to ensure that "renewable energy power plants are better designed, planned, installed, operated, and maintained". Towards this, the project implements three components: 1) Strengthening formal education through a D-4 level programme in solar PV and hydropower for two semesters at five Polytechnics for D-3 electrical, mechanical and civil engineering graduates, 2) Providing modular non-formal trainings for solar PV and hydropower in ten training centers, and 3) Enhancing the exchange within the RE sector in Indonesia. The project partners include three Ministries, namely the Ministry of Energy and Mineral Resources (MoEMR), the Ministry of Manpower (MoM) and the Ministry of Education, Culture, Research and Technology (MoECRT). The project started in December 2020 and is planned to conclude in June 2025. The project is financed by SECO and implemented by GFA consultants.

Methodology: This Mid-Term Evaluation applied a multi-method approach consisting of a document review, interviews and focus group discussions with representatives from all stakeholder groups. A total of 35 interviews and 5 focus groups with partners in the Ministries, training institutes, teachers and graduates were conducted in four purposefully selected institutes: Polytechnics in Jakarta, Bali and Makassar, and a training center in Lombok. Additionally, selected interviews with alumni and employers were conducted. In total, the opinions of 112 people were considered.

Findings: The RESD project makes a relevant contribution to the skills development for the ambitious energy transition of Indonesia. Especially component 1 and 3 are relevant to promote the RE sector, whose development is currently constrained due to regional overcapacities in electricity production (from fossil fuels) and lack of incentives for RE. The project design with the three components is relevant.

The project is coherent with Indonesia's national mid- and long-term priorities and its national energy transition roadmap (leading to net-zero greenhouse gas emissions in 2060). The project also continues a Swiss TVET legacy and transfers relevant state-of-the-art Swiss pedagogical and technical expertise in solar PV and hydropower to the Polytechnics and training centers. The RESD project has solid quality assurance mechanisms in place and does careful context monitoring.

The project has made good achievements and is expected to reach the most outputs and outcomes by end of 2025, i.e. graduating 468 D-4 level students during the two semester long extension (a novel approach introduced by RESD), training 400 people in non-formal training courses and the RE exchange was enhanced by organising events and webinars, and setting-up of a job matching and information website. Crucial was the training of 163 instructors on pedagogical and technical aspects and the introduction of the 'capstone approach', the practical final work in the D-4 extension. The employers are very satisfied with the competences and performance of the trainees. The impact is somewhat diluted by the fact, that 73% of D-4 graduates from the first two batches already have a job when they start (and 80% 6 months after they have left) and only 17% of non-formal trainees have jobs in the RE sector. It must also be guessed that several D-4 graduates are working for the State Electricity Company (PLN) and might not have traditional RE functions in their current positions.

The project is efficiently managed, especially considering the complex set-up with several Ministries, Polytechnics, training institutes, private sector and Swiss partners. Budgetary uncertainties and decisions by the Indonesian partners have led to procurement delays for the co-financing of hydropower lab materials.

Owing to the strong anchoring of the introduced curricula, concepts (such as the capstone project approach) and course programmes at the Polytechnics and non-formal training centers, there is good scope for durability of the RE D-4 and non-formal training programmes.

The sustainability of Component 3 is more challenging and the support of the Swiss universities depends to a big extent on RESD funding.

Recommendations for the remaining Phase 1:

- Support the MoECRT (polytechnics) in preparing course notes for teachers of the D-4 level extension programme.
- Collaborate more intensively with private sector in job-market service providers.
- Follow-up with D-4 level non-graduates of batch 1.
- Review the experience with online courses from the Polytechnic in Bali.
- Validate the real need for having more frequent Steering Committee meetings or whether alternative platforms fulfil the need.

Recommendations for Phase 2:

Overall:

- Continue to support energy transition towards RE, although the demand is at an early stage.
- Establish clear contractual agreements for all partner contributions.
- The methodology of tracer studies should be reviewed to better grasp impact.
- Promote women participation in the formal and non-formal training programmes and embed gender equality subjects in the training.
- Explore the potential to develop energy efficiency / saving curriculum for D-4 level training.
- Equip a next logframe with tangible indicators and target values and use it as a strategic tool.
- Develop specific inception courses for the formal (D-4 level) and informal training specifically designed for participants with little or no background in (electrical) engineering.

Component 1:

- Consider extending the D-4 course by additional modules (adding thematic depth).

Component 2:

- Support the BPVPs in linking graduates with the private sector.

Component 3:

- Support MoEMR in policy development regarding Indonesia’s human resources needs for RE development.

1 Introduction

1.1 Context

The mandate

The State Secretariat for Economic Affairs' (SECO) Infrastructure Financing Section (WEIN), as the sole donor of the Renewable Energy Skills Development (RESD) project, has initiated an external Mid-Term Evaluation (MTE) to evaluate the Renewable Energy Skills Development (RESD) project in Indonesia. This review was planned in the project design. This MTE is implemented within the existing contract on Urban Expert Advisory by SECO-WEIN with the consortium consisting of Urbaplan, Enco and Transitech for the backstopping support of Urban Scoping Studies.

Indonesian energy context

Renewable energy targets: The Government of Indonesia (GoI) has set the target to reach net-zero emissions for carbon dioxide (CO2) and CO2 equivalents by 2060 or sooner and to generate 30% of the primary energy mix from renewable energy (RE) by 2030, with an interim target of 23% by 2025, as stated in the Medium-Term Development Plan 2020-2024 (GoI, 2019). However, the transition to RE has been slow, and the proportion of RE in the energy mix has instead dropped to around 10% in 2023 (Institute for Essential Service Reform, 2024). Consequently, the government has discussed revising the target to 17-19% (The Jakarta Post, 2024).

Meeting the targets require substantial policy changes. For instance, in 2022 and 2023, PLN, the state electricity company, added or contracted 12 Gigawatts (GW) of capacity from coal-fired power plants (CFPP) (Global Energy Monitor, 2024), while only around 190 Megawatts (MW) of hydropower and 370 MW of solar PV capacity were added during the same period (RESD, 2024b).

Installed electricity production capacities: As reported by the Ministry of Energy and Mineral Resources (MoEMR) in their 2023 Annual Report, the installed capacity for electricity generation varies significantly across regions and sources in Indonesia (see Table 8 Annex 6). The total installed capacity from fossil fuels was 77.6 GW, while RE sources contributed 13.4 GW**,** making up 13.4% of the electricity production. Hydropower accounts for the largest share of RE at 6.5%, while solar PV contributes less than 1%. Despite higher growth rates of RE sources compared to fossil fuel sources, the electricity production from fossil fuels has increased three times more than that from RE between 2020 and 2023, due to RE's still small proportion in the energy mix (see Table 9 in Annex 6).

RE trend and potential: The theoretical potential for RE-generated electric power is enormous, with an estimated capacity exceeding 400 GW.[1] Solar PV has the highest theoretical potential at over 200 GW. Although solar installations have substantially accelerated during the past three years, they remain short of the ambitious targets**,** with only 22% of the planned solar PV capacity installed in 2023. Regional differences are significant; for example, West Java has reached the target with 26% RE in the energy mix in 2023, while Bali stands at 3.8% (Institute for Essential Service Reform, 2024).

[1] The unexploited RE potential in Indonesia is 419 GW, including 208 GW of solar, 75 GW of hydro, 60.6 GW of wind, 32.6 GW of bioenergy, 23 GW of geothermal, and 19.3 GW of micro-hydro energy (Nugroho, 2023).

The GoI has shown some commitment to boost the capacity of large and small-scale solar power plants (PLTS), including rooftop solar PV. Solar PV regulations were unclear and have changed regularly.

As of December 2023, the development of rooftop PLTS has only reached 140 MW, highlighting the need to accelerate the expansion (Indonesian Information Portal, 2024). To address this, the MoEMR has issued the Ministerial Regulation Number 2 of 2024, effective 31 January 2024, regarding rooftop solar PV that are connected to the public electricity power network (Cabinet Secretariat of the Republic of Indonesia, 2024). This regulation aims to boost solar PV installation, targeting annual construction of around 1 GW of rooftop solar PV connected to the PLN network and 0.5 GW from off-grid sources.

RE employment generation: During its inception phase, RESD estimated that an additional 1,000 to 1,500 jobs are needed to increase the RE capacity in Indonesia. However, these estimations are uncertain due to the evolving context factors and missing reliable data. Interviews with the Ministry of Education, Culture, Research and Technology (MoECRT) indicated that the actual demand could be lower than estimated. Assuming 1 GW of PLTS is installed each year, and that each solar module has a capacity of 450 Watt-peak, approximately 3.3 million solar panels would need to be installed annually. This estimate is validated in the Findings section in chapter 3.5 on Impact.

Swiss International Development Cooperation with Indonesia

The RESD project is part of the current Swiss-Indonesian Cooperation Programme 2021-2024 (SECO, 2021a) and aims to contribute to develop further the RE sector in Indonesia. It focuses on improving the quality and competence of Indonesia's vocational education system, and enhancing collaboration between schools/universities and industry, by leveraging Swiss experiences with its dual Technical Vocational Education and Training (TVET) system. The project is complemented by another SECO initiative, "Skills for Competition", which aims to strengthen the cooperation between Polytechnics and the private sector, supporting Polytechnics not covered under the RESD (SECO, 2023b).

1.2 The Project

Duration and objective: The RESD project was designed through 2018-2019 following a feasibility study. The international tender to implement the project was won by GFA Consulting Group, and the project implementation is scheduled from 15th of December 2020 until 15th June 2025 (54 months). The goal is to enable competent design, planning, installation, operation and maintenance of renewable energy power plants through the availability of qualified staff relevant to labour market needs. Its budget is CHF 6,417 million (SECO's contribution) and comprises of three components:

Component 1 of the project aims to establish a formal, one-year renewable energy extension programme[2] (D-4 level or equivalent to semesters 7 and 8) at participating Polytechnics by mid-2025, focusing on hydro and solar technologies. This programme is designed to graduate 468 specialists who meet market needs. A unique feature of this D-4 programme is the D-3 extension by two semesters focusing on solar and micro-hydro technologies as well as the 'capstone' approach. During the capstone project, the student gets an opportunity to work on real-life RE projects from the industry and or the public, through conducting feasibility studies and creating project designs. This practical component is supported by a capstone project manual developed collaboratively by the RESD project and the polytechnics. The capstone project approach has been approved

[2] While the RESD project refers to the two semsters as a «specialisation» programme we use the term extension programme in the evaluation report.

and enacted by MoECRT, ensuring that students gain hands-on experience and practical knowledge (RESD, 2024i).

Component 2 of the project ensures that training providers offer non-formal, modular training programmes for future operation and maintenance personnel of solar PV and micro-hydro installations. These courses are aligned with level 3 of the national Indonesian Qualification Framework and aim to equip at least 400 trainees with relevant skills and knowledge in renewable energy. The GoI fully subsidizes the training to support job seekers.

Finally, **Component 3** of the project facilitates the development of support structures for cooperation between training providers and the private sector in the renewable energy sector. This component helps market training programmes, provide comprehensive information about the renewable energy sector and contribute to match job seekers with potential employers. Additionally, it includes the creation of an online job platform dedicated to renewable energy-related positions, further assisting graduates in finding employment and ensuring a steady supply of skilled labour to the industry.

Expected medium-term outcomes: By 2025, RESD aims to have formal RE extension programmes at the tertiary level for solar PV and hydropower technology in the participating polytechnics, and to produce at least 468 specialised graduates that fit labour market requirements at the national Indonesian Qualification Framework Level 6. At least nine training providers offer non-formal modular trainings at level 3-4 of the national Indonesian Qualification Framework and have provided relevant skills and knowledge to at least 400 trainees. Supporting structures for cooperation between training providers and the private sector in RE are in place, helping to market training programmes, matching job seekers with potential employees and providing information about job openings.

Implementation: The project is implemented by a Project Implementation Unit (PIU) hosted by the MoEMR, which is advised by a Project Support Unit (PSU, consisting of GFA consulting and Swiss partners). Direct training institutions for Component 1 are five polytechnics (*Politeknik Energi dan Mineral* Akamigas, Bali, Jakarta, Manado and Ujung Pandang). For Component 2, four training centers (BPVPs) provided the training (Ambon, Banda Aceh, Lombok Timur, and Ternate) and additional five are foreseen in batch 2. Further partners are involved under Component 3. The MoEMR (PPSDM KEBTKE) is responsible for maintaining the RE website developed by the project (RESD, 2024c). Tracer studies (RESD, 2024d, e, and f) and an internal evaluation (RESD, 2024a) were conducted by the polytechnics and training centers.

Achievements of medium-term outcomes:

- **Component 1:** In June 2023, 147 students graduated from the five polytechnics. In the current cycle 228 students are enrolled. The following table shows the distribution of enrolments among the polytechnics (RESD, 2024a):

Table 1: Enrolment of students per polytechnics

	PEM Akamigas		Bali		Jakarta		Manado		Ujung Pandang		Total	
	22/23	23/24	22/23	23/24	22/23	23/24	22/23	23/24	22/23	23/24	22/23	23/24
Classes in RE	1	1	2	4	2	2	2	1	2	2	9	10
Total Students in D4 RE*	8	20	48	87	46	63	16	11	52	47	170	228
Executive Students (working while studying)	7	1	29	74	46	63	8	11	28	25	118	174
Female Students	1	6	5	7	10	8	2	0	9	13	27	34

* The table above refers to enrolment of students, not graduates!

Thus, the target of 468 students is expected to be surpassed by mid-2025. Based on the tracer study 72% are employed six months after graduation (RESD, 2024).[3]

[3] However, out of those with employment 23% are not working in the RE sector.

The introduction of the capstone approach (a multidisciplinary and concrete project to be done by a team of students at the end of the specialisation course) is seen as major innovation with spill-over effects to other TVET curricula.

- **Component 2:** By December 2023 the training centers (BPVPs - *Balai Pelatihan Vokasi dan Produktivitas*) have produced 211 graduates for solar PV technicians. The tracer study estimates that 34% of the graduates are working 6 months after the training while almost 53% are still looking for work[4]. A project-facilitated workshop led to the revision of PPSDM KEBTKE's Solar PV Technician Training curriculum, incorporating feedback from six industry experts to ensure its relevance to current industry needs. The project also completed the development of solar-diesel hybrid instructional material, which will be implemented in 2024, and finalised the hydropower instructional material, with additional equipment expected to be procured by mid-2024. All required technical and teaching methodology training was completed for all partners under batch 1 and ongoing for batch 2 BPVPs in 2023.
- **Component 3:** The project has developed an online platform (Renewable Energy Indonesia, REI) to bring together GoI institutions, training providers, RE companies as well as NGOs and development cooperation projects to promote the RE sector.

1.3 Purpose of the evaluation

The main purpose of the evaluation is to assess the project implementation and objectives stated in the logframe against the Organisation for Economic Co-operation and Development / Development Assistance Committee (OECD / DAC) criteria, with particular foci on the efficiency of implementation and the stock-taking of achieved results (effectiveness) of the project (RESD, 2023). This evaluation aims to assess mid-term systemic and sustainable impacts as well. This shall include analysis of lessons learned from what works and what does not work within the project setup, in order to:

- improve the running RESD intervention, and
- as strategic and technical recommendations for a potential next phase.

Hence, the evaluation findings shall be used (by SECO) as a base to make evidence-based decisions for potential adjustments to the current project phase and derive recommendations for a potential next phase by learning about success factors as well as challenges within the current phase. Additionally, it shall be used to account and valuate the results of the on-going intervention.

[4] Out of the employed, 83% are not working in the RE sector. That leaves only few graduates actually working in the RE sector after 6 months (less than 15% are actually employed in the RE sector after 6 months). This fact will merit further analysis during the evaluation.

2 Process and Methods

2.1 General background and evaluation questions

The implementation of this mid-term evaluation (MTE) was slightly delayed due to COVID-19, procurement issues to start the actual trainings, further staff changes and diverging priorities with limited resources at SECO. As the project approaches its final year of the current implementation phase, the MTE results shall fine-tune the implementation for the last year of this phase and provide suggestions for a possible next phase.

The evaluation has applied a mixed method approach by combining qualitative and quantitative data collection tools, with a focus on qualitative methods. Special attention was given to existing surveys and data from the project and publicly available secondary data to avoid redundancies.

The Terms of Reference (ToR) suggested 19 key questions across the six OECD / DAC evaluation criteria, along with one regarding lessons learnt and introduced innovations. A focus was put on efficiency considerations. The evaluation matrix, which links the evaluation questions with data collection and analysis, is provided in Annex 3.

2.2 Data collection methods

In total, 35 interviews and 9 Focus Group Discussions (FDGs) with 112 people were conducted (see Annex 3 for more details on methodology). A list of the informants is available in a separate annex to this report. The evaluation team applied the following data collection tools:

Document review: Relevant policy documents and regulations for TVET, RE and labour market strategies were consulted (see a list of references in Annex 8). The document review included the analysis of project documents, progress reports, related monitoring data, and deeper analysis of the tracer study results. The document review also included the search and analysis of relevant secondary data and statistical data related to the RE sector.

Field visits: The sample selection of locations was done purposefully in order to cover the two polytechnics with most of the students, central and remote polytechnics, and at least one Vocational and Productivity Training Center (BPVP). Thus, 4 out of 10 institutions with graduates were included in the field visits.

Semi structured interviews: Based on interview guidelines, interviews were conducted with the following partner Ministries and specific directorates: MoEMR, Human Resource Development Agency (BPSDM ESDM) and the Human Resources Development Center for Electricity, New RE, and Energy Conservation (PPSDM KEBTKE); MoECRT, Directorate for TVET; and the MoM, Directorate for Vocational Training and Productivity Development.

Interviews were also conducted with the SECO-WEIN Programme Manager, Embassy of Switzerland in Jakarta (National Programme Office staff of the Swiss Cooperation Office (SCO), the Swiss UAS partners, and the EHB. During field visits interviews were conducted with the Directorates of the training institutions, selected alumni of the first batch and two companies.

Focus Group Discussion (FGD): During the four field visits, FGDs were held with a group of teachers and also with students of the ongoing second batch.

Cooperation with other projects: Out of the numerous other development projects under implementation or under consideration in the RE sector, online interviews were conducted

with Mentari (United Kingdom), GIZ - German Agency for International Cooperation regarding the completed project 'Innovation and Investment for Inclusive Sustainable Economic Development (ISED)' and the forthcoming 'Green Jobs for Social Inclusion and Sustainable Transformation (GESIT)' project, and NZMates (New Zealand).

Triangulation: The evidence collected from the various sources were cross-checked to enhance consistency of the findings.

Others: The evaluation team has reviewed the **theory of change** (logical framework). Based on this and the evaluation findings a contribution narrative was developed. conducted briefings and a debriefings with SECO and conducted a workshop with the RESD project team was also part of the approach.

2.3 Limitations

The archipelago of Indonesia provides a huge project area with differing economic, cultural and RE contexts from island to island. While a representative sample for field visits was chosen in cooperation with the RESD project, the coverage of only one BPVP training centre – as these are located in rather remote places – limits the potential for generalisations for Component 2 in this MTE.

Moreover, the political dynamics in the energy sector of Indonesia are complex, with rapidly changing regulations that can make trend predictions difficult. The diverse training and education system for engineers and technicians at the various levels create a vast landscape, and their interlinkages with the RESD project activities could not be considered in detail in this MTE. Additionally, there is scattered availability of secondary data regarding the employment situation and future needs in the RE sector.

3 Findings

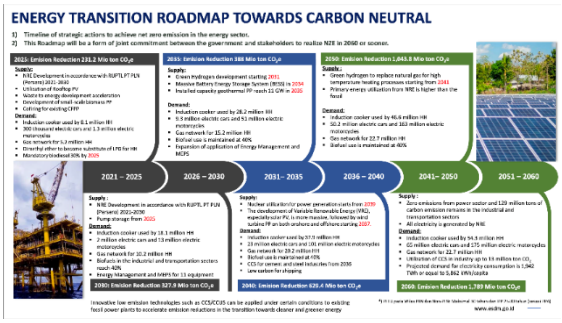
3.1 Relevance

Relevance of formal and non-formal RE trainings (Components 1 and 2): During interviews, all three partner ministries (MoEMR, MoM, and MoECRT) confirmed the high relevance of developing and upskilling the RE knowledge and skills of the Indonesian labour force. The ambitious targets to achieve net-zero greenhouse gas emissions in Indonesia by 2060, and Bali by 2045, require a major energy transition towards RE, for which the necessary manpower is currently lacking. Ministries, other authorities, and PLN require sufficiently trained and competent staff capable of drafting relevant policies and regulations, implementing them effectively, and addressing emerging challenges.

Currently, the focus is still heavily on fossil-fueled technologies. Given the diverse renewable energy technologies and various pathways for energy transition, it is important to remain open-minded on technological developments and agile in making strategic decisions. The RESD makes a relevant contribution by supporting the staff that develops RE-related organisational capacities.

The MoEMR has an energy transition roadmap where RE and nuclear energy (after 2039) play crucial roles (MoEMR, 2024a). However, RE achievements are currently off-track. The RE ratio in the energy mix is barely increasing because more CFPPs are being added to

the grid than RE sources. For instance, between 2020 and 2023, PLN's electricity production increased by 90 TWh, but RE only increased by 23 TWh. An overview about installed capacities and PLN's electricity production is provided in Table 9 in Annex 6.



However, the context situation differs between islands and depends on whether there exists an interconnected grid:

- **In the interconnected Java-Bali grid**, there is currently a surplus of electricity production from CFPPs. With the construction of an additional 8GW of CFPPs until 2030, this surplus might persist. As a result, PLN policies have slowed down the installation of RE in general and solar PV systems in particular. Recent regulations have made the development of rooftop solar PV less attractive or nearly impossible by limiting licenses above a certain cap. For example, a programme to establish solar PV on a larger scale on rooftops of hospitals and schools in Bali was scrapped. Nevertheless, there are some solar PV systems established on commercial and public buildings to conform to sustainability ambitions.
- In remote islands, such as the Moluccas (Maluku Islands)RE sources are an economically viable alternative for electricity production, as the Operation and Maintenance (O&M) of diesel generators are becoming more costly than RE solutions. In these areas, PLN and local governments are investing in RE, including solar PV, often combined with batteries. Solar PV also complements diesel generators that operate for a few hours in the evening.
- The Ministerial Regulation (MoEMR No. 2, 2024) provides regional solar PV quotas until 2028. Out of the 1.5 GW for annual implementation, 1.4 GWh is allocated for the Java-Bali grid. However, this ceiling might not be fully utilized in the short term because of two main reasons. Firstly, there exist various regulations by the Ministry of Industry, which define different levels of local components[5] for small scale off-grid, large scale off grid or on-grid solar PV systems. Secondly, time is needed to scale-up the availability of solar PV material and skilled staff.
- Out of the target for rooftop solar PV of 1.3 GW, only 290 MW (22%) was realised in 2023 (Annual Report MoEMR). This suggests that there are additional constraints to establish solar PV beyond just setting a cap or target. Therefore, scaling up the 2023 achievement of 290 MW to 1.5 GW within 1-2 years might be challenging due to the time required to build up construction capacities.

The development and implementation of the capstone approach is significant in enhancing practical learning, and to apply knowledge in a real-world client context. This integration was challenging, particularly due to the parallel polytechnic internal thesis requirements in some areas (Bali, Jakarta, and Makassar), but is approved by the MoECRT and is supported by corresponding regulations. The trainings introduced the lecturers into the project management concept and the manual clarifies the roles of the various stakeholders (lecturers, project coaches, students and clients, RESD, 2024i). The students found the capstone approach highly relevant as it allowed them to get practical insights in RE businesses and fostered cooperative work in multi-disciplinary teams.

[5] For example, not less than 40% of the panels, batteries must come from domestic production and 90% in the case of cables (Ministry of Industry, Decree No. 5/2017). This regulation was recently changed in order to stimulate foreign funding for solar PV systems. Under the new regulations, projects with at least 50% foreign funding from multilateral or bilateral lenders will be exempt from local content stipulations (Reuters, 2024).

Relevance of component 3: This component aims at promoting the exchange of relevant information and experience related to RE with the educational sector. The Indonesian partners considered the events, webinars, and the website information to be very relevant to raise awareness on RE in the educational system and beyond, given the challenges the Indonesian RE sector currently faces. The issue regarding the matchmaking function of the supply and demand will be discussed in more detail in the “Effectiveness”chapter.

Swiss perspective: The RESD is embedded in the current country development strategy 2021-2024 (SECO, 2021a) and contributes to the following outcomes: a) Continuing a long tradition of TVET system support by Switzerland to build up the polytechnics in Indonesia (many ministerial interview partners were still impressed from that period), and b) Supporting human resource development in the TVET sector and contributing to sustainable development through promotion of the transition to RE. Another aim was to include some “Swissness” through Swiss elements into the project implementation, as a service provider bringing in specific Swiss experiences on cutting edge teaching methodologies and technical content for hydropower and solar PV subjects from Switzerland.

Company perspective: The RESD has addressed formal training (D-4) during 2 semesters for D-3 graduates and non-formal training for job seekers (who have rather limited engineering background). The survey among employers of RESD graduates (RESD 2024f) confirmed their high satisfaction with the practical competences of the trainees. For companies, the practical experience of trainees and their knowledge orientation on industry demands is highly relevant in recruitment procedures.

Project design and adaptation: The RESD project emphasised creating the partners’ ownership of the training programmes. Logical frameworks were used and adapted to reflect the expected contributions by the various stakeholders. The project carefully avoided taking over service functions from counterparts, but supported them in overcoming their administrative hurdles at the level of ministries and polytechnics. The RESD supported the partners in a comprehensive and holistic manner and covered all relevant aspects to produce the outcome and outputs.

A particular strength of the RESD project is its decentralised approach. The five polytechnics, four BPVPs, and the upcoming five additional training centers are spread all over Indonesia (see map on page 5). While this geographic distribution poses challenges for] communication and coordination, it ensures that skills are developed close to where they are needed. However, many RE services, such as design and installation, are still provided by specialised companies in Jakarta, Bandung and Bali, as local markets are not yet developed.

The logical framework presented during the inception phase (RESD, 2021) and the versions slightly adapted over time are relevant and encompass all necessary elements for a TVET programme. These elements include participatory curriculum development, instructor training, equipment provision, digital teaching aid development, accreditation and quality assurance measures, and strengthening the networking among training institutions and links with the private sector. The logical framework matrix distinguishes between the roles of the PSU and the Indonesian partners, clarifying specific responsibilities.

Frequent updates to the logical framework ensures its relevance (RESD, 2023), but they also make assessment challenging, as targets change frequently. For example, the target for non-formal training was initially increased from 300 to 540, then recently reduced to 400. Most indicators lack target values. For example, the monitoring process includes gender-disaggregated data, there are no gender-disaggregated target values.

Monitoring and Reporting: The project has a solid monitoring system in place. Internal reviews and tracer studies of graduates and company satisfaction are conducted. The

progress reporting is based on the logical framework structure. The reports are well written and of high quality.

3.2 Coherence

Internal coherence

The coherence within the RESD Project components is strong, as each addresses distinct yet complementary needs within the framework of the project's objectives.

Component 1 focuses on formal education by developing and implementing a one-year renewable energy specialisation programme at polytechnics. With the two additional semesters, the students advance from D-3 level to a bachelor of applied science level. This component aims to produce graduates well-equipped with theoretical and practical knowledge relevant to the renewable energy industry.

Component 2 targets the non-formal education sector by providing modular training programs at BPVPs. This component is designed to upgrade the skills and knowledge of individuals who are already in the labour market or are seeking employment in the renewable energy sector.

Component 3 supports the overall project by focusing on communication, awareness-raising, and creating linkages between training providers and the private sector. It includes activities that promote the renewable energy sector and facilitate the dissemination of information about training opportunities and industry developments.

The RESD management actively looks for synergies between these components to ensure a comprehensive approach to workforce development in the RE sector. By addressing both formal and non-formal education needs and enhancing communication and collaboration, the RESD project creates a robust and sustainable training ecosystem for RE.

External coherence

The external coherence of the RESD project is evident in its alignment with national and international frameworks (as already outlined under the chapter Relevance) and its collaboration with other initiatives and development projects in the RE sector. The project aligns with the Government of Indonesia's (GoI) Energy Roadmap to net-zero Emissions by 2060 and the National Medium-Term Development Plan (RPJMN 2020-2024). These frameworks emphasise the development of renewable energy and the transition towards sustainable energy sources, which are central to the RESD project's objectives.

The project also aligns with SECO’s focus on skills development, employment, and sustainability. SECO's support for the development of renewable energy skills aligns with the RESD project's goals of enhancing workforce capabilities and promoting sustainable energy practices.

The project has shown strong external coherence by avoiding duplication and collaborating further with other organisations and programmes. For instance, the RESD project collaborates closely with one of the similar programmes from the New Zealand Aid (the New Zealand-Maluku Access to Renewable Energy Support (NZMates)) to support the polytechnic and University in Ambon, mainly by inviting teaching staff to attend RESD-organized teachers training. NZMates aims mainly at developing RE projects through technical assistance to make them viable and attract investment to implement them. This collaboration enhances technical and vocational education and training (TVET) in the renewable energy sector in the Maluku Islands.

Mentari is a UK-Indonesian low carbon energy partnership (2020 until 2025). It assists the MoEMR (and PLN) on policy issues related to RE, which are published on its website. It also installed a solar PV system on Sumba Island (for 200 households). The cooperation

with RESD was close from the beginning, especially in conducting RE webinars and raising gender awareness in RE.

Additionally, the RESD project coordinates with GIZ on their upcoming GESIT initiative. The previous ISED project was implemented in two phases between 2017 and 2024, with a budget of EUR 11 million, and supported the TVET system at the vocational high school level[6] up to D-3 level. RESD, on the other hand, focuses on higher education (D-4 level) and non-formal training, thus complementing the support across different educational levels. The new GESIT project will start implementation later this year, has a budget of EUR 11 million, goes beyond renewable energy, and covers sustainability aspects in other sectors (agriculture, tourism, etc.).

The RESD team is perceived as easy to approach and open to collaboration. There are regular exchanges between these programmes to avoid overlap and detect synergies (especially regarding Component 3 for events or identifying speakers for webinars). There appears to be good potential to streamline the complementarity between Mentari (if they are having a next phase) and RESD: As Mentari also organises RE events in collaboration with the MoEMR, operates its own website and also provides RE context information, there might be some potential to finetune the activities as similar issues are addressed. Despite the strong coherence, Indonesian ministerial stakeholders have suggested more frequent and regular regrouping of the Steering Committee (SC) and project implementation bodies (Project Implementation Unit (PIU) and Project Support Unit (PSU), especially for discussions at the technical level involving more medium to lower-level official. The SC meetings, which typically involve high-level officials, are held annually and are difficult to schedule because of their limited time flexibility and political will. However, there is a need for more frequent discussions among middle-level technical officials to address ongoing issues (e.g., procurement and maintenance of lab equipment) and facilitate smoother project implementation. Enhancing these interactions can lead to better coordination, quicker resolution of technical challenges, and more effective implementation of project activities.

The project has made efforts to promote gender equality, but challenges remain. The majority of participants are still male (84% in the case of the non-formal trainings and 87% in the case of D-4 extension programme). This gender bias, to some extent, reflects cultural patterns with low participation rates of women in STEM subjects (Science, Technology, Engineering, and Mathematics) in Indonesia, but as the overall ratio of females at the tertiary level is around 37% (detikEdu, 2023), the RESD participation rate has room for improvement. While the project has addressed gender inclusivity, gaps appear to persist. Continued efforts are needed to encourage more women to participate in RE training programmes. By addressing gender disparity more prominently, the project can contribute to a more diverse and inclusive workforce in the RE sector and further nourish the attractiveness of employment in the RE sector for female workers.

3.3 Effectiveness

Overall

The overall objectives of the project, as defined in the project logframe, have almost been attained. Significant achievements have been made, including the realisation of the RE

[6] In Indonesia, vocational senior high schools, known as Sekolah Menengah Kejuruan (SMK), provide specialised education that prepares students for specific trades, professions, or careers. Unlike general senior high schools, which focus on academic subjects, SMKs offer practical and technical training in various fields such as engineering, information technology, health, agriculture, and business. The curriculum combines theoretical classroom instruction with hands-on practical experience, often including internships and on-the-job training. SMKs play a crucial role in Indonesia's education system by addressing the demand for skilled labor and supporting the country's economic development.

training programmes by five polytechnics (which is one more than the number targeted) and four BPVPs through DACUM supported curricula development. The number of enrolled students in the polytechnics has increased from 170 in the first batch (graduated in 2023) to 228 in the second batch (to be graduated in 2024). The project successfully introduced the 'capstone' concept to enhance project-based learning. The number of trainees for solar PV technicians in BPVPs increased from 78 in 2022 to 141 participants in 2023.

Additionally, 119 teachers from 11 state polytechnics have been trained over 19 weeks in solar PV, hybrid solar-diesel, hydropower, and teaching methodology. So far, 44 BPVP instructors from 8 training providers have been trained over 14 weeks, and the concept of 'industry guest' lectures' was successfully introduced.

With the increase in enrolled graduates and trainees for the second batch and potential graduates from the third batch, the expected total number of graduates from both components could easily be achieved. In the first batch, 147 students graduated from five polytechnics, and 228 students enrolled in the second batch. For informal training, the expected graduates at level 3 are 400 by 2025, with 221 participants trained in the first batch, reaching 41% of the target.

Both the polytechnics and the BPVPs were working to address identified challenges by continuously improving their training courses with assistance from RESD.

Formal D-4 level training (Component 1)

Until the MTE in May 2024, 147 students have graduated from the first batch and 228 students have been enrolled in the second batch. The target of 468 graduates by 2025 is expected to be achieved or overachieved. Out of polytechnic students in the current school year 2023/2024, 15% (34 people) are female students, and the rest male (194 people).

An important observation is that 73.4% of batch 1 and 2 students were or are executive students, meaning they were already employed before starting the D-4 extension programme. To accommodate these executive students, the polytechnics created separate class groups, facilitating their attendance. So besides face-to-face (f2f) classes during the week, hybrid classes are also provided with evening teaching and lab sessions during weekends. In Bali, currently, 2 out of the 4 classes are almost entirely online (with a minimal one-time presence). It appears that each polytechnic adopted different approaches, including online, in-person, and hybrid teaching models, all attempting to balance theoretical lessons and practical sessions.

The diversity of courses in Bali puts a high work burden on teachers (as they also teach f2f) and might compromise the quality of the practical part as it limits the application of the capstone project approach. Furthermore, the 2nd batch students were still required to elaborate a thesis (*skripsi*) parallel to the capstone project, despite the changed regulation by the MoECRT. The online approach faced challenges such as monitoring of the students' attendance and limited direct coaching from teachers. Thus, the teachers felt overtaxed but tried to cope with the many demands. The practical part was constrained because the hydropower lab equipment was only partly available until now (due to procurement issues). Therefore, the practical part consists mainly of a field visit in Bali to study the partial functioning of a small-hydropower plant on the island. The same issue was noted in Makassar, where students have not yet had access to hydropower lab equipment due to unresolved financing and coordination issues.

The capstone projects have been much appreciated and beneficial for students, enhancing their ability to communicate with peers and clients and devise solutions. However, it was mentioned by students that neither the capstone projects nor the curricula covered all potential RE sources, indicating an area for further development. Another challenge observed is topic identification for capstone projects mentioned at the Bali and Makassar Polytechnics. Owing to the few new solar and (micro)hydropower projects, the identification of capstone projects is challenging and time-consuming for the teachers. Since RE in

general is a relatively new topic within the Indonesian education system, students also found it difficult to identify clients for their project. Entrepreneurs, on the other hand, prefer longer-term involvement of students and not just quick data acquisition.

Teachers of all three polytechnics visited highly valued the training provided despite the additional workload it entailed. 119 teachers (24 female, 95 male) from 11 polytechnics received training in both technical subjects and pedagogical skills. Particularly, 21 lecturers were trained in capstone project approach and project management, leading to the further refinement of the capstone project manual (RESD, 2024i). Additionally, 19 trainers have been instructed in basic carbon credit and carbon trading in response to a request from MoEMR.

However, interviews revealed that teachers found it challenging to leave their classes during the training period. Additionally, since RESD covered only the training costs, excluding travel and accommodation, some polytechnics could send only one teacher for training. In some interviews with the teachers, the rather low salary levels were remarked as a disincentive to engage in additional work.

The project has also trained 31 assessors from the private sector, 22 for solar PV and 9 for hydropower, qualifying them to conduct evaluations at both polytechnic and BPVP levels. Another challenge identified during interviews is the lack of issuance of certificates of competence, as noted by teachers and alumni. While formal educational institutions like polytechnics can issue diplomas, they generally do not provide certificates of competence. However, institutions can collaborate with the Ministry of Education to apply for a certification scheme, which alumni indicated is essential, particularly for fresh graduates. The certification issue seems to be complex due to differing regulations and standards. The RESD project has done comparative research (RESD, 2022) and recommended that the GoI, specifically the MoEMR, make a decision. This has been pending since then and RESD proposed investing the money into training activities rather than clarifying complex certification issues.

It was also interesting to note that most of the elder teachers were previously trained by Swiss TVET programmes over time. In this regard they missed the elaboration of specific course notes that would facilitate the teaching and use of teaching aids. Some attributed this to the rush in introducing the courses.

Further supporting the achievements, a gender study was completed in November 2023 and presented to 35 stakeholders from the Ministry of Energy and Mineral Resources (MoEMR), BPVPs, and polytechnics, underscoring the project's commitment to inclusivity. Additionally, the Polytechnic Akamigas (operated by the MoEMR) received and commissioned a full set of hydropower equipment, and Polytechnic Bali, Jakarta, and Manado procured partial deliveries of turbine test rigs. However, Polytechnic Ujung Pandang is still awaiting its new equipment.

The main motivation for joining the courses is the fact that the students get a bachelor’s degree within two semesters only, which is very attractive. While they wished to get a broader introduction into all RE sources (incl. wind, geothermal, biomass, etc.) this poses a dilemma with the need to have a deeper understanding of the specific technology, which in the case of solar PV is changing rapidly. Therefore, the focus on solar PV is very relevant, while the demand for micro-hydro appears to be more limited in general.[7]

Non-formal RE Trainings (Component 2)

Until the MTE in May 2024, 221 participants have been trained in four BPVPs in Ambon, Ternate, Lombok Timur, and Banda Aceh. 78 trainees finished in 2022 and 141 trainees in

[7] While some bigger hydropower plants are under construction, the dynamics in micro-hydro seem limited (e.g. Bali has only one not so well functioning smaller hydropower scheme which serves as practical study object.

2023. Out of 221 trainees, 13% (18 people) are female trainees, while the rest are male trainees.

The RESD project has developed distinct courses for solar PV (incl. battery storage), micro-hydropower, solar-diesel hybrid covering the most urgent labour market needs for these technologies.

From the students' perspective, the RESD training courses effectively combined theoretical knowledge (30%) and practical skills (70%), significantly enhancing their readiness for the workforce. This balanced approach ensured that students not only understand the fundamental principles of a specific RE technology but also gain hands-on experience, which is crucial for their future careers. This hands-on training included tasks such as installing, operating, and maintaining solar PV systems, which are integral to their role as technicians. By engaging in these practical activities, students developed a deeper understanding of the technology and became proficient in handling the equipment. Additionally, the training also involved industry experts as instructors, which added great value. These experts bring in practical knowledge and industry insights, providing students with up-to-date information on the latest trends and best practices in the RE sector.

As observed during the field visit in BPVP Lombok, the implementation of the courses encountered several challenges. These obstacles impacted the effectiveness of the training and the overall success of the programme. One of the primary challenges faced by the BPVPs was the limited budget allocation from the GoI to support on-the-job training (OJT). While the theoretical and practical components of the training are well covered, securing funds for OJT remained a critical issue. OJT is essential for students to gain further real-world experience and apply the skills they have learned in a professional setting. Currently, the students have to cover the costs for OJT by themselves, excluding especially the poorer ones from such an experience. Furthermore, the number of RE companies in remoter areas is limited, there is only one in Lombok, making the placement of trainees a bottleneck.

While the project team is intensively assisting BPVPs in the efforts to strengthen linkages with the private sector, it is crucial that the MoM finances the travel costs to ensure sustainability.

While the RESD project has provided significant support in terms of solar panel equipment and other resources, there is still an issue with insufficient equipment to fully meet the training needs. For example, the late arrival of government-procured micro-hydro equipment at the end of 2023 delayed the launch of the micro-hydro training course. Such delays hinder the training schedule and affect the overall progress of the programme. Ensuring timely procurement and an adequate supply of necessary equipment is vital.

Despite their high motivation, many participants lack fundamental knowledge in electrical engineering, which is crucial for understanding and working with RE technologies. This gap in basic skills can slow down the training process as instructors need to spend additional time covering basic concepts before moving on to more advanced topics.

Cooperation between Training Providers and Private Sectors (Component 3)

A key feature of Component 3 is the strengthening of the cooperation between the private sector and the training centers. This collaboration includes jointly developing and reviewing curricula, organising visits to RE power plants during teacher training, and hosting guest lectures, webinars and exhibitions. The industry involvement is notably higher compared to other development projects in Indonesia and is integrated at various stages, according to the project partners. Besides the cooperation with the ministries and training institutions, the RESD project has partnered with over 30 RE companies.

The project has demonstrated efforts to align graduates, representing the labour supply, with actual market demand. An RE sector cum job-search website was developed and then

launched in mid-2023 and was recently ha n ded over to PPDSM KEPKE for hosting and maintenance. It has attracted over 630 subscribers and received more than 200,000 page views, indicating its popularity and effectiveness in connecting job seekers with opportunities (RESD, 2024h). However, most alumni interviewed relied on other job-search platforms, such as LinkedIn, Jobstreet, Instagram, university job fairs, and personal networks, and were unaware of the RESD website.

In addition to preparing the labour market supply through formal and informal institutions, the project has also aimed to increase market demand. The RESD project has promoted renewable energy education in Indonesia through 12 international and national conferences and/or exhibitions. Notable events include the World Hydropower Congress 2023, *Festival Pelatihan Vokasi* (Vocational Training Festival) in 2022 and 2023, Clean and Sustainable Energy Conference (hosted by Indonesia Renewable Energy Society) in 2021 and 2022, and Solartech (in collaboration with the Ministry of Energy and Mineral Resource) in 2021 and 2022. 3 webinars supported by RESD with 500-1,000 participants were well received and contributed to networking in the RE ecosystem.

At the governmental level, multi-stakeholder communication is considered effective by the SC and all relevant actors are represented. Despite the challenges of implementation across diverse regions in Indonesia, the project promotes social and regional equity.

The RESD project has resulted in an unintended positive effect by increasing the government officials' understanding of the dynamic and complexity of energy transition. Relevant government officials (such as those from MoEMR and PPSDM KEBTKE) have received comprehensive training, not only to facilitate the project's implementation but also on topics such as handling carbon credits. This training has enhanced their understanding of RE and sustainable development at a macro level, preparing them for the forthcoming energy transition.

3.4 Efficiency

The RESD project approach provided conceptual inputs (such as the 1-year extension programme or capstone project approach), developed curricula, semester plans and instructional material (Component 2), trained the lecturers, supplied, financed crucial laboratory equipment, developed an RE website and provided various inputs by working with Swiss UAS. All costs related to the implementation of the training courses at polytechnics and the BPVPs were covered by the MoECRT plus students, or MoM, respectively. While the non-formal trainings are free for the participants, the students at the polytechnics have to pay a tuition fee. These vary from place to place (e.g., Jakarta costs around CHF 1,600 per year, and in Bali, only an average of CHF 800). Furthermore, yearly tuition fee differentiations are made on the basis of the socio-economic status of the family and, in the case of Bali, whether the course is online (approx. CHF 950) or f2f (approx. CHF 750).

While cost-benefit considerations would be nice to have, this goes beyond the scope of this evaluation as it would entail a lot of financial data from the partners and a monetisation of the outcome (such as the wage difference prior to and after the training). While most D-4 level graduates work and can apply their knowledge, in the case of the informal trainings, where the training lasts for two months only, most graduates struggle to find a job in the RE sector. Therefore, the per unit costs are relatively high, if only considering the direct expenses (approx. CHF 530'000) until the end of 2023.[8] However, no overall cost data is available, and as the programme is still fresh, initial investments are high and with more

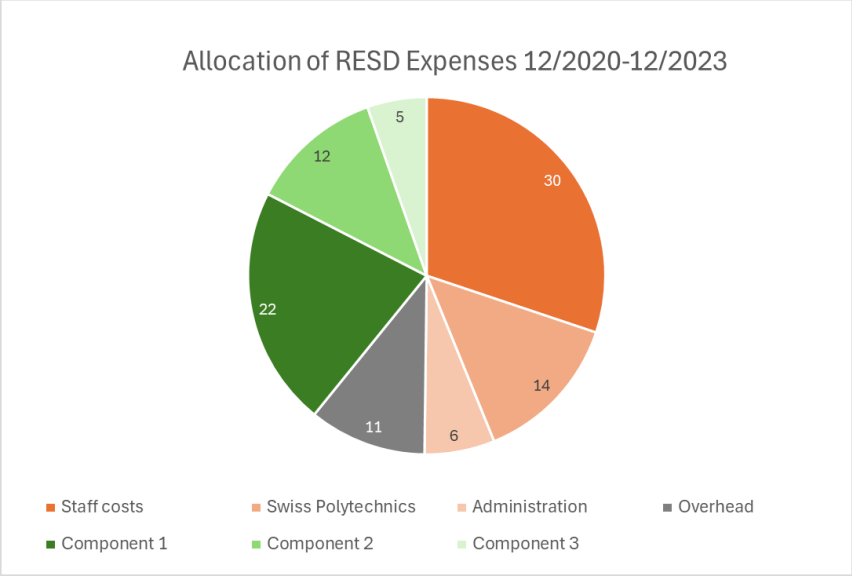
[8] This does neither include related project administration costs nor the costs of the MoM for the implementation of the courses.

students to be trained with the same investment in the future, it will bring down the unit cost significantly.

Furthermore, the project cannot easily be benchmarked with one of the other three projects covered by interviews because the concepts, working areas and project locations differ. Evidence from the interviews shows that the project is managed efficiently and prudently despite a complex set-up with many stakeholders. Thus, communication is a challenge, but it was handled very efficiently and professionally by the RESD team. The organisational set-up is adequate, with a small RESD team consisting of 5 full-time equivalent expert positions.

The project management and technical assistance costs (incl. the support by the Swiss university partners) absorb a substantial amount of the allocated budget (around 60% of project costs[9]). Staff costs are high because of a full-time expatriate position as a project manager. This is justified as the project concept followed a strong 'Swissness' approach for the transfer of know-how. However, in the longer run, the marginal benefit of such know-how transfer and innovations might be diminishing.

Figure 2: Allocation of RESD funds in percent (100% = CHF 4.4 million)



Source: RESD financial report as per 31.12.2023

The project is on track with its spending, having spent 68% of the budget after 72% of the time lapsed in the phase.

The project is steered by a Steering Committee, chaired by the Head of BPSDM ESDM (MoEMR), which meets once per year. Bringing together the various stakeholders is already a challenge owing to tight agendas and prioritisation considerations of important decision-makers on the Indonesian side. Although the presence of the National Professional Certification body and the Ministry of National Development Planning (BAPPENAS) does not seem to be crucial, the certification body plays an important role in certification issues (which are there in the case of the D-4 extension programme), and BAPPENAS has a general role in the coordination of donor inputs for the national development planning.

Two of the ministries have indicated that more frequent meetings, especially at the technical level, would be helpful. As the policy level is steered by the Embassy/SCO, such

[9] The overall budget for RESD is CHF 7.0 million, while the SECO contribution is CHF 6.4 million.

an initiative should come from the Indonesian ministries, in coordination with the implementer GFA and SECO, and at the technical level from the Head of PPSDM KEBTKE. The project would be willing to support it.

3.5 Impact

The RESD project has set two goal indicators to measure its impact, namely securing jobs for graduates in the RE sector and that employers are finding adequately trained labour.

Percentage of graduates with jobs

The first indicator is the percentage of formal and non-formal graduates who secure adequate jobs in the Indonesian renewable energy (RE) sector. The tracer studies were conducted by the training institutions for the polytechnics and the BPVPs in the spring of 2024.

Polytechnics: For batch 1 trainees, 72% of formal education graduates are currently working, 6% are continuing their studies, another 6% have started their own businesses, and 18% are still seeking employment 6 months after graduation. When the data is disaggregated by gender, women show a slightly higher employability rate (88%) compared to men (81%). These are impressive figures, but one has to keep in mind that 69% already had employment prior to joining the training. Thus, the net additional students in employment are relatively few.

There are some reservations regarding the tracer study methodology used to determine the outcomes and impacts of the RESD project. The studies conducted by the polytechnics and BPVPs in close coordination with RESD may have potential biases. This close involvement of the training providers might influence the reported results, possibly overstating the success rates of employment and other post-graduation activities. While the polytechnics and BPVPs can continue conducting tracer studies with a standard methodology for accreditation purposes, an independent organisation should handle any impact evaluation. This approach would allow respondents to provide honest feedback or critique the training providers without fear of repercussions.

Two specific issues in this regard are exemplified here: (1) Categorising students' post-graduation activities into working in the RE sector. The tracer study found that 77% of alumni are reportedly working in the RE sector. However, this classification is based on the respondents' self-assessment in response to the question, ‘How close are your work/next degree/business with your study program?’ The survey considered responses such as "pretty close," "close," and "very close" as related to the RE sector despite the questions not explicitly mentioning RE. This subjective measure may lead to an overestimation of the number of graduates working in the RE sector. (2) Categorising all alumni working at PLN as working in the RE sector is problematic, as not all roles at PLN are related to RE. Consequently, this could lead to an inflated perception of the number of graduates employed in the RE sector. Although the project mentioned that they followed guidelines from MoECRT, it is important to note that these guidelines are primarily intended for accreditation requirements of universities rather than impact evaluation for development projects.

The gender-disaggregated data from the tracer study reveals a significant difference in employment outcomes between men and women. Specifically, 70% of female participants found employment after the training, compared to only 33% of male participants. This indicates that the RESD programme has been particularly effective in improving employability for women, suggesting a positive impact on gender inclusivity.

16% (or 28 students) of the polytechnic students have not yet graduated on time due to challenges encountered with their capstone projects. These students have encountered

various obstacles that have hindered their progress, resulting in delays. In response, the polytechnics have granted an additional year to complete their capstone projects. This extension aims to provide them with the necessary time and support to overcome the difficulties, ensuring that they can fulfil the requirements of their programmes and eventually graduate.

Evidence from the interview with two female alumni indicated that they very much appreciated the capstone project, in particular the possibility to work in mixed groups and together with Swiss students. The mutual contacts have been maintained even after graduation.

In the case of BPVPs: For batch 1, only 34% are employed, 7% are continuing their education, 6% have started businesses, and 1% are participating in on-the-job training. This totals 47% with some form of engagement, while close to 53% are still seeking employment. Interestingly, when disaggregated by gender, women show a significantly higher employability rate (71%) compared to men (44%). Overall, o ut of those employed, only 17% are working in the RE or related sectors. This is rather low and does not correspond with the ambition to deliver qualified staff for the RE sector.

This indicates a strong potential to promote non-formal RE training for women and that labour market insertion is a challenge. However, despite the higher employability rate, the current situation shows that only 5% of female alumni consider working in the RE sector, compared to 12% of male alumni. This disparity suggests that while women benefit significantly from the training in terms of employability, additional efforts are needed to encourage more women to pursue careers specifically within the renewable energy sector.

One notable positive feedback came from a female student with a background in mechanical engineering, who had previously interned at a CFPP during her undergraduate degree. She expressed her appreciation for the more inclusive and women-friendly environment in the renewable energy sector compared to her experience in the traditional coal-based energy sector.

Meeting labour market demand

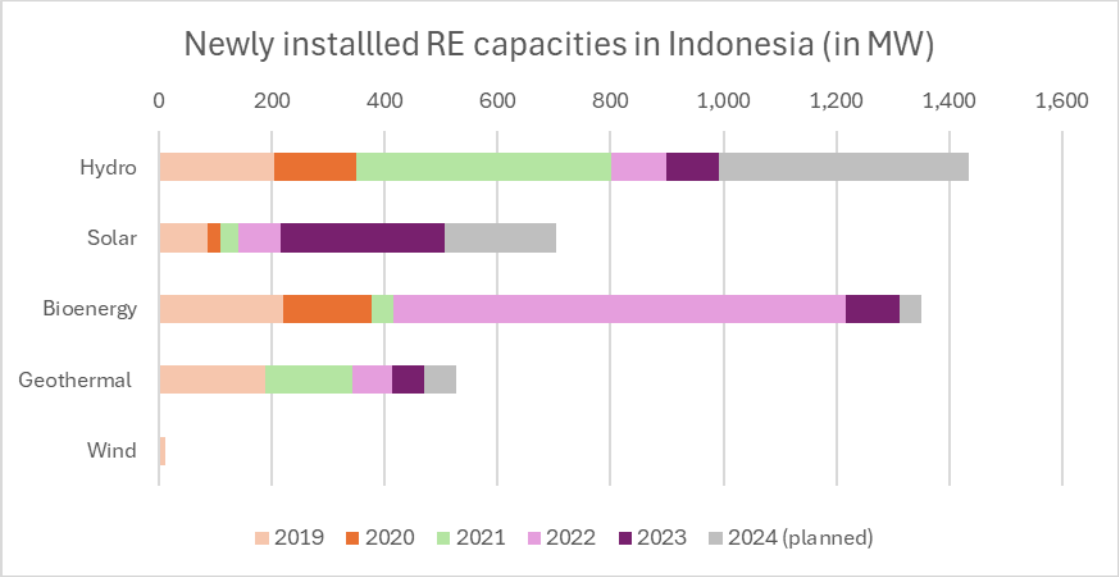
The second goal indicator focuses on whether domestic and international contractors and operators can find the required labour force within the Indonesian market. While this aspect has not yet been fully assessed[10], preliminary results from the tracer study indicate high levels of satisfaction among employers. Specifically, 71% of alumni users expressed high satisfaction with the graduates, 10% were satisfied, and 19% were quite satisfied (RESD, 2024f). Notably, no alumni user expressed dissatisfaction. These findings are corroborated by qualitative interviews with alumni managers, who also indicated a high level of satisfaction with the technical and soft skills of graduates from both formal and non-formal training programmes. This positive feedback suggests that the RESD project is effectively meeting the needs of employers in the renewable energy sector. Additionally, the RESD project has had broader impacts on the RE sector in Indonesia. It has strengthened the skills development system by working with both polytechnics and BPVPs. The BPVPs have provided better job prospects for marginalized groups, increasing their access to employment opportunities.

Moreover, the soft skills training provided by the RESD project has boosted participants' confidence, setting them apart from non-RESD alumni, according to interviews held by the evaluation team with two employers. This enhancement in soft skills is crucial as it equips graduates with the ability to navigate the job market more effectively and adapt to various professional environments.

[10] The RESD project will cover this in the first semster 2025 as per the logframe.

No recent data is available about the labour demand for the development of RE capacities in Indonesia. The following figure shows the installed RE capacities between 2019 and 2014:

Figure 3: Trend of annually installed RE capacities in Indonesia 2019 and 2024



Source: MoEMR 2024b, see data in Table 7 in Annex 6.

The average newly installed RE capacity fluctuated between 1,044 MW in 2022 and 540 MW in 2023. In 2022 most came from bioenergy expansion (palm oil bio diesel programme), and in 2023 more than half came from solar PV. While the level of hydropower installations diminished in 2022 and 2023 it is expected to grow in coming years. The importance of solar PV is steadily growing. Taking solar PV as an example and using some other sources, the following can be concluded:

- RESD estimated the labour demand for solar PV at 13 jobs per MW for installation and 0.7 for O&M. Assuming that in the following years an additional 1.2 GW solar PV is installed (1.5 GW cap minus the installed capacity of almost 0.3 GW in 2023), this would require 15,600 jobs for the installations and 840 for O&M. This does not consider hydropower, geothermal, etc.
- RE jobs are more women-friendly than in the coal sector (IRENA, 2023). Globally, 40% of solar PV positions are held by women, although many are in non-technical positions (marketing, sales, administration, distribution).
- Labour demand increases proportionately at the beginning but then declines if growth rates flatten because O&M labour demand for solar PV (and hydro) is much lower than for installation (see also the stagnating staff figures in the US during the past years despite still growing PV installations (IREC, 2023)). This decline effect was anticipated by the RESD labour scan.
- For the D-4 level graduates, the MoECRT feels that the absorption of 150-200 graduates per year might be challenging as long as solar PV development is constrained. Similarly, the low absorption rate of BPVP graduates into the RE sector from batch 1 (only 17% of those working) raises the question about the effective labour market demand. On the positive side, companies have expressed their opinion that they have difficulties finding qualified staff. Here, context also plays an important role. In the case of Bali, working as an engineer in the tourism sector is more attractive and often better paid than jobs in the RE sector.

Given the many uncertainties and fragmented data, it is very difficult to make precise judgements in a dynamic environment and where regulations can change on short notice. If the 1.5 GW target for new PLTS per year is to be achieved, the contribution of RESD to the labour market is needed, with an output of currently around 200 trained RE engineers and 150 technicians.

RE awareness

The project has also successfully raised awareness and interest in RE among participants. This includes the partner organisations and their staff in the partner ministries, the teachers and students, as well as private sector stakeholders. Furthermore, RESD's active participation in high-profile international conferences, vocational education exhibitions, and awareness-raising webinars on RE technologies has been acknowledged positively in promoting sustainability issues related to the energy transition challenge by the interviewed stakeholders.

3.6 Sustainability

Overall

The RESD project has demonstrated solid sustainability across various levels of implementation, including government partners, training providers, the private sector, and students. A 'Project Arrangement' between SECO and the MoEMR has been signed and implemented as targeted. However, the co-financing requirement of the partners was not detailed, and the MoECRT and the Ministry of Manpower were not signing partners. SECO did not elaborate on additional agreements at a later stage as advised by the RESD project. The lack of an additional Memorandum of Understanding (MoU) with the MoECRT and MoM resulted in delays in procuring and financing hydropower lab equipment through their budget lines. This has hampered the training effectiveness for formal and non-formal courses. The interviews suggest that such agreements could significantly enhance the achievement of project targets.

Positively, the project has been fully embraced by Indonesian partners. The SC facilitates communication among ministerial counterparts, while the selected polytechnics and BPVPs have independently managed and financed their course programmes using curricula developed by RESD applying the DACUM approach. Trained teachers have demonstrated improved understanding and confidence in delivering the content and continue to learn with each batch. Additionally, the alignment of subjects (solar PV, hybrid solar-diesel, and hydropower) with the net-zero emissions 2060 roadmap by the GoI further anchors the project's sustainability.

Strengthening the RE sector and transitioning from a primarily coal-based and monopolised electricity system and sector to RE is a strong contribution to sustainability. There is also a solid basis for a strong durability of the investments made to strengthen RE in the TVET sector.

Formal D-4 level training (Component 1)

Polytechnic directors have expressed satisfaction with the project and unanimously agree to continue integrating renewable energy education into their formal curriculum. Trained teachers are equipped to teach the subjects in classroom and laboratory settings and can also train other teachers as needed.

Capstone projects are incorporated into the formal curriculum despite being temporarily perceived as additional work for teachers and students. Regulatory alignment with the latest ministerial regulation supports this approach. However, individual polytechnics have varying policies regarding final projects. Some require students to complete a thesis in addition to the capstone project (Bali), which is time-consuming and often leads to students

using the same topic for both. This double project approach is seen as necessary by some polytechnics to prevent "free riders" in group projects. However, Polytechnics Jakarta and Bali plan to reevaluate this approach and will eliminate the thesis requirement, continuing only with the capstone project.

Interviews with the polytechnics revealed that in the case of Jakarta, all necessary equipment was in place, while the Polytechnic in Ujung Pandang (Makassar) and Bali only had solar PV equipment provided by the project. Both institutions expressed concerns about the project's funding scheme, particularly regarding acquiring and maintaining micro-hydro equipment. The Indonesian matching fund scheme is challenging for polytechnics because the means have to be secured by competition for grants and the proposed equipment is often deemed ineligible by assessors.

The sustainability of the cooperation with Swiss UAS for the time being is largely secured through RESD financing. The Swiss partners have only very limited possibilities to co-finance contributions to RESD by own means.

Additionally, the high workload of lecturers has limited outreach cooperation with the private sector, particularly regarding solar PV technology, which is rapidly evolving. This rapid evolution, combined with the limited absorption capacity of Training of Trainers (ToT) programmes, risks eroding learning outcomes if not enough RE projects are implemented, as warned by UAS experts. Moreover, the sustainability of acquired skills through the online courses remains a concern.

Non-formal RE trainings (Component 2)

The sustainability of the informal training courses offered by the BPVPs looks promising. During an interview with the Head of BPVP Lombok, it was highlighted that RE training remains highly attractive for job seekers. The consistently high interest and demand for the training supports the continuation of this type of training. It consistently attracts more applicants than the available slots. With a training quota of 16 participants per batch, applicants typically exceed this number by more than double. This high demand indicates a strong interest in renewable energy skills among job seekers and suggests that the programme meets a critical need in the job market. As long as this demand continues, BPVP Lombok is committed to offering the training.

Four BPVPs in Lombok, Aceh, Ambon, and Ternate have been independently running 270-hour solar PV technician training courses with full financing from the MoM and new courses (solar battery and solar-diesel hybrid) have been introduced. A critical aspect of ensuring the long-term sustainability of the training is securing the maintenance of the equipment by the training centers. Maintaining this equipment in good working condition is crucial for continuously delivering high-quality training.

Despite comprehensive training, job opportunities remain scarce, particularly in regions like Lombok, prompting many students to seek employment elsewhere, highlighting the need for BPVPs to strengthen nationwide employer linkages. Additionally, alumni are collaborating with BPVP instructors to maintain solar-powered streetlights in villages, and some aspire to establish maintenance SMEs, though they face funding and business skill development challenges.

Cooperation Between Training Providers and Private Sectors (Component 3)

The RESD project has implemented several strategic measures to ensure the durability of results. One of the key measures involves anchoring activities in the partner context by establishing robust vertical agreements with various stakeholders, which are crucial for the project's continuity. In this regard, it has secured seven vertical agreements to guarantee continuity and sustained benefits beyond the project's lifespan. These agreements include four between polytechnics and Swiss UAS, and three with RE companies/associations. Additionally, there are fourteen MoUs between RESD (GFA) and renewable energy

companies, and one MoU between RESD and Mentari project. These partnerships are essential as they establish a supportive network for ongoing renewable energy education and training programmes, facilitating a continuous exchange of knowledge, resources, and expertise.

However, further cooperation with private sector entities should be facilitated to ensure long-term job opportunities in the renewable energy sector. This is particularly crucial for the sustainability of the project, as many alumni have reported difficulties securing employment within the RE industry. Prompt execution of these partnerships will provide a stable employment pipeline for graduates, enhancing the overall impact and longevity of the project's outcomes. Ensuring these collaborations are active and functional will significantly contribute to the project's sustainability.

An integral part of Component 3 is the development of the REI website, designed as a partner-hosted platform managed by PPSDM KEBTKE rather than a temporary project website. This strategic decision ensures that the platform remains active and continuously updated even after the project's conclusion. The REI website has seen a significant increase in traffic, and its O&M was handed over to the MoEMR (PPDSM KEBTKE). However, relying on the MoEMR to maintain the job portal may not be the most effective approach, as they may lack the incentive and linkage to the RE company ecosystem to keep it updated and running optimally.

Interviews with alumni and students revealed a significant gap in awareness regarding the REI website and its job portal. Most graduates were unaware of this resource, indicating a need for better promotion and integration of the website into the job search process. To address this, the RESD Project can collaborate with established and well-known job market service providers such as Jobstreet, Glints, and Karir.com or/and using Linkedin, for which most oolytechnic graduates have a profile. Such collaboration would enhance the job portal's effectiveness, ensuring that alumni have better access to job opportunities within the RE sector. This approach would leverage the expertise and reach of established job market services to create a more robust and sustainable employment resource for graduates.

4 Conclusions

4.1 Overall

Indonesia is still very early on its energy transition path. Although mid- and longer-term targets for expanding RE installations are ambitious these still play a minor role in the energy mix. There remain structural market distortions (regulations, direct and indirect fossil fuel subsidies, overcapacity from coal-fired power plants, etc.) which currently limit the rapid expansion of electricity production from RE sources. These will be needed to meet the strategic goal to reduce carbon emissions to net-zero by 2060.

Indonesia continues to add more electricity production capacity from fossil fuels (coal) than from RE sources due to ambitious consumption projections and long realisation processes initiated about 10 years ago. With electricity overcapacity in the Java-Bali grid, alternative RE sources are promoted but on a limited scale. However, in remote areas such as islands and off-grid locations solar PV combined with batteries or solar-diesel hybrid systems are more economical than diesel generators.

The RESD project is on track to strengthen the skills basis of the RE sector in a holistic manner, by integrating relevant public and private stakeholders, throughout curricula development on solar PV and hydropower subjects. The developed curricula for solar PV and hydropower have modernised the teaching approaches, particularly with the addition of new solar lab equipment.

Contribution Narrative

The RESD project aims to strengthen Indonesia's renewable energy (RE) sector by developing a skilled workforce through targeted interventions in both formal and non-formal education, while also fostering communication and linkages within the sector. The project's logical framework provides a theory of change that outlines how these activities contribute to the desired change. It postulates that improving the quality and relevance of education and training in RE will lead to increased employability of graduates, higher employer satisfaction with their skills, and overall development of the RE sector in Indonesia.

The RESD project has significantly enhanced formal education through the development and implementation of a one-year extension programme focusing on solar photovoltaic (PV) and hydropower subjects at five polytechnics. By providing comprehensive training to lecturers, developing capstone project guidelines, and procuring necessary lab equipment, the project has ensured that polytechnics offer state-of-the-art and industry-relevant education. This effort is expected to produce around 500 graduates by mid-2025. The inclusion of a capstone approach has equipped students with practical, technical, and soft-skills.

In the non-formal education component, RESD has provided modular training programmes at BPVPs that are tailored to the needs of the RE industry. The project facilitated curriculum revisions and conducted extensive teacher training to ensure high-quality instruction. As a result, the project will produce 300 graduates for solar PV technicians.

Under Component 3, the project enhanced communication and information exchange among RE stakeholders by developing a website for the RE sector.

The RESD project's activities have directly contributed to the programme's outcome by addressing key gaps in education and training for the RE sector. However, the overall insertion into the labour market was limited because most graduates (75%) from formal education already had jobs and only a few non-formal trainees (17%) found jobs in the RE sector after training. By enhancing formal education, the project has produced graduates who are well-prepared for the labour market, as evidenced by the high satisfaction of employers. The non-formal education has provided workers and job seekers with the necessary skills for solar PV and hydropower installations.

Alternative explanations were tested but discarded, as the project has addressed clear niches with a tangible outcome plausibly linked to the theory of change. *(Photo: Solar PV training at the Polytechnic Bali)*

The labour market demand for trained and skilled staff in RE is present and is expected to grow massively in the coming years, provided the GoI reduces regulatory hurdles for RE,

particularly for solar PV. While the growth potential for micro-hydropower appears limited, the potential for solar PV is immense.

The project aligns with Indonesian and Swiss policy priorities toward achieving the 2030 Agenda and supports the energy transition by enhancing RE knowledge within the ministerial partners, the training institutions and enterprises of the RE ecosystem.

The project setup is adequate given its approach to promote 'Swissness' and establish links with Swiss RE training institutions, with all the partners maintaining their basic commitments. However, the lack of additional contractual arrangements between MoEMR with MoM and MoECRT/polytechnics has negatively affected the timely procurement of micro-hydro lab equipment. Consequently, the practical teaching aids were not fully available in some instances. The coordination of the many stakeholders was done effectively. At the strategic level, the Steering Committee meets once a year. Still, coordination at a more technical level and with the component managers of the training institutes could be enhanced, according to the partners.

4.2 Component 1

The training of teachers of the five polytechnics (plus some additional training institutions) has resulted in a pool of 163 educators capable of effectively teaching teach a modernised curriculum on the two RE technologies relevant for the employers. While the curriculum was optimised for project-based learning, including the highly regarded capstone project approach, the teaching modalities and standards differ between the involved polytechnics. While some focus on in-person or hybrid teaching, Bali has introduced two fully online teaching courses. This variety strains teacher's resources, as they must manage the different modalities in addition to the regular subjects). The project has substantially enhanced the institutional capacities at the five polytechnics to deliver up-to-date courses relevant for the RE companies.

The provision of technical and project management knowledge to teachers, complemented by solar lab equipment, has greatly facilitated the practical learning processes and learning outcomes by students, which is testified by a high level of employers' satisfaction for batch one graduates. A notable challenge in the case of the Polytechnic in Bali is additional burdens for students and teachers. Students in the Bali Polytechnic still have to produce a thesis (*skripsi*) at the end of their curriculum, in addition to the a capstone project. This approach remained despite the MoECRT's changed regulation that the successful completion of the capstone project is sufficient for graduation, creating double requirements for students and teachers.

The polytechnics have shown great engagement to introduce the formal D-4 level training courses, and these developed into flagship courses among the many study programmes they provide. The students have highly appreciated the curriculum, teaching aids, and the capstone project approach, particularly in the few cases where Swiss and Indonesian students jointly worked on such projects.

The high number of executive students (those already employed when they joined the programme) offers advantages, as they bring substantial practical experience to the programme. However, this also limits the impact, as 69% of the students in batch 1 and 74% in batch 2 were already employed, reducing the number of graduates newly entering the labour market after graduation. The evaluators have some reservations regarding the methodology of the tracer study as positive results might be overstated, such as the effective employment of graduates in the RE sector, as many are employed by PLN).

4.3 Component 2

The focus on enhancing skills and knowledge relevant to the RE labour market through modular non-formal training is well aligned with national skill standards, facilitating the upskilling necessary for the future RE sector demands. Key areas of assistance included: a) instructor training to enhance teaching capabilities, b) the development of comprehensive curriculum and training modules for solar PV, hydropower and solar-diesel hybrid technologies, c) the provision of essential solar panel equipment, and d) the promotion of training programmes. The curriculum was continuously improved based on feedback from each training batch and the industry, ensuring that it remains relevant and effective.

Despite the high relevance of the training due to the increasing demand in RE skills, challenges such as the limited presence of renewable energy companies outside Java-Bali corridor and the delayed arrival of micro-hydro equipment (from MoM) have posed obstacles.

From the students' perspective, the RESD training effectively combines theoretical knowledge and practical skills, significantly enhancing their readiness for the workforce. This balanced approach ensures that students understand the fundamental principles of RE technologies and gain hands-on experience. Industry experts are involved as instructors, providing practical insights and up-to-date information on industry trends. This exposure helps bridge the gap between academic learning and industry requirements.

The low level of labour market absorption in the RE sector appears to be a challenge. While 50% of graduates find a job within half a year after graduation, only 17% of those working have a job in the RE sector. A challenge in these short term-courses is the different backgrounds of the participants as there is no prerequisite for joining. Despite their high motivation, many participants lack fundamental knowledge in electrical or mechanical engineering, which is crucial for understanding and working with RE technologies. This gap in basic sectoral knowledge can slow down the training process as instructors need to spend additional time covering foundational concepts before moving on to more advanced topics.

The sustainability of the renewable energy training courses is promising. While there is a high demand for the freely-provided training, low application of the learned skills poses a challenge for optimising the curriculum. The differentiation of courses by the ongoing addition of solar battery and solar-diesel hybrid courses was a good development in the programme to address specific RE sector needs.

4.4 Component 3

This component plays a significant role in defining the overall success of this project by enhancing communication and awareness within Indonesia's RE sector, by linking training providers with the private sector. This component of the project organises events and webinars to promote RE education among GoI officials, training institutes and other stakeholders, and to facilitate networking. Moreover, this component of the project also maintained a website to disseminate information about training opportunities and industry developments, addressing both formal and non-formal education needs.

Despite the project's efforts in aligning graduates with market demand through the REI job-search website, most alumni are not aware of this online platform and continue to rely on other platforms like LinkedIn and Instagram. Handing over ownership of the platform to the MoEMR has enhanced the potential of long-term use of this platform, but its utilization remains a challenge.

To ensure the project's sustainability, numerous agreements and MoUs have been secured with educational and industry partners, yet more private sector engagement and partnerships between polytechnics/BPVPs and RE companies are needed.

5 Lessons learnt

Some of the lessons learned by the RESD stakeholders during project implementation so far are:

Context:

- The energy transition to enhance the ratio of RE in the energy mix is more complex and time-consuming than anticipated. Frequently changing PLN regulations regarding solar PV limits the rapid expansion of RE investments in the Java-Bali corridor.
- Potential for RE development is more conducive in remote areas of the archipelago, where solar PV is an economical alternative to diesel generators. However, many installation and O&M services are provided by RE companies from Java.
- Despite the unfavorable RE regulations, the installed solar PV capacity has significantly increased in the last two years and is expected to continue growing, not only in off-grid locations but also across various sub-sectors, such as big hotels and companies with sustainability goals. In contrast, hydropower development has been more inconsistent, heavily reliant on larger or big projects[11]. The last two years have seen a drop in installed hydropower capacity. Other RE sources, like wind, play a niche role, while geothermal and bioenergy are covered by special programmes.

RESD Project

- The intensive training of instructors in pedagogical and technical RE fields (solar PV and hydropower) as well as the intensive cooperation with Swiss UAS were important to develop relevant curriculum and to anchor the D-4 level and non-formal training programmes at the polytechnics and BPVPs.
- The sequenced approach, combined with the integration of relevant stakeholders, including the private sector, resulted in the training programmes being sustainably anchored.
- The substantial efforts invested in the capstone approach (fostering practical project-based learning) is well embedded in the project-based learning approach of MoEC and fosters linkages to the private sector, although the potential is not yet fully used.
- Teachers are already heavily burdened by the existing routine teaching and research activities. The various D-4 course modalities applied in Bali (face-to-face, hybrid and online) add to the complexity. The challenges were addressed with a lot of creativity to make the best of the situations and demands.
- Integrating three Ministries and promoting multi-disciplinary approaches with the D-4 level extension programme has allowed to make systemic change in the TVET sector, with spillover to other training programmes of the involved polytechnics (and in some cases participants from other polytechnics).

[11] For example, in 2027 a large pumped storage hydyropower plant of 1,040 MW is expected to be commissioned in Java.

- The open communication with other projects has enabled to establish good relations with other development actors mutually benefitting the promotion of RE skills.
- A comparison of original and recent risks in project implementations (see Table 6 in Annex 6) reveals that some risks have reduced over time. The motivation of the partners in Component 1 (polytechnics) and Component 3 (MoEMR) was higher than originally anticipated. Similarly, the risk of lack of interest from Swiss UAS and instructors was mitigated, thanks to the project's proactive communication approach and delivery of reliable services. However, new risks emerged, particularly regarding the procurement of hydro lab equipment due to financing issues. The lack of additional contractual arrangements has not facilitated this.
- There was a dilemma on content: While graduates expressed interest in a broader introduction to RE topics, including other RE sources such as wind, geothermal, and biomass, this would result in a further dilution of technical contents. Furthermore, this broader knowledge might not improve technical and practical skills sufficiently and hence would not enhance employability, especially of D-4 level graduates.

6 Recommendations

The following recommendations address short-term next-steps for Phase 1, and longer-term measures oriented towards a potential Phase 2.

6.1 Recommendations for the remainder of Phase 1

- **Support the MoECRT (polytechnics) in preparing course notes for teachers of the D-4 level extension programme:** Course notes are important and helpful as supporting teaching tools for the instructors, and also allow for maintaining similar standards and learning outcomes across the polytechnics.
- **Collaborate more intensively with companies in the job-market service providers**: Entrusting the MoEMR with maintaining the job market portal may not be effective in the long run, as they lack incentives to provide a comprehensive service. The project could explore and establish collaborations with established job-market service providers, such as Glints, Jobstreet, Karir.com, and LinkedIn, to manage job vacancies.
- **Follow-up with D-4 level non-graduates of batch 1:** There is a risk of delays in completion or dropping out of the program. 16% of students did not complete their studies after two semesters, partly because of delays in finishing the capstone project. As this is a relatively high number, the reasons for the delays should be analysed.
- **Review the experience with online courses from the Polytechnic in Bali:** While the D-4 level curricula was designed for face-to-face teaching, the Bali Polytechnic offers primarily online courses. Operating different course modalities is challenging for the teachers and could also affect the learning outcome as the practical part / capstone project is virtual.
- **Validate the real need for having more frequent Steering Committee meetings or whether alternative platforms fulfil this need:** Several partners have expressed their concerns over the relevance of Steering Committee meetings. As the RESD project only facilitates such meetings with the ministerial partners, SECO should decide whether to

increase the frequency or having more technical online exchange meetings or technical meeting with medium and lower level government official in between the Steering Committee meetings.

6.3 Recommendations for possible Phase 2

In view of a possible Phase 2, the following recommendations can be made:

Overall

- **Continue to support energy transition towards RE, although the demand is at an early stage**: RE energy installations, and especially solar PV systems in all combinations will have to receive an important role in the future to achieve net-zero greenhouse gas emissions. The demand for skilled labour is evident to implement this transition.
- **Establish clear contractual agreements for all partner contributions**: This is necessary, as the lack of additional agreements that specify contribution modalities with the MoECRT and MoM has hampered the timely procurement and maintenance of hydropower lab equipment, which is necessary for the practical trainings both at polytechnics and BPVPs.
- **The methodology of tracer studies should be reviewed to better grasp impact:** The first tracer study – implemented by the training organisations – might have had some biases and overstating the number of graduates working in the RE sector based on a re-analysis of data. Another option is to implement separate assessment to measure program's outcome and impact in more rigid methodology and minimize biases.
- **Promote women participation in the formal and non-formal training programmes and embed gender equality subjects in the training**: The RE sector offers good framework conditions for women employment and the current level of female participants in D-4 level is still below the proportion of female students in STEM subjects at tertiary level. Such efforts could include targeted outreach, gender target indicators (for example 25-30%), mentorship support and addressing the issue in ToT workshops and intensified show-casing success stories in different media channels.
- **Explore the potential to develop energy efficiency / green building curriculum for D-4 level training:** As RE development in Indonesia may not take off soon, and covering other RE sources by Switzerland appear not to have a high priority from the partners, a new phase or new project could support polytechnics in covering energy efficiency and green building aspects. The potential in improving air conditioning (AC) in commercial buildings is very high as they consume 63% if its electricity for AC (IESR, 2024). This approach would provide a broader scope of training that addresses immediate energy needs while still promoting sustainability. However, this would require careful mapping of donor activities and coordination with other emerging donor supported programmes in that sector (for example the World Bank).
- **Equip the next logical framework with tangible indicators and target values and use it as a strategic tool:** Equipping the indicators with target values, preferably with baseline data, would ease monitoring and evaluation. The logframe should not be used as a planning instrument and being updated too frequently.
- **Develop specific inception courses for the formal (D-4 level) and informal training specifically designed for participants with little or no background in (electrical) engineering**: An inception course or preliminary sessions integrated into the curriculum would provide a more tailored and supportive training approach, bringing all participants to a similar level of understanding. Addressing this gap is essential (especially for the BPVPs) to ensure that all trainees can keep pace with the programme and successfully graduate on time.

Component 1

- **Consider extending the D-4 course by additional modules (adding thematic depth):** Strong feedback from both students and alumni indicated a desire for deeper knowledge in renewable energy (RE) as they are eager to learn more. The project should adding thematic modules to the D-4 course. This extension would allow for additional thematic depth and more time for finishing capstone projects or engaging in practical work.

Component 2

- **Support the BPVPs in linking graduates with the private sector:** The improved absorption of trainees by companies is important to enhance the success and cost-effectiveness of these trainings.

Component 3

- **Support MoEMR in policy development regarding Indonesia's Human Resources needs for RE development:** To strengthen the dynamics towards energy transition, the MoEMR should be supported in their policy level work by contribution more intensive to the bi-annual Human Resources Summit, or by establishing a labour market observatory for the RE sector, together with other donors.

Annex 1: ToR

Terms of Reference

for

External Mid-term Evaluation

of

Renewable Energy Skills Development (RESD)

in

Indonesia

SAP: UR_01248-01/02 ACTA NOVA ID:

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II Standard Format for Evaluation Reports
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XII Amendment PA RESD BPSDM-SECO (05/2022)
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Further project documents can be delivered during implementation of the evaluation.

1. Purpose of the Evaluation

The main purposes of the evaluation are to assess OECD DAC criteria, with particular foci on the efficiency of implementation and the stock-taking of achieved results (effectiveness) of the project against the objectives as reflected in the project logframe (Annex IIIa/b), as well as on mid-term systemic and sustainable impacts. Include lessons learned from what works and what does not work within the project setup, in order to a) improve the running RESD intervention, and b) as strategic and technical recommendations for a potential next phase. Hence, the evaluation findings will be used (by SECO) as a base to make evidence-based decisions for a) potential adjustments to the current project phase, if any, and b) derive recommendations for a potential next phase by learning about success factors as well as challenges within the current phase. Additionally, it will be used to account and valuate the results of the intervention.

The mandate is initiated by SECO (Infrastructure Financing Section) as the sole donor of RESD as planned at project start. It is to be implemented within the existing contract by SECO-WEIN with a consortium (Urbaplan/ Enco/ Transitech) for *Urban Backstopper Support for Scoping Studies*.

The outputs of the mandate are addressed in priority to SECO, to the implementing agency GFA, but also to the below mentioned stakeholders. The following list shows the main stakeholders of the RESD project, besides SECO and further actors:

- Politeknik Energi dan Mineral Akademi Minyak dan Gas Bumi / Polytechnic of Energy and Mineral Resources, Oil and Gas under MoEMR (PEM-AKAMIGAS)
- Badan Pengembangan Sumber Daya Manusia / Human Resources Development Agency (BPSDM)
- Pusat Pengembangan Sumber Daya Manusia Ketenagalistrikan, Energi Baru, Terbarukan dan Konservasi Energi / Human Resource Training Center for Electricity, New and Renewable Energy, and Energy Conservation (PPSDM-KEBTKE)
- Badan National Sertifikasi Profesi / Indonesia Professional Certification Authority (BNSP)
- Fachhochschule Nordwestschweiz / University of Applied Sciences and Arts, Northwestern Switzerland (FHNW)
- Ostschweizer Fachhochschule / Eastern Switzerland University of Applied Sciences (OST)
- Eidgenoessische Hochschule fuer Berufsbildung (EHB / SFUVET; Swiss Federal University for Vocational Education and Training)

In addition as governmental partners, the Ministry of Energy and Mineral Resources (MoEMR), as signatory of the Project Agreement on behalf of the Government of Indonesia and the Ministry of Education, Culture, Research & Technology (MoECRT; formerly Ministry of Education and Culture), the Ministry of Manpower (MoM), and Badan Perencanaan Pembangunan Nasional / Ministry of National Development Planning (BAPPENAS) are further key stakeholders within project RESD.

- Polytechnics under MoECRT: Politeknik Negeri Jakarta, Politeknik Negeri Bali, Politeknik Negeri Manado, Politeknik Negeri Ujung Pandang (Makassar)
- BPVPs (formerly BLKs) under MoM in: Batch 1 - Ternate, Ambon, Lombok Timur, Banda Aceh; Batch 2 – Solo, Padang, Samarinda, Makassar, Sorong

Additional stakeholders may be identified as part of the evaluation.

2. Description of the Intervention

Project title	Renewable Energy Skills Development (RESD), Indonesia					
Duration of project	***Current phase***	Phase 1	***Project launch***	Dec 15, 2020	***Closing date***	June 15, 2025
Budget	***Budget for Year 3***	CHF 1,349,000	***Overall budget***	CHF 7'017'000	***Overall contribution by SECO***	CHF 6'417'387

Background: Renewable energy becomes increasingly important for the sustainable economic development of Indonesia. Electrification in remote areas can only be achieved in an efficient way, if renewable technologies are used. In addition, the constant economic growth triggers a raising demand in electricity, of which up to 25% is expected to be covered through climate-friendly renewable sources. At the same time, renewable energy projects in Indonesia show a very high failure rate due to the lack of technical support for design, operation and maintenance. Main reason is a shortage of specialists with skills responsive to the labour market needs.

Objectives: The Renewable Energy Skills Development Project (RESD) aims at supporting the expansion of renewable energy in Indonesia. The overall goal of RESD is to enable competent design, planning, installation, operation and maintenance of Renewable Energy power plants through the availability of qualified staff relevant to labour market needs. The project will do so by setting up multidisciplinary training programs at the tertiary level that equips civil, mechanical and electrical engineers with the necessary renewable energy know-how. In the long run it will thereby contribute to more and better jobs in the sector and support the Government of Indonesia in successfully exploring its significant potentials in Renewable Energy generation and greenhouse gas emission reduction.

Within **Component 1**, the project is targeting that by mid-2025 to have a formal, one-year renewable energy specialisation programme at tertiary level for hydro and solar technology in the participating polytechnics in place and have 468 specialized graduates relevant to market requirements produced.

With its **Component 2**, the project does ensure that at least nine training providers offer non-formal, modular trainings to future operation and maintenance personnel, equivalent to the Indonesian IQF levels 3 and 4, and will provide relevant skills and knowledge in renewable energy to at least 400 trainees, whereof some were already active in the labour market before attending training.

And finally, under its **component 3**, the project does facilitate the development of supporting structures for the cooperation between training providers and the private sector in the renewable energy sector, help to market training programs, match job seekers with potential employers and provide information about the RE sector in general.

Medium-terms outcomes: By 2025, formal Renewable Energy specialization programs at tertiary level for solar PV and hydropower technology are in place in the participating polytechnics and produced at least 468 specialized graduates that fit labour market requirements. At least nine training providers offer non-formal modular trainings at level 3-4 of the national Indonesian Qualification Framework (IQF is a neutral reference framework

that can equalize learning outcomes resulted from formal and non-formal education), and have provided relevant skills and knowledge in Renewable Energy (Solar PV and hydropower) to at least 540 trainees. Supporting structures for cooperation between training providers and the private sector in Renewable Energy are in place, helping to market training programs, matching job seekers with potential employees and providing information about job openings.

Source: Logframe RESD extract (see annex IIIa and IIIb; revised-V11-06.10.2023)

The following list gives an **overview of the outcome- and output-indicators** within project RESD (detailed indicators attached to annex IIIa and IIIb):

Overall Project Goal: Renewable energy plants are better designed, planned, installed, operated, and maintained.

Outcome 1 Formal, multidisciplinary RE specialisation programs at D4 level are in place and produce labour market relevant graduates for the RE sector.

- **Output 1.1** Roles and responsibilities with Indonesian partners clarified, established, and approved.
- **Output 1.2** Curriculum for D4 program in RE developed and accredited.
- **Output 1.3** Required equipment procured and commissioning and instructors' training carried out.
- **Output 1.4** Instructional material developed.
- **Output 1.5** Qualification standards and assessment procedures for D4 RE specialization program clarified and implemented.
- **Output 1.6** Capstone Project approach for D4 programs developed and adopted by Polytechnics.
- **Output 1.7** Teachers trained and certified.
- **Output 1.8** Students for D4 RE specialization enrolled and programs launched.
- **Output 1.9** Adequate tracer studies, monitoring and job placement services adopted.
- **Output 1.10** Selected instructional material digitalized.

Outcome 2 Various training providers offer modular non-formal trainings in accordance with national skill standards providing skills and knowledge upgrading relevant to the RE labour market.

- **Output 2.1** Roles and responsibilities of Project and with Indonesian partners clarified and approved.
- **Output 2.2** Curricula for modular solar PV and hydropower short-courses defined.
- **Output 2.3** Instructional material for modular solar PV and hydropower short courses developed.
- **Output 2.4** Required equipment, commissioning and instructors training defined, equipment procured and commissioning and instructors' training carried out.
- **Output 2.5** Qualification standards and assessment procedures for solar PV and hydropower courses reviewed.
- **Output 2.6** Teacher training needs assessed, training to fill gaps conducted and trainers certified.
- **Output 2.7** Modular RE courses introduced at public and/or private training providers.
- **Output 2.8** Program implementation monitored by Indonesian partner in cooperation with private sector

Outcome 3 Exchange and understanding within the RE sector and with the education sector has led to a higher acceptance and use of RE.

- **Output 3.1** Web- or other digital platform(s) on Indonesian RE sector (technologies, policies, regulations, government institutions, training options, private sector companies, services, experts, etc.) enhanced.
- **Output 3.2** RE sector conferences organised and/or contributed to.
- **Output 3.3** Awareness campaigns for wider introduction of RE technologies supported with expertise.
- **Output 3.4** National and international training institutions linked.
- **Output 3.5** Training of Ministerial staff

More detailed information is given in Annex IIIa/ IIIb and in the last project report Annex XI.

3. Scope and Focus of the Evaluation / Evaluation Questions

Scope: activities and results for all components and sub-components of the project are subject of the Evaluation.

Focus: Appraisal of the project against selected OECD DAC criteria, with key foci on Effectiveness and Efficiency, as well as on mid-term systemic and sustainable impacts, including recommendations for future optimisation.

The Evaluation will analyse the following questions according to OECD/DAC evaluation criteria (see Annex V for guidance):

Relevance (short assessment only; not a key focus)**:**

- Are the programs developed by RESD (in cooperation with partners) relevant to the needs on the labour market and supporting GoI policies?
- Is the chosen approach supporting GoI structures and supporting their further development?
- Are the project stakeholders supported to cooperate in a holistic manner, and to provide relevant, systemic and sustainable products to strengthen the RE sector?

Effectiveness:

- To what extent have the overall objectives of the project (outputs and outcomes), as defined in the project logframe, been attained or are likely to be attained?
- To what extent did the intervention contribute to achieving the objective?

Efficiency:

- How well were/are resources used?
- How effective and efficient are the project coordination, the communication channels, the flow of information and the decision-making processes between the various project stakeholders? What is working well, what can be improved and how?
- How effective and efficient are the organizational set-ups, implementation mechanisms and working relations?
- How were/are the project partners suited for the setup and implementation of RESD? To what extent did the project's stakeholders fulfil their designated roles and benefit

from the project? Should other institutions (including ministries) have been/be involved and how?

Coherence:

- How well do the interventions fit into (TVET/ RE) sector strategy of Indonesia, the Swiss cooperation strategy for Indonesia and the development portfolio and IC strategy of SECO (Infrastructure Financing)?
- How have SECO transversal themes (gender equality, climate and resource efficiency) and digitalisation been incorporated within the design and implementation of the project RESD?
- How does the project coordinate with other ongoing and/or future projects and activities of respective content, in order to lift cross-cutting synergies and avoid doubling?

Impact:

- Is the targeted impact (project goal) likely to be achieved? Has the project strengthened the skills development system for the RE sector?
- Were there so far unexpected (positive or negative) results related to the project?

Sustainability:

- Are the benefits likely to last also after the intervention?
- What measures have been taken for assuring sustainability of project goals?
- What might be needed to enhance sustainability further, i.e. in order to integrate potential achievements of the project into Indonesia's future development[12] and TVET system?

Learning and Innovation:

- What were/are the most critical factors to successfully implement and finalize the project?
- What are the recommendations of the evaluation team for future project implementation in terms of operational structure, procedures and roles and responsibilities?
- Based on the answers to the above evaluation questions, how could SECO potentially engage further with the intervention (next phase), and what lessons could be transferred to other projects?

The inception report offers the option to further refine the evaluation questions. The final evaluation questions will be agreed on by SECO and the consultants within the inception report.

The scoping should also take into account activities of other development partners (donors or financiers) and GoI strategies, including global or regional programs being active in formal

[12] e.g. RE curriculums, capstone project development, scientific exchange etc.

and non-formal educational activities with relation to RE (and EnEff) in Indonesia, including a view on complementarity, potential risks and (used/ unused) synergies[13].

Additional tasks may prove to be necessary during execution of the mandate to be agreed upon request.

4. Evaluation Methods and Process

The **Evaluation method** shall include the following aspects:

- Analysis / desk study of project documents (incl. project monitoring information, reports etc.) and external secondary data; study before writing the inception report
- Qualitative data collection using purposive sampling strategy: On site interviews and focus group discussions of/with key internal and external stakeholders. The sample should include a reasonable amount of external stakeholders who can give a neutral opinion about the project.
- (If the Consultant deems relevant quantitative data collection may be proposed in the inception report.)
- Evaluation matrix linking evaluation questions with data sources, data collection methods, data analysis procedures and main findings. Findings are to be based on several data sources (triangulation).
- Solid way of assessing project contribution/ attribution to outputs/ outcomes (e.g. Contribution Analysis) (DAC Effectiveness/Impact criteria).
- Solid way of assessing managerial / cost efficiency (DAC Efficiency criteria)
- Complete in the SECO assessment grid (annex I).

The Consultant shall propose the detailed methodology (incl. to be used evaluation matrix/evidence table, sample, data collection methods, data analysis procedures etc.) in the inception report.

The **Evaluation process** will be conducted by an external expert who will for that purpose constitute a team in line with the requirements outlined in Chapter 7 of these ToR (Team and Qualifications). The main expertise of the team should be TVET, the Indonesian education system, Renewable Energy technologies and sectoral development including industrial demands, and methodological skills in conducting evaluations.

The consultant should subcontract local consultant(s) with respective experience and network within Indonesia. To meet all the requested qualifications, the team leader has the possibility to associate with other experts qualified for the fields where he/she lacks the requested expertise from the overall team. The team is set for the entire duration of the mandate and in coordination with SECO. However, the team leader and unique contract partner for the overall mandate takes full responsibility for the execution of the mandate. He/She is responsible for coordinating the respective experts for the implementation of the specific tasks under the mandate and for ensuring the quality of products.

[13] Examples are the following projects: planned IBRD AOB Indonesia skills project; planned UNOPS ETP Specialised Workforce Development to Support Energy Transition in Indonesia; SECO-financed project Swiss Skills for Competitiveness (SS4C); etc.

An estimation of the necessary budget and overall expenses for this mandate has to be delivered by the consultant to SECO in advance, and to be confirmed by SECO.

The size of the evaluation team should not exceed three experts, covering proven expertise on a) DAC-evaluations, b) Indonesian TVET sector, c) Indonesian RE sector.

To complete this Evaluation a mission to Indonesia (covering Jakarta and possibly further local areas) is foreseen, plus 1 visit (or videoconference) to SECO Headquarters in Berne for a debriefing. Further modalities will be agreed on between SECO and the contractors within the existing urban advisory contract.

The Swiss Cooperation Office (SCO) in Indonesia will be available to support the Consultant in the preparation of his/her mission to Indonesia, in coordination with SECO headquarters in Berne and if necessary, SCO supports in establishing contacts to the relevant interview partners within the sector institutions it knows.

Other contacts should be established directly through the RESD project team in Indonesia or via the existing contracts or sub-contracted local consultant(s).

5. Deliverables

The deliverables of the mandate are:

- **Inception Report** (max. 5-10 pages) detailing out the methodology, detailed implementation plan, team composition, timetable etc.

- **Evaluation Report** (maximum 15-25 pages plus attachments) in the format therefore foreseen by SECO (Annex II) which will incorporate in its attachments a Project Logframe (revised version from October 2023) expanded with so far achieved results and an Assessment Grid on OECD DAC criteria (Annex I).

The deliverables will be provided to SECO in draft (MS-Word-document) format, commented by SECO (plus potentially by the implementing agency) and finalized by integrating the SECO comments.

The final versions of the deliverables may be shared by SECO with the RESD project steering committee (for further distribution) and, upon request, may be made available to interested third parties, according to the provisions of the Freedom of Information Act (FoIA).

Besides the above-mentioned main deliverables, the following intermediary products should be provided:

- An agenda for the mission to Indonesia (to be elaborated in close cooperation with the SCO in Jakarta).
- A summary note on key findings of the mission to Indonesia (Mission Report).
- A (powerpoint) presentation of the main findings of the Evaluation Report.

6. Tentative Schedule

The mandate will be conducted along a schedule to be proposed by the Consultant (and in coordination with SCO and the implementing agency GFA), with the objective to have it finalized, including the completion of the final reports, latest until 31st July, 2024.

The key milestones of this schedule are:

- Attribution of the Mandate
- Formulation of data requests to stakeholders
- Deadline(s) for collection of data and documents involving stakeholders and other sources
- Virtual and/or physical interviews with key stakeholders
- Mission to Indonesia to complete the evaluation and conduct the scoping, including briefing/de-briefing with SCO and potentially the implementing agency
- Compilation of draft deliverables and submission to SECO
- Comments of draft deliverables by SECO
- Compilation of final deliverables for SECO (may be shared with key stakeholders)
- Presentation of key results and findings to SECO and selected actors.

7. Evaluation Team / Qualifications

The mandate will require the following expertise and experience for an evaluation team with all in all maximum three experts:

- Minimum of 5 years of experience in managing/conducting evaluations, involving OECD DAC criteria and logframes, preferably in the fields of education or renewable energy;
- Sound methodological skills in the area of evaluation (incl. using evaluation matrixes, data collection and analysis, assessing the contribution of a project to results);
- A minimum of 5 years of expertise and experience in working in and with national government on TVET, including formal and non-formal education;
- Proven knowledge and experience in the Indonesian educational system, context and a network of key institutions/actors in the field;
- Experience in improving educational service delivery and regulation, including aspects of gender equality and digitalization;
- Expertise in capacity and skills development in polytechnics, and in institutional strengthening;
- Expertise in the field of Renewable Energies (RE), in particular on wind/ solar/ and water power plant technologies, as well as regulatory and policy frameworks;
- Know-how on the linkages between investment into future educational planning and linkages/ demands to and by (RE) industries;
- Proven knowledge of existing Swiss expertise and a network of Swiss contacts in TVET and RE;
- Proven experience in project formulation of donor funded projects, preferably in the field of skill development and technical education;
- Proficiency in English (written/spoken) plus preferably in *Bahasa Indonesia* (spoken).

The team is set for the entire duration of the mandate. However, the team leader and unique contract partner for the overall mandate takes full responsibility for the execution of the mandate. He/She is responsible for sub-contracting and coordinating the respective experts for the implementation of the specific tasks under the mandate and for ensuring the quality of deliverables.

8. Budget

The contractor (Urbaplan/ Enco/ Transitech) drafts a mini-offer for SECO within the existing contract, and a preliminary budget plan, including realistic estimations for realising the abovementioned services, which have to be agreed on by SECO before implementation.

The mandate is exempt from Swiss value added tax.

Annex 2: List of People Met (separate document)

For reasons of data protection this list is available as a separate document.

Annex 3: Detailed Method and Evaluation Matrix

General background

The evaluation was planned to be a mid-term assessment in the project document. However, the MTE was delayed due to various factors (incl. delays due to COVID-19, procurement problems for lab equipment). The evaluation applied a mixed method approach and combined qualitative and quantitative data collection and analysis. Special attention was given to existing surveys and data from the project as well as other studies and sources, or publicly available secondary data (e.g. statistics from the MoEMR).

The following table provides an overview about the interviews and Focus Group Discussions (FGD) conducted in the framework of this evaluation to cover all stakeholder perspectives.

Table 2: Overview about the interviews conducted

Stakeholder	**Place Number of interviews or FGD (participants)**				**Total People**
SECO and Swiss UAS	8 online interviews				9
	Jakarta	Bali	Makassar	Lombok	
Ministries (interview and FGD)	4				8
Directors / Programme managers	1	1	1	1	6
Teachers (FGD and interview in Lombok)	1 (5)	1 (8)	1 (15)	1	29
Students FGD)	1 (6)	1 (12)	1 (6)	1 (5)	29
Alumni (one FGD in Bali and short online interviews)	2	3 (5)	4	2 (8)	19
RE entrepreneurs		1	1	1	3
Project briefings (SECO; RESD staff)	2				9
Total	**19 (incl. Switzerland)**	**7**	**8**	**6**	**112**

Evaluation questions

The ToR suggested 19 key questions across the six OECD / DAC evaluation criteria plus lessons learnt and introduced innovations. A focus was on efficiency considerations, but preliminary discussions revealed the difficulty to obtain tangible cost data from partners. Also cost-benefit considerations are beyond the scope of this evaluation, especially as outcome measurement could be methodologically demanding and misleading. The evaluation matrix (see next page) links the evaluation questions with data collection and analysis.

One question regarding the roles of partners was put under relevance and the question regarding recommendations was dropped as it is a purpose of the evaluation to make future oriented recommendations to adjust the implementation for the rest of the current phase or for a possible next phase.

Data collection methods

The data collection consisted of the following methods:

- **Document review:** This included an analysis of project reports such as the inception report, progress reports, logframes, tracer studies, internal evaluation, etc.. This included the review of related project monitoring data, as well as a deeper analysis of the tracer study results. The review also included partner documents such as RE sector and TVET and labour market strategies, policy documents and relevant policy regulations. For coherence aspects SECO strategies were consulted. The document review also included the search and analysis of relevant secondary data and statistical data related to the RE sector.
- **Semi structured interviews:** Interviews with the three key partner ministries (MoECRT, MoM and MoEMR, and related Directorates) based on an interview guideline. Online interviews were conducted with all involved stakeholders of the Swiss UAS (FHNW, FHOst, ZHAW), and the Swiss Federal University for Vocational Education and Training (EHB). All discussion were recorded and transcript for later analysis
- **Field visits:** Out of the ten training institutions included in batch 1, four were covered with field visits to obtain direct feedback and insights. The selection was done on the basis of purposeful sampling: (1) where most of the investments were done in the Polytechnics, (2) the two Polytechnics with the biggest enrolments, (3) one not centrally located Polytechnic should be part of the sample and one BPVP, and (5) last but not least the reachability of the institutes for a short field visit. The final choice was based on project recommendations and included the Polytechnics in Jakarta, Bali, Makassar, and the BPVP in Lombok. This allowed to obtain a field level picture in Polytechnics and BPVPs, both centrally located as well as peripheral ones. In Jakarta and Bali alone, more than 60% of component 1 graduates are represented.

  The case studies included meetings / interviews with the following stakeholders:

  - Interview with directors, and/or programme management staff;
  - FGD with lecturers;
  - FGD with students (executive students / normal students) preferably gender mixed;
  - Online interview with 2-5 alumni graduates on the basis of the tracer study contact list. The selection was done randomly and included alumni working/not working in the RE sector, male/female, and working/looking for a job in the case of BPVP Lombok;
  - Interviews with 2-3 entrepreneurs hosting ex-graduates (e.g. in Bali).
- **Benchmarking with other projects:** There are numerous other development projects under implementation or under consideration. RESD is cooperating with several other projects (e.g. on teacher training). The evaluation covered three donor projects active in the TVET RE sector and financed/implemented by GIZ, UK and New Zealand. Benchmarking was limited by the fact that all three projects are in different implementation stages, have entirely different

designs and approaches, or cover different subjects (for example GIZ focusing TVET activities on green jobs at SMK and NZ Mates to the Maluku islands). Therefore, a real benchmarking or calculating cost-benefit data for various TVET measures would need a research set-up.

- **Validation of the theory of change:** The evaluation team reviewed the theory of change as outlined in the initial and revised logframes. This validation was based on the evidence gathered from the interviews and focus groups as well as from the document analysis.
- **Triangulation:** The evidence collected from the various sources mentioned above was cross-checked to enhance consistency of the findings. Additionally the views of the mixed team offered researcher triangulation.
- **Workshop with project team:** At the end of the mission, the preliminary findings will be discussed with the project team/ SECO.

Table 3: Evaluation matrix

Evaluation Questions	Data collection / source	Data analysis	Stakeholders to be covered
Relevance			
9. Are the programmes developed by RESD (in cooperation with partners) relevant to the needs on the labour market and supporting GoI policies?	• Document review • Interviews with GoI / donors	• Labour market absorption rate	• MoEMR, MoECRT, MoM • Polytechnics and training centers • SECO / Embassy
10. Is the chosen approach supporting GoI structures and supporting their further development?	• Document review • Interviews • Focus groups	• Alignment with partner priorities	• MoEMR, MoECRT, MoM • Polytechnics and training centers • RESD project team • SECO / Embassy
11. Are the project stakeholders supported to cooperate in a holistic manner, and to provide relevant, systemic and sustainable products to strengthen the RE sector?	• Interviews • Focus groups	• Review of the organisational set-up (PSU, PIU and steering	• MoEMR, MoECRT, MoM • Polytechnics and training centers
12. How were/are the project partners suited for the setup and implementation of RESD? To what extent did the project's stakeholders fulfil their designated roles and benefit from the project?	• Document review • Interviews	• Review of the organisational set-up (PSU, PIU and steering	• MoEMR, MoECRT, MoM • RESD project team
Effectiveness			
13. To what extent have the overall objectives of the project (outputs and outcomes), as defined in the project logframe, been attained or are likely to be attained?	• Document review (internal evaluation, logframe) • Interviews	• Comparison of targets and achievements • Context factors	• MoEMR, MoECRT, MoM • Polytechnics and training centers • RESD project team
14. To what extent did the intervention contribute to achieving the objective?	• Contribution analysis based on document review and interviews)	• Review of partner contributions (financial and other resources (manpower, infrastructure, etc.) • Evidence for change • Elaborating a contribution narrative • Testing alternative explanations	• MoEMR, MoECRT, MoM • Polytechnics and training centers • RESD project team
Efficiency			

15. How well were/are resources used?	• Document review • Interviews • Focus groups	• Financial allocation to components • Contributions by partners • Staffing	• Polytechnics and training centers • RESD project team • SECO / Embassy
16. How effective and efficient are the project coordination, the communication channels, the flow of information and the decision-making processes between the various project stakeholders? What is working well, what can be improved and how?	• Document review • Interviews • Availability of circular letter	• Role of Steering Committee • Coordination mechanisms with partners, within the PSU	• MoEMR, MoECRT, MoM • Polytechnics and training centers • RESD project team / Swiss partners
17. How effective and efficient are the organizational set-ups, implementation mechanisms and working relations?	• Document review • Interviews • Focus groups	• Analysis of the org. set-up and roles	• MoEMR, MoECRT, MoM • Polytechnics and training centers • RESD project team / Swiss partners
Coherence			
18. How well do the interventions fit into (TVET/ RE) sector strategy of Indonesia, the Swiss cooperation strategy for Indonesia and the development portfolio and IC strategy of SECO (Infrastructure Financing)?	• Document review • Interviews	• Alignment with GoI TVET approaches • Strategic fit with SECO's country Programme	• MoEMR, MoECRT, MoM • RESD project team / Swiss partners • SECO / Embassy
19. How have SECO transversal themes (gender equality, climate and resource efficiency) and digitalisation been incorporated within the design and implementation of the project RESD?	• Document review • Interviews • Focus groups	• Gender approach / female participants • Review of curricula contents	• Polytechnics and training centers • Teachers and students • RESD project team / Swiss partners
20. How does the project coordinate with other ongoing and/or future projects and activities of respective content, in order to lift cross-cutting synergies and avoid doubling?	• Document review • Interviews	• Use of formal coordination mechanisms • Informal stakeholder consultations	• Polytechnics and training centers • RESD project team / Swiss partners • Other donors
Impact			
21. Is the targeted impact (project goal) likely to be achieved? Has the project strengthened the skills development system for the RE sector?	• Document review (e.g. tracer study) • Secondary data • Interviews	• Ownership of training programmes by the ministries and training institutions • Spill over of conceptual innovations to other training programmes • Scope of change within the TVET / RE sectors	• MoEMR, MoECRT, MoM • Polytechnics and training centers • RESD project team / Swiss partners • Teachers and companies

22. Were there unexpected (positive or negative) results related to the project?	• Interviews • Focus groups	• Open	• All
Sustainability			
23. Are the benefits likely to last also after the intervention?	• Document review • Interviews	• Durability of benefits • Level and prospect for co-financing	• MoEMR, MoECRT, MoM • Polytechnics and training centers • Alumni
24. What measures have been taken for assuring sustainability of project goals?	• Document review • Interviews • Focus groups	• Taking over of responsibilities by the partners	• Polytechnics and training centers • RESD project team / Swiss partners
25. What might be needed to enhance durability of benefits further, i.e. in order to integrate potential achievements of the project into Indonesia's future development and TVET system?	• Document review • Interviews	• Open	• MoEMR, MoECRT, MoM • Polytechnics and training centers
Learning and Innovation			
26. What were/are the most critical factors to successfully implement and finalize the project?	• Interviews • Focus groups	• Open	• All
27. Based on the answers to the above evaluation questions, how could SECO potentially engage further with the intervention (next phase), and what lessons could be transferred to other projects?	• Document review • Interviews	• Drafting recommendations based on obtained evidence	• Evaluation team

Annex 4: Example for an Evaluation Guideline

For data collection altogether 8 interview guidelines were used to cover the different stakeholder groups

- Ministries
- Swiss partners
- Directorates of Polytechnics
- Alumni
- Other RE projects
- Private sector
- Focus groups with teachers
- Focus groups with students

Table 4 : Interview guideline for Ministerial partners

Nr.	**Interview guideline for the SECO financed RESD MTE** **A - Ministerial partners**	**Eval. Quest.**
	Info about the Interview Date: xxx Ministry / Directorate: xxx Names and functions: - xxxx, xxxx - xxxx, xxxx - xxxx, xxxx	
1	How do you assess the relevance of the RESD intervention for the needs of the Indonesian labour market?	Rel.
	- X	
2	What were the main achievements / highlights or impacts regarding the three components in your opinion: 1) the formal 1-year specialisation course (hydro and solar technology) 2) the non-formal module training on renewable energy (RE) 3) improved cooperation, match making and understanding among RE actors?	Eff.
	- X	
3	What were the main obstacles and problems encountered during the implementation?	Eff.
	- X	
4	Was the chosen approach supporting GoI structures (ministries, Polytechnics, training	Rel

	centers) appropriate?	
	- X	
5	Does the intervention fit into your strategy for promoting TVET/RE sector?	Coh
	- X	
6	Did you observe any unintended (positive or negative) effects?	Imp.
	- X	
7	How do you assess the organisational set-up and the coordination mechanisms 1) within the project, and 2) with the Indonesian partners (Ministries and training institutes)?	Effic.
	- X	
9	How do you assess the likelihood of durability of benefits?	Sust.
	- X	
9	What are the main lessons learnt for you?	
	- X	
10	Final comment or recommendation?	
	- X	

Annex 5: SECO Assessment Grid

Assessment grid (version October 2023)

This assessment grid is a mandatory annex to external evaluations (and internal assessments in the case of SECO) of SDC and SECO financed projects and programs (hereinafter referred to as an 'intervention'), be they commissioned by SDC, SECO or external partners. It is based on the OECD Development Assistance Committee evaluation criteria and guidance.[14] Its purpose is to help make results of evaluations more transparent and quantify them (transform the qualitative information in the evaluation reports into quantitative scores) in a standardized manner. This serves accountability purposes and helps for the aggregate reporting, steering and learning.

How to use this assessment grid:

- Evaluators should provide the filled assessment grid in ***Word***.
- All *applicable* sub-criteria should be scored and a short explanation provided. If the evaluation ToRs explicitly exclude some DAC criteria, they should not be filled in the assessment grid. To guarantee coherence, it is advised to match each evaluation question in the ToRs to a sub-criterion in the assessment grid.
- The 20 sub-criteria shall not be modified, however additional sub-criteria may be added to reflect specific objectives and learning interests of the commissioner.
- If specific results are not yet measurable at the time of the assessment, it requires analysing the likelihood of achieving those results (in particular for the criteria effectiveness, impact and sustainability). Please mention this in the dedicated section (evaluability assessment on p. 2).
- There are hyperlinks on each evaluation criterion in the assessment grid, which lead to the OECD guidance on each specific criterion. The guidance also includes information on the interlinkages and differences between the DAC criteria.
- When applying a gender and climate lens, evaluators are expected to use the relevant guidance.[15]
- To rate each sub-criterion, select your rating (0-4, kindly only use integers) in the column “score”:

	Relevance / coherence / efficiency	Effectiveness	Impact	Sustainability
1 = Highly	There were **no shortcomings** in relation to the intervention’s	Objectives at outcome level were (or are likely to be) **fully** achieved or exceeded.	The intervention had (or is likely to have) a **significant positive**	**All** of the intervention’s benefits (will) last. *Note: for this rating, clear evidence is*

[14] Two guiding principles were set out by the OECD DAC Network on Development Evaluation alongside the definitions of the six criteria. These are:
a. Principle One: The criteria should be applied thoughtfully to support high-quality, useful evaluation.
b. Principle Two: Use of the criteria depends on the purpose of the evaluation.
The OECD guidance Applying Evaluation Criteria Thoughtfully (2021) explains these principles and provides advice as well as examples for the use of the criteria.

[15] See for instance Applying a Human Rights and Gender Equality Lens to the OECD Evaluation Criteria

satisfactory	relevance/ coherence/ efficiency.		impact.	*required (not only assumptions).*
2 = Satisfactory	There were **moderate shortcomings** in relation to the intervention's relevance/ coherence/ efficiency.	Objectives at outcome level were (or are likely to be) **largely** achieved.	The intervention had (or is likely to have) an **overall positive** impact.	**A majority** of the intervention's benefits (will) last.
3 = Unsatisfactory	There were **important shortcomings** in relation to the intervention's relevance/ coherence/ efficiency.	Objectives at outcome level were (or are likely to be) only **partially** achieved (at a rather low level). *Note: if outputs are achieved, but do not result in the expected outcomes, consider rating effectiveness as unsatisfactory.*	The intervention had (or is likely to have) **no** impact.	**A minority** of the intervention's benefits (will) last.
4 = Highly unsatisfactory	There were **very severe shortcomings** in relation to the intervention's relevance/ coherence/ efficiency.	Objectives at outcome level were **not** achieved (or are **un**likely to be achieved).	The intervention had (or is likely to have) an unexpected **negative** impact.	**None** of the intervention's benefits (will) last.
0 = Not assessed	The criteria statement cannot be assessed. Please explain in the justifications section.			

Along with the assessment grid, please also fill in this table with data on the evaluation, on the evaluated intervention and on the evaluability of the intervention.

Evaluation data			
Title of the evaluation report	Renewable Energy Skills Development (RESD) in Indonesia		
Evaluation mandated by	SECO - WEIN	Evaluation dates (start – end)	18.04.2022 to 31.07.2024
Evaluation carried out by:		For external evaluations: Total evaluation budget (including	44,000

Name of lead evaluator (If relevant) Name of company	Dieter Zürcher KEK – CDC	all fees and costs) and currency	CHF
Has any member of the evaluation team been involved in the intervention?	Select Yes or No	If yes, how?	Briefly explain the type of involvement here
Evaluated intervention data			
Name of Project (including phase number)	Renewable Energy Skills Development (RESD) Project		
Project ID (if available) Datasheet Nr.:	UR_XXXXX-XX 10000XXXX	Dates of the evaluated phase (start – end)	15.12.2020 to 15.05.2025
Is it the final phase?	Select Yes or No No	Total budget for the evaluated phase (incl. other donors); Approved SECO funding	6,417,000 Contribution
Evaluability[16] assessment by evaluator			
To which extent do you consider that the intervention can be evaluated in a reliable and credible fashion?	2 - reliable		
If applicable, please select the type of limitation(s) to the evaluation and provide a brief explanation	☐ Objectives are not adequately defined (e.g., weaknesses in intervention design, lack of baselines and targets)		

[16] See definition of evaluability in OECD (2023), Glossary of Key Terms in Evaluation and Results Based Management for Sustainable Development (Second edition), OECD Publishing, Paris https://www.oecd-ilibrary.org/docserver/632da462-en-fr-es.pdf?expires=1690787009&id=id&accname=guest&checksum=ED10CC16AE8370653438B9C7A52688E0

Note: when assessing evaluability also consider the representativeness and participation of specific stakeholders/groups involved in the evaluation as well as the influence of conflict/fragile context on the quality and validity of the data and access to target groups (if applicable)	☒ Results are not verifiable (e.g., too early to tell, lack of sufficiently robust data and evidence) ☐ Other limitation(s) The project had its first batch of trainees graduated in 2023, the second one takes place this summer. Therefore the experience is still young and evolving

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
1 Relevance: Is the intervention doing the right things? Summary: The extent to which the intervention's objectives and design (at the time of design and at time of evaluation) respond to beneficiaries' and involved stakeholders' needs and priorities, and continue to do so if circumstances change. *Note: Understanding gendered power dynamics and reflecting on the SDG commitment to "leave no one behind" are crucial in understanding relevance.*	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	The design of the project addressed the needs of the involved stakeholders, from Ministries to TVET institutes (Polytechnics and training centers (BPVP). It makes a crucial input into human resources development to strengthen the RE sector in Indonesia and thus positively contributing to the on-going energy transition pathway to achieve Net-Zero greenhouse gas emissions by 2060
1.1 ***Responsiveness to needs, policies and priorities***: the extent to which the objectives (at output, outcome and impact levels) of the intervention respond to the needs and priorities of the beneficiaries (target group), involved stakeholders (involved in funding, implementing and/or overseeing the intervention) and, when relevant, to indirectly affected stakeholders (e.g., civil society, etc.). *Note: A particular emphasis should be placed on beneficiaries. If there are trade-offs, please describe them in the justification.*	1 - highly satisfactory	The RESD answers to the needs of the partner ministries to enhance skills in the RE sector in order to have trained manpower for the energy transition away from coal and towards RE. It addresses well the needs of the partner ministries as well as the 14 involved training institutions.
1.2 ***Sensitiveness and responsiveness to the context and capacities of the beneficiaries and involved stakeholders****:* the extent to which the context was considered in the design of the intervention (e.g., economic, environmental, equity, social, cultural, political economy and last but not least capacity considerations).	1 - highly satisfactory	The design did consider the challenging context and applied an agile management mode to stay relevant. However, uncertainties regarding labour market situation and demands for RE skills differ substantially from Province to Province

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
Note: Evaluators are encouraged to describe which contextual factors are most pertinent to the intervention.		and Island to island. The project has rightly shifted the focus towards skills required for off-grid solar PV systems.
1.3 ***Quality of design****:* the extent to which core design elements of the intervention (such as objectives and their related indicators, logframe, theory of change including related assumptions, choice of services and intervention partners, exit strategy) reflect the needs and priorities of the target group, are appropriate, realistic, clearly defined, measurable and feasible (technical, organisational and financial feasibility). *Note: the exit strategy should be planned from the outset of the intervention to ensure the continuation of positive effects as intended, whilst allowing for changes in contextual conditions.*	1 - highly satisfactory	The design was robust to address the labour market needs and the approach to involve private sector in curriculum development was a strong asset. The combination of courses for formal and non-formal trainees also offered chances to people from marginalised groups. The decentralised provision of the various RE training across the archipelago of Indonesia is a strong plus.
1.4 Adaptation over time*:* the extent to which the intervention has meaningfully adapted to changes over the course of its lifespan (e.g., evolving policy and economic contexts, change of funding, new opportunities, outbreaks of conflict or pandemic, etc.).	1 - highly satisfactory	The project constantly observed the context and has adapted the approaches based on lessons learned. Ensuring a high level of ownership by the partners was a primary principle followed even if it delayed some activities (e.g. procurement on GoI side).
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
2 Coherence: How well does the intervention fit? Summary: The compatibility of the evaluated intervention with other interventions in a country, sector or institution, i.e., the extent to which other interventions (in particular policies) support or undermine the intervention and vice versa.	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	The project exhibits strong internal coherence through its distinct yet complementary components. Externally, the project aligns well with the GoI's Energy Roadmap to Net-Zero Emissions by 2060 and the National Medium-Term Development Plan (RPJMN), as well as SECO's focus on skills development, employment, and sustainability. The RESD project avoids duplication and collaborates closely with other similar programmes.
2.1 ***Internal policy alignment***: the extent to which the intervention aligns with the wider policy frameworks of the Swiss Development Cooperation, including the most recent Swiss	select1 - highly	The project has emphasized sustainable development, poverty reduction, and economic growth through skill

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
international cooperation strategy overall and at country level, as well as to relevant international norms and standards to which Switzerland adheres (international law, international agreements, etc.).	satisfactory	enhancement and job creation, which are key priorities in Switzerland's international cooperation strategy. By focusing on renewable energy, the RESD project supports Switzerland's commitment to environmental sustainability and clean energy, adhering to international norms such as the Paris Agreement on climate change and the United Nations Sustainable Development Goals (SDGs), specifically SDG 7 (Affordable and Clean Energy) and SDG 8 (Decent Work and Economic Growth).
2.2 ***Internal compatibility***: the extent to which the intervention is compatible with other interventions of Swiss development cooperation in the same country/region and thematic field (consistency, complementarity, synergies, avoiding duplication of efforts, subsidiarity). *Note: if feasible, evaluators are encouraged to also take into account compatibility with the interventions of different levels / departments of the Swiss government in the same operating context (e.g.: development, diplomacy, trade, security, etc.)*	select0 - not determined	The 'Skills4competetiveness' project is part of the SECO portfolio in Indonesia. While it also addresses skills development at tertiary level (Polytechnics) it has no thematic link and the supported Polytechnics are complementary from those included in the RESD project.
2.3 ***External compatibility***: the extent to which the intervention is compatible with interventions of other actors in the country and thematic field (complementarity, synergies, overlaps and gaps, value-added, use of existing systems and structures for implementing activities, harmonization, coordination, etc.).	1 - highly satisfactory	The RESD project collaborates closely with the New Zealand's NZMates initiative, UK's Mentari programme and GIZ's ISED and upcoming GESIT initiatives, effectively avoiding duplication of efforts and exploiting synergies in training and development of the RE sector. These collaborations support technical and vocational education and training in the RE sector, ensuring that efforts are complementary and mutually reinforcing. By working in bilateral tandems with these programmes, the RESD project ensures a coordinated and efficient approach to addressing skill gaps, fostering a cohesive and integrated development strategy.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
3 Effectiveness: Is the intervention achieving its objectives? Summary: The extent to which the intervention achieved, or is expected to achieve, its objectives and its results, including any differential results across groups.	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	The intervention is largely achieving its objectives as evidenced by the successful implementation of RE training programmes across five Polytechnics and four BPVPs, surpassing initial enrolment targets and introducing innovative educational approaches like the 'capstone' concept. It has also unintentionally enhanced government officials' understanding of energy transition complexities and facilitated networking through a job-search website, despite its underutilization. Efforts to ensure inclusivity and equity, including flexible class schedules and gender-specific training, underscore the project's commitment to non-discrimination and leaving no one behind.
3.1 ***Achievement of objectives****:* The extent to which the intervention achieved or is expected to achieve its intended objectives (outputs and outcomes) as originally planned (or as modified to cater for changes in the environment), including its transversal objectives (e.g., gender, climate) *Note: If some – but not all – of the objectives were achieved the evaluators will need to examine their relative importance to draw conclusions on the effectiveness.*	1 - highly satisfactory	The project has achieved its intended objectives (outcome and outputs) as initially planned. The implementing renewable energy training programmes at five Polytechnics and four BPVPs, increasing enrolled students from 170 to 228 in the second batch. The introduction of the 'capstone' concept and significant training efforts, including 119 teachers and 44 BPVP instructors, have enhanced project-based learning and practical skills in renewable energy technologies.
3.2 ***Unintended effects***: The extent to which the intervention has responded adequately to the potential benefits/risks of the positive/negative unintended results.	1 - highly satisfactory	The project has responded adequately to the potential benefits/risks of the positive and negative unintended results. Among others, it led to an increased understanding among government officials regarding the complexity of the energy transition, particularly through comprehensive training on topics such as carbon credits. Additionally, the introduction of the REI job-search website, although underutilized by alumni, has indicated high interest and engagement, showcasing the project's unexpected positive effect on RE education and

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
		employment networking.
3.3 ***Differential results****:* the extent to which the intervention results (outcomes) were inclusive and equitable amongst beneficiary groups and the extent to which key principles such as non-discrimination, accountability and leave-no-one-behind were taken into account during the implementation.	2 - satisfactory	The intervention has promoted inclusivity and equity, accommodating executive students with flexible class schedules and providing gender-specific training that involved 24 female and 95 male teachers. Efforts to balance theoretical and practical sessions through various teaching models, despite regional challenges, have aimed to ensure non-discrimination and leave-no-one-behind principles. The proportion of female students at D-4 level could be further enhanced. The project's commitment to social and regional equity is evident in its balanced distribution of supported training institutes across the islands.
4 Efficiency: How well are resources being used? Summary: The extent to which the intervention delivers, or is likely to deliver, results in an economic and timely way.	*Please do not write anything here. The DAC criteria score will automatically be calculated.*	The RESD project has strengthened the partners' capacities (Ministries, Polytechnics, training centers (BPVPs)) so that they finance the implementation of the activities by own resources.
4.1 ***Economic efficiency*****:** The extent to which the intervention delivered the results (inputs outputs; inputs outcomes) in the most cost-efficient way possible (including allocation of resources between target groups and time periods; available options for purchasing inputs according to market conditions, etc.).	1 - highly satisfactory	The project will deliver the promised results for all components in good quality not least thanks to clear and effective communication with all stakeholders. The organisational set-up consists of many partners (3 Ministries and 14 training institutes) and the management coordinated the network efficiently.
4.2 ***Timeliness*****:** The extent to which the intervention delivered the results (outputs, outcomes) in a timely manner (within the intended timeframe or reasonably adjusted timeframe) and the extent to which efforts were made to mitigate delays. *Note: In case timeliness was unsatisfactory for reasons outside of the intervention's control, the*	2 - satisfactory	The COVID-19 pandemic was used to develop curricula and content modules/concepts. This has allowed to start with only little delay. Procurement delays in hydropower lab equipment

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
rating should still be unsatisfactory and explanation provided in the justification field.		has compromised the teaching for D-4 courses (e.g. in Bali)
4.3 ***Operational efficiency***: The extent to which management, monitoring and steering mechanisms supported efficient implementation (resource allocation, spending and redirection, risk management, logistics and procurement decisions, etc.).	1 - highly satisfactory	RESD applies a sound monitoring and is in close contacts with the stakeholders (Ministries and training institutes).
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
5 Impact: What difference does the intervention make? Summary: The extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects. Impact addresses the ultimate significance and potentially transformative effects of the intervention. It seeks to identify social, environmental and economic indirect, secondary and potential consequences of the intervention that are longer term or broader in scope than those already captured under the effectiveness criterion. It does so by examining the holistic and enduring changes in systems or norms, and potential effects on people's well-being, human rights, gender equality, and the environment. *Note: depending on the timing of the evaluation and the timescale of intended benefits, evaluators can assess for both actual impacts (i.e., already evident) and foreseeable impacts.*	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	The project has impacted the employability of its graduates, particularly enhancing opportunities for women in the RE sector. Tracer studies show that 70% of formal education graduates are employed, with women having a slightly higher employability rate (88%) compared to men (80%). For non-formal education graduates, 34% found employment, with women again showing higher rates (71%) compared to men (44%). Employers have expressed high satisfaction with the technical and soft skills of graduates. Additionally, the project has strengthened the skills development system in Indonesia, improved job prospects for marginalized groups, and raised awareness and interest in renewable energy.
5.1 ***Intended impacts*****:** The extent to which the intended (planned and, where applicable, revised) 'higher-level effects' (i.e., lasting changes in the lives of beneficiaries) of the intervention were (or are expected to be) achieved. *Note: also consider the extent to which the intervention contributed to "holistic and enduring changes in systems or norms" and transformational change (addressing root causes or systemic drivers of poverty, inequalities, exclusion and environmental damage).*	2 - satisfactory	While the project has contributed to significant know-how gains in RE technologies (especially for solar and hydropower) for teachers, instructors, students and private sector actors, the proportion of additional trainees in RE jobs is rather limited because at D-4 level most students already have a job when starting and because most of the non-formal trainees could not find a job in the RE sectors. Tracer studies indicate that a substantial percentage of graduates, especially women, have secured employment in

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
		the renewable energy sector, reflecting the project's success in creating lasting changes in their professional lives. Employers have expressed high satisfaction with the technical and soft skills of the graduates, suggesting that the training programs are meeting industry needs. As this is based on the first batches it is a preliminary assessment
5.2 ***Contribution to intended impacts:*** The extent to which the intervention actually contributed (or is expected to contribute) to the intended higher-level effects. *Note: results of contribution analysis, etc.*	2 - satisfactory	The project has demonstrably contributed to its intended higher-level effects by significantly improving the employability of its graduates and strengthening the renewable energy skills development system in Indonesia as expressed by the employers' satisfaction. However, the net insertion of trainees into the labour market was rather low owing to a high proportion of formal level trainees already in work when joining the training and the low level of non-formal trainees finding a job in the RE sector after training
5.3 ***Unintended impacts***: Has the intervention brought about (or is it expected to bring about) any unintended (positive and/or negative) higher-level development results? If yes, to what extent have these higher-level effects been positive (or are likely to be positive)? *Note: consider here any kind of unintended effects such as escalating or deescalating effect on a conflict or context of fragility, effect on the legitimacy of the state or non-state actors, effect on the inclusion or exclusion of vulnerable groups, unintended pollution, etc. If there wasn't any noteworthy unintended impact (higher-level effect), mark this question as non-applicable (n/a) and do not give a rating.*	select0 - not determined	Not observed
5.4 ***Differential impact***: the extent to which the intervention's intended and unintended higher-level results (impacts) were (or are expected to be) inclusive and equitable amongst beneficiary groups and the extent to which key principles such as non-discrimination,	1 - highly satisfactory	The project has demonstrated a strong commitment to inclusivity and equity, ensuring that its intended and unintended higher-level impacts are widely accessible across

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
accountability and leave-no-one-behind were taken into account during the implementation. *Note: Keep in mind that positive impacts overall can hide significant negative distributional effects.*		diverse beneficiary groups. The complementarity between the formal D-4 level and non-formal training address different company needs and also offer new skills for different population segments. The project has been effective in improving the employability of women, with tracer studies showing significantly higher employment rates for female graduates compared to their male counterparts. Additionally, the project has provided better job prospects for marginalised groups, enhanced through comprehensive soft skills training and targeted support.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
6 Sustainability: Will the benefits last? Summary: The extent to which the net benefits of the intervention continue or are likely to continue. Includes an examination of the enabling environment for sustainable development, i.e., financial, economic, social, environmental, and institutional capacities of the systems needed to sustain net benefits over time. Involves analysis of resilience, risks and potential trade-offs. *Note: depending on the timing of the evaluation and the timescale of intended benefits, evaluators can assess for both actual sustainability (i.e., the continuation of net benefits created by the intervention that are already evident) and prospective sustainability (i.e., the net benefits for key stakeholders that are likely to continue into the future)*	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	The RESD project has made significant strides in ensuring the sustainability and longevity of its benefits. It has effectively enhanced the capacities of training providers and government partners, ensuring they are well-equipped to continue delivering renewable energy education. Strategic partnerships with Swiss UAS and renewable energy companies bolster financial sustainability, although challenges remain in securing ongoing funding for equipment maintenance. Contextually, the project has implemented MoUs with key stakeholders, fostering a conducive environment for sustained impact. These efforts indicate a strong foundation for the benefits of the RESD project to endure over time, contributing positively to Indonesia's renewable energy sector. But the lack of agreement with two ministerial partners has challenged procurement of hydropower lab materials.
6.1 ***Capacity and resilience development***: The extent to which the beneficiaries and development partners have strengthened their capacities (at the individual, community, or	1 - highly	This project has significantly enhanced the capacities of beneficiaries across multiple levels, including training

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
institutional level), have the resilience to overcome future risks and external shocks that could jeopardise the intervention's results and have improved their ownership or political will.	satisfactory	providers, government partners, and students. Through comprehensive curriculum development and teacher training, Polytechnics and BPVPs have strengthened their capabilities to deliver better RE education. Trained teachers are now proficient in classroom and laboratory settings, with the ability to mentor others. Moreover, the project's alignment with Indonesia's Net Zero Emissions 2060 roadmap underscores its resilience to future energy sector shifts, promoting long-term sustainability in the transition to renewable energy.
6.2 ***Financial sustainability***: The extent to which development partners have the financial resources to maintain the intervention's net benefits over time (e.g., increased national (and where applicable subnational) financial or budgetary commitments).	2 - satisfactory	Despite challenges with equipment procurement and funding mechanisms, the project has laid a foundation for financial sustainability through vertical agreements with Swiss UAS and RE sector companies. These partnerships ensure ongoing support for educational programs beyond the project's lifespan, enhancing the resilience of the initiative. However, securing additional funding for equipment maintenance by GoI training institutions remains crucial to sustain high-quality training delivery. The sustainability of the Swiss UAS support depends on third party financing, which in this case is secured by RESD.
6.3 ***Contextual factors***: The extent to which the context is conducive to maintain the intervention's net benefits over time (e.g., policy or strategy change; legislative reform; institutional reforms; governance reforms; increased accountability for public expenditures; improved processes for public consultation in development planning). *Note: It includes assessing the trade-offs associated between instant outcomes and potential longer-term effects as well as the trade-offs between financial, economic, social and environmental aspects.*	1 - highly satisfactory	This project has navigated various contextual factors to maintain its relevance over time. By establishing MoUs with renewable energy companies and industry associations, the project has integrated itself into the broader RE sector ecosystem. These agreements facilitate policy alignment and institutional reforms necessary for sustaining RE efforts in the TVET sector. Moreover, ongoing efforts to enhance the visibility and functionality of the Renewable Energy Indonesia (REI) website seek to institutionalize job placement support, aligning with evolving legislative and governance reforms

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
		aimed at advancing Indonesia's renewable energy goals.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
7 General comments Summary: this section is only for free text (no score). The evaluator may provide an overall assessment of the evaluated intervention, explore and reflect on relationships and synergies between different criteria (this includes considering if and how they are causally related).		The political economy of the electricity power sector in Indonesia – which mostly relies on fossil fuel plants – is complex and the dominant role of the PLN will determine the speed of the energy transition towards RE. Indonesia is at the very beginning of this transition and RE investments must considerably increase to achieve the goals for the improved RE energy mix and starting to reducing carbon emissions.

The following information is to be completed by the SECO Evaluation Unit. This information will be included in SECO's evaluation database.

Evaluation Sheet	▪		▪	▪	
ID: WEQA-No.	▪ (x = yes)	Cross-Check needed: ☐	▪	Date of fiche elaboration: ▪	select
	▪ LastName	Prepared by: FirstName		ActaNova: ▪	link to evaluation report
Sheet prepared for year of performance statistics:	▪	YYYY	▪	Management response available ▪	select

Annex 6: Data about RESD and the RE sector

Table 5: Employment status 6 months after the training

Emplyoyment status of BPVP graduates								
Polytechnics Gender		EET	Working	Continuing studies	On the job training	Not working but looking	Doing business	Total
Male	abs.	71	63	3		17	5	88
	%	80.7	71.6	3.4		19.3	5.7	100
Female	abs.	14	10	3		2	1	16
	%	87.5	62.5	18.75		12.5	6.25	100
Total	**abs.**	85	73	6		19	6	104
	%	81.7	70.2	5.8		18.3	5.8	100
BPVPs								
Male	abs.	48	34	8	1	61	6	110
	%	43.6	30.9	7.3	0.9	55.5	5.5	100
Female	abs.	10	8	1	0	4	1	14
	%	71.4	57.1	7.1	0.0	28.6	7.1	100
Total	**abs.**	**58**	**42**	**9**	**1**	**65**	**7**	**124**
	%	**46.8**	**33.9**	**7.3**	**0.8**	**52.4**	**5.6**	**100**

Source: Tracer studies (RESD, 2024d and 2024e)

Table 6: Comparison of opportunities/risks during project implementation

Factor	Inception		Last progress Report (2023)		Comment
	Likelihood	*Impact*	*Likel.*	*Impact*	
Opportunities					
Expansion to other RE technology	++++	++			
Formal training model will be adopted by DIKTI	++	+++			
Additional Poly will take over training model	+++	++			
Modular training taken over by BLKs and other local TP	+++	++			
RE technology demand will increase due to civil society demand	+++	+++			
Information on RE technology knowledge in society will increase	+++	++			
Legend:	++++ high	++++ systemic change			
	+++ likely	+++ significant			
	++ probably	++ high impact			
	+ unlikely	+ no impact			
Risks					
	Likelihood	*Impact*	*Likel.*	*Impact*	
Political unrest	++	++	++	++	
Community protests	+	+++	++	+++	
Low interest at steering level	++	+++	+	+++	
Low motivation of partners in component 1	++	++	+	++	
Low motivation of partners in component 2	+	+++	+	+	
Low motivation of partners in component 3	++	+	+	++	
Supply chain issues in pro-curement of laboratory equipment			++	++	
No interest by private sector	+	++++	+	+++	
No interest in training project by trainees	++	++++	++	++++	
Low interest by trainers/in-structors	++	++++	+	+++	
Swiss partners not interested	++	+++	+	+++	
Drop of predicted labor force demand in the sector			+	+++	Assumption: GoI policy adjustments increase demand
Legend:	++++ high	++++ grave			Lowwerd risk/impact
	+++ likely	+++ high			Increased risk/impacts
	++ probably	++ light			
	+ unlikely	+ none, if addressed			

Source: Own compilation from Inception Report (RESD, 2021) and Progress Report (RESD, 2024k)

Table 7: Trend in installed electricity capacity from RE sources (MW)

RE Source	2018	2019	2020	2021	2022	2023	*2024*
Installed Capacity							
Wind	144	154	154	154	154	154	*154*
Solar	68	154	176	207	283	574	*771*
Bioenergy	1882	2101	2259	2297	3099	3195	*3233*
Geothermal	1948	2136	2136	2291	2360	2418	*2573*
Hydro	5792	5996	6141	6591	6689	6784	*7225*
Total	**9833**	**10540**	**10865**	**11541**	**12586**	**13125**	***13956***
Newly installed capacity							
Wind		11	0	0	0	0	*0*
Solar		86	22	32	76	291	*197*
Bioenergy		219	157	38	802	97	*38*
Geothermal		187	0	155	69	57	*58*
Hydro		204	145	451	97	95	*441*
Total		**707.3**	**324.4**	**676.4**	**1,044.7**	**539.5**	***734.0***

Source: MoEMR 2024b

Table 8: Installed electricity capacity per source and region in 2023

Fuel Type	Sumatera		Java		Kalimantan		Sulawesi		Papua, Nusa, Bali		Total
	GW	%	GW	%	GW	%	GW	%	GW	%	GW
Steam	6.2	35%	30.1	59%	2.3	47%	6.1	61%	5.1	67%	**49.76**
Gas	4.7	27%	15.8	31%	1	21%	0.8	8%	0.9	12%	**23.21**
Diesel	1.1	6%	0.5	1%	1	20%	0.7	7%	1.4	18%	**4.64**
Fossil	**12.0**	**68%**	**46.4**	**91%**	**4.3**	**88%**	**7.6**	**76%**	**7.4**	**97%**	**77.6**
Water/Hydro	1.9	11%	2.9	6%	0.03	1%	1.6	17%	0.1	1%	**6.45**
Geothermal	1	6%	1.2	2%	0	0%	0.3	4%	0.02	0%	**2.56**
Biomass	2.5	15%	0.2	0%	0.5	10%	0.02	0%	0.006	0%	**3.28**
Solar	0.05	0%	0.5	1%	0.02	0%	0.04	0%	0.1	2%	**0.71**
Wind	0	0	0.001	0%	0	0%	0.1	1%	0	0%	**0.13**
Coal Gassification	0	0	0	0	0.03	10%	0.2	2%	0	0%	**0.25**
RE	**5.4**	**32%**	**4.3**	**8%**	**0.6**	**11%**	**1.92**	**21%**	**0.126**	**1%**	**13.4**
TOTAL	**17.4**		**50.7**		**4.9**		**9.5**		**7.5**		**91.0**

Source: https://web.pln.co.id/statics/uploads/2017/05/BUKU_1_RUPTL_2015_2024.pdf (MoEMR, 2024b)

Table 9 : Electricity production as per source of energy in Indonesia PLN (GWh)

Fuel Type	2020	2021	2022	2023	*2024 (plan)*	abs. change 2020/23	% change 2020/23
HSD (High Speed Diesel)	5,791	5,882	5,892	6,229	*6,568*	438	7.6
MFO (Marine Fuel Oil)	575	623	690	772	*953*	197	34.3
Gas	52,525	51,184	51,374	53,747	*53,625*	1,222	2.3
LNG (Liquefied Natural Gas)	33,400	34,844	36,388	40,673	*41,105*	7,273	21.8
Coal	259,470	287,629	313,880	340,198	*361,131*	80,728	31.1
Fossil	**351,761**	**380,162**	**408,224**	**441,619**	**463,382**	**89,858**	**25.5**
Hydro	18,916	21,108	26,136	30,200	*35,876*	11,284	59.7
Solar/Hybrid	6	6	7	7	*7*	1	16.7
Biomass	50	50	50	50	*50*	0	0.0
Import	1,397	1,172	1,578	1,487	*1,503*	90	6.4
Geothermal	21,391	26,508	30,742	33,395	*49,353*	12,004	56.1
RE	**41,760**	**48,844**	**58,513**	**65,139**	**86,789**	**23,379**	**56.0**
TOTAL	**393,522**	**429,007**	**466,737**	**506,757**	***550,171***	**113,235**	**28.8**
% RE	10.6	11.4	12.5	12.9	15.8		
% Solar	0.002	0.001	0.001	0.001	0.001		
% Hydro	4.8	4.9	5.6	6.0	6.5		

Source: https://web.pln.co.id/statics/uploads/2017/05/BUKU_1_RUPTL_2015_2024.pdf

Annex 7: Fotos from field visits

Polytechnic Jakarta, solar PV installation of lab rooftop

Polytechnic Makassar, solar PV lab modules

BTI office in Denpasar (solar installation and O&M start-up)

Teacher at Polytechnic in Makassar


Solar PV equipment in BPVP Lombok


BPVP students in Lombok

Annex 8: Documents and websites

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RESD (2024e): Tracer Study Results - Graduates of Solar PV Technician Training, period Dec. 2022 – July 2023

RESD (2024f): Tracer Study Results - Users' Satisfaction of Graduates from 1st intake, graduated July 2023

RESD (2024g): Financial Reporting (internal excel sheet)

RESD (2024h): Power Point Presentation for the Project Team Discussion with External Evaluators

RESD (2024i): D4 RE Specialization Program Capstone Project Manual

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