



Quality Plan Report

Development of Energy Education in the Mekong Area

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DEEM Project Description

With the continuously increasing impacts of changing climate, there is a strong need to support building sustainable energy pathways in least developed countries. Responses to the challenges present in the energy-poverty-environment nexus call for multidisciplinary and situated knowledge and capacities, which are currently lacking in local decision-making and research. Higher education institutions (HEIs) have crucial roles in providing expertise to meet local needs in a sustainable manner.

National energy and education policy documents in Cambodia, Laos and Myanmar acknowledge a gap in skilled labor, and quality of national level higher education is hindering the economic development of the countries. This manifests especially in energy engineering where research laboratories and teaching methods are largely outdated. Through updated expertise, the countries can address both energy access, regional connectivity issues, and climate change mitigation while fostering local economy and entrepreneurship.

The DEEM project responds to the identified needs of the HEIs in the Mekong area to:

- create sustainable energy engineering curricula,
- improve the sustainable energy knowledge and promote innovative pedagogical approaches and skills to foster research oriented learning, and
- improve international, national and regional networks and knowledge exchange.

The project aims to integrate futures and sustainability thinking, promote innovation and entrepreneurship, build public-private partnerships and include innovative teaching methods. Associate partners from national governments and civil society provide guidance on most relevant challenges and skills needed.

The wider objective is to ensure that the partner HEIs are able to respond to the capacity and employment needs of sustainable energy development in Cambodia, Laos and Myanmar. The objective will have a direct link to strengthening the integration of sustainable energy goals into national level energy policies, providing qualified energy experts into the local, national and regional labor markets and fostering greater collaboration between the traditionally siloed public and private sectors and increasing regional level cooperation and mobility in research, entrepreneurship and innovation. The direct short-term impacts include modernisation and internationalisation of HEIs, and in long term, the project will contribute to sustainable energy policies, mitigation of climate GHG emissions and climate change, energy security and better access to energy for all.

During the project implementation, altogether over 1000 members of academic staff members and students from all the participating institutions took part in trainings on climate change, renewable energy, energy system modelling, research methodology, teaching pedagogics, energy planning, and environment-related issues. A total of 30 trainings were carried out at partner universities by various experts. After most of the trainings, a short assessment was carried out. The purpose of the assessment questionnaire was to evaluate the participants' skills and understanding of the topics in question as well as the teaching methodologies in order to assure a high quality of the trainings. The assessments were crucial in providing an information base and a benchmark against which to



monitor and assess how well the original DEEM project objectives have been achieved after the project's completion.

In addition, the assessment served in not only planning, monitoring and evaluating progress but was also fundamental in informing the project board on the general performance and progress of the project. This assessment can also be used in the planning of similar projects in the future. This capacity assessment report that compiles the results of the assessment questionnaires sought to answer the following questions:

- What is the level of understanding of all underlying topics in each training?
- Has the training approach created change and improvement in the level of knowledge of the participants when it comes to the topics handled, and if so, to what extent?
- Which topics have been of highest relevance to the participants and what topics should any following trainings focus on?
- Have the training approach and methodology been suitable to achieve the objective of optimal capacity building among all participants?

Following this introduction, the report briefly outlines the methodology used. This is followed by a summary of the survey results from trainings in Yangon, Phnom Penh and Vientiane. Additionally, what follows is a chapter that further discusses the ways forward in upcoming projects and evaluations.

The DEEM partner HEIs based in Yangon have been Yangon Technological University (YTU) and Yangon University (YU). The majority of trainings has been hosted by YTU. Nevertheless, for each training in Yangon participants of both partnering HEIs have been invited to participate. The surveys showed that both HEIs had a good mix of staff participating in trainings.

In Phnom Penh, trainings took place at both the Royal University of Phnom Penh (RUPP) as well as Institute of Technology of Cambodia (ITC). In Phnom Penh, the more technical trainings were hosted by ITC and the more environmentally or socially related trainings were mostly been hosted by RUPP.

National University of Laos (NUOL) was the only partnering HEI from Vientiane, Laos. Therefore, all trainings in Laos have been hosted by NUOL.

Methodology

After most of the trainings carried out during the DEEM project all participants were asked to take part in a survey. The surveys have been sent to all participants during or immediately after the trainings. It was the responsibility of the local coordinator to ensure questionnaires were delivered to participants and encourage them to respond. Surveys have been undertaken after several trainings, which took place between February 2017 and September 2019. Unfortunately, not all trainers were able to design the questionnaire and collect data, but the responses cover over 80% of all training sessions.

The questionnaire contained both closed and open-ended questions and acted as the primary method of data collection. The questionnaire was administered in English. The questionnaire for the survey was designed around key expected outcomes and associated indicators of the DEEM project. The questionnaire was tailored for each training, handling the topics covered in the trainings and deemed relevant. However, the results of questionnaires between trainings could be compared, as the trainings followed a similar structure. The results of the capacity assessment are summarized in



the following sections. For all the graphs, the horizontal axis is the subjects covered whilst the vertical axis is the number of answers for the respective answer.

Results

This section of the report represents the results by training in Yangon (YTU, YU), Phnom Penh (ITC, RUPP) and Vientiane (NUOL) in chronological order.

Trainings organised in Yangon, Myanmar

Most DEEM trainings were hosted either by YTU or YU. Nevertheless, in the case of every training organized in Yangon, academic staff from both Universities were invited to participate in the trainings regardless of which university hosted the training. The collaboration between both HEIs as well as with other members of the project consortium has proven to be beneficial for all involved institutions.

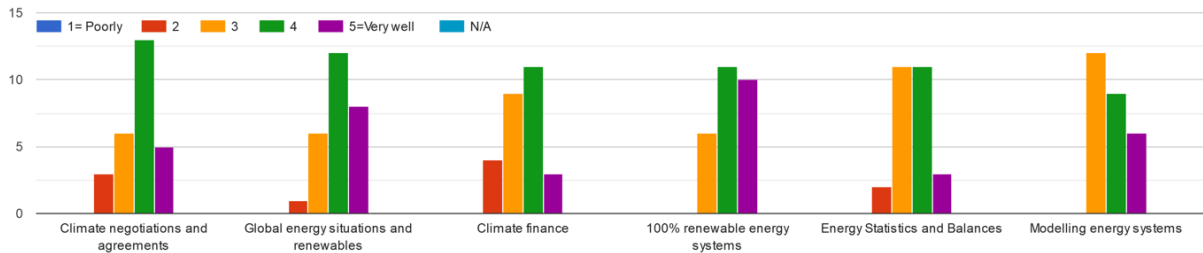
Training in February 2017

In the trainings held in February 2017, a total of 27 participants from YTU and YU responded to the questionnaire. The training initiated a set of climate change and energy planning trainings. The topic covered modules on looking at the need for and ways to work towards sustainable energy systems. Specifically, climate change was discussed from the points of view of basic science, impacts, climate change negotiations and agreements and climate financing. Renewable energy and energy planning were emphasized through various presentations about the current and future global renewable energy situation, energy planning basics and different tools for modeling energy systems. The Asian partner HEIs also shared their insights of how national energy planning is carried out, how investment and policy decisions are made on energy system expansion as well as main actors and stakeholders in the energy sector.

The sessions were organized in an interactive way to accommodate a lot of discussion and debate about how to incorporate the training topics into local curricula and about the opportunities of HEIs to influence evidence based policy planning.

Results in Figure 1 show that the majority of topics taught in the trainings were well understood. Nevertheless, energy statistics and balances and modelling energy systems show a slightly weaker understanding among the participants. Thus, this was noted and the topic was added in the next training in autumn 2017. Overall, it seems that this round of training was received and understood well, but there were also participants who did not understand everything.

Figure 1: How well did you understand the following subject areas? (n=27)

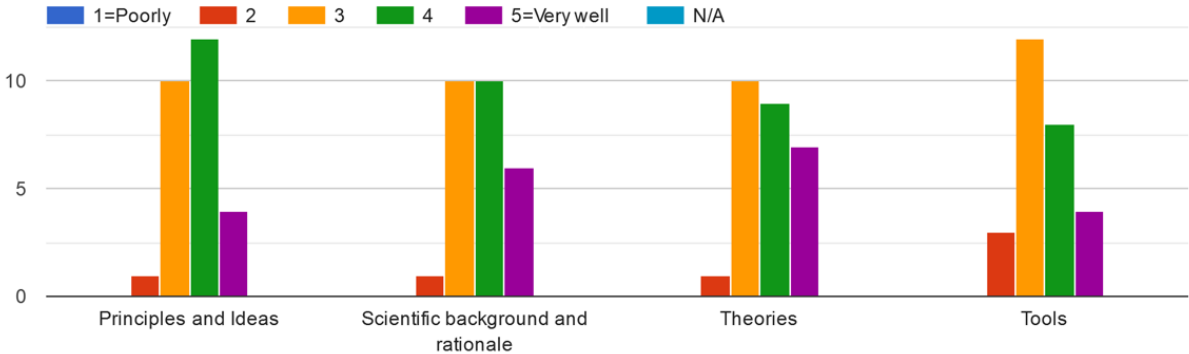


Results in Figure 2 display participants’ understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different



dimensions of the training including principles and ideas, scientific background, theories as well as the tools used during the training. The results show that all dimensions have been understood quite well by the majority of participants. Only a minority stated that some tools used have not been understood that well.

Figure 2: How well were you able to understand the following? (n=27)



Results in Figures 3 and 4 show how the participants rated their own skills and competence before and after the trainings on the underlying topics. Generally, skills have improved, but the change is not very significant. The majority of competences before the trainings were not so good. After the training, the majority stated their competences to be quite good. This evaluation also indicates that the skills of students were quite low before the training sessions, justifying the need for such capacity building activities.

Figure 3: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of....? (n=27)

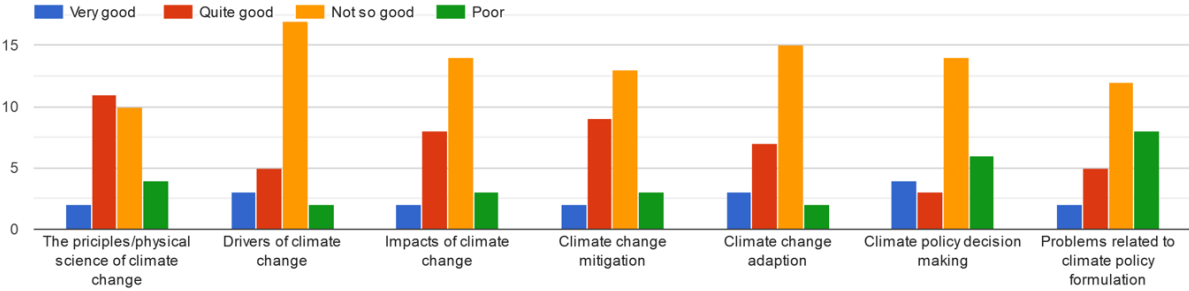
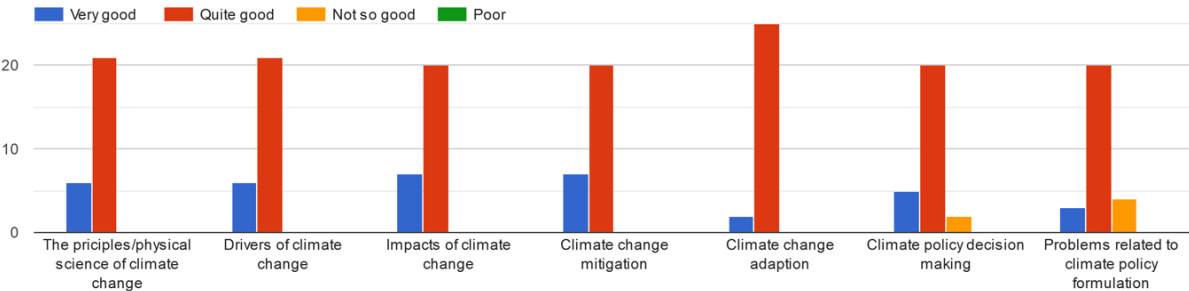
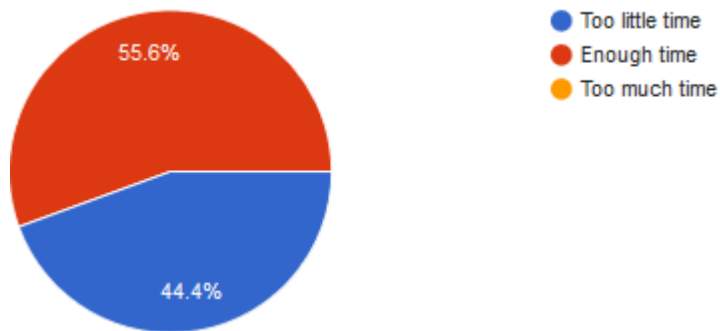


Figure 4: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of....? (n=27)



The participants were also asked whether they think enough time was allocated in the training to ensure the main principles and ideas were understood. Figure 5 shows the percentage of answers per topic. It is significant there are participants who would have needed more time.

Figure 5: Participants were asked: Was enough time allocated to exercises and Q&A? (n=27)



Training in October 2017

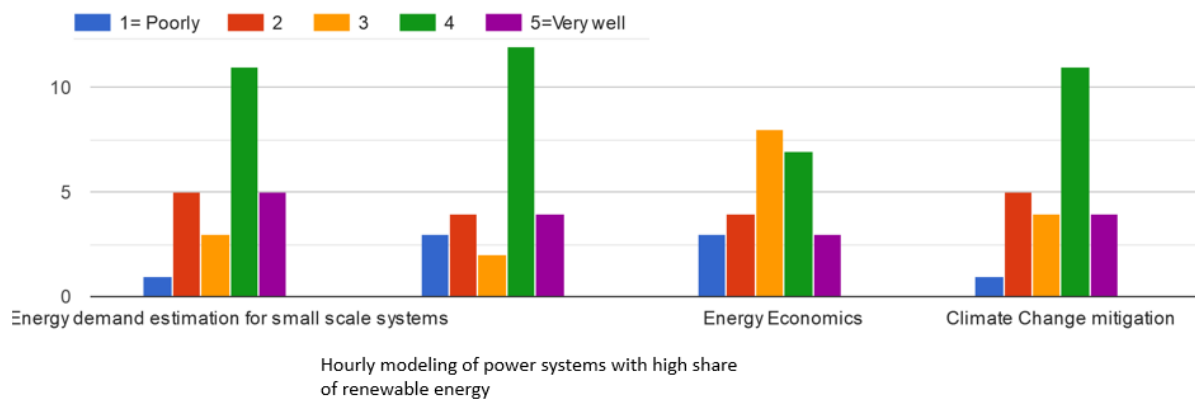
Another training in Yangon was held at YTU in October 2017. In this training, there were a total of 62 participants from the YTU and YU of whom 25 responded to the questionnaire. This time, the training's focus was on the continuation of more advanced energy modeling topics as well as energy economics and climate change mitigation.

In terms of energy modelling, the training consisted of the theory of estimating electricity demands by using a bottom-up approach. Through it, the participants were able to develop their own electricity consumption time series for e.g. small villages within an integrated group work. In connection to demand estimation, the hourly modelling of electricity systems was introduced using an Excel sheet-based approach. The participants achieved the necessary skills to be able to develop their own model to be followed up on during the next trainings as a continuous group work. In addition, the covered topics included understanding of global energy markets for different energy sources as well as factors that influence them. Within the theory of climate change mitigation, different strategies and the external costs induced by ongoing climate change were discussed.

Results in Figure 6 show that the majority of topics taught in the trainings were well understood. Understanding was quite evenly distributed between the covered topics. The only topic where one could see a slightly weaker understanding was energy economics. A possible reason for that could have been that this topic has dealt in major parts with liberalized energy markets. As energy markets in the partnering countries are not liberalized, this topic might be more difficult to understand. Nevertheless, energy economics was rather well understood by the majority of participants. Overall, it seems that this round of training was received and understood well. However, there were also participants who did not understand everything.

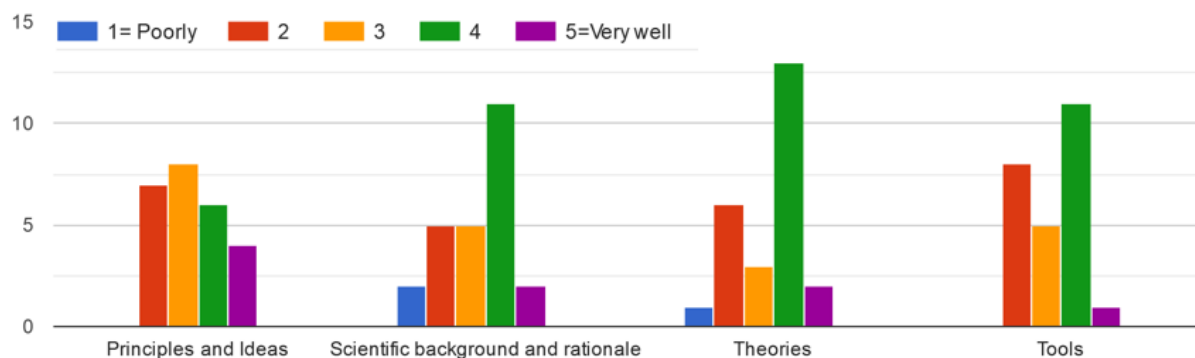


Figure 6: Participants were asked: How well did you understand the following subject areas? (n=27)



Results in Figure 7 point out the participants' understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different dimensions of the training including principles and ideas, scientific background, theories and the tools used during the training. The results show that all dimensions have been understood quite well by the majority of participants. Only a minority stated that some tools used have not been understood well.

Figure 7: Participants were asked: How well were you able to understand the following? (n=27)



Results in Figures 8 and 9 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can be quantified. It can be seen that skills have improved quite well and after the training most participants have rated their skills and competencies as very good. Before the training, the level of skills was evenly distributed. Thereby this round of training has been very successful in terms of skill improvement.



Figure 8: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: Why is it important to estimate energy demand?, b: How to estimate energy demand for house-hold energy consumption in villages?, c: Acknowledging the most important parameters affecting the energy demand?, d: Estimating future energy demand for villages with excel based tools? (n=27)

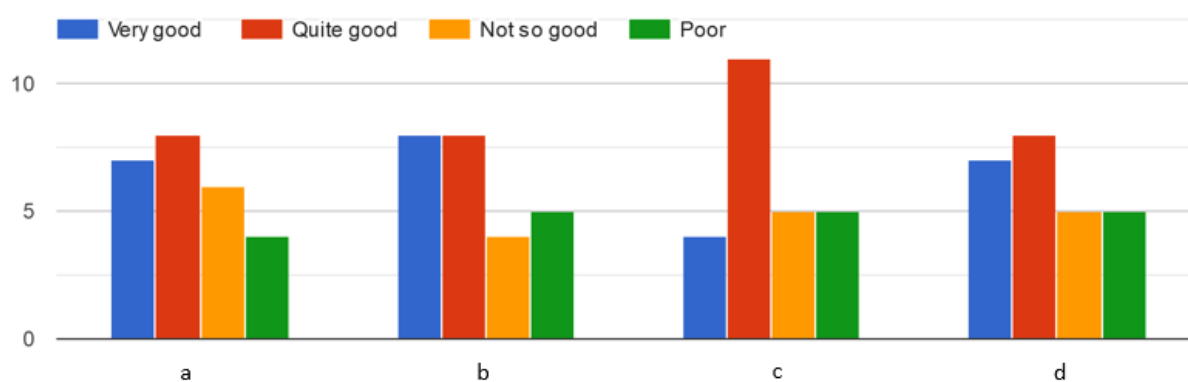
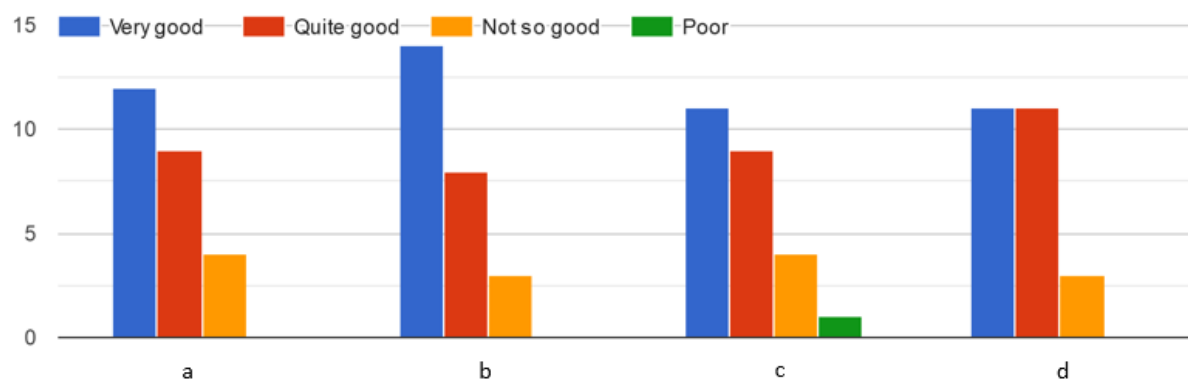


Figure 9: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: Why is it important to estimate energy demand?, b: How to estimate energy demand for house-hold energy consumption in villages?, c: Acknowledging the most important parameters affecting the energy demand?, d: Estimating future energy demand for villages with excel based tools? (n=27)



What is more, participants were asked which topic or part of the training they found to be the most useful and interesting. Here are some of the responses quoted:

“Energy demand estimation for small scale system.”

“Energy scenario construction and energy demand estimation”

On the other hand the participants were asked whether there was a topic which they did not found useful. Here are some of the responses quoted:



“Energy economics”

“Hourly Modeling of Power Systems with high share of renewable energy”

According Figure 6, the answers show that there was a little lack especially in the training part dealing with energy economics. As already stated above, this might be connected to the missing understanding of the concept of liberalised energy markets.



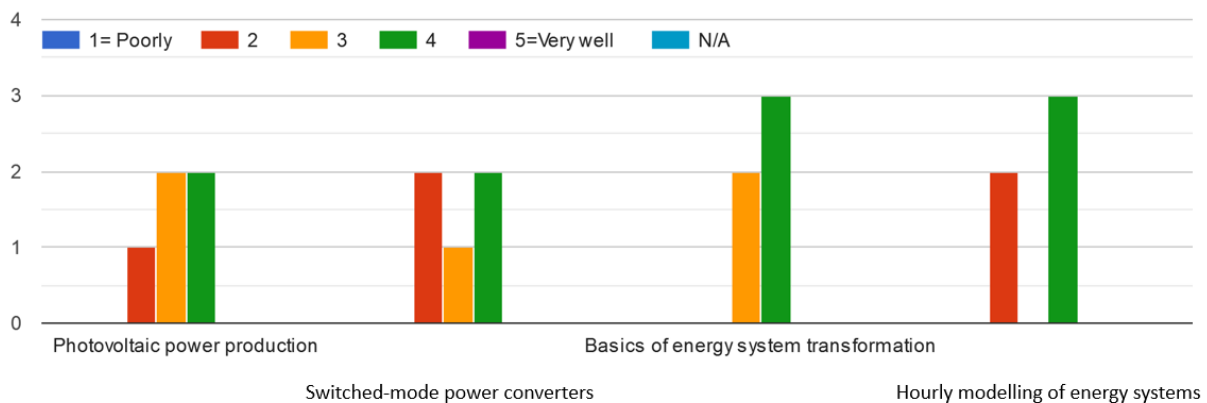
Training in February 2018

The next training in Yangon was held in February 2018. In this training, there were a total of 45 participants from YU and YTU. Five participants responded to this questionnaire. The training was about aspects of designing switched-mode power electronic converters for photovoltaic application.

The objective of the training was to give basic knowledge on switched-mode converters used in photovoltaic applications. The goal was to provide the attendees with knowledge on the basic control and modulation methods of the converters. Also, the objective was that after the training the attendees were able to understand what kinds of control methods are required in photovoltaic applications and able to solve the voltage/current stresses for selecting the power-stage components suitable for the given application. During the training, the attendees created a simulation model including a solar power panel, switched-mode converter and load or energy storage in Matlab Simulink. Additionally, they reported the simulation results and critically analyzed the accuracy of the created simulation model.

Results in Figure 10 show a mixed quality of understanding of the different topics of this training. The basics of energy system transformation has been understood the best. The more technical topics on photovoltaic power production, switched mode power converters but also hourly modelling of energy systems show a slightly weaker understanding among the participants who responded to this questionnaire. This corresponds to the fact that 40% of the participants stated there was too little time allocated to the exercises and Q&A. This indicates the need for additional time to be allocated to more technical topics. Consequently, the topic of energy system modelling was included in the following trainings as well. Nevertheless, the majority of the participants who responded to the questionnaire at least had an average to good understanding of the topics.

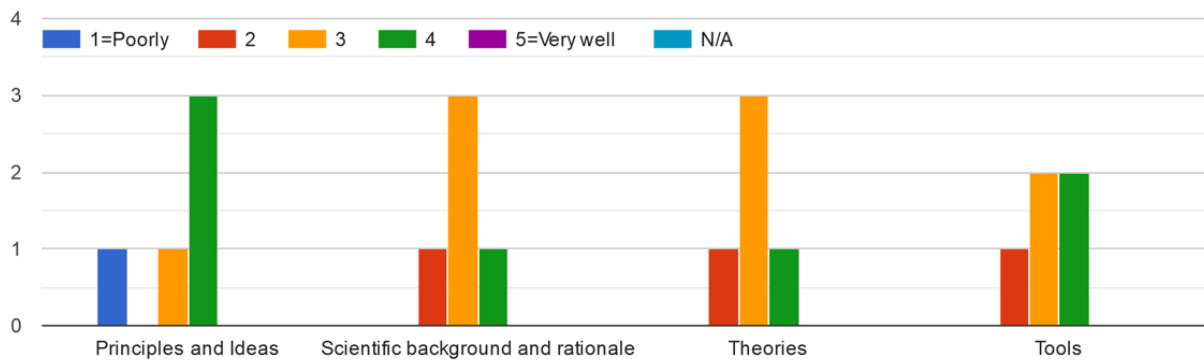
Figure 10: Participants were asked: How well did you understand the following subject areas? (n=5)



Results in Figure 11 show that participants understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different dimensions of the training including principles and ideas, scientific background, theories as well as the tools used during the training. The results show that all dimensions have been understood medium to quite well from the majority of participants. Only a minority stated that especially some tools used have not been understood well. This is in line with the above mentioned fact that this round of training has not been as well understood as most of the other trainings held in DEEM. This might indicate a need for additional trainings in those more technical related fields but also a lack of the right pedagogical approach tailored to the specific needs of the audience.



Figure 10: Participants were asked: How well were you able to understand the following? (n=5)



Results in Figures 12 and 13 show how the participants rated their own skills and competence before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can be quantified. It can be seen that skills have improved quite well. After the training, all participants have rated their skills and competencies quiet good or very good. Before the training, the level of skills has been more evenly distributed. Nevertheless, none of the participants had a poor understanding of the topics before the training. This indicates that most of the topics have been at least somehow familiar to the participants by e.g. former trainings.

Figure 12: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: Using an excel based hourly simulation model of a 100% renewable energy system, b: Analysing the impact of changes in the composition of the selected technologies on the cost of electricity, c: Analysing the impact of changes in storage volume on the necessary power production capacities, d: Analysing the impact of changes in storage volume on the cost of electricity, e: Analysing the impact of different hub heights of wind turbines on the cost of electricity. (n=5)

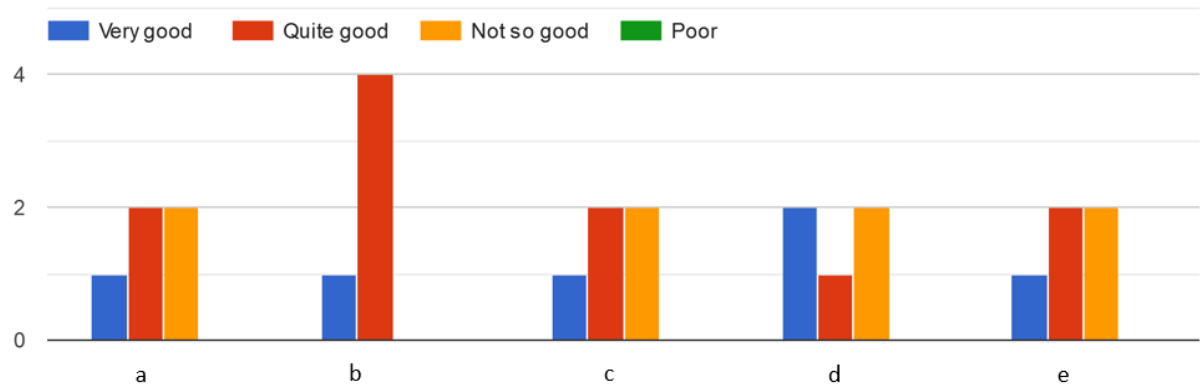
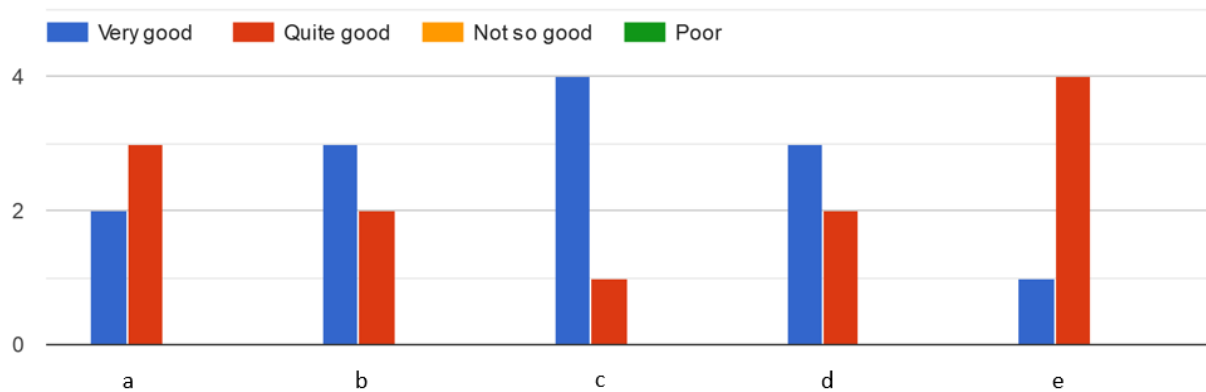


Figure 13: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: Using an excel based hourly simulation model of a 100% renewable energy system, b: Analysing the impact of changes in the composition of the selected technologies on the cost of electricity, c: Analysing the impact of changes in storage volume on the necessary power production capacities, d: Analysing the impact of changes in storage volume on the cost of electricity, e: Analysing the impact of different hub heights of wind turbines on the cost of electricity. (n=5)



Training in September 2019

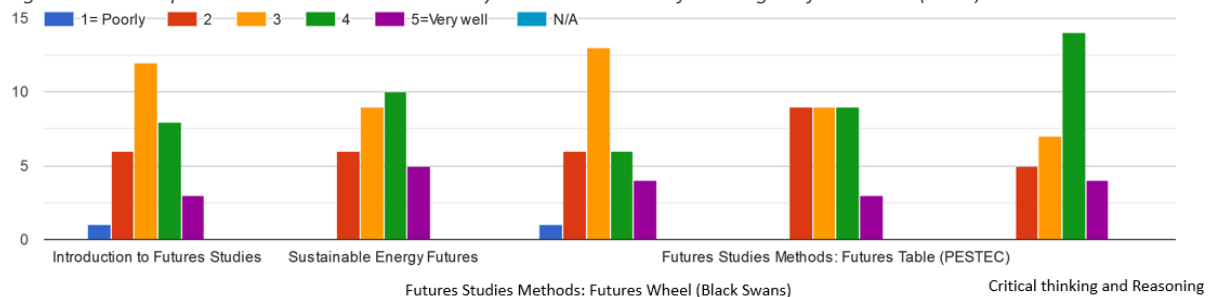
The last Training in Yangon was held in September 2019. In this training, there were a total number of 37 participants from the YTU and YU, 30 of whom responded to the questionnaire. The training was about futures studies and future of sustainable energy in teaching.

More specifically, the topics included sessions under the following headings:

- Futures Provocation – what is systematic futures thinking and why do you need it?
- Methods for Studying Energy Futures
- Critical thinking applied to energy systems
- Energy scenarios and backcasting
- Critical thinking and futures studies in teaching
- Futures table and Neo-Carbon Scenarios in Myanmar 2050
- Reasoning and argumentation
- Questions and answers

Results in Figure 14 show that the majority of topics taught in the trainings were understood moderately well to well. Among all different topics, the understanding was quite evenly distributed. Nevertheless, the training on critical thinking was best understood by the participants. Overall, it seems that this round of training was received and understood moderately well to well. However, there were also participants who did not understand everything and a very few which stated they had a poor understanding of the training.

Figure 14: Participants were asked: How well did you understand the following subject areas? (n=30)



Results in Figures 15 and 16 show how the participants rated their own skills and competence before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can be quantified. Before the training, the level of skills and competencies was distributed quite evenly averaging in a medium range. After the training, all participants rated their skills and competencies quite good or even very good. Only a minority of participants rated their skills after the training as not so good. Nevertheless, this was the case for all different topics. It can clearly be seen that the level of skills has improved among the majority of participants but there is still room for additional improvement.

Figure 115: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: Introduction to Futures Studies, b: Sustainable Energy Futures, c: Futures Studies Methods: Futures Wheel (Black Swans), d: Futures Studies Methods: Futures Table (PESTEC), e: Critical thinking and Reasoning, f: Non-verbal Behaviour and Rhetorical figures. (n=30)

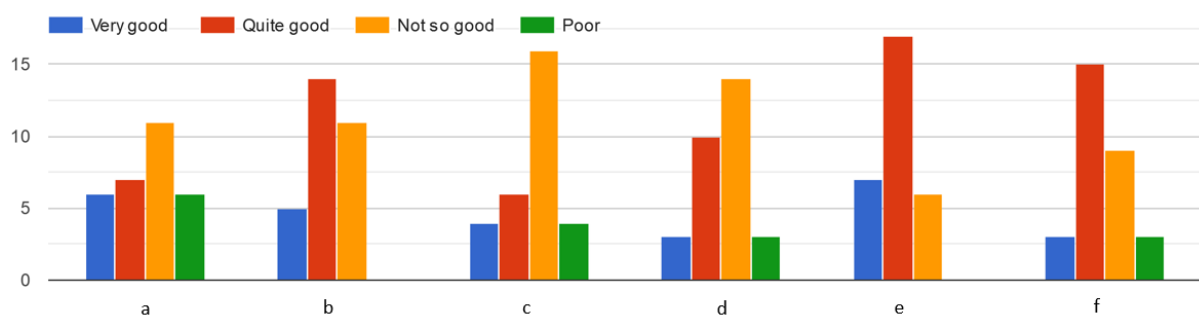
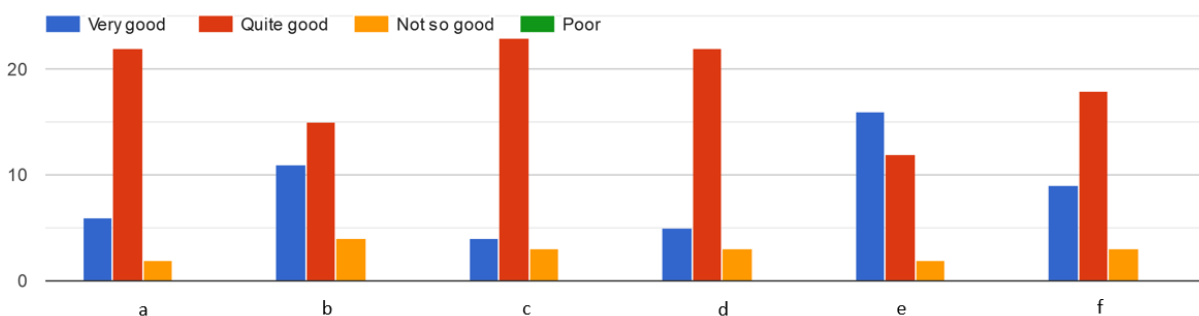


Figure 126: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: Introduction to Futures Studies, b: Sustainable Energy Futures, c: Futures Studies Methods: Futures Wheel (Black Swans), d: Futures Studies Methods: Futures Table (PESTEC), e: Critical thinking and Reasoning, f: Non-verbal Behaviour and Rhetorical figures. (n=30)



What is more, participants were asked which topic or part of the training they found to be the most useful and interesting:

“Critical thinking since it is very useful not only in teaching but also in our daily life. And 100% renewable energy idea is also fascinating to think about and to create a better future for our generation.”

“I love the section related with sustainable energy plan for a country because I got knowledge about it and it is useful plan for countries”

“Non-verbal behavior and rhetorical figures because it help the teachers to get more attention from students and it helps to boost ones' self-confidence. It helps not only for career of teaching but also in many ways”



“Critical thinking in Education. Because of we must need to motivate our students/generation for growing their critical thinking”

On the other hand, the participants were asked whether there was a topic that they did not find useful:

“theory of future study because i am physics specialization”

“Future studies is a topic that is a little interesting for me as this subject is quite separated from my major and all of us are not able to predict future in details by showing evidences with theories.”

The answers for topics that have been most useful and interesting have been very various indicating that this set of training has gained a special interest of all participants in the training. Especially the part about critical thinking has gained a broad interest among most participants.



Trainings organised in Phnom Penh, Cambodia

Most DEEM trainings which took place in Phnom Penh, Cambodia were hosted either by ITC or RUPP. Nevertheless, in each case academic staff from both universities were invited to participate in the trainings regardless of which university hosted the training. The collaboration between both HEIs as well as among the whole project consortium has proven to be beneficial for all institutions.

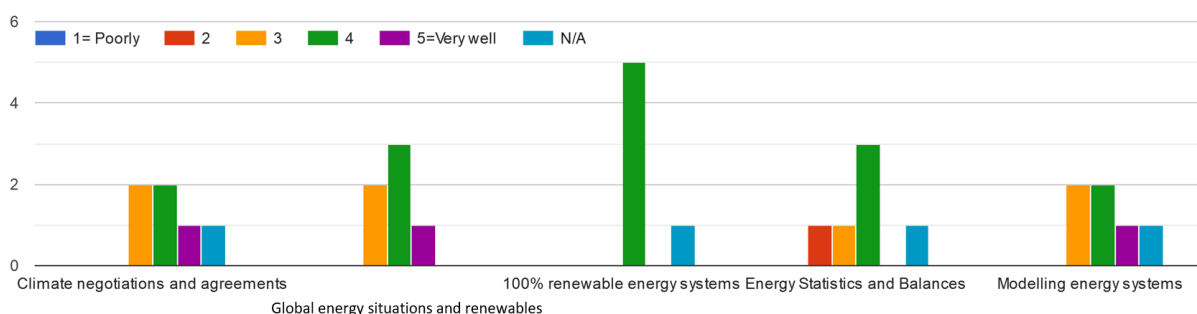
Training in February 2017

In the trainings held in February 2017, a total of 13 participants from RUPP and ITC participated in the training. Six of the participants responded to this questionnaire. The training initiated a set of climate change and energy planning trainings. The topic covered modules on looking at the need for and ways to work towards sustainable energy systems. Specifically, climate change was discussed from the points of view of basic science, impacts, climate change negotiations and agreements and climate financing. Renewable energy and energy planning were emphasized through various presentations about the current and future global renewable energy situation, energy planning basics and different tools for modeling energy systems. The Asian partner HEIs also shared their insights of how national energy planning is carried out, how investment and policy decisions are made on energy system expansion as well as main actors and stakeholders in the energy sector.

The sessions were organized in an interactive way to accommodate a lot of discussion and debate about how to incorporate the training topics into local curricula and about the opportunities of HEIs to influence evidence based policy planning.

Results in Figure 17 show that majority of the topics covered in the trainings were well understood. Out of the different topics, the session on 100% renewable energy systems was understood best. Nevertheless, the other topics were in some cases only understood moderately well. Overall, it seems that this round of training was received and understood well, but there were also participants who did not understand everything.

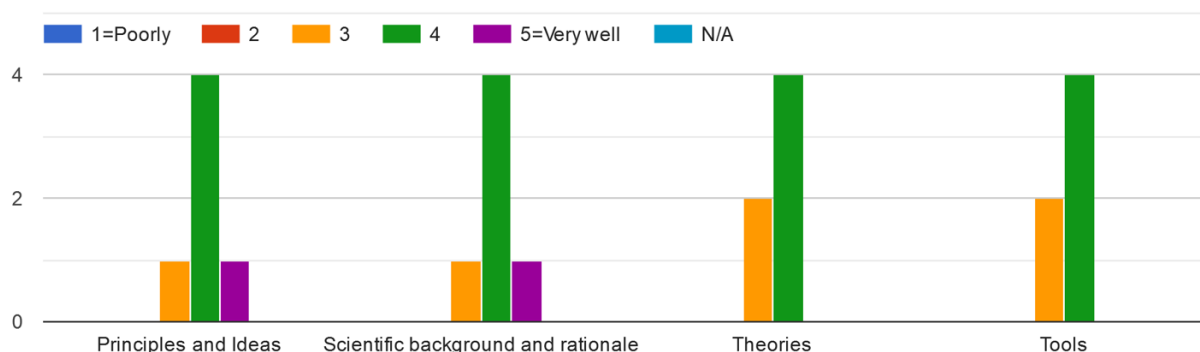
Figure 137: Participants were asked: How well did you understand the following subject areas? (n=6)



Results in Figure 18 show the participants' understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different dimensions of the training including principles and ideas, scientific background, theories and the tools used during the training. The results show that all dimensions have been well understood by the majority of participants. Only a minority stated that some tools and theories have only been understood moderately well.



Figure 18: Participants were asked: How well were you able to understand the following? (N=6)



Results in Figures 19 and 20 show how the participants rated their own skills and competences before and after the training. Generally, it can be said that skills were improved quite well. Nevertheless, policy-related topics (f: climate policy decision making, g: problems related to climate policy formulation) show a weaker improvement compared to other topics. The reason for this weaker understanding in the field of policy might be related to the different local policy approached compared to western policy standards. This evaluation also indicates that the majority of skills were below average before the training, justifying the need for such capacity building activities.

Figure 19: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: The principles/physical science of climate change, b: Drivers of climate change, c: Impacts of climate change, d: Climate change mitigation, e: Climate change adaption, f: Climate policy decision making, g: Problems related to climate policy formulation. (n=6)

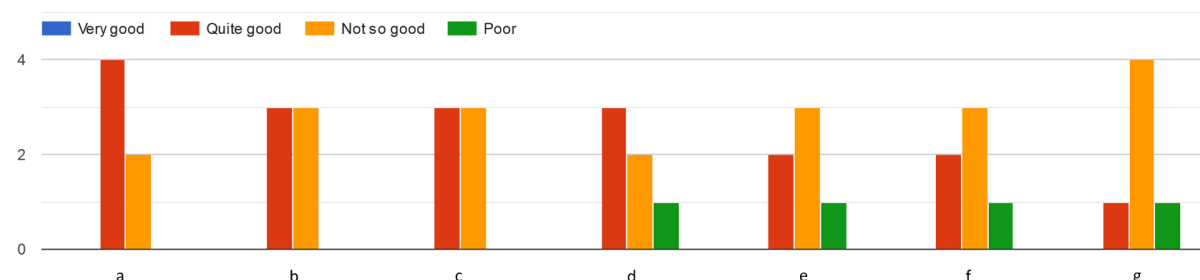
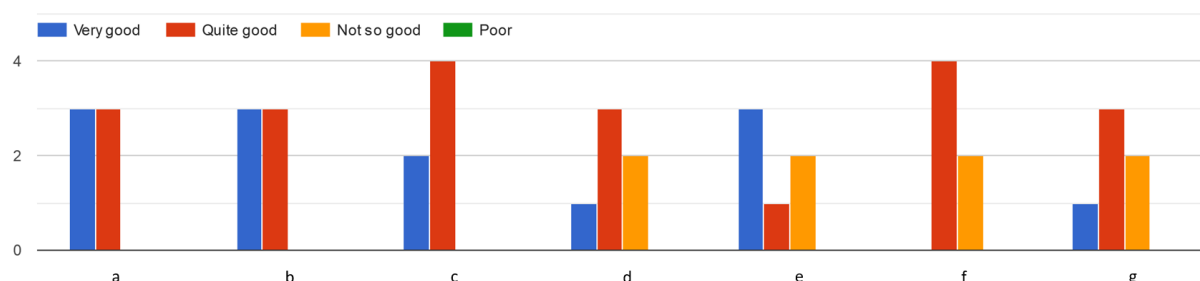


Figure 20 Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: The principles/physical science of climate change, b: Drivers of climate change, c: Impacts of climate change, d: Climate change mitigation, e: Climate change adaption, f: Climate policy decision making, g: Problems related to climate policy formulation. (n=6)



Moreover, participants were asked which topic or part of the training they found to be the most useful and interesting:

“Climate change, sustainable energy development”

“Modelling of Energy System”



On the other hand, the participants were asked whether there was a topic that they did not find useful. None of the participants answered this.



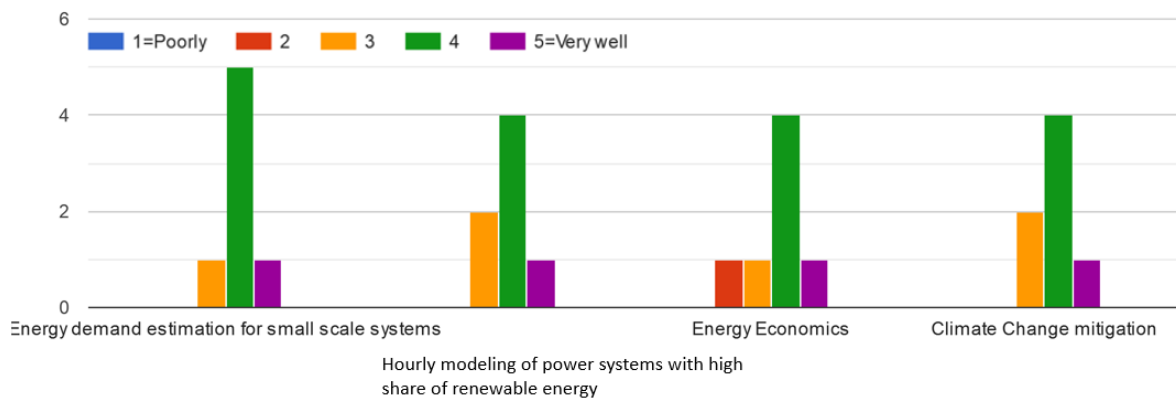
Training in October 2017

Another training in Phnom Penh was held at ITC in October 2017. In this training, seven of the training participants responded in the questionnaire. The training's focus was on the continuation of more advanced energy modeling topics as well as energy economics and climate change mitigation.

In terms of energy modelling, the training consisted of the theory of estimating electricity demands by using a bottom-up approach. Through it, the participants were able to develop their own electricity consumption time series for e.g. small villages within an integrated group work. In connection to demand estimation, the hourly modelling of electricity systems was introduced using an Excel sheet-based approach. The participants achieved the necessary skills to be able to develop their own model to be followed up on during the next trainings as a continuous group work. In addition, the covered topics included understanding of global energy markets for different energy sources as well as factors that influence them. Within the theory of climate change mitigation, different strategies and the external costs induced by ongoing climate change were discussed.

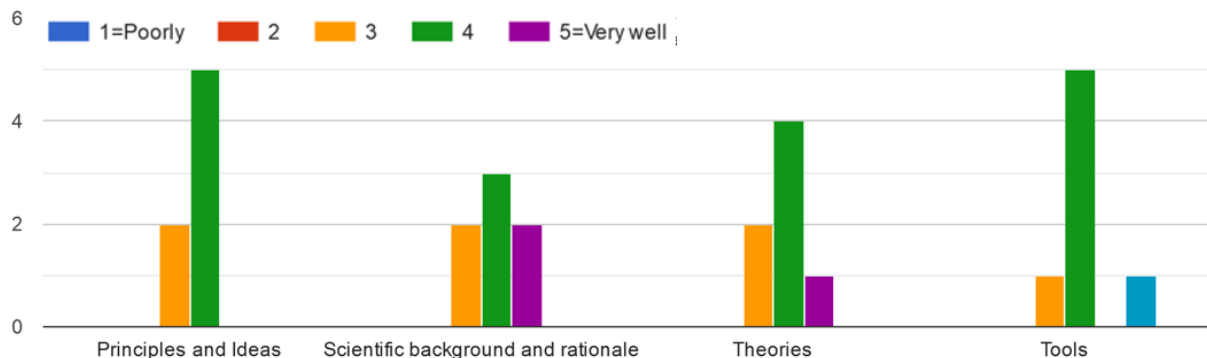
Results in Figure 21 show that majority of the topics taught in the training were well understood. Understanding was quite evenly distributed among all different topics. Overall, it seems that this round of training was received and understood very well.

Figure 21: Participants were asked: How well did you understand the following subject areas? (n=7)



Results in Figure 22 show the participants' understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood different aspects of the training including principles and ideas, scientific background, theories and the tools used during the training. The results show again that all dimensions have been understood well.

Figure 22: Participants were asked: How well were you able to understand the following? (n=7)



Results in Figures 23 and 24 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can be quantified. It can be seen that skills have improved. After the training, all participants rated their skills and competences quite good or very good.

Figure 23: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: Why is it important to estimate energy demand?, b: How to estimate energy demand for house-hold energy consumption in villages, c: Acknowledging the most important parameters affecting the energy demand, d: Estimating future energy demand for villages with excel based tools. (n=7)

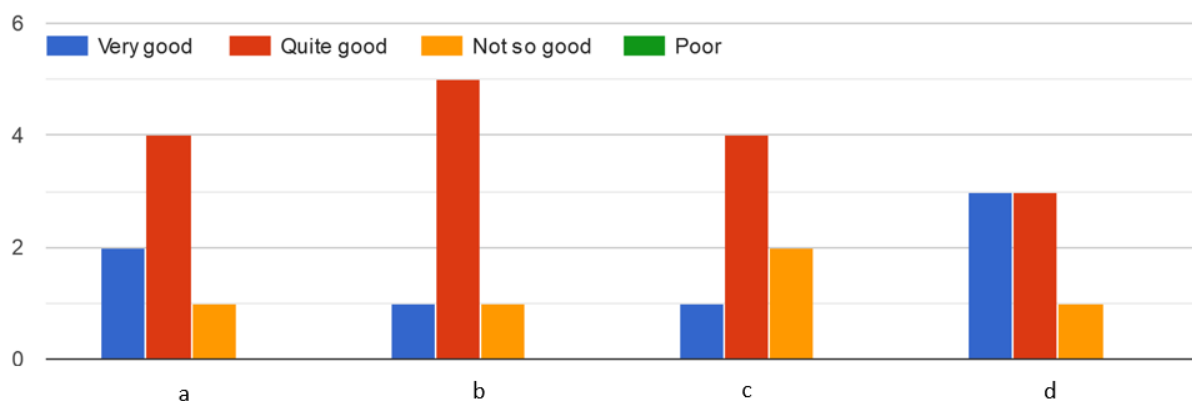
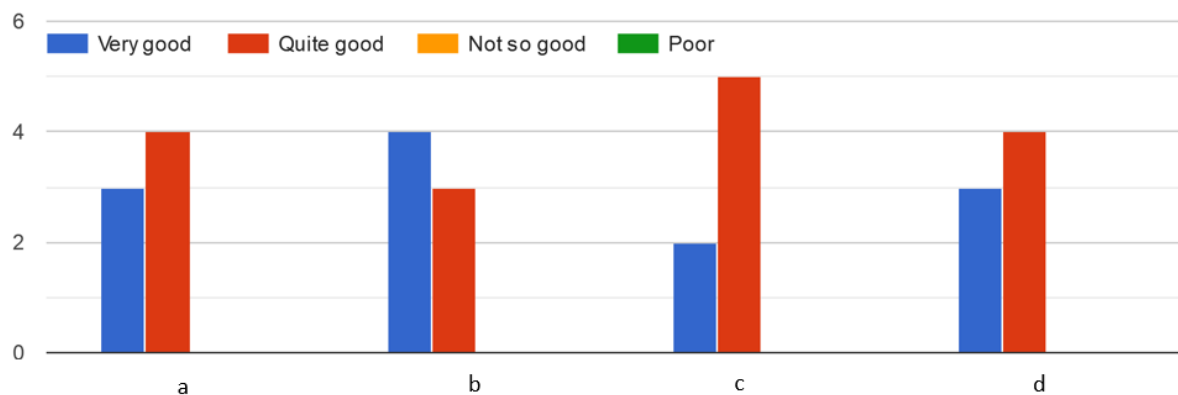


Figure 24: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: Why is it important to estimate energy demand?, b: How to estimate energy demand for house-hold energy consumption in villages, c: Acknowledging the most important parameters affecting the energy demand, d: Estimating future energy demand for villages with excel based tools. (n=7)



Moreover, participants were asked which topic or part of the training they found to be the most useful and interesting. Some quotations from the responses are included below:

“Energy demand estimation for small scale systems”

“Energy policies”

“Load demand estimation. It will be useful for energy planning”

On the other hand, the participants were asked whether there were topics that they did not find useful. There has been only one response to this point:

“Climate Change”



Training in March 2018

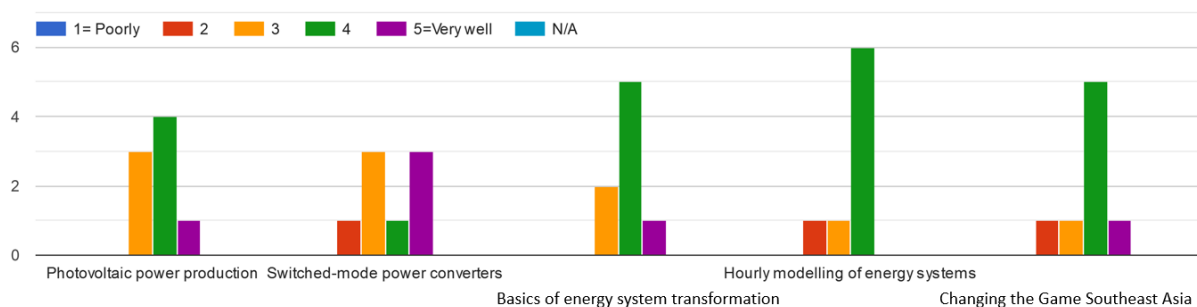
The next training in Phnom Penh was held in March 2018. In this round of training, there were a total number of 34 participants from the ITC and RUPP. Eight participants responded to this questionnaire. The training was about aspects of designing switched-mode power electronic converters for photovoltaic application.

The objective of the training was to give basic knowledge on switched-mode converters used in photovoltaic applications. The goal was to provide the attendees with knowledge on the basic control and modulation methods of the converters. Also, the objective was that after the training the attendees were able to understand what kinds of control methods are required in photovoltaic applications and able to solve the voltage/current stresses for selecting the power-stage components suitable for the given application. During the training, the attendees created a simulation model including a solar power panel, switched-mode converter and load or energy storage in Matlab Simulink. Additionally, they reported the simulation results and critically analyzed the accuracy of the created simulation model.

The training also incorporated another session titled 'Changing the Game'. Changing the Game is an educational tool allowing participants to create their own future energy scenario for 2030. Originally, it was developed for Europe's energy system but was adapted for Southeast Asia. By using Lego bricks to visualize the energy production and consumption in different sectors, participants developed their own energy scenario for 2030 by choosing different policy change options via the games policy change cards. Those policy change cards like e.g. implementation of electric vehicles consider not only the costs, but also the effect on the energy demand. All decisions were made by the participants by discussing different views and needs of the government, citizen, industry and NGOs. Based on that the energy system for 2030 can be completely changed from the Business As Usual (BAU) scenario including its impact on costs, CO₂-emissions as well as its social impact.

Result in Figure 25 show a mixed level of understanding of the different topics. Most of the topics were understood quite well. Nevertheless, some more technical topics on photovoltaic power production and switched mode power converters show a slightly weaker understanding.

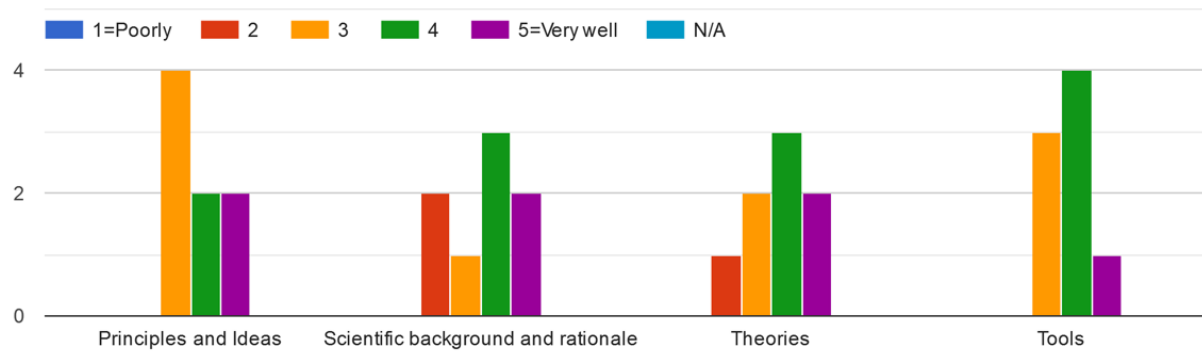
Figure 25: Participants were asked: How well did you understand the following subject areas? (n=8)



Results in Figure 26 show the participants' understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different aspects of the training including principles and ideas, scientific background, theories and the tools used during the training. The results show that all dimensions have been understood moderately well or quite well by the majority of participants. Only a minority stated that some theories and the scientific background were not understood well. As some of the topics in this training were very technical, one could argue that the understanding depends on the personal specialization of the participant as well as their field of study.



Figure 26: Participants were asked: How well were you able to understand the following? (n=8)



Results in Figures 27 and 28 show how the participants rated their own skills and competence before and after the trainings on the underlying topics. Therefore, the improvement of participants' skills can be quantified. In this training the skills and competences have improved to some extent, yet not as much as in most of the other trainings. As stated before the reason for this might be the technical specialization if this training.

Figure 27 Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: How the photovoltaic power production depends on irradiance and temperature, how e.g. shading effect of clouds effects on power production?, b: What kind of switched-power converter topologies are used in photovoltaic applications?, c: What kind of issues needs to take into account in photovoltaic application compared to e.g. conventional switched-mode power supply design?, d: Are you able to model the operation of switched-mode power converters by using Matlab Simulink?, e: What means MPPT and what kind of principles are used in the algorithms? (n=8)

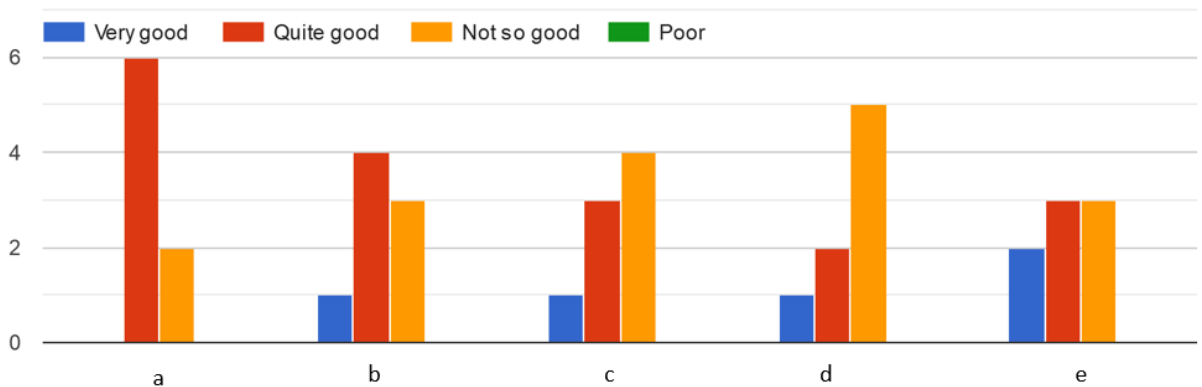
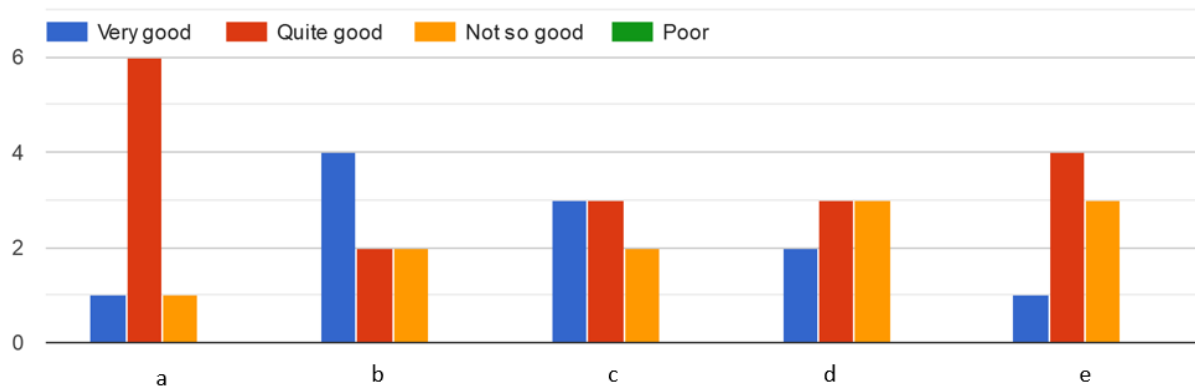


Figure 28 Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: How the photovoltaic power production depends on irradiance and temperature, how e.g. shading effect of clouds effects on power production?, b: What kind of switched-power converter topologies are used in photovoltaic applications?, c: What kind of issues needs to take into account in photovoltaic application compared to e.g. conventional switched-mode power supply design?, d: Are you able to model the operation of switched-mode power converters by using Matlab Simulink?, e: What means MPPT and what kind of principles are used in the algorithms? (n=8)



Moreover, participants were asked which topic or part of the training they found to be the most useful and interesting. Some of the responses are quoted below:

“Aspects on designing switched-mode power electronic converter for photovoltaic application and Energy Modelling. The main reason is that those topics are related to my current lecture courses for ITC students and also related to my research projects for rural electrification in the coming years”

“I think energy modeling is most useful for me because my knowledge about it is so poor. After that I understand a lot about it”

“Understanding the usage of energy and power throughout the discussion within groups”

On the other hand, the participants were asked whether there was a topic that they did not find useful. There was only one response to this point:

“MPPT”

It seems like some participants found this training very useful as it suited their specific needs. Nevertheless, it must be said that the results above have shown that the improvement of skills was weaker compared to the majority of the other trainings conducted within the DEEM project. The technical content of the training seemed to require a higher level of prior knowledge from the participants in order to be able to understand the content of the training. This was then considered when designing the next technical trainings in March 2019.

Training in September 2018

The next training in Phnom Penh was held in September 2018. In training, there were a total number of 14 participants from ITC and RUPP. Only three participants responded to the questionnaire this time. The training was on project management and sustainability indicators and analyzing sustainability with different tools.

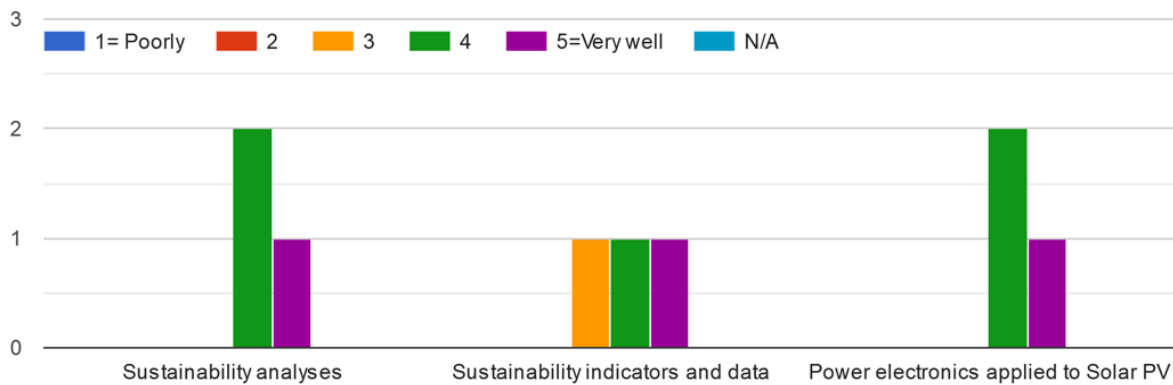
The objective of the training was to give participants basic knowledge on different data and indicators available for sustainability planning, to demonstrate methods for data analysis and provide context for green transition management. The training consisted of seven training sessions, which included

- (i) Advanced Sustainability Analysis (ASA) approach,
- (ii) Sustainability Window (SuWi) analysis,
- (iii) Synergy analysis,
- (iv) Sustainable Development and Transition Management
- (v) Green transition,
- (vi) Sustainable Society Index (SSI) Database and its use for development analysis and planning,
- (vii) Sustainable Development Goals (SDGs) Database and
- (viii) Summary and discussion of the training contents.

The training included interactive group work and hands-on training sessions utilizing different analytical tools. The objective was to motivate the participants to use the new methods and tools in their own studies and research work.

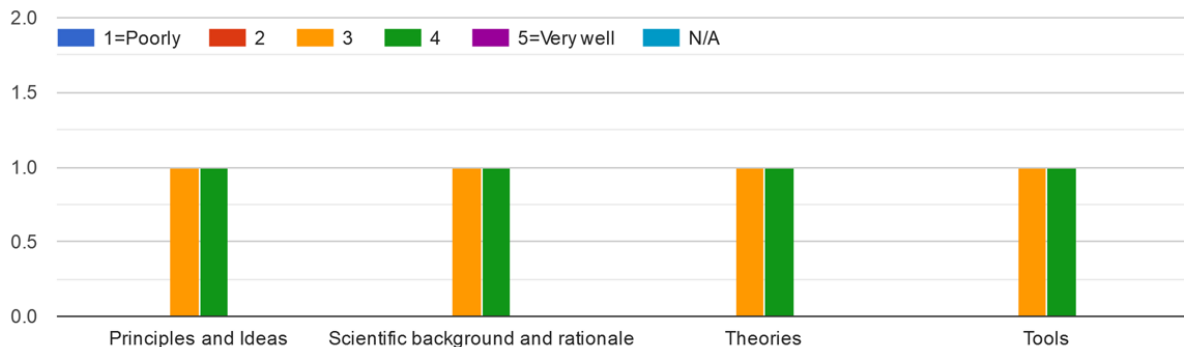
Results in Figure 29 show a mixed quality of understanding of the different topics. Most of the topics were understood quite well and only one participant stated a moderate level of understanding. As only three of the participants responded to the survey, the results do not give a satisfactory representation of the entirety of the training.

Figure 29: Participants were asked: How well did you understand the following subject areas? (n=3)



Results in Figure 30 show the participants’ understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood different aspects of the training including principles and ideas, scientific background, theories as well and tools used during the training. The results show that all dimensions have been understood moderately well to quite well by the two participants who responded to this question.

Figure 30: Participants were asked: How well were you able to understand the following? (n=2)

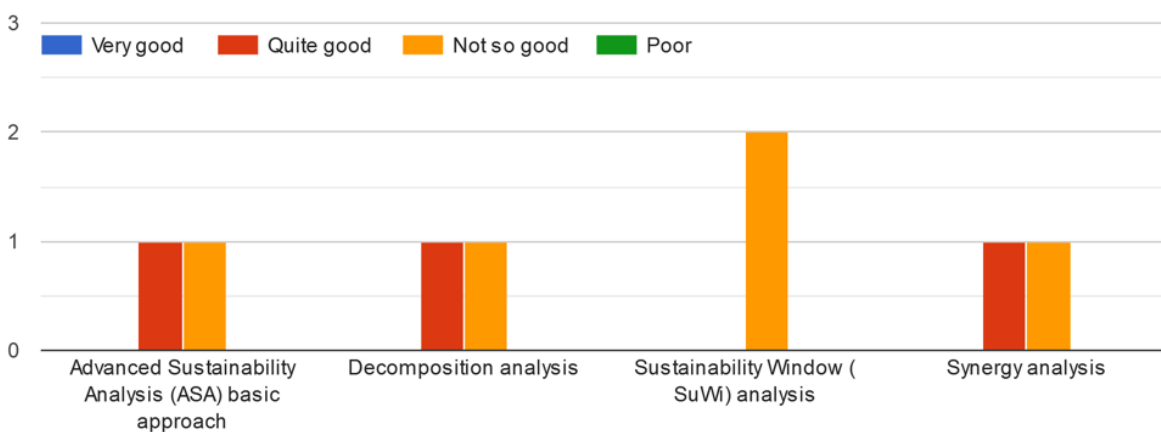


Results in Figures 31 and 32 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Therefore, the improvement of participants' skills can be quantified. In this training, the skills and competencies of the respondents improved only slightly and not as much as with most of the other trainings.

Figure 31: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? (n=2)



Figure 32: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? (n=2)



Training in September 2019

The last training in Phnom Penh was held in September 2019. In this training, there were a total number of 22 participants six of whom responded to the questionnaire. The training was about futures studies and future of sustainable energy in teaching.

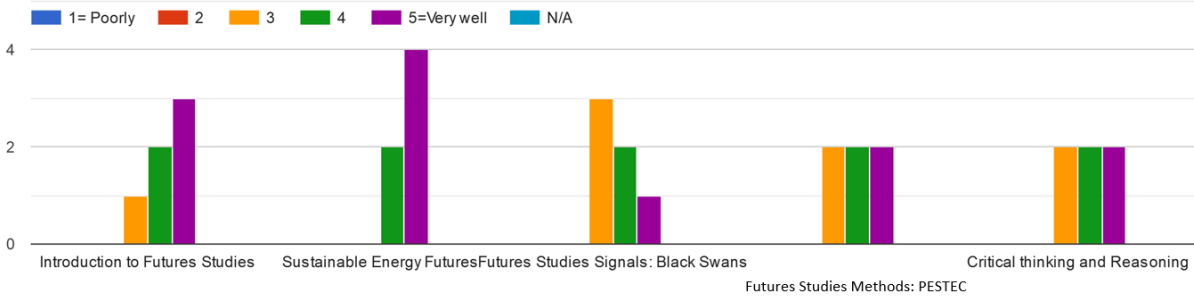
More specifically, the topics included sessions under the following headings:

- Provocation and introduction to futures studies
- Critical thinking applied to energy systems
- Critical thinking and futures studies in teaching
- Energy scenarios and backcasting
- PESTEC exercise on future of energy in Cambodia
- Reasoning and argumentation
- How to teach the topics as a self-assessment



Results in Figure 33 show that the majority of topics taught in the trainings were moderately to well understood. Understanding was quite evenly distributed among all the topics covered. Nevertheless, the training on sustainable energy future was best understood by the participants. Overall, it seems that this round of training was received and understood quite well.

Figure 33: Participants were asked: How well did you understand the following subject areas? (n=6)



Results in Figures 34 and 35 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can be quantified. Before the training, the level of skills and competences was distributed quite evenly ranging from very good to quite poor. After the training, more than half of the participants responded that their skills were quite good or very good for each topic.

Figure 34: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of....? (n=6)

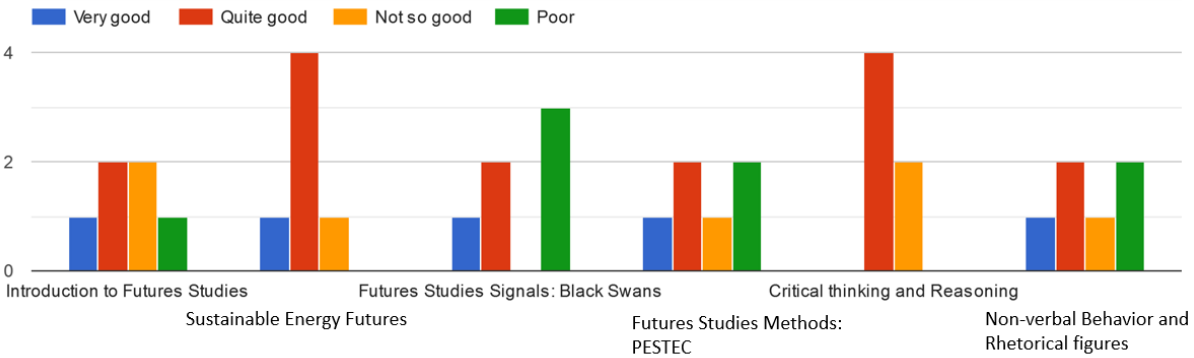
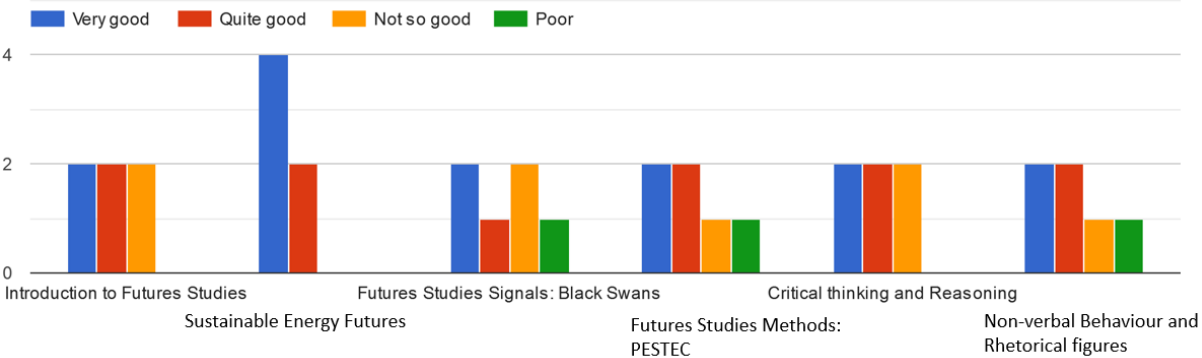


Figure 35: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of....? (n=6)



Moreover, participants were asked which topic or part of the training they found to be the most useful and interesting:

“The most interesting part of training is about the future study and method of PESTEC. I find it very helpful to extend my knowledge and more deep understanding on how society can be developed in terms of sustainable energy and environment.”

“Sustainable Energy Futures. Because it is related to our well-being of the future.”

“Critical thinking and reasoning”

On the other hand the participants were asked whether there was a topic which they did not found useful. The only answer to that question was:

“Black swans”



Trainings organised in Vientiane, Laos

NUOL was the only participating HEI from Laos in the DEEM project. Therefore, all trainings in Laos have been hosted by NUOL.

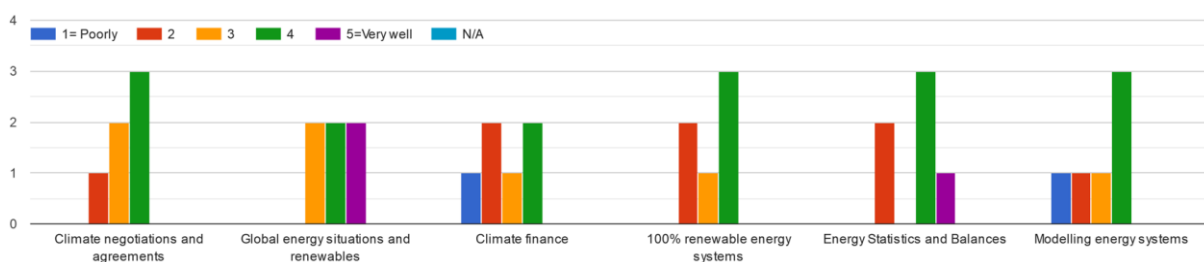
Training in March 2017

In the trainings held in March 2017 at NUOL there were a total of 12 participants. Six of the participants responded to the questionnaire. The training initiated a set of climate change and energy planning trainings. The topic covered modules on looking at the need for and ways to work towards sustainable energy systems. Specifically, climate change was discussed from the points of view of basic science, impacts, climate change negotiations and agreements and climate financing. Renewable energy and energy planning were emphasized through various presentations about the current and future global renewable energy situation, energy planning basics and different tools for modeling energy systems. The Asian partner HEIs also shared their insights of how national energy planning is carried out, how investment and policy decisions are made on energy system expansion as well as main actors and stakeholders in the energy sector.

The sessions were organized in an interactive way to accommodate a lot of discussion and debate about how to incorporate the training topics into local curricula and about the opportunities of HEIs to influence evidence based policy planning.

Results in Figure 36 show that the level of understanding of the underlying topics was quite diversified among the participants. Except for the content about global energy situations and renewables there were always participants with a below average understanding and in two cases a participant answered that they only gained a poor understanding of a specific topic. Therefore, we concluded that the topics need better introduction. Instead of trying to include as much content as possible into the schedule of the trainings, we learned to put a greater focus on assessing the participants' level of skills and competencies and to put a greater effort on tailoring the next trainings to the specific needs of the participants. Nevertheless, the majority of participants gained an above average understanding of the covered contents.

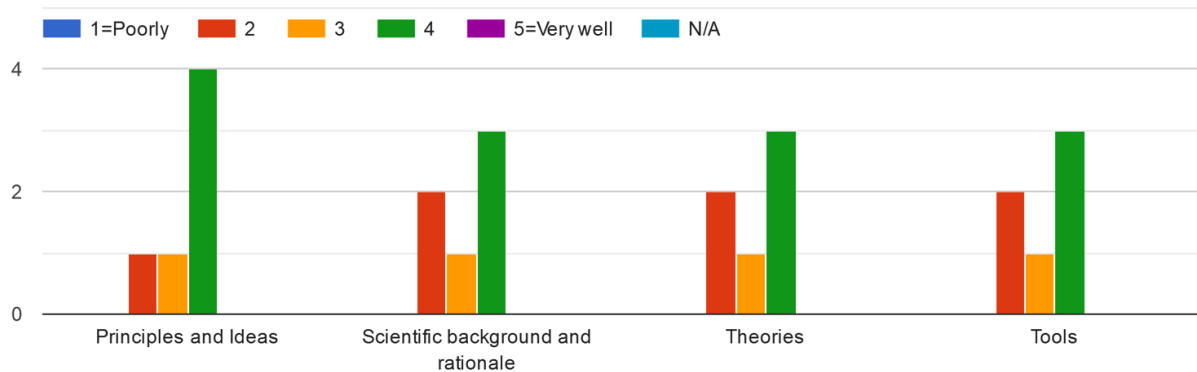
Figure 36: Participants were asked: How well did you understand the following subject areas? (n=12)



Results in Figure 37 show the participants' level of understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different aspects of the training including principles and ideas, scientific background, theories and the tools used during the training. The results are in line with Figure 36, indicating that the different dimensions were only understood to a certain degree. Therefore, the results only show a moderate level of understanding.



Figure 37: Participants were asked: How well were you able to understand the following? (n=12)



Results in Figures 38 and 39 show how the participants rated their own skills and competences before and after the training. Nevertheless, as the two figures above displayed only an average understanding of the different dimensions and the contents of the training the results below show a considerable improvement in the skills and competences of the participants. Therefore, all except one respondent were assessing their skills and competences as quite good or very good.

Figure 38: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? (n=12)

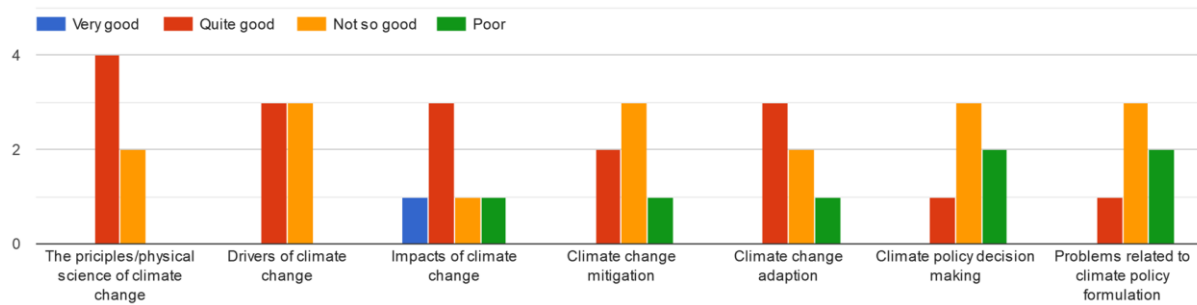
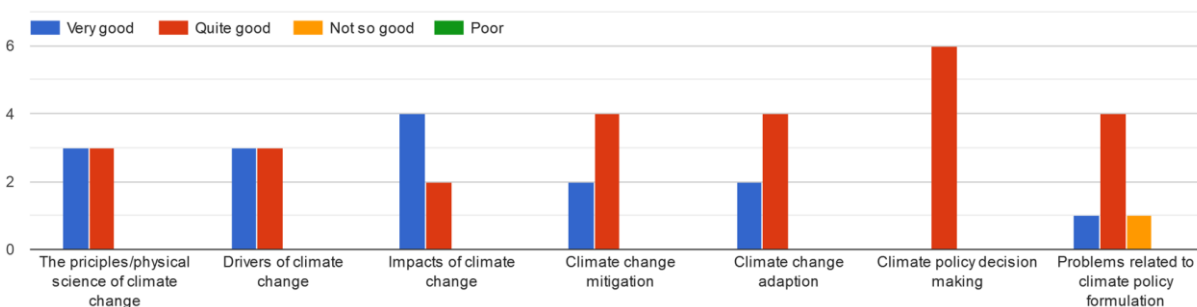


Figure 39: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? (n=12)



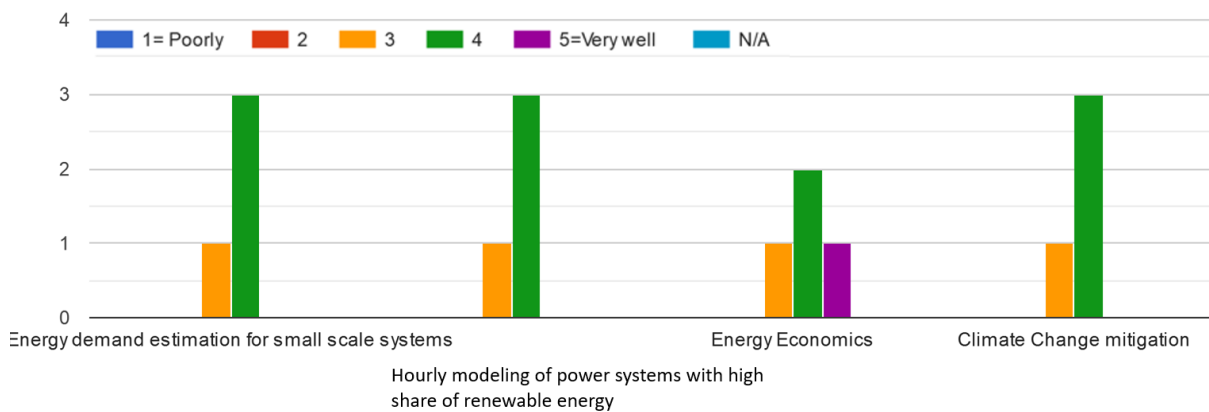
Training in October 2017

Another training was held in NUOL in October 2017. In this training, there were a total of 13 participants, four of whom responded to the survey. The training focus was on the continuation of more in depth energy modeling topics as well as energy economics and climate change mitigation.

In terms of energy modelling, the training consisted of the theory of estimating electricity demands by using a bottom-up approach. Through it, the participants were able to develop their own electricity consumption time series for e.g. small villages within an integrated group work. In connection to demand estimation, the hourly modelling of electricity systems was introduced using an Excel sheet-based approach. The participants achieved the necessary skills to be able to develop their own model to be followed up on during the next trainings as a continuous group work. In addition, the covered topics included understanding of global energy markets for different energy sources as well as factors that influence them. Within the theory of climate change mitigation, different strategies and the external costs induced by ongoing climate change were discussed.

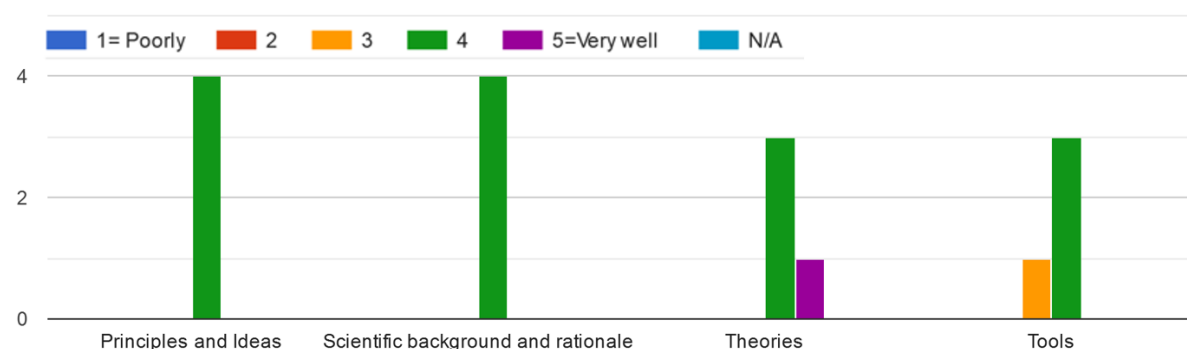
Results in Figure 40 show that the majority of topics taught in the trainings were well understood.

Figure 40: Participants were asked: How well did you understand the following subject areas? (n=4)



Results in Figure 41 show the participants' understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different aspects of the training, including principles and ideas, scientific background, theories and the tools used during the training. The results show that all dimensions were understood well.

Figure 41: Participants were asked: How well were you able to understand the following? (n=4)



Results in Figures 42 and 43 show how the participants rated their own skills and competence before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can

be quantified. It can be seen that skills have improved quite well. After the training, all participants rated their skills and competences as quite good and some as very good. Before the training, the competences were estimated to be weaker, averaging to a moderate level of understanding. Thereby, the improvement of skills during the training can be seen in all topics covered.

Figure 42: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: Why is it important to estimate energy demand?, b: How to estimate energy demand for house-hold energy consumption in villages, c: Acknowledging the most important parameters affecting the energy demand, d: Estimating future energy demand for villages with excel based tools. (n=4)

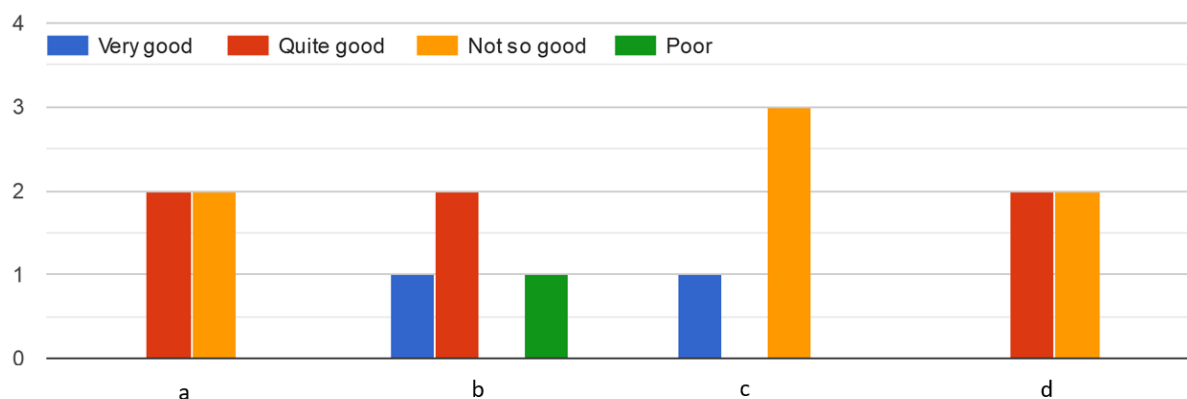
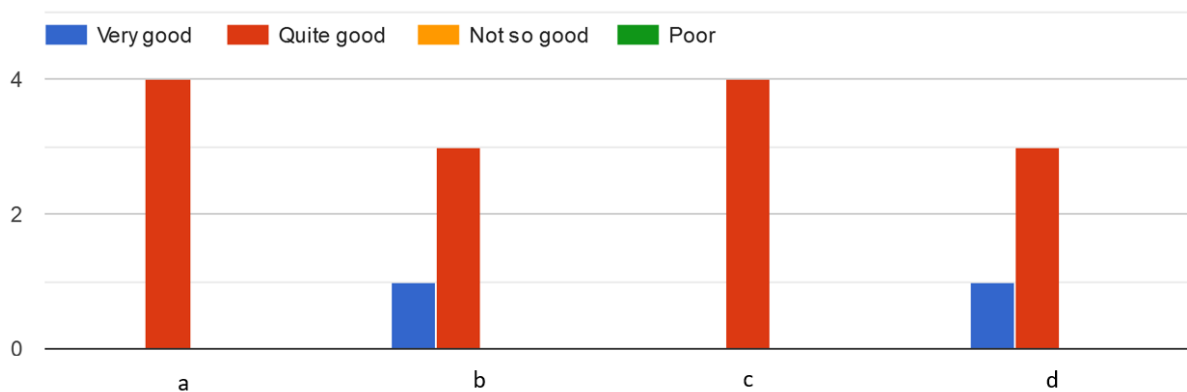


Figure 43: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: Why is it important to estimate energy demand?, b: How to estimate energy demand for house-hold energy consumption in villages, c: Acknowledging the most important parameters affecting the energy demand, d: Estimating future energy demand for villages with excel based tools. (n=4)



Moreover, participants were asked which topic or part of the training they found to be the most useful and interesting. Some of the responses are quoted below:

“Climate change is quite important for my field, due to we need to use this information for solving environmental impact in our country”

“All topics are very important, because I can use it for teaching, and transfer to another people who worked on the related work to energy, and climate change.”

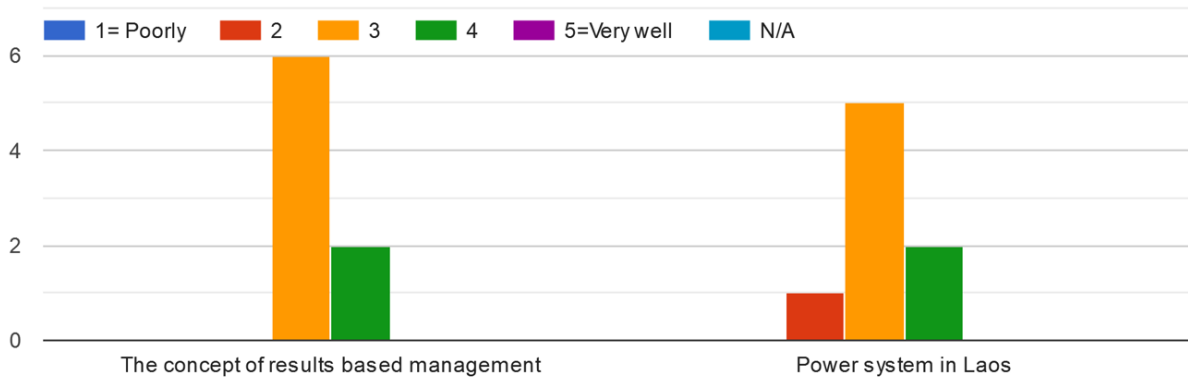


Training in September 2018

Another training at NUOL was held in September 2018. Eight of the people who participated in the training responded to this questionnaire. The training was about project management and the future of the energy system in Laos.

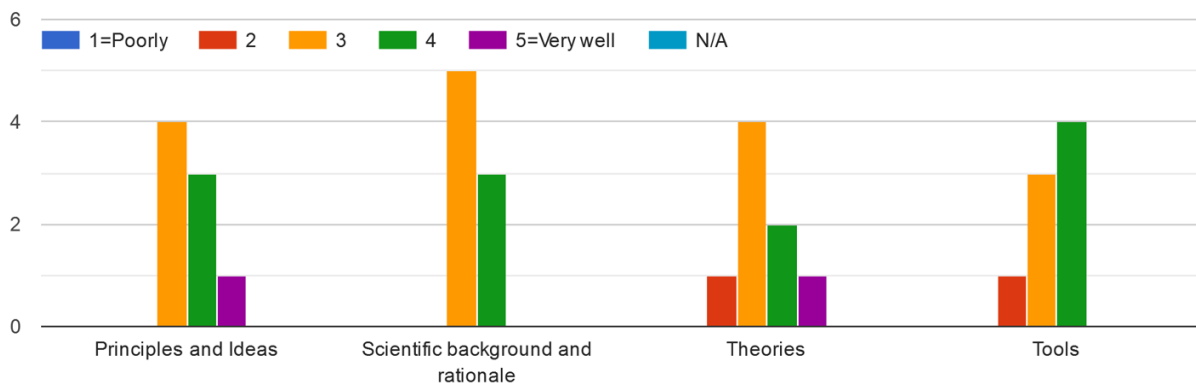
Results in Figure 44 show that everyone except one respondent had a moderate to good understanding of the different contents of the training.

Figure 44: Participants were asked: How well did you understand the following subject areas? (n=8)



Results in Figure 45 show participants' understanding of the different dimensions of the training content and methodology. The participants were asked how well they understood the different aspects of the training, including principles and ideas, scientific background, theories and the tools used during the training. The results show that most dimensions have been understood moderately to quiet well.

Figure 45: Participants were asked: How well were you able to understand the following? (n=8)



Results in Figures 46 and 47 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Thereby, the improvement of participants' skills can be quantified. In this training the skills and competences improved considerably. Before the training, the participants rated their competences on a wide spectrum. After training, every response except one stated that the skills and competences were either quite good or very good for all topics of the training.



Figure 46: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? a: The concept of results based management, b: Results chain and logical framework analysis, c: Concepts of results impacts/outcomes/outputs and objectives, intermediate objectives, d: Problem tree and objective tree analysis, e: Building m&e information and data collection with indicators, baselines and targets. (n=8)

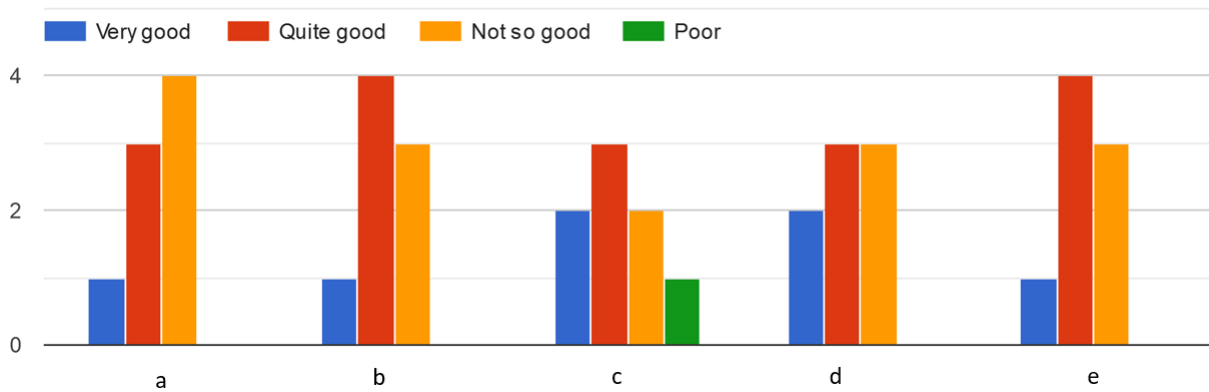
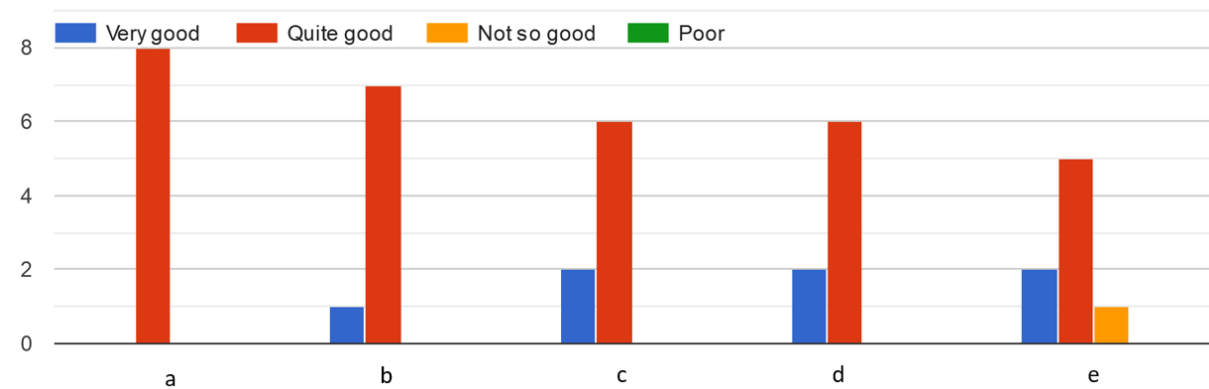


Figure 47: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? a: The concept of results based management, b: Results chain and logical framework analysis, c: Concepts of results impacts/outcomes/outputs and objectives, intermediate objectives, d: Problem tree and objective tree analysis, e: Building m&e information and data collection with indicators, baselines and targets. (n=8)



Training in September 2019

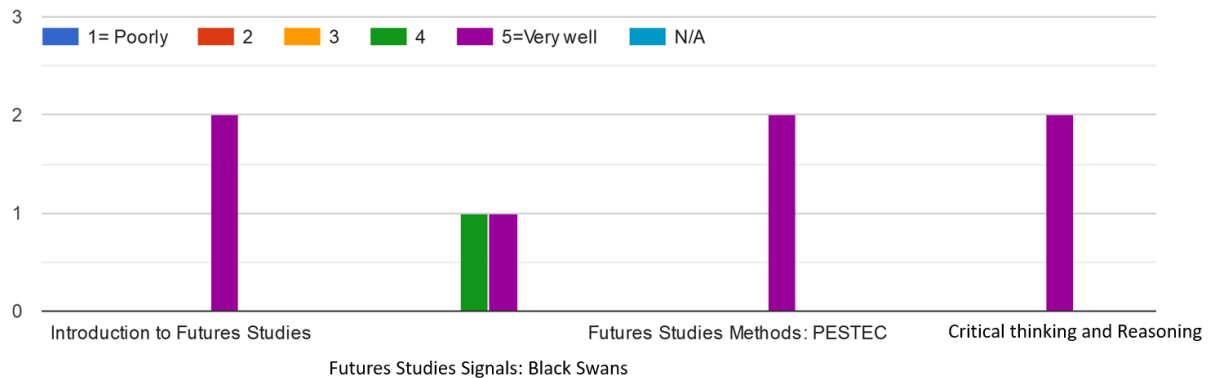
The last Training at NUOL was held in September 2019. In this training, there were a total number of 32 participants of whom only two responded to the questionnaire. Therefore, the feedback should not be considered as representative for this training session. Nevertheless, it can be used to get some implication. The training was about futures studies and future of sustainable energy in teaching.

More specifically, the topics included sessions under the following headings:

- Introduction to Futures Studies
- Critical thinking
- PESTEC method and energy scenarios for Laos 2050
- Argumentation and reasoning
- Opening ceremony of the NUOL Smart Energy Lab

Results in Figure 48 that the majority of topics taught in the trainings were well understood.

Figure 48: Participants were asked: How well did you understand the following subject areas? (n=2)



Results in Figures 49 and 50 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Therefore, the improvement of participants' skills can be quantified. Before the training, the level of skills and competences was quite good and very good for some of the covered topics. After the training, the level of skills and competences was slightly higher than before, justifying the success of the training. Nevertheless, it seems that the content for this training was not perfect for NUOL participants due to the high level of prior knowledge before the training. However, because only two participants took place in the survey this might not be the case for the majority of the participants who did not respond to the survey but took place in the training.



Figure 149: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? (n=2)

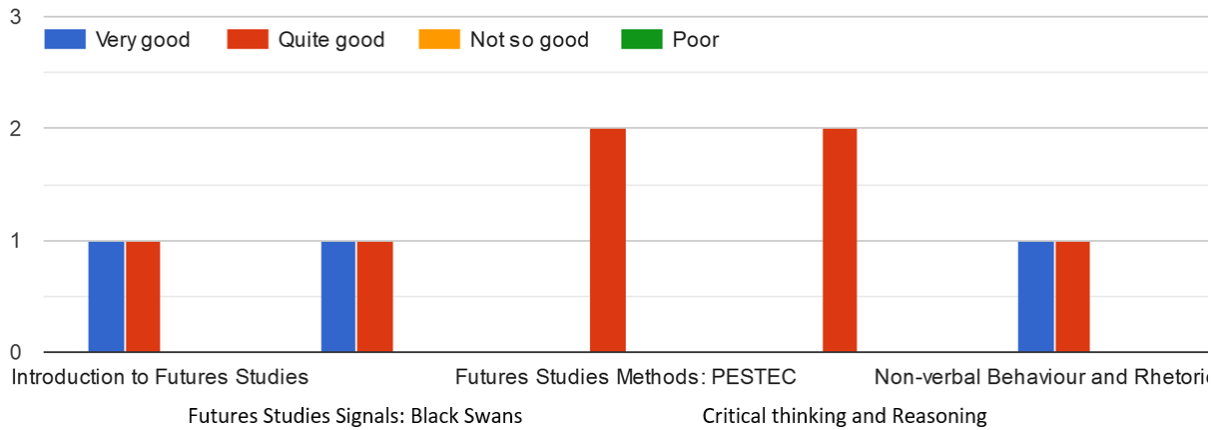
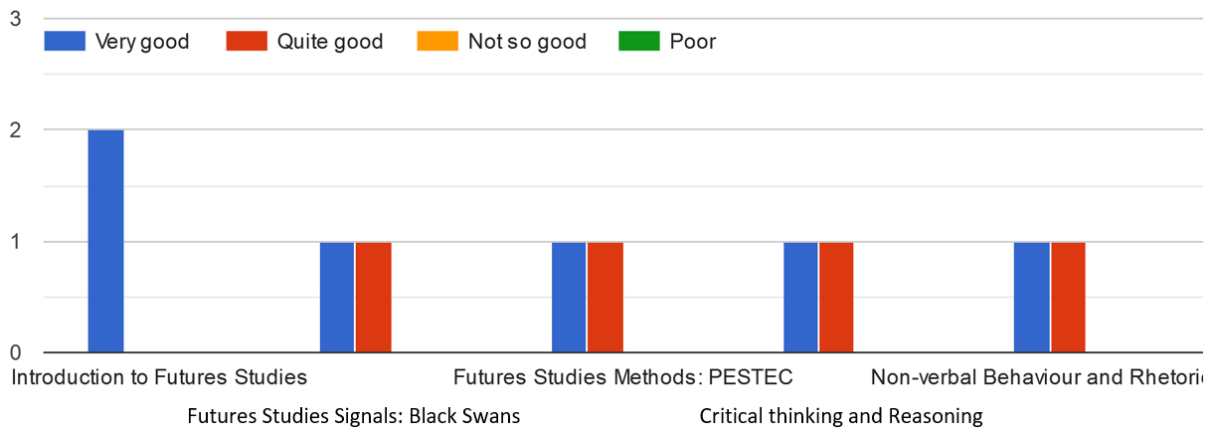


Figure 50: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? (n=2)



All Universities

One survey was carried out by a single questionnaire that was sent to all participating universities. In this case, the training content has been the same in RUPP, ITC, YU, YTU and NUOL.

Training in July 2017

This training was organized with the same content in Yangon, Phnom Penh and Myanmar. The survey used in these trainings differed from the one used in all the other trainings as it was based on data gathered through a different set of questions.

These responses have been coded so that the response to a claim has been translated into a number in the following fashion:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

The training dealt with curriculum development and didactical skills, targeting professionals who wanted to design or redesign curricula and courses and are interested to reflect upon and improve their didactical skills in the field of sustainable energy and engineering education.

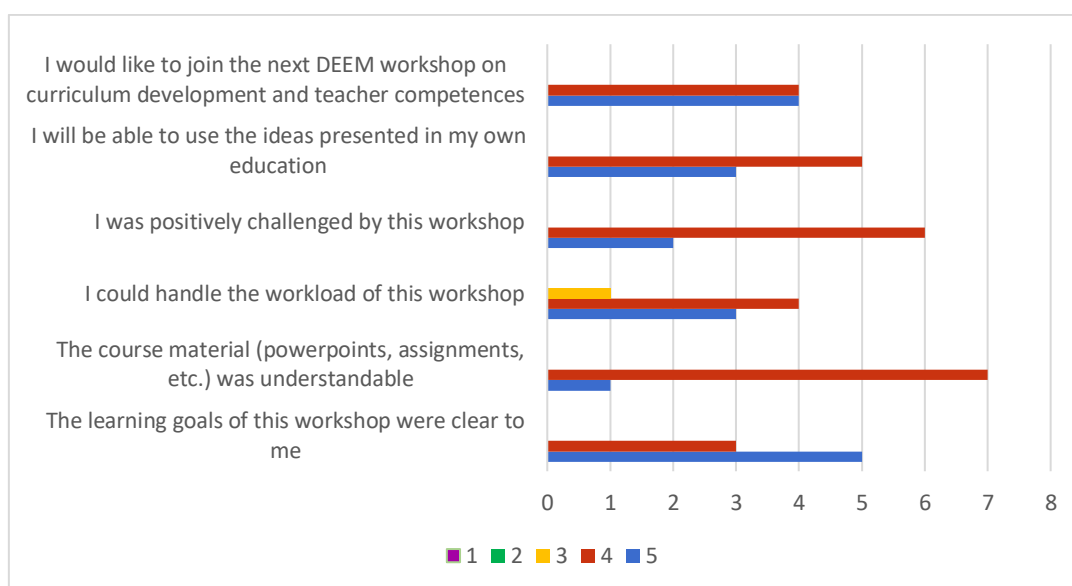
After completing the training, the participants were expected to

- understand basic theory on curriculum development practices;
- formulate sound learning outcomes for your course or curriculum based on the taxonomy of Bloom
- explain a number of interactive and innovative teaching methods that are suitable in their own working conditions and that allow for learning across various learning domains (knowledge, skills, attitude and interdisciplinary learning);
- design a coherent assessment strategy;
- reflect on own teaching competences and to develop an action plan accordingly.
- integrate the aforementioned aspects into (interdisciplinary) programmes and curricula related to sustainable energy development.

All eight participants who responded to the survey after the training in Phnom Penh (Figure 51) responded either “Strongly agree” or “Agree” to statements investigating whether they are able to use the ideas presented in their own education, whether they were positively challenged by the workshop, whether the course material was understandable and whether the goals of the workshop were clear to them. Only one of the participants in Cambodia responded “Neither agree nor disagree” to the statement “I could handle the workload of the workshop”. Based on their responses, it also seemed that they found the training useful as they wanted to continue to participate in DEEM trainings in the future.

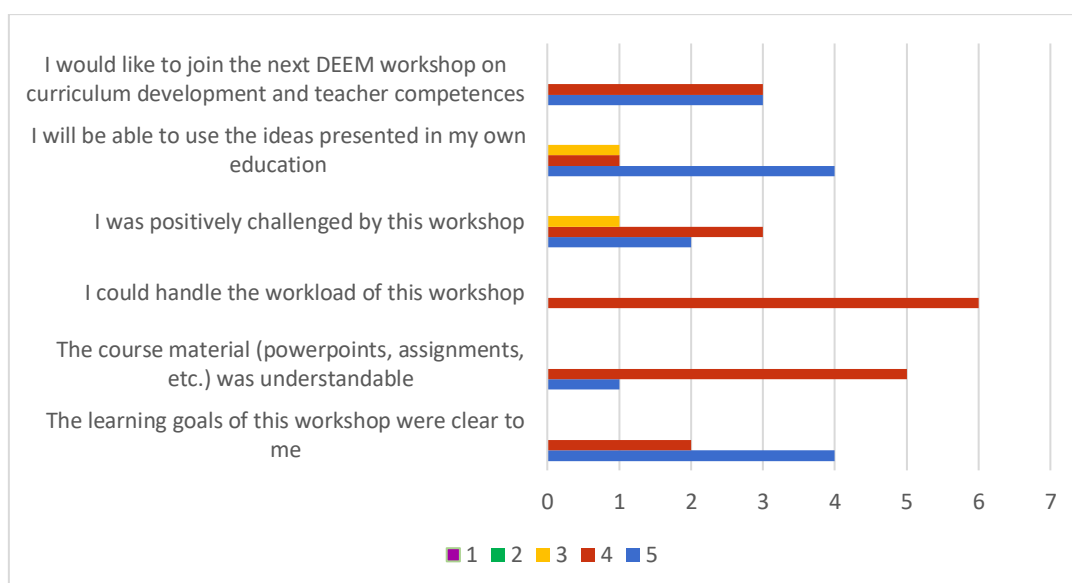


Figure 51: July 2017 training survey results from Cambodia (n=8)



Six of the participants who took part in the Vientiane workshop responded to the feedback questionnaire (Figure 52). All participants responded either “Agree” or “Strongly agree” to statements asking whether they could handle the workload of the workshop, whether the course material was understandable and whether the goals of the workshop were clear to them. One participant out of six responded “Neither agree nor disagree” to the statements “I will be able to use the ideas presented in my own education” and “I was positively challenged by the workshop. As was the case in Cambodia, based on their responses, it seemed that they found the training useful and that they wanted to continue taking part in DEEM trainings in the future.

Figure 52: July 2017 training survey results from Laos (n=6)



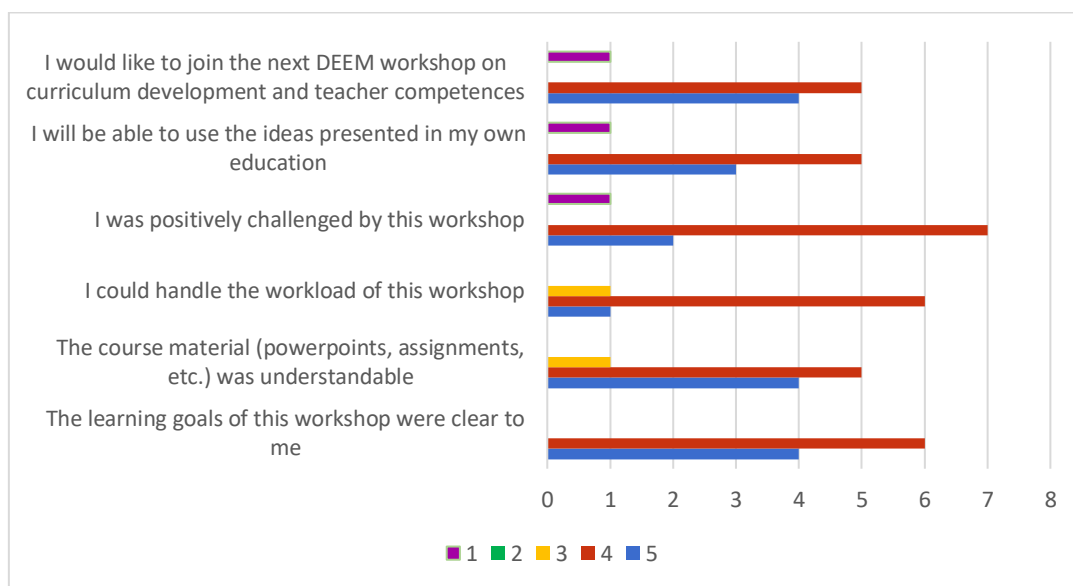
Ten participants took the post-training survey after the training in Yangon (Figure 53). In this survey, there was more variance in the results of the survey. All participants responded either “Agree” or “Strongly agree” to the statement “The learning goals of this workshop were clear to me”. For the



statements “I could handle the workload of this workshop” and “The course material was understandable”, all except one participant responded “Agree” or “Strongly agree”. The one participant responded “Neither agree nor disagree” to these statements.

For the statements “I would like to join the next DEEM workshop...”, “I will be able to use the ideas presented in my own education” and “I was positively challenged by this workshop”, all except one participant responded “Agree” or “Strongly agree”. To each of the previously mentioned statements, one participant responded “Strongly disagree”. Thus, it can be concluded that the Myanmar training worked quite well for the majority of the training participants, but some of the participant felt that the training was not relevant for them.

Figure 53: July 2017 training survey results from Myanmar (n=10)



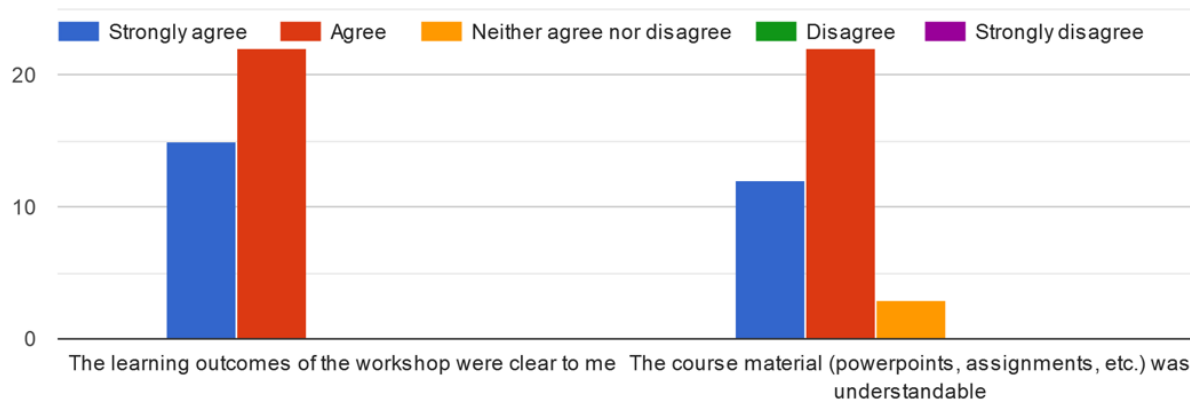
Training in June/July 2018

The training took place at each location of the partnering HEIs. Therefore, one set of trainings took place in Yangon, one in Phnom Penh and one in Vientiane. The content was the same for all locations. At all trainings combined, there were a total number of 78 participants of whom 37 responded to the questionnaire. Therefore, we were able to get a representative sample of feedback in order to evaluate the success of the training. The training was about linking university education to the industry, focusing on thesis, internships and innovative courses that reinforce this link. The training built on the previous workshops on constructive alignment in curricula and coursework.

Results in Figure 54 show that the majority of topics taught in the trainings were well understood.



Figure 54: Participants were asked: How well did you understand the following subject areas? (n=37)

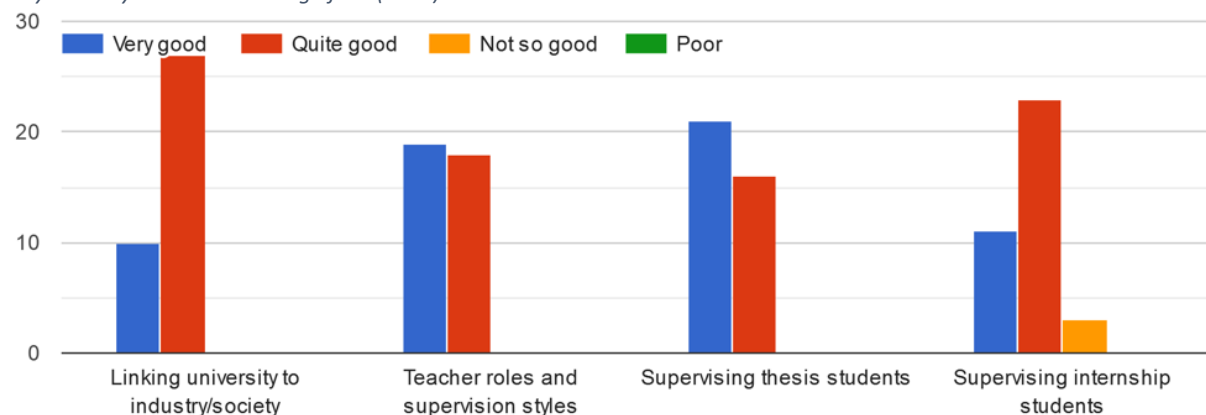


Results in Figures 55 and 56 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Therefore, the improvement of participants' skills can be quantified. As the replies are more various in Figure 55 than Figure 56 and the fact that nearly all respondents answered „Very good“ or „Quite good“ when asked to assess their skills and competences after the training supports the conclusion that these trainings were successful.

Figure 55: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of...? (n=37)



Figure 56: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of...? (n=37)

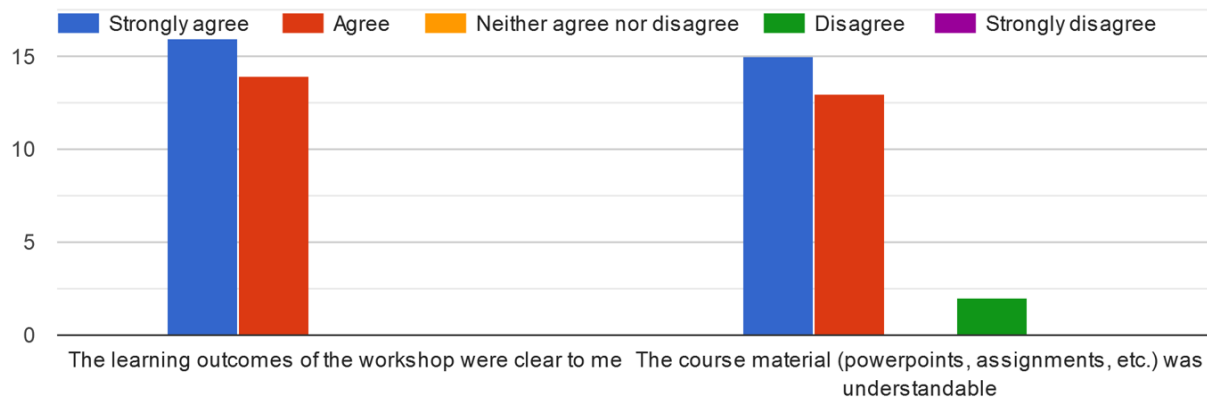


Training in December 2018

The December 2018 training, too, took place at each location of the partnering HEIs. Therefore, one set of trainings took place in Yangon, one in Phnom Penh and one in Vientiane. The content was the same for all locations. At all trainings combined, there were a total of 76 participants of whom 30 responded to the questionnaire. The aim of the training was to identify the needs and substance for a sustainable energy programme in the partner universities. The participants have redesigned a student-centered interdisciplinary sustainable energy-related course which integrates knowledge from all DEEM trainings. The training did use an interactive and emancipatory approach. The purpose was to develop understanding and knowledge about the nature and root causes of current education practices in order to develop real strategies to change them. In the training setup, we integrated plenty of time for the participants to reflect individually and with each other upon their current teaching experiences and practices.

Figure 57 shows that nearly all participants did agree or agree strongly that the learning outcomes of the training did become clear to them as well as the course material were understandable.

Figure 57: Participants were asked: How well did you understand the following? (n=30)



Results in Figures 58 and 59 show how the participants rated their own skills and competences before and after the trainings on the underlying topics. Therefore, the improvement of participants' skills can be quantified. Before the training, the level of skills and competences was very diversified among the participants ranging from poor to very good. Nevertheless, the majority of participants rated their competencies as not so good.

After the training the level of skills and competencies has increased substantially on all underlying topics. Except a small minority all participants rated their skills and competencies as good or even very good after the training.



Figure 58: Participants were asked: How do you rate your competencies BEFORE THE TRAINING in the following skills or how do you rate your understanding of....? (n=30)



Figure 59: Participants were asked: How do you rate your competencies AFTER THE TRAINING in the following skills or how do you rate your understanding of....? (n=30)



Moreover, participants were asked which topic or part of the training they found to be the most useful and interesting. Some of the responses are quoted below:

“Interdisciplinary course development”

“The teaching methods and preparation for new courses are very useful”

“6 dimensions of the PESETC framework & student centered teaching methods as well as discussions”



Conclusion

It can be derived from the survey data presented above that participants from all partner HEIs did acquire an increased competences and skills on most of the given topics through participating in the trainings in DEEM capacity-building project between 2016 and 2019. Through the assessment, we covered the majority of conducted trainings in order to achieve sufficient quality control during the project period. The assessment results delivered necessary information about the training achievements in order to adapt the trainings while the project was ongoing for an increased quality of trainings. Thereby, the project consortium was able to understand the specific requirements of each partner to this capacity project and to tailor the trainings to their specific needs. In general, the results of this assessment show a positive shift of participants' skills, competences and level of understanding as a result of participating in the trainings in most but not all topics. In addition, the findings show that the participants were generally satisfied with the delivery of the training. However, some participants claimed that the study program was very intense in terms of scheduling and that not all topics were covered thoroughly enough. The high interest in topics dealing with climate change, renewable energy, energy system modelling, critical thinking, pedagogical methods and theories and futures studies has been encouraging. The way the DEEM project structure was designed dictated that the trainings can only take a limited amount of time, as all lecturers participating in the project were also very much involved in other day to day work at their HEIs. Given the limited temporal resources, the objective was to get the most out of the trainings. However, it must be said that the requirements for skills and competency development in during a short training were a challenge that the project team acknowledged.

This quality assessment has shown that the more technically oriented topics were not sufficiently understood by all participants. Some of those topics required a certain degree of prior knowledge to build upon. The skills and the knowledge of the participants differed a lot from one another, which challenged the trainers to adapt their training contents and methods to the needs of the participants. It was not always possible to get a sufficient overview of the participants' skill level in advance. Therefore, it was not always possible to plan the best suitable training contents and methods ahead of each training. However, in most cases the trainings resulted in a considerable increase in participants skills compared to their skills before each training.

Moreover, the English language proficiency of the participants varied a lot and therefore the flow of communication during the training was not always satisfactory. Even though not all the participants had perfect language skills to participate in the trainings, it was seen that the participants' language skills and courage to speak up improved a lot during the project period. By taking a participatory approach in many of the trainings, DEEM not only increased skills and competences specifically related to the topic at hand but also in terms of language, communication, presentation and group working skills. However, the positive tendency shows that the communication and training approaches were effective in enhancing and promoting the competencies and skills relevant to the project at all partner HEIs.

Finally, this capacity assessment provided crucial information for the project management team and the trainers about how to structure the trainings and how to allocate resources for particular topics. The participants indicated that the knowledge they have acquired through DEEM activities will be transmitted to the academia and relevant stakeholders. Furthermore, the training material as considered useful for partner HEIs and has been distributed effectively.

Between 2016 and 2019, the partnering HEIs from the Mekong Area began to translate and adapt the training content into their own courses and curricula.





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