

Independent Evaluation Division
Office of Evaluation and Internal Oversight

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Volume II – Annexes



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

TABLE OF CONTENTS.....	PAGE
Annex I. Methodology and adaptive approach of this evaluation.....	1
Annex I.1 Phasing.....	1
Annex I.2 Approach of the component analysis	1
Annex I.3 Development of a Theory of Change.....	2
Annex I.4 Approach of the barrier analysis.....	2
Annex I.5 Approach of the indicator analysis.....	3
Annex I.6 Conduct four terminal evaluations as case studies	4
Annex I.7 Expert Survey	4
Annex I.8 Realist Evaluation (ICMO approach)	4
Annex I.9 Approach of the Qualitative Comparative Analysis.....	7
Annex I.10 Sectoral analysis according to ISIC.....	7
Annex I.11 Analysis of ISO 50001 survey data	8
Annex II. Evidence and findings for evaluation questions	9
Annex II.1 Evaluation question 1b: Have the projects influenced behaviour at the company or sectoral level?	9
Annex II.1.1 Outputs of UNIDO project engagement with companies	9
Annex II.1.2 Outcome level effects resulting UNIDO project engagement with companies	11
Annex II.1.3 Impact level effects resulting from changes in company behaviour.....	14
Annex II.1.4 Summary of evaluation question 1b.....	18
Annex II.2 Evaluation question 1a: Have the projects influenced market transformation?.....	20
Annex II.2.1 Outputs of UNIDO project's awareness raising and capacity building....	21
Annex II.2.2 EE market changes observed in UNIDO intervention countries.....	24
Annex II.2.3 Summary of evaluation question 1a.....	33
Annex II.3 Evidence and findings for evaluation question 1d: Have the projects contributed to positive economic and social impacts?	36
Annex II.4 Evaluation questions 1c and 2c: How can changes be measured which baseline data should be collected?	38
Annex II.4.1 General considerations of logframes.....	38
Annex II.4.2 GEF-specific aspects	39
Annex II.4.3 Logic and structure of the reconstructed standardised logframe.....	39

Annex II.5	Evaluation question 2a: What are the factors affecting the achievement of impacts?	55
Annex II.5.1	Factors that are part of the programme logic.....	55
Annex II.5.2	Factors affecting project management but not specific to energy efficiency.....	56
Annex II.5.3	Factors external to the project.....	57
Annex II.6	Evaluation question 3: What is the influence of the company selection strategy?	59
Annex II.6.1	Company selection strategies.....	59
Annex II.6.2	Approach: Qualitative Comparative Analysis.....	65
Annex II.6.3	Summary of evaluation question 3.....	66
Annex II.7	Evaluation question 4: How can the demand for energy efficiency services be sustained?	67
Annex II.7.1	Increasing demand for EE services.....	68
Annex II.7.2	Increasing supply of competent EE service providers.....	71
Annex II.7.3	Strategy for developing an EE services market	73
Annex III.	Component analysis	74
Annex III.1	Approach.....	74
Annex III.2	Findings	74
Annex IV.	Indicator analysis.....	88
Annex IV.1	Impact indicators – higher efficiency and its metrics.....	88
Annex IV.2	Outcome and output indicators.....	90
Annex IV.2.1	Output and outcome indicators related to the wider economy.....	92
Annex IV.2.2	Output and outcome indicators related to UNIDO light-intervention companies.....	94
Annex IV.2.3	Output and outcome indicators related to UNIDO partner energy-intensive enterprises.....	99
Annex IV.2.4	Output and outcome indicators related to UNIDO partner small- and medium-sized enterprises (SMEs)	102
Annex IV.2.5	Output and outcome indicators related to national experts and services professionals (independent / within industrial companies).....	103
Annex IV.2.6	Output and outcome indicators related to equipment supply chain (manufacturers and vendors).....	106
Annex IV.2.7	Output and outcome indicators related to the finance community	107
Annex IV.2.8	Output and outcome indicators related to the policy and technical standards community	109

Annex V. Barrier analysis.....	115
Annex VI. Cross-country survey amongst energy experts	121
Annex VI.1 Comparison of answers across the questionnaire.....	142
Annex VII. Survey of energy efficiency experts in UNIDO intervention countries	147
Annex VIII. Draft survey of participants in UNIDO IEE training	156
Annex IX. Interviewees and list of evaluations considered	165

List of figures

Figure 1: Intervention-context-mechanism-outcome logic chain.....	5
Figure 2: ICMO statements developed by the evaluation team.....	6
Figure 3: Number of pilot projects in the four case study countries (Egypt, Indonesia, Iran, Thailand)	10
Figure 4: Number of participants in user training in the four case study countries	11
Figure 5: Company investments in EE measures per country.....	12
Figure 6: Monetary savings per country.....	12
Figure 7: Targets and verified gross annual GHG emissions reductions per project.....	15
Figure 8: GHG emissions resulting from direct assistance to companies and from capacity training (user trainings) for four case study countries.....	17
Figure 9: Gross energy savings resulting from direct assistance to company and from capacity training (user trainings) for four case study countries.....	18
Figure 10: Number of case studies prepared / published per project.....	22
Figure 11: Number of participants in awareness raising activities of four IEE projects.....	23
Figure 12: Number of experts trained in EnMS and SO of four IEE projects.....	24
Figure 13: Expert survey: Spread of country averages of observed market changes in the previous five years.....	25
Figure 14: Expert survey: Spread of country averages of ratings of UNIDO's importance for key developments of the EE-Market.....	26
Figure 15: Development of ISO 50001 certifications in UNIDO intervention countries covered by the impact evaluation survey.....	28
Figure 16: Average / median annual number of ISO 50001 certifications (global, low- & middle-income countries and UNIDO intervention country averages).....	29
Figure 17: Average annual change in the number of ISO 50001 certifications (global averages, low- & middle-income country averages, UNIDO intervention country averages).	30
Figure 18: Share of females in project activities	37
Figure 19: Results chain of the reconstructed standardised logframe	41

Figure 20: Sector selection of 17 IEE projects, per sector.....	62
Figure 21: Sector selection of 17 IEE project, per country	63
Figure 22: Barrier removal activity of the ten most frequent UNIDO interventions	120
Figure 23: Q 1. “For which UNIDO project are you answering this questionnaire?”	122
Figure 24: Q 2 “Involvement with the UNIDO project of survey respondents”	123
Figure 25: Q 3. “In the last 5 years, has energy efficiency become more important for industrial companies in your country?”	124
Figure 26: Q 4. “How important was the UNIDO project for this development [the increase in EE importance for industrial companies]?”	125
Figure 27: Q 6. “Which of the following instruments has the government implemented?”	126
Figure 28: Q 7. “In the last 5 years, how effective were the instruments introduced by the government in fostering the development of industrial energy efficiency in your country?”	127
Figure 29: Q 9. “How important was the UNIDO project to the development of the policies or regulations addressing IEE in your country?”	128
Figure 30: Q 10. “How important were the following other factors for the development of IEE in your country in the past 5 years?”	129
Figure 31: Q 12. “In the last 5 years, has the number of industrial companies that are using an energy management system (EnMS) increased in your country?”	131
Figure 32: Q 13. “How important was UNIDO’s project for the increase of energy management systems (EnMS) implemented?”	132
Figure 33: Q 14. “In the last 5 years, have companies’ investments to make their production more energy efficient increased?”	133
Figure 34: Q 15. “How important was UNIDO’s project to the increase in investment in IEE?”	134
Figure 35: Q 16. “In the last 5 years, has it become easier to receive external financing or bank loans for investments in energy efficiency?”	135
Figure 36: Q 17. “How important was UNIDO’s project to the improvement of access to external financing or loans?”	136
Figure 37: Q 18. “Has the product range offered by vendors of high-efficiency equipment improved in the last 5 years?”	137
Figure 38: Q19. “How important was UNIDO’s project to the improvement of the product range offered?”	138
Figure 39: Q 20. “In the last 5 years, has the number of companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits) increased?” ...	139
Figure 40: Q 21. “How important was UNIDO’s project for this increase in companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits)?”	140

Figure 41: Q 22. “After the UNIDO project’s closure, which of the following will be available at a better level than before?” 141

Figure 42: Question comparison: Average of country averages of observed market changes in the previous five years..... 142

Figure 43: Question comparison: Average of country answers for observed market changes in the previous five years..... 143

Figure 44: Question comparison: Average of country averages of ratings of UNIDO’s importance for key developments of the EE-Market 144

Figure 45: Question comparison: Average of country answers for the ratings of UNIDO’s importance for key developments of the EE-Market 145

List of tables

Table 1: Reconstructed standardised logframe - objective / impact level 44

Table 2: Reconstructed standardised logframe - Component 1 45

Table 3: Reconstructed standardised logframe - Component 2 47

Table 4: Reconstructed standardised logframe - Component 3 49

Table 5: Reconstructed standardised logframe - Component 4 50

Table 6: Reconstructed standardised logframe - Component 5 52

Table 7: Reconstructed standardised logframe - Component 6 53

Table 8: Company selection strategy 60

Table 9: Example of a QCA result using the effectiveness rating as ‘independent variable’ 65

Table 10: Main themes in the IEE, RECP and ODS programmes..... 75

Table 11: Main target stakeholders and supporting resources of the IEE, RECP and ODS programmes..... 76

Table 12: Project codes for the component analysis 77

Table 13: Component outputs aimed at the stakeholder group industry..... 78

Table 14: Component outputs aimed at the service and equipment supply chain 82

Table 15: Component outputs aimed at the finance community..... 85

Table 16: Component outputs aimed at the policy and technical standards community 86

Table 17: Frequency of impact indicators in the three project portfolios..... 89

Table 18: Project Groups for IEE countries on the basis of similarities in indicator formulation 90

Table 19: IEE indicators addressing the wider economy (including non-intervention companies)..... 92

Table 20: IEE indicators addressing UNIDO light-intervention companies..... 95

Table 21: IEE indicators addressing UNIDO partner energy-intensive enterprises	100
Table 22: Indicators addressing UNIDO partner small and medium-sized enterprises.....	102
Table 23: IEE indicators addressing national experts and service professionals	104
Table 24: IEE indicators addressing equipment manufacturers / vendors.....	107
Table 25: IEE indicators addressing banks and financial services institutions and energy service companies.....	108
Table 26: IEE indicators addressing government / regulators / authorities.....	111
Table 27: IEE indicators addressing standards organisations	114
Table 28: Barriers addressed by UNIDO interventions.....	117
Table 29: Open-text-field responses to Q11. “Are there other factors that have contributed to changes in IEE?”	130
Table 30: Average degree of observed market changes and average rating for UNIDO importance to observe market changes	146
Table 31: List of projects analysed in the first report (Data collection phase I).....	165
Table 32: List of evaluations considered for the impact evaluation (Data collection phases II and III)	166
Table 33: List of interviews conducted for the impact evaluation.....	167

List of acronyms

Abbreviation	Meaning
CASO	Compressed Air System Optimization
CEO	Chief Executive Officer
EE	Energy efficiency
EESL	Energy Efficiency Services Ltd.
EIP	Eco-industrial Parks
EM	Energy management
EnMS	Energy Management System
EnPI	Energy Performance Indicator
ESCO	Energy service company
(E)SO	(Energy) Systems Optimization
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
HQ	Headquarters
ICMO	Intervention, context, mechanisms and outcomes
IEE	Industrial energy efficiency
ISIC	International Standard Industrial Classification of all economic activities
ISO	International Organization for Standardization
M&V	Monitoring & Verification
MEPS	Minimum Energy Performance Standards
MSME	Micro, Small and Medium Enterprises
MTE / MTR	Mid-term evaluation / Mid-term review

Abbreviation	Meaning
ODS	Ozone-Depleting Substance
PM / PC	Project manager / project coordinator
PSO	Pump System Optimization
QCA	Qualitative Comparative Analysis
RE	Renewable energies
RECP	Resource Efficient and Cleaner Production
SDG	Sustainable Development Goals
SEC	Specific energy consumption
SMART	Specific, measurable, attainable, relevant and time-bound
SME	Small and medium enterprises
SO	System Optimization
TE	Terminal evaluation
TOC	Theory of Change
TONC	Theory of No Change
UNEP	United Nations Environment Programme, now United Nations Environment
UNIDO	United Nations Industrial Development Organization
YEI	Yayasan Energi Indonesia

Annex I. Methodology and adaptive approach of this evaluation

Annex I.1 Phasing

The evaluation was conducted by a team of four consultants and a member of the UNIDO Independent Evaluation Division, with the assistance of Arepo back office and national consultants for the four terminal evaluations. As data availability was unclear at the outset, the evaluation approach had to be reconsidered several times during the evaluation. Overall, the impact evaluation went through three phases.

In a **scoping phase** the team scrutinized the project documents of 21 projects in the three programmes (IEE, ODS, RECP) (Table 31 lists the portfolio of phase I). In the course of this phase, the evaluation team undertook a **component analysis** of the three programmes. From the component analysis followed the development of a **Theory of Change** for the overall project portfolio and an **analysis of barriers** stakeholders face to adopt more energy efficient behaviour and an analysis of how UNIDO's interventions address these barriers. Based on the logframes the evaluation team carried out an **indicator analysis**. The indicator analysis was carried out to identify indicators suitable to assess the impact of the overall programme.

In the second phase, the evaluation team carried out four terminal evaluations of UNIDO Industrial Energy Efficiency projects as case studies in Egypt, Indonesia, Iran and Thailand.

The **third phase** was added as data collection in the four case study countries proved unsatisfactory. This phase included a survey in twelve project countries¹ and a realist evaluation methodology analysis of the available terminal evaluations, the so-called ICMO analysis (intervention, context, mechanisms and outcomes). Additionally, it was planned to conduct a Qualitative Comparative Analysis (QCA) to analyse the company selection strategy and its relevance for the projects' success. Additional methods of analysis and data sources have been a **sectoral analysis according to ISIC** and an analysis of **ISO 50001 survey data set** (2017). Table 32 lists the IEE projects covered by the respective data collection of the phases II and III.

Annex I.2 Approach of the component analysis

The key question of the component analysis was to answer the question: ***How do projects attempt to influence industrial energy efficiency?*** 21 projects (16 IEE projects, three RECP projects and two ODS projects) were examined via their project documents. To analyse and compare the projects' structures a common terminology and component classification was generated. This required an iterative process, revisiting and reclassifying project components several times.

Data limitations of the component analysis

The component analysis was done on the basis of project documents rather than terminal evaluations. The reasons were: The project documents are shorter and more focused on project

¹ Egypt, India, Indonesia, Iran, Malaysia, Moldova, Myanmar, North Macedonia, Philippines, South Africa, Thailand and Viet Nam.

design and logframes. In addition, the accessible sample was bigger as terminal evaluations had not yet been completed for all the projects. Potential drawbacks are that this approach could be biased towards the conceptual thinking of UNIDO and might ignore the practical experiences learned in implementation: project documents represent the organization's expectations and best practice thinking on how a project should be carried out and how impact is maximized, but they do not always describe how projects were executed in the end. Some projects evolved considerably between the planning and execution phases. Yet, most of the differences between plans and execution related to details (e.g. number of pilots) or emphasis (e.g. less attention to policy assistance, more to training), the evaluation team believes that the project documents provided a valid overview of project components for the inception phase.

A second potential shortcoming is the choice of the 21 projects. The projects are relatively similar and might not be fully representative of the entirety of the UNIDO energy efficiency action. For example, the IEE projects examined promote mainly energy management and energy system optimization, which are not the main thrust of other IEE projects, such as Promoting Energy Efficiency Technologies in the Beer Brewery Sector (Burkina Faso), Promoting Energy-Efficient Cook Stoves in Micro and Small-scale Food Processing Industries (Chad) and Integrated Adoption of New Energy Vehicles (China). In the case of ODS, the two examined projects focusing more on industrial energy efficiency than the ODS programme's main work to date. However, it is possible that these two ODS projects will become more representative for a future portfolio, as the ODS programme's projects evolve to address issues associated with the Kigali Amendment to the Montreal Protocol.

The choice of the projects examined for this analysis imposes a certain level of consistency to the components and project approaches. The evaluation team believes this potential sampling bias is acceptable given that the exercise is meant to support a "thematic evaluation" rather than a "programme evaluation."

Annex I.3 Development of a Theory of Change

Based on the component analysis, a generalized Theory of Change (TOC) was reconstructed in order to visualize the programme logic linking the projects' outputs by stakeholder group to outcomes and impacts (see Figure 3 in Volume I).

Annex I.4 Approach of the barrier analysis

For its barrier analysis, the evaluation team adopted the Theory of No Change (TONC) by Woerlen et al. (2011). The TONC is a systematic approach to barrier analysis, based on a large number of observations of market developments and project interventions. It structures the challenges the different stakeholders face to fulfil their role in the energy efficiency market. It assumes that there are primary stakeholders (the energy users) and secondary stakeholders (those that help or hinder energy users to save energy) and both are facing barriers to exhibit the "correct" behaviour that would facilitate markets or market transformation towards energy efficiency. These barriers to "correct" behaviour are generally the same, no matter what stakeholder is observed. They are a subset of: lack of awareness of the correct behaviour, lack of motivation / interest to exhibit the correct behaviour, lack of expertise to exhibit the correct behaviour, the correct behaviour might have added cost compared to the current behaviour (lack of cost effectiveness) or require high

investments (lack of affordability), or might not be possible for technical reasons (e.g. lack of access to the technology).

So, the barriers to an energy efficiency market identified by the Theory of No Change, i.e. the barriers that prevent energy consumers (like industrial companies) from adopting more energy efficient behaviours are **lack of motivation / interest**,² **lack of awareness**, **lack of expertise**, **lack of access to the technology**, **lack of cost-effectiveness**, and **lack of affordability**. A number of these barriers cannot be influenced by the energy users themselves but by stakeholders that provide (or fail to provide) enabling conditions for energy efficient behaviour. These secondary stakeholders - service and equipment providers, financiers and policy makers - may themselves encounter barriers to facilitate industrial energy efficiency. These barriers can be described in the same six barrier types: Policy makers, suppliers and financiers might equally i. **lack the motivation** (and commitment) to change market conditions, e.g. policy makers might not place a high priority on mitigating the negative environmental effects of production processes and therefore refuse to apply policy instruments that increase the price of energy. Secondary stakeholders such as the financial sector might not even be aware that they have a role to play as enablers of industrial energy efficiency (ii. **“lack of awareness”**). Stakeholders might not have the right means to facilitate energy efficiency because they iii. **“lack expertise”** (e.g. on available best practices for technologies, management models, but also policy schemes) or iv. **“lack access to the technology.”** Finally, it might not be v. **cost-effective** or vi. **affordable** to them to provide the conditions or services (see Annex VI for details).

Annex I.5 Approach of the indicator analysis

All UNIDO projects are expected to have logframes with indicator frameworks and monitoring and evaluation plans that include specific, measurable, attainable, relevant, time-bound (SMART) indicators for outputs, outcomes and impacts. All projects in the portfolio aim at improving industrial energy efficiency. The component analysis of 21 projects of the IEE, RECP and ODS programmes showed that the projects follow the same fundamental logic and often implement the same or similar components. It was assumed that the projects therefore monitor to some extent common sets of indicators. In order to understand to what degree there was an indicator overlap, all of the 21 projects in the sample were subjected to a comparison of their indicator frameworks and screened for the possibility to aggregate and measure impacts for the portfolio as a whole.

The **impact indicators** have been analysed for all three programmes. The objectives and indicators of the projects of each programme were extracted and compared so that similarities and differences in their formulation were distilled. The analysis of **output and outcome indicators** has been limited to the IEE portfolio (16 projects). Here, the output and outcome indicators were first matched with the stakeholder groups³ and components that derived from the component analysis and then were compared to each other. Overall, the different logframe styles and the large variety of indicator formulations made the analysis cumbersome and to a certain degree impossible.

² This barrier can also include organizational interests like managerial priority or staff time and capacity.

³ The stakeholder groups are: energy-using enterprises (wider economy; light-intervention companies; and UNIDO partner companies), technical services and equipment supply chain (*independent national experts and service professionals; and equipment manufacturers and vendors*), finance community, and the policy and technical standards community (government, regulators and authorities; and technical standards community) (See also section 2).

Annex I.6 Conduct four terminal evaluations as case studies

Arepo Consult provided the team leaders for four terminal project evaluations (Sarah Rieseberg and John Newman) covering the UNIDO IEE projects in Egypt, Indonesia, Iran and Thailand to self-generate a better data-basis for the impact evaluation.

- a. **TE Egypt:** The evaluation took place from June 2018 to January 2019, with a field mission during July 30th and August 9th, 2018. Preliminary findings were discussed with staff at UNIDO head quarter (HQ) in Vienna in November 2018.
- b. **TE Indonesia:** The evaluation took place from June to November 2018, with a field mission during August 20st till 31st, 2018. Preliminary findings were discussed with staff at UNIDO HQ in Vienna in November 2018.
- c. **TE Iran:** The field mission took place in the period of June 18th to June 26th, 2018. Preliminary findings were presented to the Project Management Unit and members of the Project Steering Committee in Tehran on June 26th, 2018. The findings of the terminal evaluation were discussed with staff at UNIDO HQ in Vienna in December 2018, leading to a final report in February 2018.
- d. **TE Thailand:** The field mission took place in the period of May 30th, 2018 to June 8th, 2018. The findings were discussed with staff at UNIDO HQ in Vienna in December 2018, leading to a final report in January 2019.

Annex I.7 Expert Survey

An expert survey was conducted to collect expert opinions on whether a transformation of the industrial energy efficiency market was observed in the relevant intervention countries and whether UNIDO's IEE projects had a relevant impact contributing to this development. The survey was designed to help answer the following evaluation questions: **Q1a) Have the projects influenced market transformation, Q2a) What are the factors affecting the achievement of impacts (positive and negative, intended and unintended).**

Twelve UNIDO IEE intervention countries participated in the survey, namely Egypt, India, Indonesia, Iran, Malaysia, Moldova, Myanmar, North Macedonia, Philippines, South Africa, Thailand and Viet Nam. The target group of the survey were IEE experts in the respective country. The survey was sent out to the experts that had participated in the UNIDO expert training for whom e-mail addresses were available to the evaluation team.

Another share of experts was picked by project managers and project coordinators based on the experts' professional expertise in the industrial energy efficiency market. Project manager / project coordinator (PM / PC) picked experts from different backgrounds, e.g. government / public sector, private sector, education / academia and possibly other viewpoints.

See Annex VI and Annex VII to review the survey questions and answers.

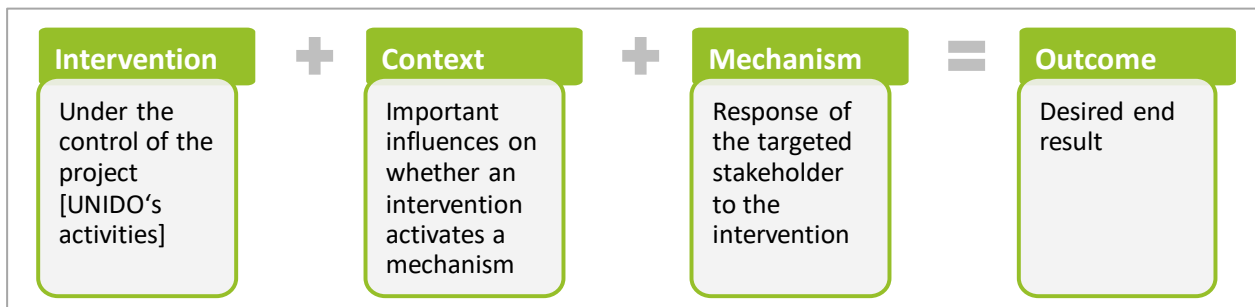
Annex I.8 Realist Evaluation (ICMO approach)

The realist evaluation approach was developed around 20 years ago by Pawson and Tilley.⁴ The method is used to evaluate the impact of a project as it opens up the black box between intervention activities and outcomes and answers the question „*How and why does the project work or not work,*

⁴ Pawson / Tilley (1997).

for whom and in what circumstances?." The analysis method displays the linkages between interventions, the mechanism that cause an intervention to work or not to work in its specific context and the resulting outcomes. Figure 1 shows the logic chain between UNIDO's projects' activities (**I - Intervention**), important contextual influences that are not under the control of the project (**C - Context**) and the response of the targeted stakeholder to the intervention activities (**M - Mechanism**) leading to the desired end result (**O - Outcome**). In the report, this methodology is therefore called the ICMO-analysis.

Figure 1: Intervention-context-mechanism-outcome logic chain



Source: own graph.

As a first step, the project team developed **7 ICMO statements** related to the different stakeholder groups determined in the TOC, an additional ICMO was added for gender equality (Figure 2).

Each of these statements contains different UNIDO intervention activities addressing the particular stakeholder group. The contextual influences that could be important for the projects' outcomes were taken from the barrier analysis and the TOC (external market factors). The ICMO outcomes are based on the intermediate, the higher-level outcomes and the impacts from the TOC.

Textbox 1: Example of an ICMO statement – ICMO statement #1

ICMO-1 includes as **UNIDO's interventions** that target '**deep-intervention companies**' or so-called '**pilot companies**' i) *in-depth training interventions for partner companies*, ii) *UNIDO's assistance with the implementation of EnMS and SO* (incl. formulation of case studies), iii) *technical assistance to partner companies in formulating business cases and accessing external financing* and iv) *the conduction of energy audits and needs assessments under the surveillance of UNIDO*.

Contextual factors which may be relevant are political or economic circumstances or the motivation of the partner companies to use evidence and learned skills.

The **Mechanism** is that the interventions i-iv increase the expertise of the factory staff and companies and enable them to share the learned skills and put it into practice or convinces the own company or non-intervention companies of EE measures.

Outcomes expected to be observed are

- effects within the partner companies, i.e. increased investments in EE saving measures or measurable monetary, energy or GHG emission savings, and
- roll-out to other company locations / affiliated companies and the wider economy, i.e. the roll-out of EnMS and SO in affiliated companies or the replication by other companies, increased recognition of EE implementation or increased outreach by UNIDO and companies to other companies.

Textbox 2: Example of an ICMO statement – ICMO statement #2

ICMO-2 summarizes the **UNIDO's interventions** that target **'light-intervention companies'**: i) user-training interventions (incl. creation and dissemination of resource materials supporting IEE practices / technologies / benchmarks) for light-intervention partners, ii) provision of nationally applicable evidence that implementing EE / EnMS / SO measures are beneficial / cost-effective (results documentation, case studies published, outreach measures, quick needs assessments / walk-throughs) and iii) awareness raising activities, such as workshops, study tours / knowledge exchange, peer networks, conferences, trade shows.

The ICMO #2 interventions are not free of overlaps with ICMO statement #6, where expert trainings were placed, nor overlaps with ICMO statement #3 where awareness raising activities can be found.

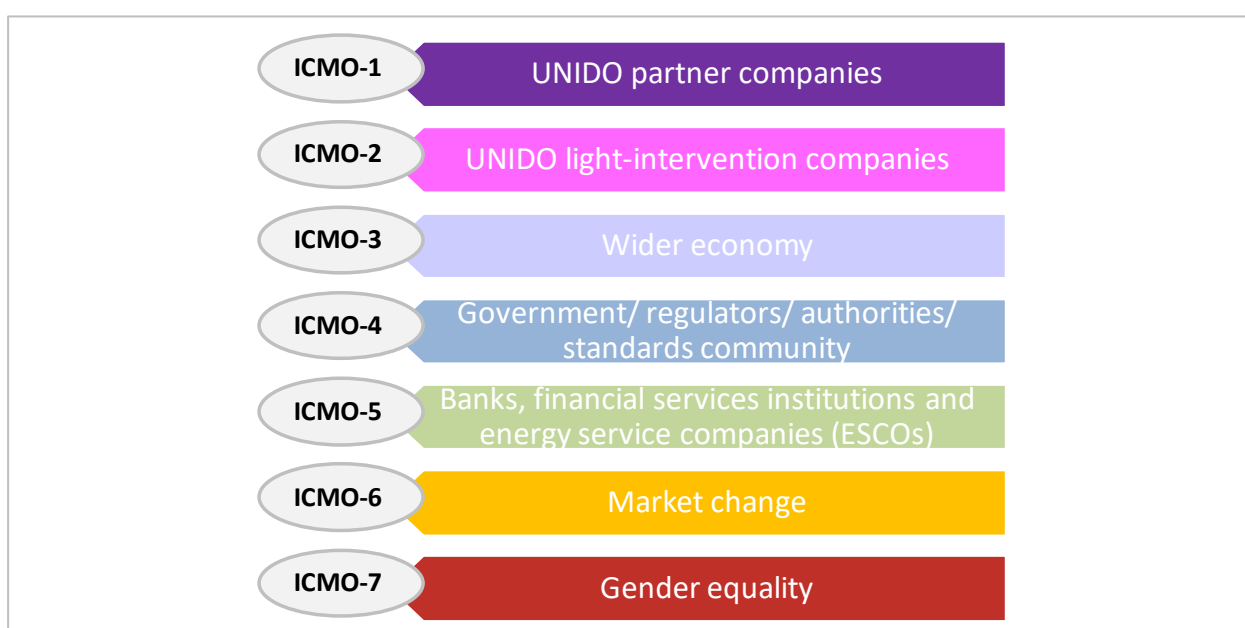
Contextual factors which may be relevant are political or economic circumstances, the motivation of the light-intervention companies to use evidence and learned skills, or the availability of financing instruments for large-scale investments and financial institutions have the necessary capacity to process loan applications.

The **Mechanism** is that the interventions i-iii may increase the expertise of the factory staff and companies and enables them to share the learned skills and put it into practice, or it may spark an eye-opener in which light-intervention companies see the benefits of EE / EnMS / SO.

Outcomes expected to be observed are

- effects within the light-intervention companies, i.e. increased investments in EE saving measures; measurable monetary, energy or GHG emission savings; increased demand for EE services or EE equipment; higher competitiveness of light-intervention companies; and economic growth and macroeconomic rebound effects.
- roll-out to other company locations / affiliated companies and the wider economy, i.e. the roll-out of EnMS and SO in affiliated companies or the replication by other companies, increased recognition of EE implementation or increased outreach by UNIDO and companies to other companies.

Figure 2: ICMO statements developed by the evaluation team



Source: own graph.

After the development of the ICMOs, they were tested, and evidence was collected from 13 terminal evaluations and one mid-term evaluation of the IEE project portfolio. Table 32 lists the project countries considered for the analysis. According to the evidence found, the ICMO statements were revised in an iterative process, adding, for example, additional contextual influences or outcomes. Containing the evidence collected from the projects' evaluation reports for each of the ICMO-statements, the coding matrices clarified which interventions in which projects have been linked to which outcomes in which contexts. ICMO statement #1 was the only ICMO statement where the TEs included a sufficient number of outcome statements to carry out a proper analysis. The overall results are summarised on the portfolio level (Annex II.2) and are used to answer evaluation question **1a. *Have the projects influenced market transformation?*** and evaluation question **1b. *Have the projects influenced behaviour at the company or sectoral level?***

Annex I.9 Approach of the Qualitative Comparative Analysis

Qualitative Comparative Analysis (QCA) is a data analysis method for determining the causal interpretation of a data set. It is a theory-based approach that applies systematic, logic based, cross-case analysis to largely qualitative data to identify potential pathways of change. It is particularly useful in complex settings where contextual and intervention characteristics vary across cases and there are interdependencies between contextual and intervention conditions, as it can be used to identify different combinations of conditions necessary to achieve a desired outcome. In this technique, the predicting value of (qualitative or binary) indicator values – in multivariate statistical regression these would be the independent variables - for a (qualitative or binary) result – in multivariate statistical regression, these would be the dependent variables – is identified. Initially, it was planned to use QCA to answer evaluation question **3. *What is the influence of the company selection strategy?*** In this case, the dependent variable would be project success, and the independent variables would be the different project selection strategies. In the analysis, 19 IEE projects in 17 different countries have been included (cf. Table 32 in Annex VIII).

Annex I.10 Sectoral analysis according to ISIC

During the third phase of analysis, the evaluation team found out that most projects targeted specific economic sectors. For the analysis which sectors the projects most frequently concentrated on the sectors and sub-sectors mentioned in the project documents were harmonized and categorized according to the International Standard Industrial Classification of all economic activities (ISIC) of the Statistics Division of the UN Department of Economic and Social Affairs.⁵

The ISIC is the international reference classification for productive activities and is also widely used by UNIDO Statistics.⁶ Since 1948 and with its current fourth revision, ISIC is, on the one hand, an important tool for harmonizing and comparing statistical data on economic activities at the international level. On the other hand, ISIC is used by many countries to develop a classification system at national level.

⁵ UN Department of Economic and Social Affairs. Statistics Division (2008).

⁶ UNIDO (n.d. b).

Annex I.11 Analysis of ISO 50001 survey data

Annually ISO publishes the results of the ISO 50001 survey data (2017). National certification bodies are reporting the certifications they handed out to companies. The data set from 2017 covers the time period from 2011 to 2017 and includes 113 countries.

Annex II. Evidence and findings for evaluation questions

Based on the Theory of Change (Figure 3 in Volume I) the project team assumes that changes in behaviour at company or sectoral level (evaluation question 1b) that result from UNIDO's intervention are intermediate outcomes and can be observed prior to a full-scale market transformation (evaluation question 1d), this evaluation question is therefore addressed first.

Annex II.1 Evaluation question 1b: Have the projects influenced behaviour at the company or sectoral level?

To answer evaluation question **1.b Have the projects influenced behaviour at the company or sectoral level?** the project team used the following data sources:

- The four terminal evaluations that were conducted by the evaluation team (in-depth portfolio)
- 14 terminal evaluations of IEE projects that were subjected to the ICMO analysis

In the following sections the findings from the data collection are presented. A summary of the assessment follows in Annex II.1.4.

Based on the four TE case studies and the ICMO analysis the evaluation team tried in a first step to understand the output level and the extent to which UNIDO projects engaged with partner companies in so called "deep-interventions" by quantifying and comparing the **number of pilot companies** and the **number of case studies** prepared. Further on it was analysed how many **experts** were **trained** (many of which are permanent staff of factories) and how many factory staff of light-intervention companies were trained in "**user training**."⁷

In a second step the team analysed available outcome information among them **EE investment** by companies, **monetary savings** and **demand for external financing**. On impact level the evaluation analysed **energy and GHG savings data**.

Annex II.1.1 Outputs of UNIDO project engagement with companies

The number of demonstration projects and trainees was available for the four terminal evaluations conducted by the impact evaluation team itself in a coherent assessment suited for comparative analysis. The case studies were compared across the 14 evaluations through the ICMO analysis.

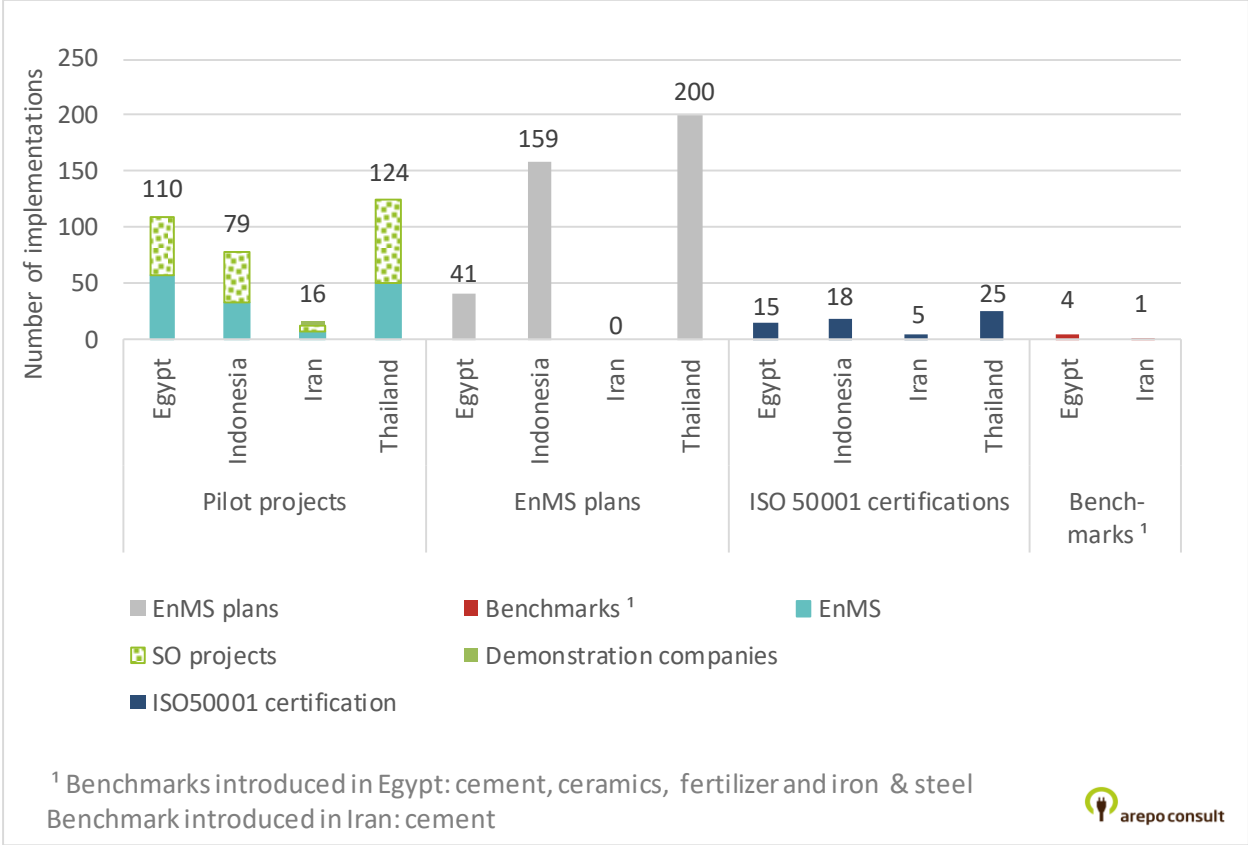
Projects carried out between 16 and 124 demonstration projects (EnMS, SO or other forms of pilot projects) (Figure 3d). If a project implemented EnMS plans, 41 to 200 plans were implemented. In two of the four evaluation case study countries, Iran and Egypt, had the project produced an economy wide energy benchmark (in the case of Iran for the cement industry, in the case of Egypt for the cement, ceramics, fertilizer and the iron and steel industry). Five to 25 of the pilot companies received an ISO 50001 certifications in the context of the project.

The ICMO analysis showed that in the case of South Africa (2016) 10 companies and in the case of Viet Nam (2015) 15 pilot companies went for certification in the context of UNIDO's IEE project.

⁷ Factory staff frequently receives light training of up to two days introduction referred to as user training.

The ICMO analysis of 14 IEE TEs showed, that as a result of UNIDO’s work with pilot companies the projects produced between 4 and 150 case studies, with a median of 20. The case studies are discussed in more detail in the market transformation section (Annex II.2).

Figure 3: Number of pilot projects in the four case study countries (Egypt, Indonesia, Iran, Thailand)

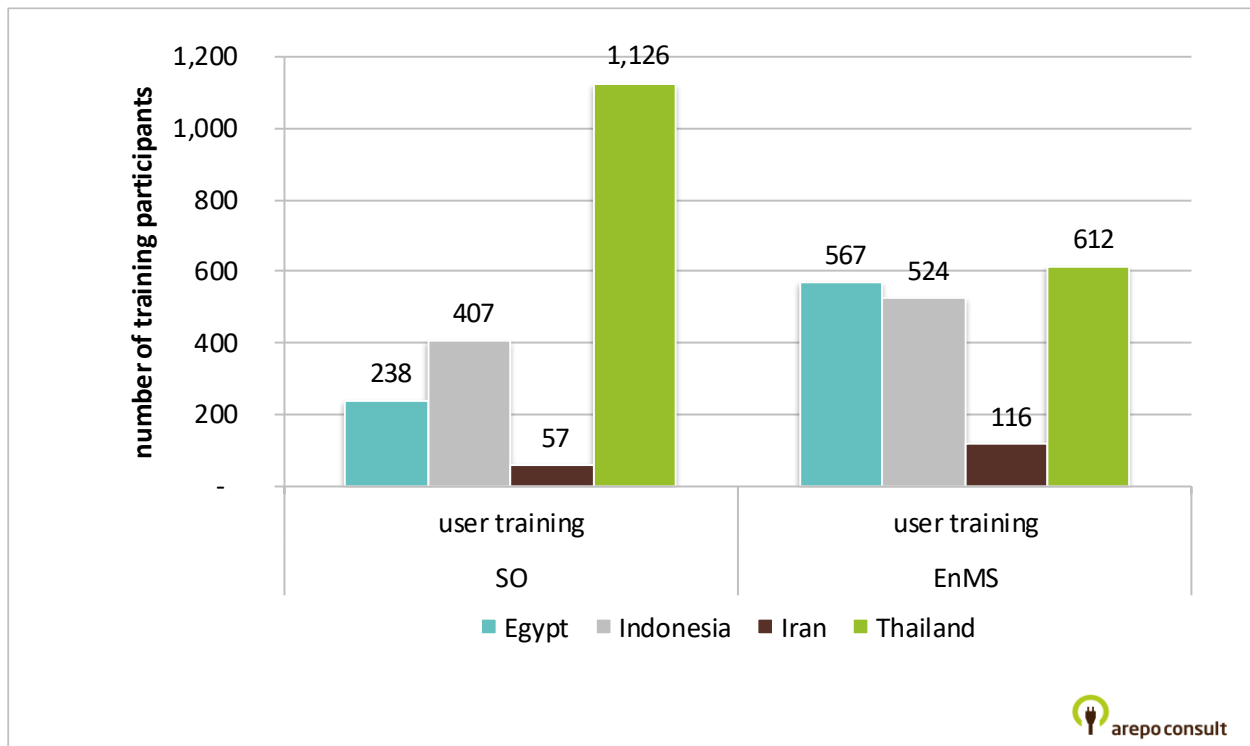


Source: Results of the four terminal evaluations (Egypt, Indonesia, Iran, Thailand).

The four IEE projects trained between 46 and 172 experts in SO and 38 to 234 experts in EnMS. The experts were located both within factories - many of them pilot companies - as well as independently active as energy consultants. The expert training is therefore discussed in more detail in the *outcome level effects section* (Annex II.2.1, Figure 12).

The comparison of the number of trainees in user trainings, showed that Thailand trained the highest number of personnel (1,126 in SO and 612 in EnMS) (Figure 4). Iran saw the lowest number of training participants (57 SO trainees and 116 EnMS trainees).

Figure 4: Number of participants in user training in the four case study countries



Source: Results of the four terminal evaluations (Egypt, Indonesia, Iran, Thailand).

Annex II.1.2 Outcome level effects resulting UNIDO project engagement with companies

On the outcome level the evaluation team analysed the EE investment by companies, monetary savings and demand for external financing.

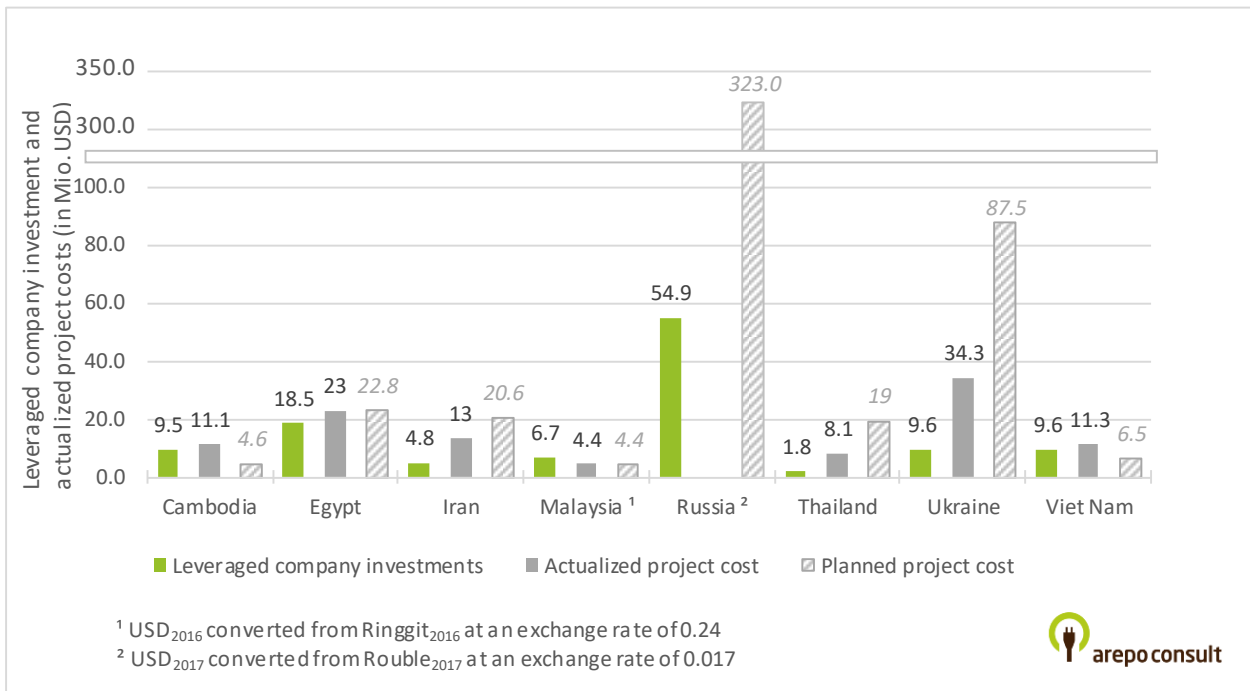
Increased implementation of EE measures

In the case of TE Ecuador the evaluators sent a survey to the companies’ executives and technical staff involved in project implementation and found that *“a large share (>89 %) of management staff, that answered the survey, consider that actions taken by the project bring medium to high impact benefits and that they are cost effective and can be sustained by companies”* (TE Ecuador: p. 24).

Investments and monetary savings of companies

At least eight terminal evaluations quantified the investments made by partner companies (Cambodia, Egypt, Iran, Malaysia, Russia, Thailand, Ukraine and Viet Nam). Reported investments ranged widely between projects: from USD 1.83 Mio. in the case of Thailand to USD 54.9 Mio. In the case of Russia. The average company investments in the eight project countries was USD 14.43 Mio., the median was USD 9.55 Mio.

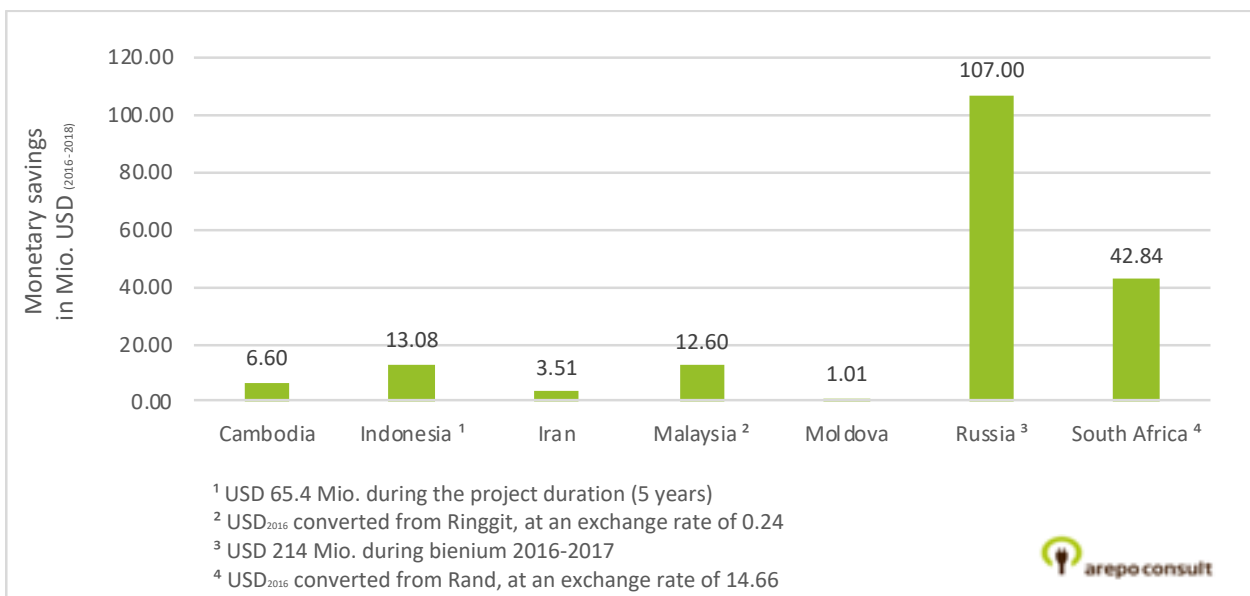
Figure 5: Company investments in EE measures per country



Source: Analysis of fourteen IEE TEs (ICMO-Portfolio).

At least another seven TEs quantify the monetary savings of the pilot projects (Cambodia, Indonesia, Iran, Malaysia, Moldova, Russia and South Africa). Reported savings range widely from USD 1 Mio. annually in Moldova, to USD 107 Mio. annually in Russia. The average monetary saving of the seven projects is USD 26.7 Mio., the median is USD 12.7 Mio. annually.

Figure 6: Monetary savings per country



Source: Analysis of fourteen IEE TEs (ICMO-Portfolio).

Demand for loans

The expected outcome of the ICMO analysis “... increased demand for EE equipment”, “... increased demand of EE services” was not reported by the TEs, this lack of observation might be an omission or a lack of follow up. In contrast the outcome of ICMO statement #1 “increased demand of loans for energy efficiency investment by partner companies” was not only not observed but at least three TEs evaluators reported that there was no need for loans:

- „The evidence so far shows limited usage of the [finance] facility by the industrial enterprises“ (TE Viet Nam: p. 17)
- „At this time, larger industrial enterprises in Cambodia have the financial resources available to implement IEE measures.“ (Cambodia: p. 44)
- „Financing through loan schemes by participating banks which were included in the project design turned out to be not relevant.“ (TE Thailand: p. 87)

The projects in Viet Nam and Thailand had planned in large shares of the project budget to make credit lines available to the pilot companies but these proved to be not necessary and were never utilized.

Where projects had institutionalized new public funds for energy efficiency financing – Egypt, Iran,⁸ Moldova - these funds had received requests for funding, but not necessarily from partner companies and not necessarily for the types of EE measures promoted by UNIDO.

Replication effect of light-house projects

Ten TEs gave anecdotal evidence of the replication of pilot projects, and one TE included evidence to the contrary (Moldova) (Textbox 3). But too little information was available to what extent or via which pathways replication of pilot projects took place. On the basis of the anecdotal evidence provided, no patterns became obvious under which circumstances replication might have worked particularly well or did not work.

⁸ In the case of Iran, the fund had received funding request but by the time of the terminal evaluation the fund had not been yet established and it was not sure whether it would be successfully set up.

Textbox 3: Anecdotal evidence of the replication of pilot projects

- “Over 10 other brickmaking companies had converted to the energy efficient rotary Hoffman kiln. Their initiative to convert came from the pilot project at Sun Rise Brick Company.” (TE Cambodia: p. 37)
- “The SIDPEC petrochemical company successfully implemented an EnMS as a Project demonstration project and rolled out training and implementation activities in other petrochemical companies. SIDPEC trained 37 representatives of six petrochemicals companies on EnMS and followed up on the implementation of EnMS in those companies under the supervision of UNIDO experts. This created the basis for a peer to peer (P2P) network that was established under the supervision of the Holding Company for Petrochemicals EICHEM.” (TE Egypt: p. 22)
- “Other than a few pilot initiatives and some energy audits or metering activities, there has been limited up take of energy efficient technologies or activities. For example, in Coimbatore, one of the better performing clusters, only about 10% of industries have taken up EE activities.” (TE India I: p. 21)
- “There were several projects (considered to be “replication” projects) offered as commercial services by national experts, either individually or through the Indonesia Energy Foundation (Yayasan Energi Indonesia, YEI). Nike was a pilot company and the experts succeeded in carrying out EnMS and Compressed Air System Optimization (CASO) along the Nike supply chain companies. Other EnMS and SO projects were carried out in Pupuk Kaltim Indonesia (a large fertilizer company) and Kwarsa Indah Murni (a glassware company).” (Case study TE Indonesia)
- “Feed-back from stakeholders was not very positive in respect to the outreach and visibility of the demonstration projects. Some of the test rig projects applied technology which was very sector specific and partially site specific. The learning and demonstration effects of these applications therefore seem rather limited. The evaluation team received anecdotal evidence of replication of two of the test rigs but could neither validate nor quantify this replication effect.” (TE Iran: p. 44)
- “By the end of the Project, another 20 factories were in the process of implementing EE measures. (...) Assessment done for these factories show that another 14,126 MWh of electricity can be saved every year, contributing to the reduction of another 9.8 thousand tons of CO₂ reduction, and there is potential to save 193 thousand GJ of thermal energy every year, and reduce 10.8 thousand tons of CO₂ emissions.” (TE Malaysia: p. 19)
- **Evidence to the contrary:** “The 3 IEE investments made in this Component did not constitute achievement of the outcome of a “broader set of case studies on IEE best practices being available in Moldova” that could facilitate a rapid rise in interest by the Moldovan industrial sector in energy efficiency.” (TE Moldova: p. 47)
- “Roll out of integrated management system, including ISO 50001 by one of the partner companies in all its 8 factories.” (TE Russia: p. 28);
- “These successfully implemented investments served to boost the awareness and confidence of other industrial SMEs in considering EE and RE measures to reduce their operational costs and increase the competitiveness.” (TE Ukraine: p. 66)
- One of the UNIDO trained factory experts carried out EnMS / SO optimization in several factory sites of a petrochemical cooperation. (Case study TE Thailand)
- “Demonstrations are being replicated successfully in other industrial enterprises.” (TE Viet Nam: p. ix)

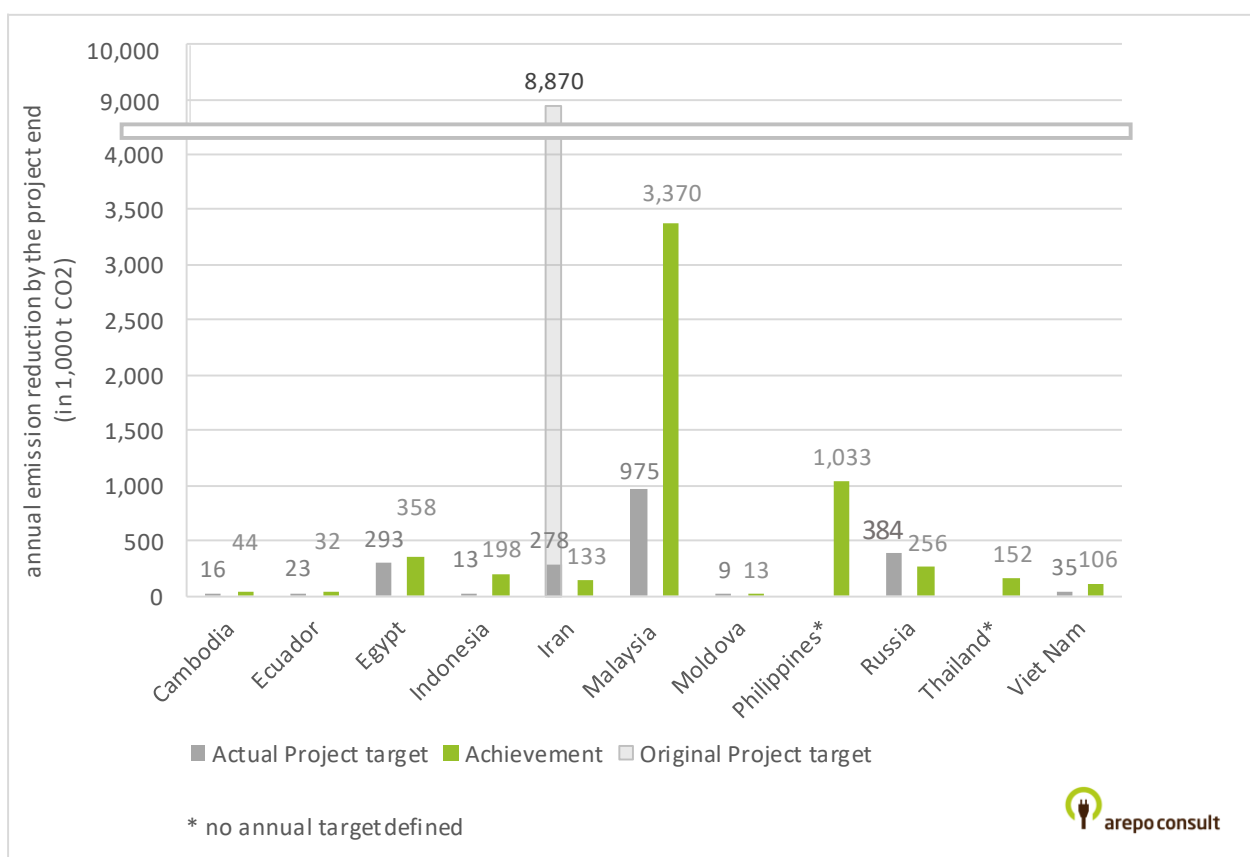
Annex II.1.3 Impact level effects resulting from changes in company behaviour

All the terminal evaluations included in the ICMO analysis stated that **interventions led to implementations of EE measures generating energy savings and GHG emission reductions.** It

can therefore be shown for ICMO statement #1, that “where UNIDO conducts training interventions for partner companies and where UNIDO assists partner companies in the implementation of EnMS and SO” “... implementation of EnMS / SO in partner companies is carried out” resulting in “measurable energy and GHG savings in partner companies.” This effect was recorded by all TE’s independently of the local context.

Where monitoring data was collected by the projects, this data shows that training and capacity building result in implementation and energy savings. Annual GHG emission reduction data⁹ was available for only eleven of the 14 TEs in the ICMO portfolio (Figure 7). Gross GHG reduction varied between 13,000 t CO₂ / a in the Moldova project and 3,370,000 t CO₂ / a in the Malaysia project. Median annual reduction was 151,600 t CO₂ / a.

Figure 7: Targets and verified gross annual GHG emissions reductions per project



Source: ICMO analysis.

However, a number of caveats apply. Overall the programme’s **GHG monitoring data was not satisfactory**:

- The projects never corrected reported savings for free-rider effects or a baseline development. All data is gross savings data (therefore overestimating net impact).
- Reported savings from companies were not extrapolated over all participating companies (e.g. by multiplying “savings / company” times “number of companies participating in

⁹ Presumably information reported with this description typically relates to reductions in the last year of project implementation.

trainings“). The data collected is merely a limited snapshot of what those companies that answered to the survey reported (therefore underestimating impact).

- Several projects did not follow up on the indirect effects, particularly the implementations following user trainings and other forms of light-interventions. This was for example the case in IEE Egypt, Moldova, South Africa (therefore underestimating impact).

The data presented in Figure 7 cannot be used for a cross project comparison or for drawing conclusions regarding the effectiveness of different project strategies. To give an example, the Thailand project has much higher numbers of users trained than the Iran project but in the latter case the effects of user training have not been followed up in the monitoring. The data does not allow for a comparison of implementation of energy efficiency measures following user trainings.

In addition, most of the emission reductions in the case of Iran result from few very large refurbishments (outside of EnMS and SO) in partner companies, while Thailand’s data is based on a large number of companies where EnMS and SO measures took place.

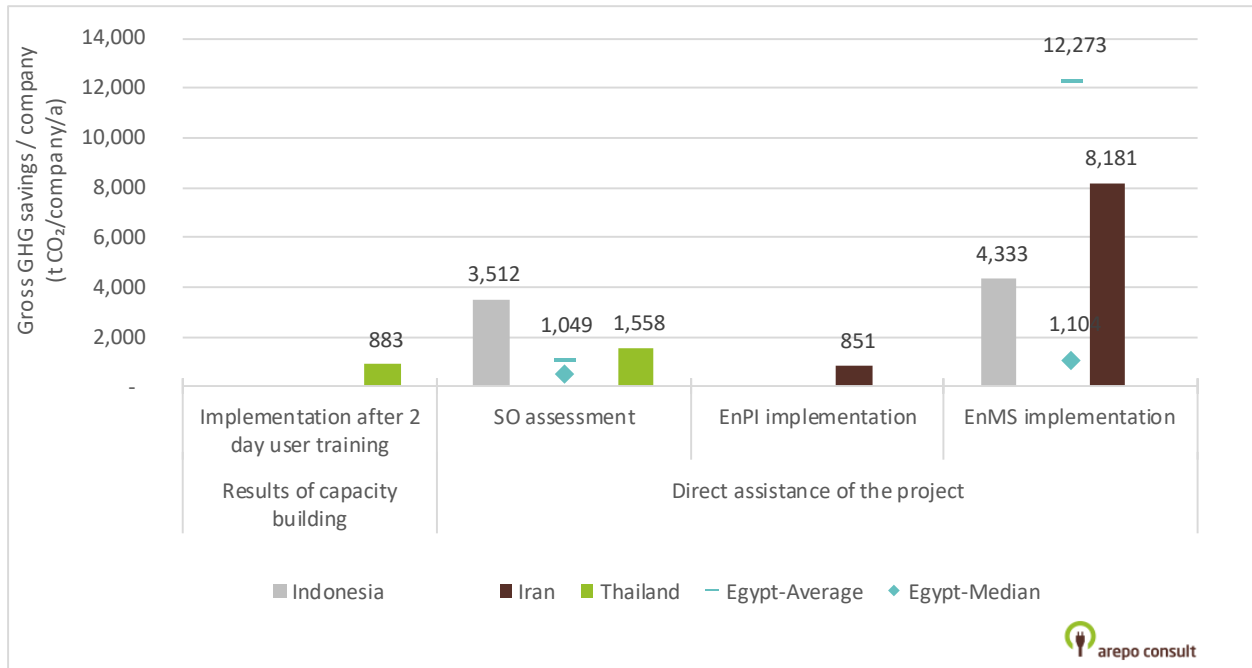
Emission reduction data was not available as per UNIDO-supported measure, per trainee or per company. Even though the indicator “per company savings” is very sensitive to the industrial structure in the host country and the sector / company size targeted by the IEE projects, this indicator at least corrects for the extreme variations in number of trainees and number of demonstration projects the IEE projects carried out. The following section shows such an indicator applied to the four case study countries.

GHG emission reductions per company

Figure 8 shows the GHG savings achieved per company in Thailand, Indonesia and Iran. The monitoring data in Thailand allows for a separate analysis of the results achieved in pilot projects that implemented project with UNIDO’s direct assistance and those that only received user training. Direct assistance in Thailand resulted in savings of 1,558 t CO₂ / company / a and capacity building resulted in savings of 883 t CO₂ / company / a. In the case of Thailand, around 29 % of the GHG-savings resulted from companies that sent their staff to user trainings.¹⁰

¹⁰ The savings estimations are most likely conservative since some companies failed to reply to the monitoring survey and no extrapolation took place.

Figure 8: GHG emissions resulting from direct assistance to companies and from capacity training (user trainings) for four case study countries

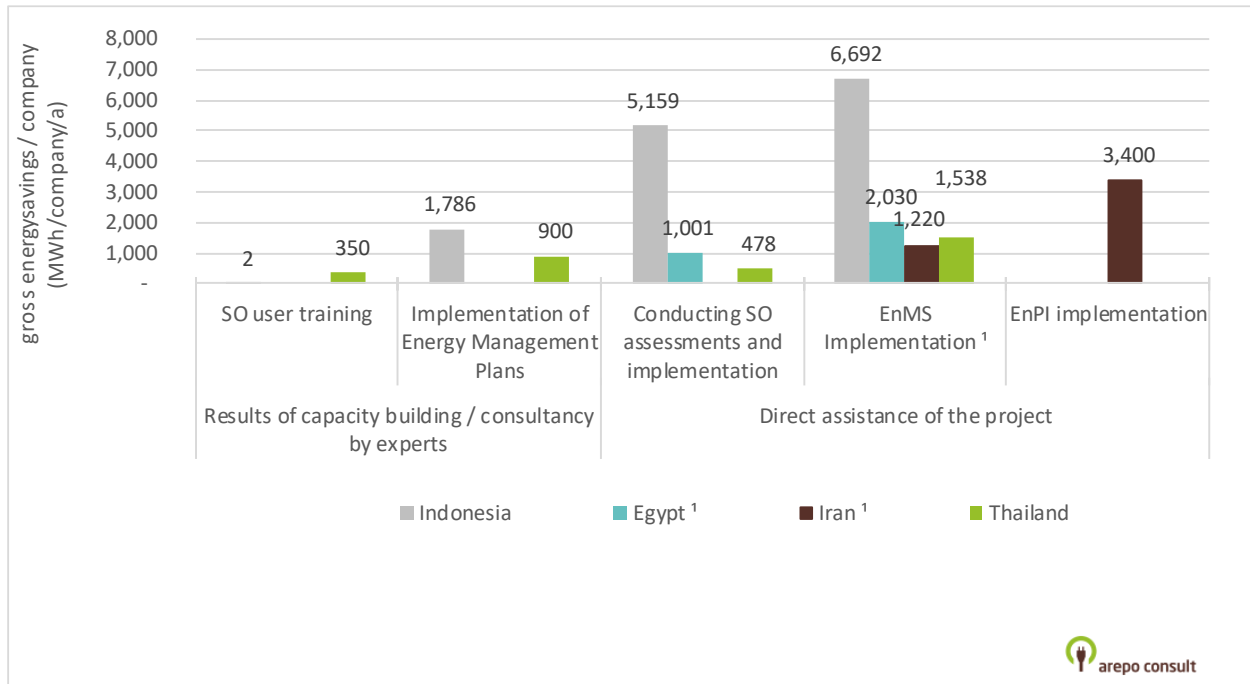


Source: own graph.

Energy savings per company

Figure 9 shows the energy savings (in MWh) per company and per topic from the Thailand project. The figure distinguishes between the results achieved from companies which received direct project assistance in comparison to energy savings from companies with capacity building only. Companies that implemented an Energy Management Plan following training achieved savings of 900 MWh / and companies that sent staff to SO trainings reported savings of 350 MWh. On their own, the companies which implemented an EnMS achieved savings of about 73 % of the saving that were achieved in assisted companies. For SO, capacity building-only resulted in 59 % of the savings in comparison to companies that were assisted in SO by UNIDO.

Figure 9: Gross energy savings resulting from direct assistance to company and from capacity training (user trainings) for four case study countries



Source: own graph.

Annex II.1.4 Summary of evaluation question 1b

Overall, the analysis undertaken to address **1.b Have the projects influenced behaviour at the company or sectoral level?** indicates that UNIDO did contribute to behavioural change of companies.

On output level UNIDO supported up to 124 pilot companies per country. Up to 25 of the country pilots continued to receive ISO 50001 certification. Up to 200 companies per country implemented Energy Management Plans. Based on data from six projects, the pilot companies invested per country on average USD 14.43 Mio. (with a median of USD 9.55 Mio.) A portfolio of seven TEs concluded that the median monetary savings amounted to USD 12.6 Mio. annually.

In the four case study countries, projects trained between 38 to 234 experts in intensive courses, of which many were employed factory staff. The number of trainees is comparatively small given the large scale of the projects and the major focus on training within the UNIDO projects.

Experts frequently produced the case studies published about the demonstration projects (a median of 20 case studies was published by projects.)

In addition, projects have trained several hundred factory staff working at companies in user trainings. Many of the factories have reported back to the UNIDO teams that they have also achieved savings. In the case of Thailand, their achievements were between 59 % and 73 % of the savings that were achieved by the deep interventions in pilot companies.

All projects could report energy and GHG savings resulting from their interventions and projects reported a median annual GHG emission reduction of 151,600 t CO₂ / a. Improved monitoring would probably result in overall higher registered savings. Unfortunately, at the current level of monitoring

these GHG data is not showing the full picture of project achievement and do not allow for cross-project comparisons.

Annex II.2 Evaluation question 1a: Have the projects influenced market transformation?

To address evaluation question **1a Have the projects influenced market transformation?** the project team used the following data sources:

- Analysis of 14 terminal evaluations / ICMO analysis
- Conducting four terminal evaluations in case study countries
- ISO 50001 global survey data to provide context for UNIDO projects
- An expert survey

In the following sections the findings from the data collection are presented. The section is organizing the findings along 1) output and 2) outcomes. It is subdivided along the individual stakeholder groups identified in the Theory of Change (Figure 3 in Volume I):

1. Outputs of UNIDO project's awareness raising and capacity building (awareness raising activities and experts trained)
2. EE market changes observed in UNIDO intervention countries:
 - Outcomes of awareness raising activities among the wider economy
 - Outcome level changes among industry: mainstreaming of ISO 50001
 - Outcomes of capacity buildings of EE experts offering EE services / independent consultants,
 - Outcomes of interventions with the financing community,
 - Outcomes of interventions with the policy and technical standards community,
 - External Factors,
 - Overall observed market development and UNIDO's impact on IEE market development in individual project countries
3. Summary

The project team understands the term "market transformation" to have the same definition as "mainstreaming" or "market change" have within GEF literature (cf.).

Textbox 4: Terminology on adoption of promoted practices outside of the project

Market change: GEF-supported initiatives help catalyse market transformation by influencing the supply of and / or demand for goods and services that contribute to global environmental benefits. This may encompass technological changes, policy and regulatory reforms, and financial instruments.

Mainstreaming: Information, lessons, or specific results of GEF are incorporated into broader stakeholder mandates and initiatives such as laws, policies, regulations, and programmes. This may occur through governments and / or through development organizations and other sectors.

Source: GEF (2017).

According to this definition, market change is expressed in changes in demand and supply structures, in this case, for energy efficiency practices, equipment, technologies, financing and services. This can provide the way for further adoption of the practices and technologies in the sense of broad adoption as a standing industry practice. Mainstreaming in the sense of the GEF definition is limited to

including energy efficiency practices and technologies into “*broader stakeholder mandates and initiatives such as laws, policies, regulations, and programmes.*” In the UNIDO programmes, this is one of the expected outcomes of the work with policy makers, and thus an aspect of market change.

Unfortunately, a systematic analysis of the market for energy efficiency practices, equipment, technologies, financing and services is not part of the standard process of developing a UNIDO project. In several cases, there was already a market for energy auditors or certification schemes. Building on such a market should be easier and faster than creating these services from scratch.

While the UNIDO projects work towards establishing and improving a community of (freelance and within-company) energy experts and advisors, the projects’ monitoring does not track whether there is a demand for these services. Energy efficient equipment is even less of a focus of UNIDO projects.

Generally, UNIDO projects build markets through their barrier removal activities, including awareness raising, skill building in expert workshops, providing financing options and supporting changes in policy frameworks. These are implemented in varying depths in the projects, and lead to different levels of success.

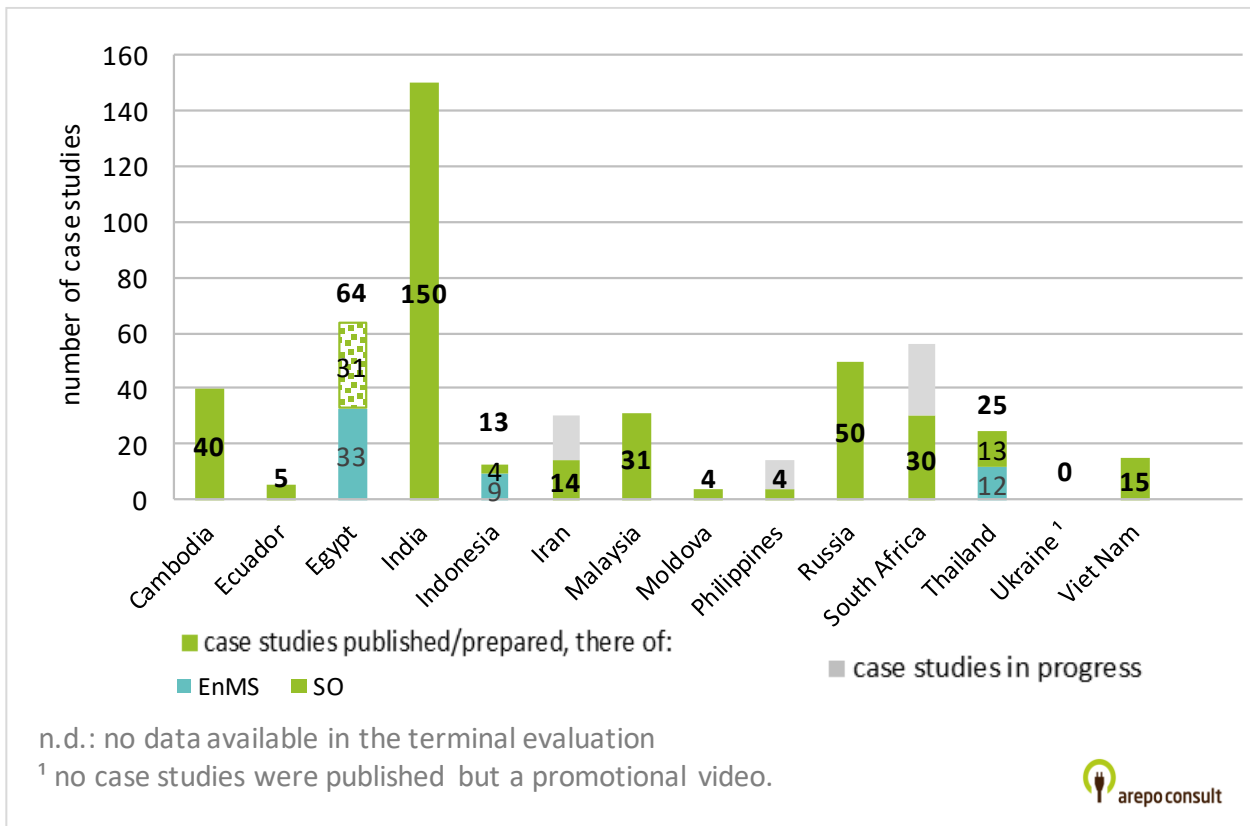
Annex II.2.1 Outputs of UNIDO project’s awareness raising and capacity building

The ICMO analysis (ICMO statement #3-wider economy) showed that projects engaged in similar activities to create awareness of EnMS and SO and disseminate information among industrial companies.

- All **14 projects** in the portfolio had a project **website**.
- **Thirteen projects** prepared / published **case studies** (Ukraine published a video of pilots instead of case studies).
- At least **eight projects** participated in **trade shows** and **conferences** or prepared **awareness workshops** (Indonesia, Iran, Malaysia, Moldova, Philippines, Russia, Thailand, Ukraine).
- At least **six projects** implemented a **national awareness campaign** (Egypt, Iran, Malaysia, Philippines, Russia, Viet Nam).
- At least **six projects** implemented an **award** or **recognition scheme** for companies (Egypt, Iran, Malaysia, Philippines, Thailand, Viet Nam).

For most projects the preparation / and publication of case studies was reported in the TEs. The number of case studies varied between 4 and 150, with a median of 20 (compare Figure 10).

Figure 10: Number of case studies prepared / published per project



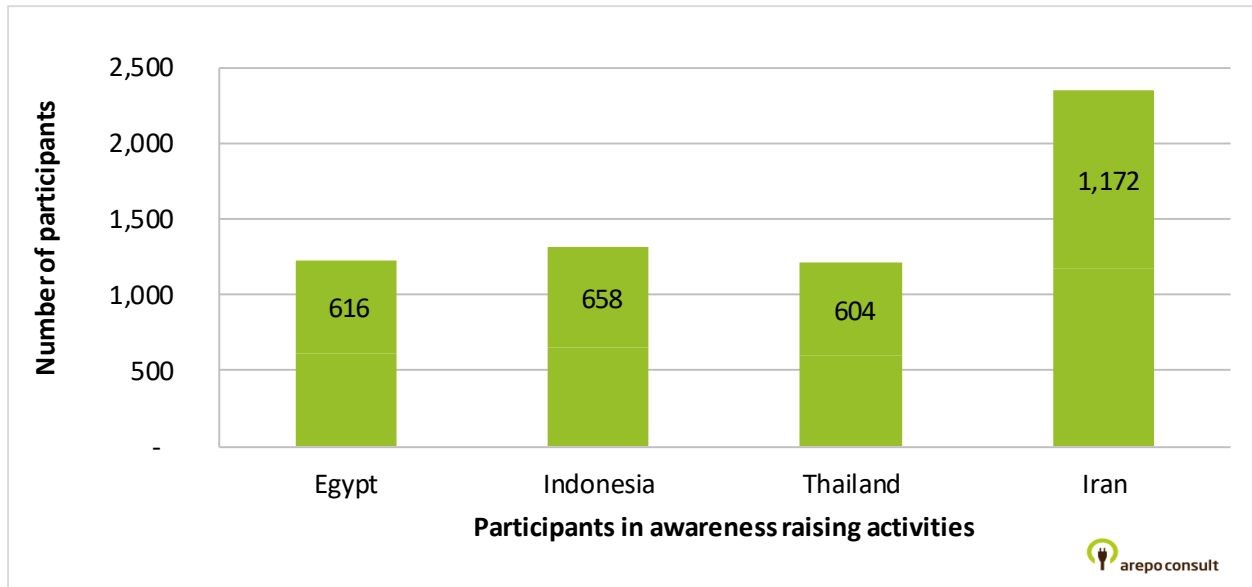
Source: Analysis of fourteen IEE TEs (ICMO-Portfolio).

Participants in awareness activities

Only for the terminal evaluations conducted by the impact evaluation team itself, could the impact evaluation collect the number of participants in awareness raising activities (Figure 11). Participants in face-to-face awareness raising workshops, seminars and events varied between 300 in the case of Egypt and 1,400 in Indonesia.

For the case of Russia, the TE reports, that a nationwide webinar training on EnMS and ISO 50001 recorded 25,000 participants.

Figure 11: Number of participants in awareness raising activities of four IEE projects

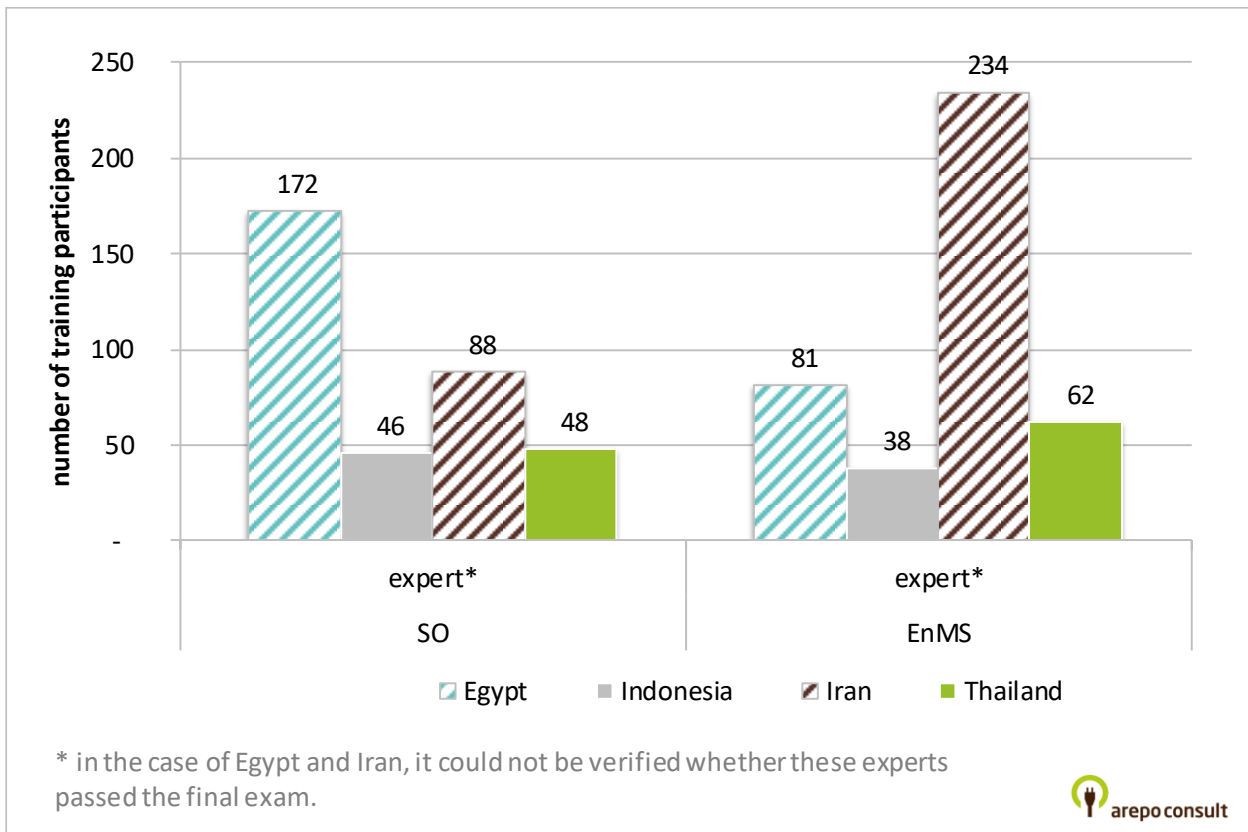


Source: own graph.

Expert trainings

All of the IEE projects in the portfolio engaged in the training of national experts both among factory staff as well as independent consultants. Only for the terminal evaluations conducted by the impact evaluation team itself, could the number of experts trained be accurately collected (Figure 12). In the four case study countries between 44 and 172 experts were trained in SO and 25 to 81 experts in EnMS.

Figure 12: Number of experts trained in EnMS and SO of four IEE projects



Source: own graph.

Annex II.2.2 EE market changes observed in UNIDO intervention countries

The following sections summarize the outcomes of the barrier removal pathway identified in the Theory of Change which addresses the entirety of market stakeholders including the wider economy of industrial companies, the EE service and supply chain, the financing community and the policy and technical standards community (compare Figure 3 in Volume I).

Neither the four case study evaluations carried out by the evaluation team, nor the ICMO analysis based on the TE portfolio provided a satisfactory amount of data for evaluation question 1a **Have the projects influenced market transformation?** Therefore, an expert survey was conducted. A complete overview of the survey can be found in Annex VI and Annex VIII. The expert survey included seven questions inquiring about changes in the state of the EE market the experts had observed in the previous five years, paired with questions of UNIDO’s importance for these changes.

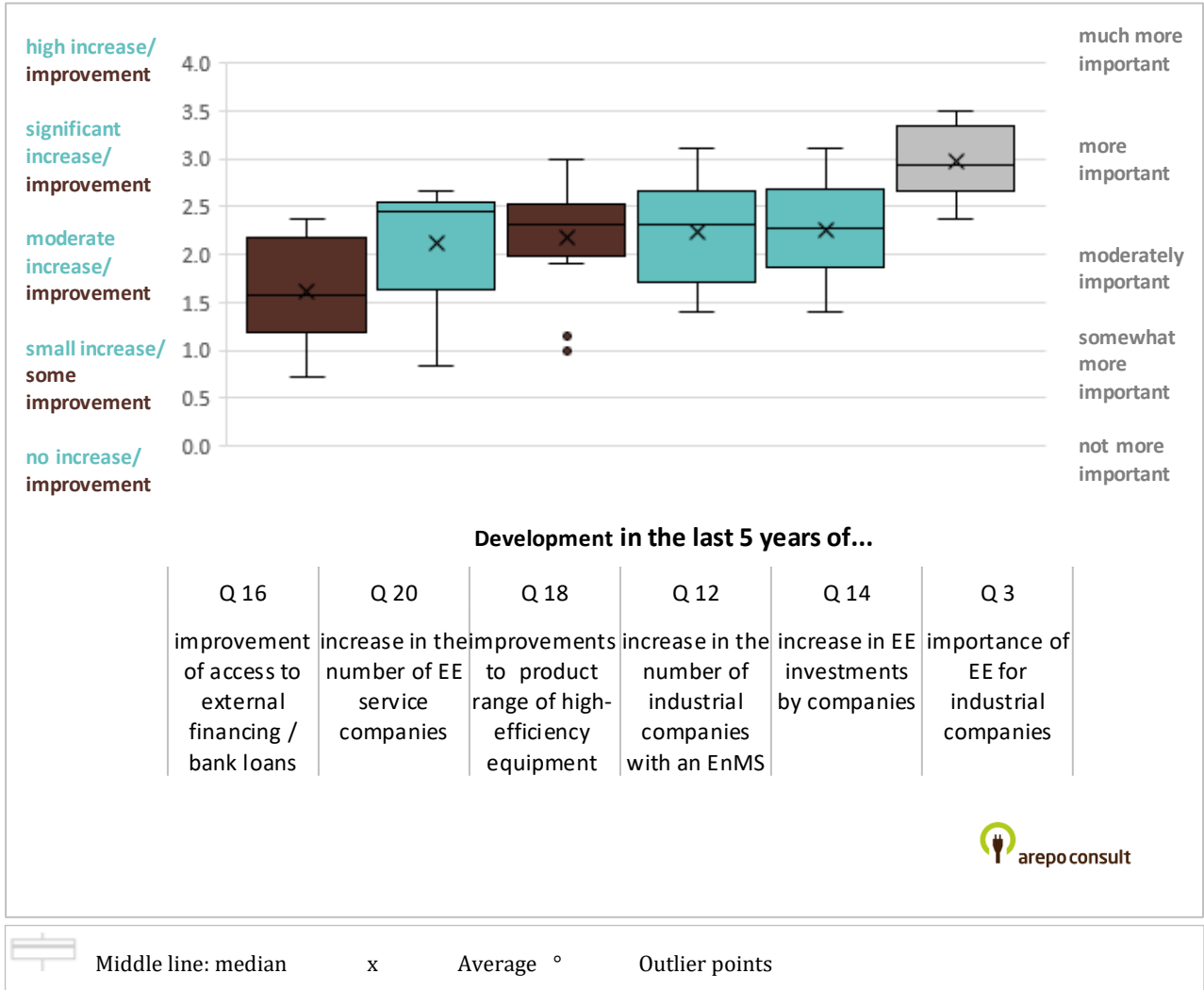
The questions ask for and assessment of changes in:

- i) the overall importance of EE for industrial companies (survey question 3),
- ii) the effectiveness of policy instruments introduced by the government to foster IEE (survey question 7),
- iii) the number of industrial companies with an EnMS (survey question 12),
- iv) companies' investments in EE (survey question 14),
- v) access to external financing or bank loans for EE investment (survey question 16),
- vi) improvements to the product range offered by vendors of high-efficiency equipment (survey question 18),

- vii) the number of companies providing EE services (e.g. consultancy services, energy audits, in-house visits) (survey question 20).

Figure 13 presents the assessments of the energy efficiency experts regarding changes of the markets for energy efficiency services and technologies as a boxplot diagram.

Figure 13: Expert survey: Spread of country averages of observed market changes in the previous five years



Source: own graph.

Figure 14 shows the average country ratings for the importance of UNIDO for the various observed market changes as a boxplot diagram.

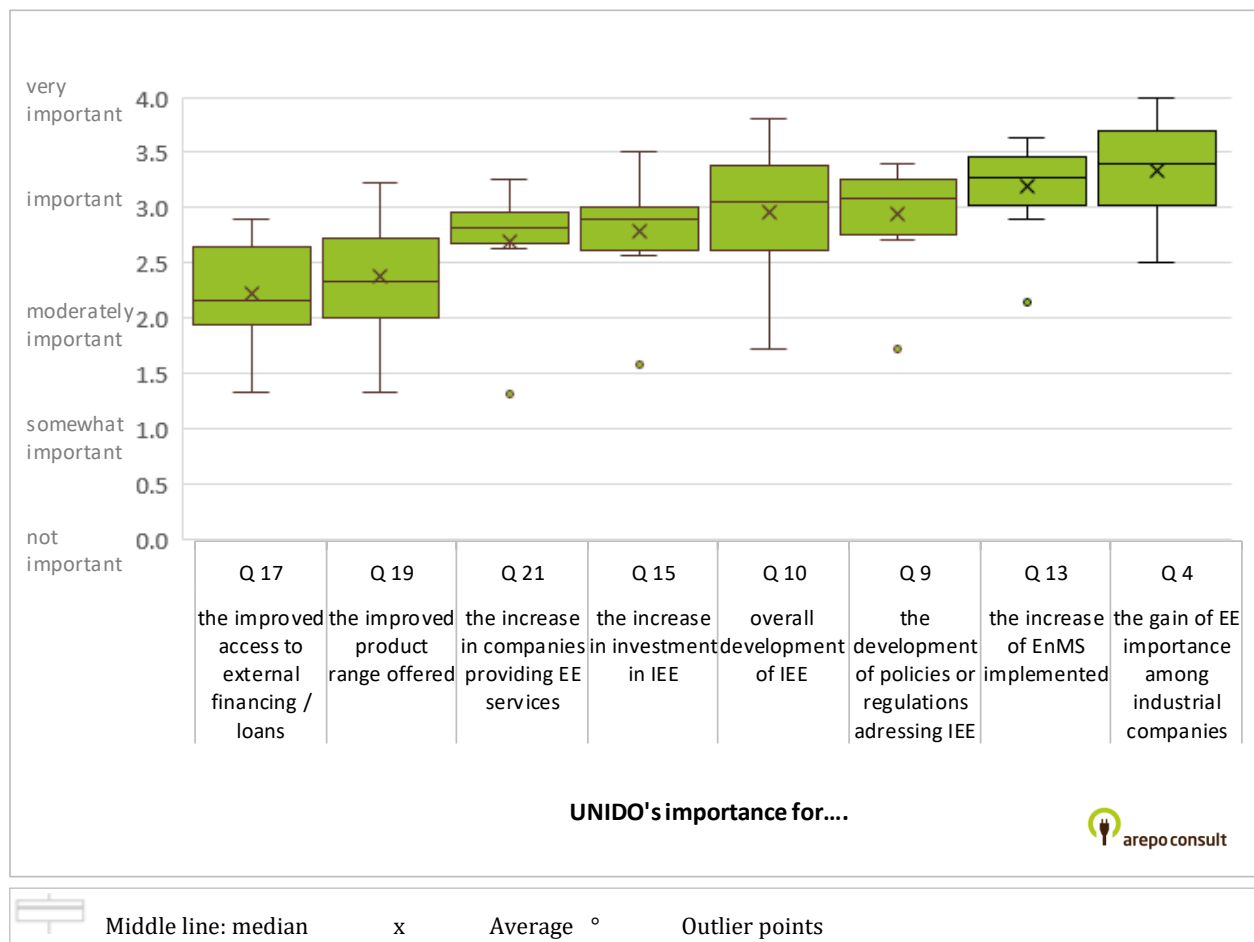
The questions ask for an assessment of UNIDO's importance for:

- a) the increase in importance of energy efficiency for industrial companies (survey question Q 4),
- b) the development of the policies or regulations addressing IEE (survey question Q 9),
- c) the increase of energy management systems (EnMS) implemented (survey question Q 13),

- d) How important was UNIDO's project to the increase in investment in IEE (survey question Q 15),
- e) the improvement of access to external financing or loans (survey question 17),
- f) the improvement of the product range offered (survey question 19), and
- g) the increase in companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits) (survey question 21).

It should be noted that that all respondents were directly involved in the UNIDO project so that this answer needs to be considered somewhat biased. Further on, the projects in South Africa, Myanmar and India as well as North Macedonia were ongoing at the time of the survey, which might affect their ratings. The project in Myanmar started in 2014, the second IEE projects in India and South Africa both started in 2015.

Figure 14: Expert survey: Spread of country averages of ratings of UNIDO's importance for key developments of the EE-Market



Source: own graph.

Outcomes of awareness raising activities among the wider economy

There was little to no tracing of the outcomes of the awareness raising activities. Though all projects reviewed had established a project website, none of the evaluations reported on the downloads of case studies or the websites' visitor traffic. Some of the websites, e.g. IEE website Malaysia, were no longer available after the project ended. Most TEs did not quantify the effects of the awareness campaigns and award schemes. Some of the TEs provided qualitative statements of the possible impact, such as MTE India, TE South Africa and TE Viet Nam:

- *“Energy audits and the discussion and dissemination of the audit findings have increased awareness and demand for energy management within industries” (MTE India: p. 21).*
- *“The project played a leading role in building a consciousness around, and ability to implement, energy efficiency in the country. A systemic change has not occurred and significant opportunities to implement energy efficiency in industry still need to be taken up, but the project has played the most significant role in enabling that change” (TE South Africa: p. 47).*
- *“Ownership, awareness and capacity built within government agencies and industrial enterprises are likely to continue to shape attitudes and behaviours in the long term.” (TE Viet Nam: p. 16).*
- *“Awareness on energy efficiency has only been partially developed. It was increased only among stakeholders that were directly involved in project implementation” (TE Ecuador: p. 32)*

In the expert survey, responders observed that overall, energy efficiency had become “more important” for industrial companies (Q 3, rating: 3.0). Experts were asked to rate UNIDO's importance for the observed market changes. The overall question Q 4 *“How important was the UNIDO project for gain of EE importance among industrial companies”* received the highest average rating (rating: 3.3).

Experts were also asked, what would remain after the UNIDO project's closure (Q 22, Figure 41 in Annex VI). For this question it is noteworthy that availability of information material ranked second lowest, which might indicate that the case studies are not receiving the widespread dissemination they are intended for.

Outcome level changes among industry: EE investment and EnMS implementation

On average the experts observed only moderate increases / improvements for the more specific changes in market conditions, including *EE investment* (Q 14, rating: 2.3) and *EnMS implementation* (Q 12, rating: 2.2) (Figure 13).

According to the country averages, UNIDO's project was important for *EnMS implementation* (Q 13, rating: 3.2), the *overall development of IEE* (Q10-rating: 3.0), and the *increase in EE-investment* (Q 15, rating: 2.8).

The spread of country averages (Figure 14) shows that the experts' opinion for Q 10, UNIDO's *importance for overall development of IEE*, showed the widest spread. Iran and South Africa had the lowest and Myanmar and India the highest ratings. The outlier for questions Q 13 and Q 15 is Iran.

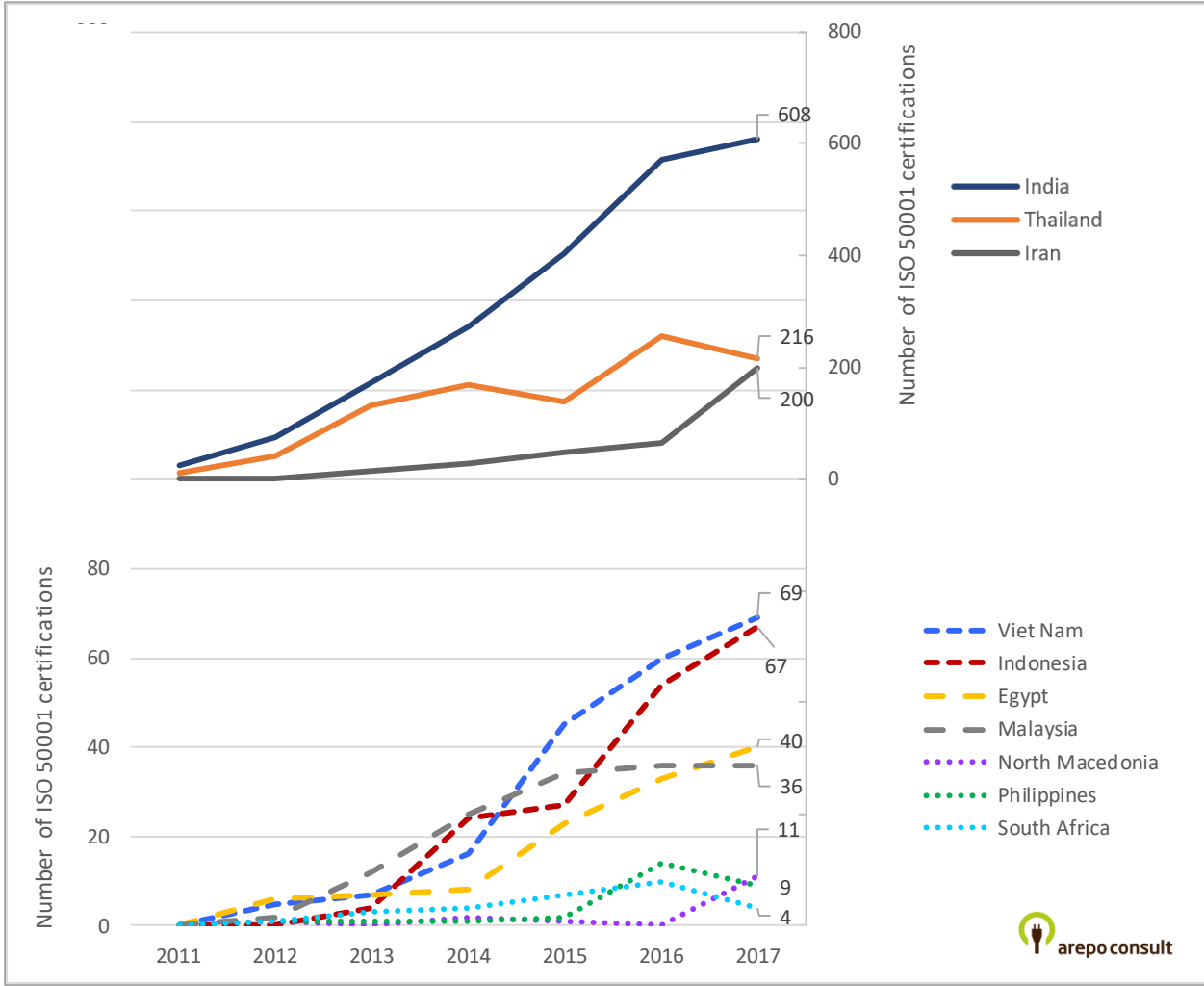
Outcome level: mainstreaming of ISO 50001

The project team analysed the ISO 50001 global survey data (2017) to assess whether ISO 50001 was becoming more widespread in UNIDO intervention countries.

As shown in Figure 15 the number of ISO 50001 certifications have continuously increased in most of UNIDO’s intervention countries. Exceptions have been South Africa, the Philippines and Thailand where certifications have dropped in 2017, which might be an effect of companies having waited for the new ISO 50001 version being published in 2018.

The number of certified companies has increased to very different degrees and seemingly independently of the size of the industrial sector of a country. Top runners are India, Thailand and Iran (200-608 certified companies). Viet Nam, Indonesia, Egypt and Malaysia form the middle field (36-69 certified companies). North Macedonia, Philippines and South Africa lag behind (4 to 11 certified companies).

Figure 15: Development of ISO 50001 certifications in UNIDO intervention countries covered by the impact evaluation survey



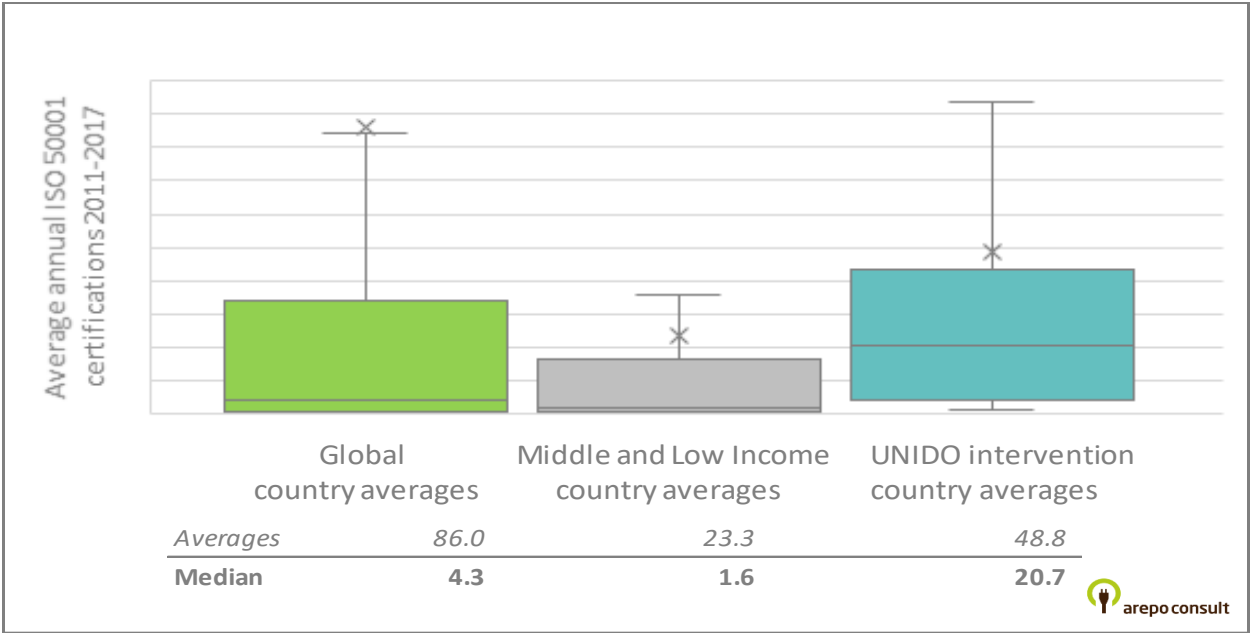
Source: own graph bases on ISO 50001 survey.

TEs provide findings that in some countries a significant share of ISO 50001 certifications had been carried out in the context of the IEE project: In the case of South Africa all companies (10 out of 10 in 2016), in Egypt 38 % (15 out of 40 in 2017), in Viet Nam 33 % (15 out of 45 in 2015) and in Thailand 10 % (25 out of 255 in 2016) of all certified companies in the country had received their certification

in the context of UNIDO’s IEE project. In other countries such as Indonesia, Ukraine or Iran the contribution of the IEE project to certification was not as strong.

The analysis of ISO 50001 survey data (2011-2017) shows that in the period 2011 to 2017 UNIDO intervention countries had a median number of certified companies per year of 20.7 whilst global medians were 4.3 and median of low- and middle-income countries were 1.6) (Figure 16).¹¹

Figure 16: Average / median annual number of ISO 50001 certifications (global, low- & middle-income countries and UNIDO intervention country averages)



Low- & middle-income countries according to World Bank Country groups definition.

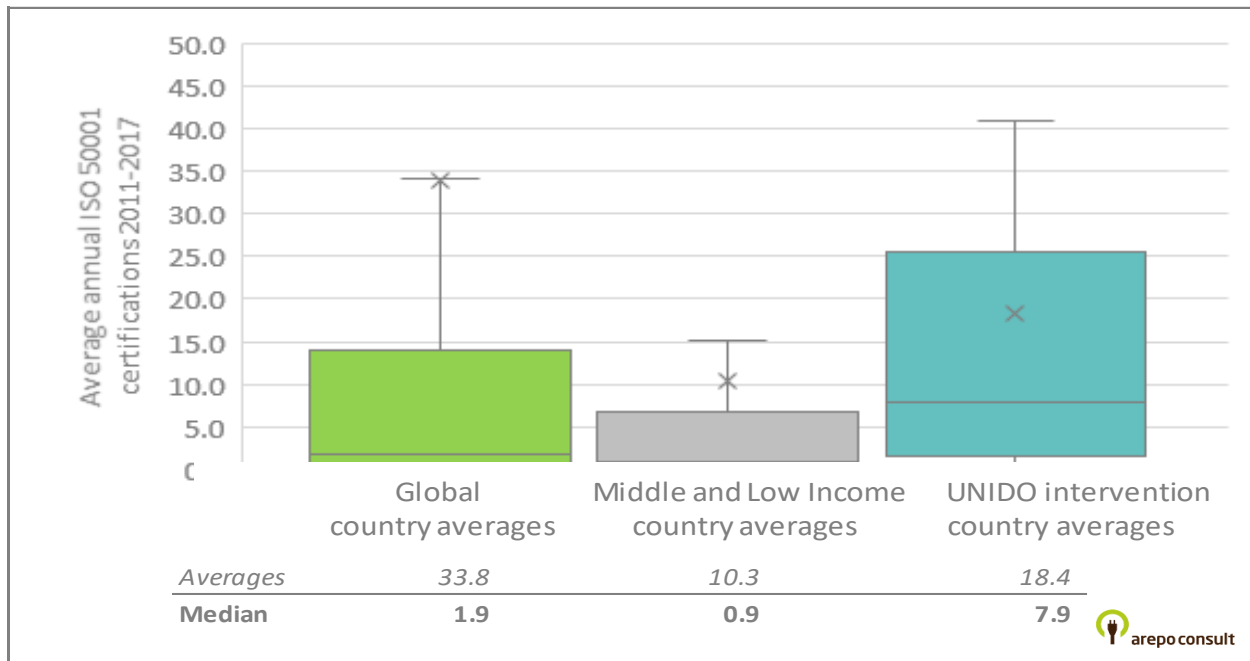
UNIDO intervention countries: Cambodia, Colombia, Ecuador, Egypt, India, Indonesia, Iran, Malaysia, North Macedonia, Philippines, Russian Federation, South Africa, Thailand, Ukraine and Viet Nam.

Source: own graph.

UNIDO intervention countries had a median annual increase in certifications of 7.9 whilst global median increase was 1.9 and median of low- and middle-income countries was 0.9) (Figure 17). By 2017, in UNIDO intervention countries a median of 40 companies were certified, whilst the median in low- and middle-income countries was 10 and globally it was 32.

¹¹ It is necessary to use the median, because countries like Germany or the United Kingdom, with very strong legislation to back up certification or particularly large countries like India and China distort the averages significantly.

Figure 17: Average annual change in the number of ISO 50001 certifications (global averages, low- & middle-income country averages, UNIDO intervention country averages)



Low- & middle-income countries according to World Bank Country groups definition.

UNIDO intervention countries: Cambodia, Colombia, Ecuador, Egypt, India, Indonesia, Iran, Malaysia, North Macedonia, Philippines, Russian Federation, South Africa, Thailand, Ukraine and Viet Nam.

Source: own analysis based on ISO 50001 survey data.

Outcomes of capacity buildings of EE experts offering EE services / independent consultants

The monitoring of the development of the EE service and supply chain has been among the weakest aspects of the projects' monitoring. Though capacity building is at the centre of UNIDO's strategy little is known what happens to the trainees or what kind of savings they achieve. Many projects did not follow up on the effects of expert trainings.

Even if evaluators could not systematically assess or quantify the effect of training of experts and factory staff, many made qualitative assessments, the basis of which is often unclear:

- *“High rate of adoption of IEE measures and technologies throughout Cambodia” (TE Cambodia: p. 31)*
- *“Transitions in Micro, Small and Medium Enterprises (MSME) in the clusters from energy inefficient to more energy efficient is evident” (MTE India: p. 18)*
- *“The Project was successful in creating a cadre of trained EE professionals in industrial facilities, public and private sector experts and suppliers of technology to provide services on EnMS and optimization of industrial systems” (TE Malaysia: p. 18)*
- *“Abundance of positive feedback regarding its training activities and the benefits to participating industrial enterprises that has resulted in requests for further training and technical assistance” (TE Philippines: p. 43)*

- *“The interviewees stated that overall, energy efficiency was gaining more widespread attention in Thailand and also, industrial demand for energy efficiency services and the number of consultants offering those services was growing steadily.” (TE Thailand: p. 47)*

Some TEs could provide anecdotal evidence of activities of trained independent consultants:

- *“In addition, there were several projects (...) offered as commercial services by national experts, either individually or through the Indonesia Energy Foundation (Yayasan Energi Indonesia, YEI) – e.g. EnMS and Compressed Air System Optimization (CASO) for Nike supply chain companies, EnMS and Pump System Optimization (PSO) for Pupuk Kaltim Indonesia (a large fertilizer company) and CASO for Kwarsa Indah Murni (a glassware company).” (TE Indonesia: p. 30)*

In the expert survey, responders observed only moderate increases / improvements in the EE market in respect to the *range of high-efficiency equipment* (Q 18, rating: 2.2), and *EE service industry* (Q 20, rating: 2.1) (Figure 13).

Answers to Q 18 (improvements to product range) showed two negative outliers: Iran and Myanmar (Figure 13). The spread of country averages shows that answers for Q 20 (increase in the number of EE service companies) had the largest range: experts from Myanmar, Moldova, the Philippines Iran and North Macedonia and saw less than “moderate increases” in the services on offer (Figure 13).

According to the country averages, UNIDO’s project was rated as “important” for *the development of the EE service sector* (Q 21, rating: 2.8). UNIDO’s importance for *improvements to EE product range* received slightly lower rating with an equivalent of “moderately important” (Q 19, rating: 2.4). Both aspects ranked lower than other UNIDO contributions. The outlier for questions Q 21 is Iran. The spread for Q 19 is explained by lower ratings from Iran and South Africa (for Q 19, <2) and high ratings from Thailand and India.

The experts further found that the greater availability of qualified EE consultants was the third most important contribution of UNIDO for the time after the project (Q 22, Figure 41 in Annex VI).

Outcomes of interventions with the financing community

The ICMO analysis (ICMO statement #5-finance) showed that 13 terminal evaluations in the ICMO portfolio mention the banking sector. Nine of these gave a limited amount of detail on the outcomes of the interventions in the banking sector (Cambodia, Egypt, Thailand, Indonesia, Iran, Malaysia, Moldova, Philippines, Viet Nam).

The ICMO analysis did not find any evidence that new credit lines were established by commercial banks in any of these cases. Even if this can be explained by the lack of monitoring following the training of banks in two cases evaluators had a chance to ask trained banks (TE Thailand, Malaysia) whether they had established new commercial credit lines and had received negative responses.

- *“The evaluation found that SME Corp was not convinced to adopt any specific measures to support investments in IEE by making changes to the existing tools employed for enhancing capabilities of SMEs through business advisory and financial support” (TE Malaysia: p.19).*

Several terminal evaluations found that there is limited necessity for loans to implement IEE in larger companies and even in many SMEs (TE Cambodia, Philippines, Thailand, Viet Nam):

- “None of the industrial partners of Industrial energy efficiency in the Philippines (PIEEP) to date have required bank financing indicates that large industrial stakeholders can self-finance their own EE projects.” (TE Philippines: p. 28)
- “It is clear that many of the SMEs have financial resources to implement IEE measures.” (TE Cambodia: p. 44)

As discussed in section Annex II.1.2 three TEs reported that larger industrial partner companies, including SMEs, were not requiring external financing for the implementation of EE measures. Two terminal evaluations did mention the need of (smaller) SME’s for external financing (Philippines & Cambodia).

In the expert survey, “*improved access to external financing / bank loans*” was observed less than other aspects of the EE market (Q 16, rating: 1.7). *Improvements to access to financing* (Q 16) was rated considerably less highly than average by experts from Iran, Indonesia and Malaysia (Figure 13).

UNIDO’s importance for *the availability of external financing* (Q 17, rating: 2.3) received the lowest of all of the ratings with an equivalent of “moderately important” (Figure 14). The spread for Q 17 is explained by lower ratings from Iran and Indonesia (for Q 17, <2) and high ratings from Egypt and India.

By the end of the project, “*better access to financial support*” was found to be the least relevant aspect of lasting impact of the projects (Q 22, Figure 41 in Annex VI).

Outcomes of interventions with the policy and technical standards community

The ICMO analysis (ICMO statement #4-policy and technical standards community) revealed a mixed picture of policy improvements: the TEs included a few positive impressions (Viet Nam, Ukraine, Philippines) but also a larger number was negative about policy improvements supporting IEE (Egypt, Malaysia, Ecuador, Cambodia). ISO 50001 was adopted as a national standard in six of the intervention countries (Ecuador, Indonesia, Moldova, Philippines, South Africa, Viet Nam).

Figure 27 in Annex VI shows in how many countries experts mentioned policy instruments which the government introduced in the previous five years. Many countries had introduced policies promoting energy audits and EnMS but only few countries had worked on improving the business case of energy efficiency investment by increases the costs of or energy / carbon. The introduced policy instruments were rated as moderately effective (Q 7, rating: 2.1) (Figure 28 in Annex VI)

According to the country averages, UNIDO’s project received one of the highest rating and was rated as “important” for *the development of policies or regulations* (Q 9, rating. 3.0). The outlier for questions Q 9 is Iran (Figure 29 in Annex VI).

External Factors

Besides policy instruments other factors also influenced the development of IEE. The survey asked the experts how important these other factors were in their country’s context (Figure 30 in Annex VI). The results do not show a lot of variance, most options (*increased competitive pressure, increases in energy prices, the UNIDO IEE project, availability of equipment and EE services*) received the rating „important.” Only the option customer demand for environmental certifications was rated lower as only „moderately important.”

Observed market development and UNIDO's impact on IEE market development in individual project countries

The average of all countries and all questions showed that experts observed “**moderate improvement**” to the IEE market state (rating: 2.25, Table 30 in Annex VII). The overall rate of IEE market development was rated lowest in Myanmar and Iran and highest in Viet Nam and India.

The overall importance of UNIDO for the observed market changes was rated as “important” (rating: 2.84). UNIDO's importance was rated lowest in Iran with a rating of “**moderately important**” (rating: 1.7) and highest in and India with a rating of “**very important**” (rating: 3.52). All other countries ranged UNIDO's importance for observed market changes as “**important.**” As is shown in Table 30 in Annex VII the ratings did not correlate with the strength of market development reported by the experts.

Annex II.2.3 Summary of evaluation question 1a

The triangulation of the different data sources showed that UNIDO did have an important influence on IEE market transformation.

To assess evaluation question **1a) Have the projects influenced market transformation** the evaluation team conducted four terminal evaluations in case study countries, collected data screening 14 terminal evaluations (ICMO analysis), analysed the ISO 50001 global survey data (2017) and surveyed experts in 14 UNIDO intervention countries.

12 out of the 14 TEs rated project effectiveness as “satisfactory” and in the expert survey, the overall importance of UNIDO for observed market changes was rated as “important.”

The following sections summaries the findings for the individual stakeholder groups identified in the Theory of Change.

Awareness of the wider economy of IEE

The ICMO analysis of ICMO statement #3-wider economy, which addressed general awareness of the industry, could not find enough evidence in the terminal evaluations to confirm or reject the ICMO statement developed. The lack of outreach impact data prevents an assessment of the outcome level effects of the websites, case studies and other information materials. While output figures for the four terminal evaluations put the number of participants in awareness raising activities (with the constrain that their nature can be different) between 300 and 1,977, it is not possible to draw conclusions regarding the effect that these measures had on awareness or skills.

As a fall-back data source, the expert survey was conducted. The experts observed the highest improvements in the *importance of EE to industrial companies*. Countries stated on average that it had become “**more important.**” The observed market changes had been paired with a question to rate UNIDO's importance for any observed changes. On average countries rated UNIDO's contribution for the *increase in IEE importance* to companies the highest.

Increased IEE implementation in the wider economy

The data shows that in countries where UNIDO was active, ISO 50001 certification seems more popular than in other countries. The ISO survey analysis shows that in the period 2011 to 2017 the

median of certified companies per country was 5 times higher in UNIDO intervention countries than globally and 13 times higher than in low- and middle-income countries.

Overall though, comparatively few companies are interested in certification and even in UNIDO intervention countries by 2017 a median of 40 companies was certified per country. The overall reach of certification in terms of coverage of the industrial sectors would have to expand drastically to change the development pathway in industrial energy efficiency to make a significant contribution to the climate crisis.

Experts observed “**moderate increases / improvements**” in their markets in respect to the improvements of *EE investment* and *EnMS implementation*. The questions addressing UNIDO’s contribution to the *increase in EE-investment* and *EnMS implementation* received average ratings of “**important.**”

Development of the IEE service and supply chain

In respect to the activity levels of the trained experts, seven terminal evaluations report that national experts remain active, but they do not quantify the share of independent experts that remain in the EE service industry nor their activities, e.g. by surveying trained experts.

Experts observed “moderate increases / improvements”, in respect to the *range of high-efficiency equipment* offered and the *number of companies providing EE services*.

The questions addressing UNIDO’s contribution to the *development of the EE service sector* received average ratings of “**important.**”

UNIDO’s importance for *improvements to EE product range* received slightly lower rating with an equivalent of “**moderately important.**”

Development of the IEE financing

The ICMO analysis (ICMO statement #5-finance) showed that almost all of the TEs mention UNIDO interventions in the banking sector. Nine TEs gave limited amount of detail on the outcomes. The ICMO analysis did not find any evidence that new credit lines were established by commercial banks. And in two cases even received information of the contrary. Several terminal evaluations stated that there is limited necessity for loans to implement the type of IEE measures promoted by UNIDO in larger companies and even in many SMEs. Two terminal evaluations did mention the need of (smaller) SME’s for external financing.

In the expert survey, *improved access to external financing / bank loans* was observed less than other aspects of the EE market (Figure 42). UNIDO’s importance for the *availability of external financing* received slightly lower ratings than the other assessments resulting in an equivalent of “**moderately important.**”

Development of the IEE policy and technical standards

Many countries had introduced policies promoting energy audits and EnMS but only few countries had worked on improving the business case of energy efficiency investment by increasing the costs of energy or carbon emissions. The introduced policy instruments were rated as “**moderately effective**” by the experts.

According to the country averages, UNIDO's project received one of the highest ratings and was rated as **"important"** for the *development of policies or regulations*.

Overall summary of UNIDO's impact on IEE market development

The overall rate of IEE market development was rated lowest in Iran, Myanmar and highest in Viet Nam and India. The overall importance of UNIDO was rated lowest in Iran (rating: 1.7) with a rating of **"moderately important"** and highest in and India with **"very important."** All other countries ranged UNIDO's importance for observed market changes as **"important."** With the exception of Iran, UNIDO's intervention received high average ratings ranging between important to very important. The ratings were irrespective of the strength previously associated to the market development.

Annex II.3 Evidence and findings for evaluation question 1d: Have the projects contributed to positive economic and social impacts?

1. An additional evaluation question is 1.d 'Have the projects contributed to positive economic and social impacts (non-energy related) through increased productivity and profitability?'

The project team used the following data sources:

- The four terminal evaluations that were conducted by the evaluation team (in-depth portfolio),
- 14 terminal evaluations of IEE projects that were subjected to the ICMO analysis.

Economic growth and job creation

Only one TE (South Africa) touches upon the impact projects had on **job creation** within partner companies. In the case of South Africa (SA), a socio-economic impact study was conducted (ERM, 2015) which analysed job retention and creation based on four case study enterprises. The TE concludes that *"the SA IEE Project has contributed to improvements in productivity and competitiveness although the extent to which this is the case is uncertain. There are examples of where it has contributed to job retention and, to a lesser extent, enabled growth and productivity increases that lead to job creation."* (TE South Africa: p. 68).

In the case of Thailand, the evaluation team could only ask a limited number of national experts to what degree the course affected their **hireability or income**; statements were inconclusive. Trained staff stated that it might increase their hireability but none of the (non-representative number of) respondents had received wage increases (TE Thailand: p. 47)

The ICMO analysis in Annex II.1.2 showed that in the course of the projects, companies made substantial investments at a median of USD 9.55 Mio. (based on a group of eight projects), assuming that investments were cost-effective the projects generated savings for the companies.

Most terminal evaluations do not give feed-back on whether the projects have contributed to **positive social and economic developments**, those that do state that effects cannot be quantified, e.g. South Africa: *"The impact of the SA IEE Project's activities to improved industrial energy efficiency will have had a positive, albeit minimal, impact on gross domestic product (GDP) but the extent of that impact cannot be determined."* (TE South Africa: p. 100)

Gender mainstreaming

The ICMO analysis showed (ICMO statement #7-gender) that gender was not considered in any of the projects in the portfolio.

Some projects did either not track participants number disaggregated or evaluations did not report these numbers (Egypt, Malaysia, South Africa).

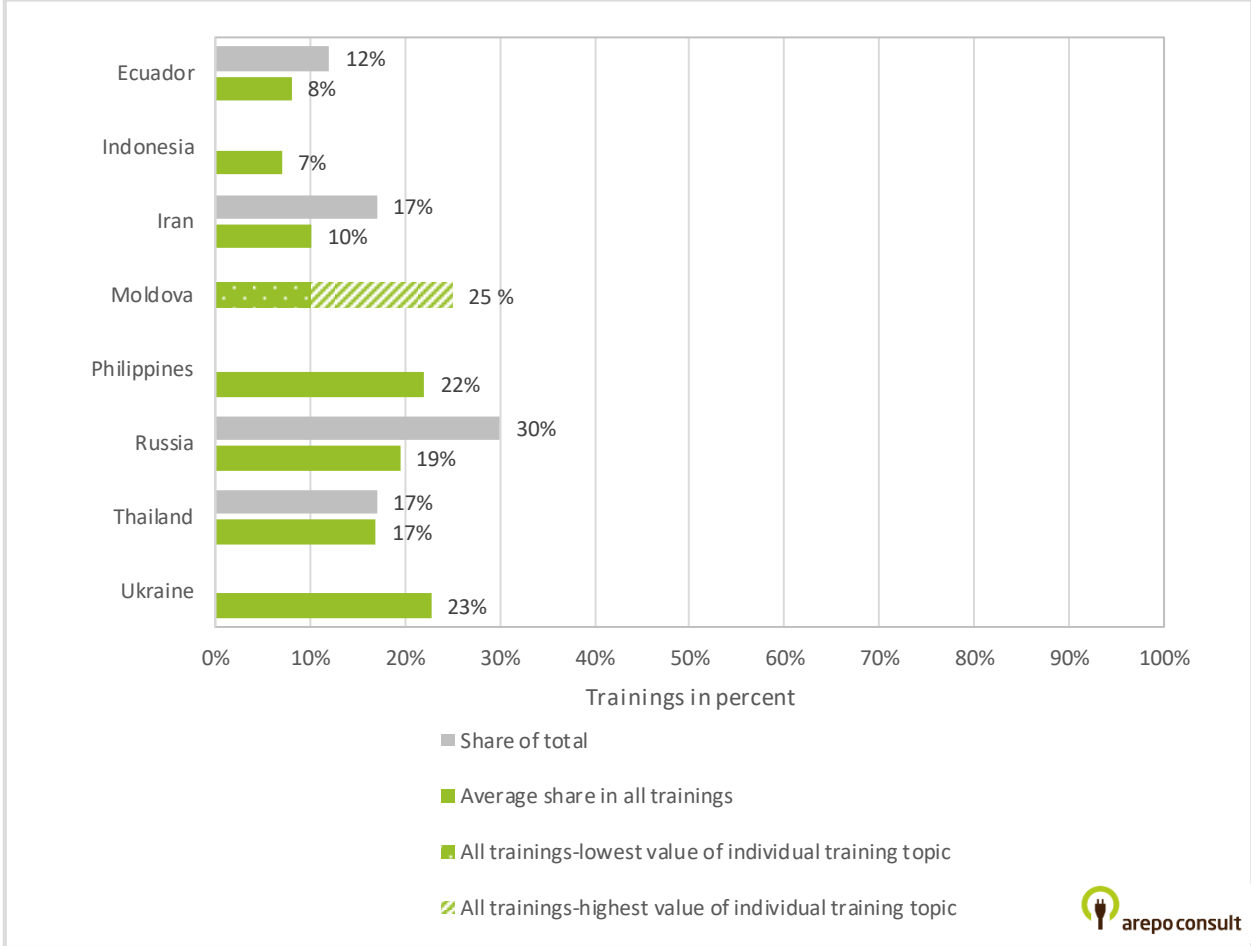
One terminal evaluation stated explicitly that the project did not make a significant contribution to gender mainstreaming (TE Cambodia: p. 53).

Some projects tracked participant numbers sex disaggregated, in those projects the share of females in training activities seems to have been 7 % to 23 %. The share of females in awareness raising

activities, in workshops with governments, standards bodies and banks seems to have been slightly higher. Where the share in total participants was reported it ranged from 12 % to 30 %.

The most detailed sex disaggregated data is provided in the TEs of Thailand and Iran stating participant numbers for each type of training activity.

Figure 18: Share of females in project activities



Source: own graph.

Annex II.4 Evaluation questions 1c and 2c: How can changes be measured which baseline data should be collected?

To address evaluation questions **1.c How can these changes be measured?** and **Q2c. What kind of baseline data should project managers collect in the future?** the project team used the following data sources:

- Findings and conclusions from the component and indicator analyses
- Findings and conclusions from the Theory of change and the barrier analysis

Annex II.4.1 General considerations of logframes

The logical framework (logframe) is a useful and often necessary tool for monitoring the project development. However, there are certain elements that are seen as obligatory and a standard logframe should include:

- **Result statements** for what should be achieved, on different levels (goal /impact, outcome, output)
- **Indicators** that show how the achievement of the results will be measured and which are aligned to institutional mandates and KPIs to the degree possible
- **Targets** that state the desired level of achievement at project end for each indicator (additionally it can be useful to include milestones or achievements at mid-term stage of the project)
- **Means of verification**, i.e. data sources for indicators
- **Risks & Assumptions** that underlie the logical links between outputs and outcomes, and outcomes and impacts.

It is good practice to adhere to the concept of SMART indicators.¹²

- **Specific:** The indicator captures the essence of the desired result by clearly and directly relating to the achievement of an objective and only that objective.
- **Measurable:** The monitoring system and indicators are observable at reasonable costs.
- **Attainable:** the indicator should be realistically achievable within the project's implementation period.
- **Relevant:** The indicator should measure a change that has a clear relationship with the result and with the change that is to be achieved.
- **Time-bound:** The indicator has defined milestones and targets that need to be reached at specific times.

¹² While this acronym is widely used, there is divergence among the different stakeholders and organisations on the specific meaning of each letter. It is worth pointing out that GEF has formulated definitions for SMART monitoring systems in their monitoring and evaluation policy. GEF (2010): The GEF Monitoring and Evaluation Policy 2010. Evaluation Document November 2010, No. 4, <http://www.gefio.org/evaluations/gef-monitoring-and-evaluation-me-policy-2010>. Yet, we present a slightly different and more hands-on definition for individual indicators here.

Annex II.4.2 GEF-specific aspects

The overall objective “Sustainable reduction of GHG emissions of the industrial sector” was included here as most of the projects were funded by GEF and thus adhered to the funding objective of the GEF to reduce GHG emissions. For UNIDO's use, it would be possible – or even advisable – to adopt the highest levels of UNIDO's mission statements, institutional indicators or SDGs into the standard logframe. For example, social and economic impacts could be included on that highest level, i.e. *gender awareness, job creation, enhanced competitiveness or increased investment volumes*. It would be then, of course, necessary to include also on the lower results level appropriate results and indicators so that the development of the objective can be measured and monitored accordingly. In the current proposal, the evaluation team has included the gender mainstreaming as an intermediate outcome as well as on the outcome and output /activity level with corresponding indicators (see Table 1 to Table 7). As long as the UNIDO gender policy is respected, the gender specific focus in the logframe could also be dropped.

GEF also provides very specific guidelines for how GHG emission reductions are supposed to be calculated. The indicators for measuring the GHG emission reductions in Table 1 are formulated according to the Guidelines for Greenhouse Gas Emissions Accounting and Reporting of the GEF Council.¹³ GEF has identified three different types of GHG emission reductions as relevant:

1. **Direct GHG emission reductions** which are attributable to the investments made during the project's implementation period.
2. **Direct post-project GHG emission reductions** which are achieved through investments that are supported by GEF-sponsored revolving financial mechanisms still active after GEF project's closure, and
3. **Consequential emission reductions** that could result from a broader adoption and are typically achieved after GEF project closure and occur outside of the project logical framework (logframe). Even though consequential emission reductions are not included in the project logframe, projects should include processes to monitor and evaluate this indicator.

This nomenclature and the GEF calculation formulae should be adhered to in calculating the targets for the logframe, and also in monitoring. For this methodology, the following input variables are necessary, and should be known from the project preparation or monitoring processes:

- Type of energy efficiency measure (e.g. what type of energy is saved and how much)
- Number of energy efficiency measures planned / implemented
- CO₂-emission factors of energy that is saved (e.g. electricity, heavy fuel oil)

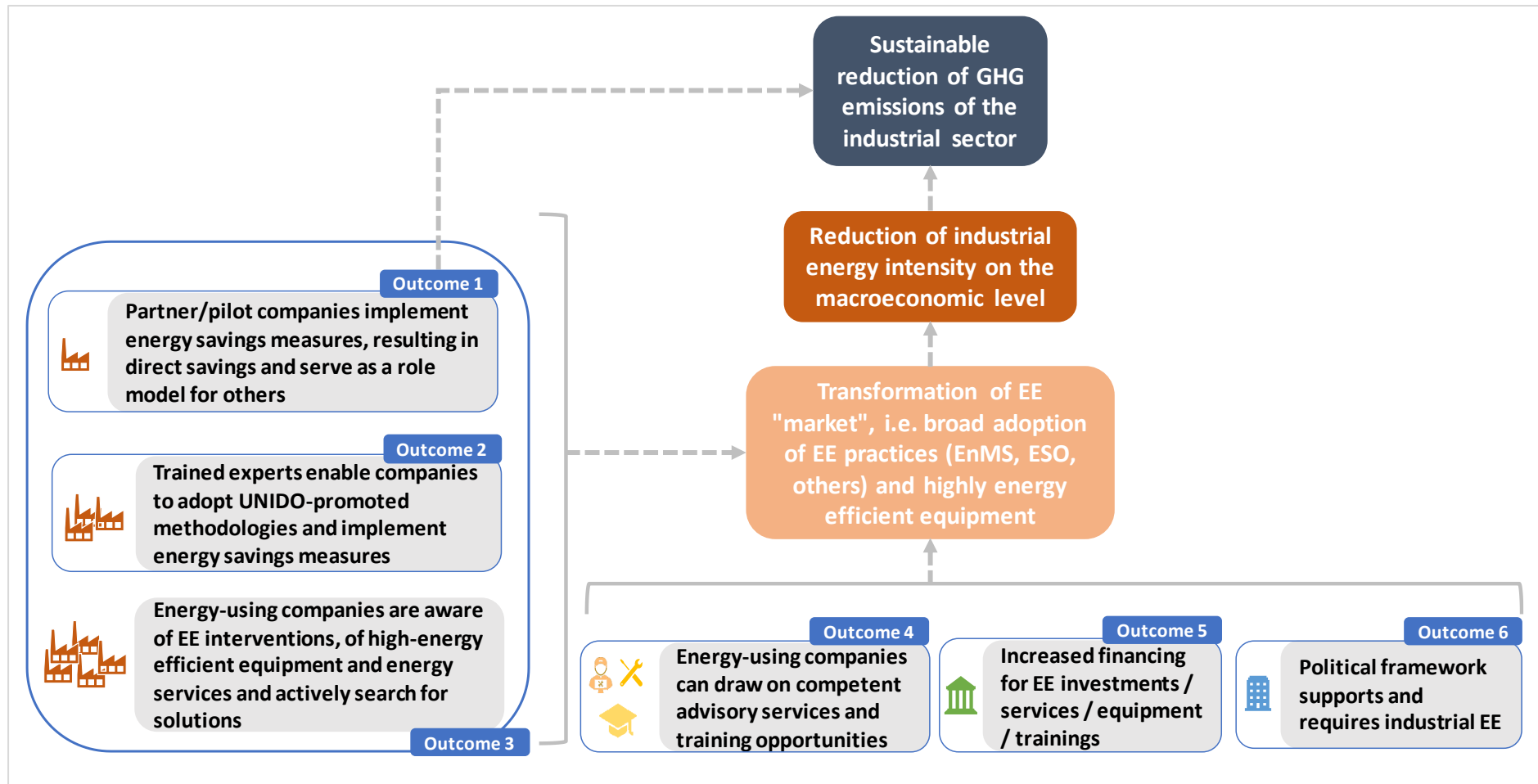
Annex II.4.3 Logic and structure of the reconstructed standardised logframe

Based on the discussions with UNIDO programme managers and the analyses conducted for this study, the evaluation team developed a model logframe with a set of common and standardised indicators which can be used as a basis for future energy efficiency project logframes. This allows the programme to aggregate impacts for the programme and to compare the progress of the individual projects more easily. In Figure 19, the general logic of the logframe is depicted. It shows six outcomes addressing the different identified stakeholders of UNIDO IEE projects that lead to the intermediate

¹³ GEF Council (2015).

outcome of EE market transformation, i.e. broad adoption of EE practices (EnMS, SO, and others) and highly energy efficient equipment. Through the market transformation, the industrial energy intensity in the country will be reduced (high-level outcome) and finally lead to the sustainable reduction of GHG emissions of the industrial sector. Additionally, Outcome 1, where UNIDO assists partner /pilot companies directly with the implementation of energy savings measures, has also a direct impact on the objective of GHG emission reductions.

Figure 19: Results chain of the reconstructed standardised logframe



Source: own figure.

In the following, Table 1 shows the outcome-to-impact level of the logframe, while Table 2 to Table 7 contain the different components with their specific outcomes and the outputs that lead to them. Generally, the tables reflect the desired results on the different levels (impact / outcome) and associated indicators how these results should be measured by the project. The logframe tables give also examples for the means of verifications for each indicator. In addition to the impact and outcome levels, activities and output indicators were included. These may not be complete but are meant to give a general indication to project manager when formulating a project's logframe with respect to the type of measures that could be included, respectively in each component.

For simplification, some standard logframe elements, such as baseline levels and risks & assumptions, are not included but need to be developed by the project management itself. Generally, the baseline should define how to measure the situation at project outset, i.e. 'initial level of EE services offered in the market', 'current availability of financing instruments in the market'. For the baseline, it is important that the project management collects sufficient data (economy wide as well as company specific) before and during the project design phase. It is beneficial if a bunch of different tools and a variety of data sources are used.

The developed standardised logframe also gives some ideas regarding possible means of verification, e.g. general data on sectoral market or macroeconomic level from government reports and statistics or reports on energy consumption and GHG emissions to the United Nations Framework Convention on Climate Change (UNFCCC). Where available on time, a comparison of these data at project beginning and end can give valuable insights into the existing trends in industrial energy consumption during and after the project. Most of the data during project implementation, especially on the output level, can be collected through the monitoring of the project, i.e. number of participants in the trainings.

Another tool for monitoring data which is very important are surveys as they can provide information about the current status of the market and can reveal qualitative results that are otherwise difficult to measure, i.e. the quality of trainings or behavioural change. It is highly recommended to use such surveys to support the monitoring data directly collected by the project. Interviews can be used to complement the survey. They might constitute a useful tool to get information from governments, regulatory bodies or renowned energy experts in the market.

Alternatively, there might be commercial or free offers of market surveys for energy efficiency-related markets, like markets for energy efficient hardware imports or distributors, or energy auditors. These can give important indications of the current state of supply and demand in the country, and also for major players that could give insights into market barriers.

Relevant risks & assumptions that should be considered might be

- Major deterioration in the macroeconomic and political environment might delay project success on any level
- Low energy prices are making energy efficiency measures less cost effective.
- Often, interest of companies in energy efficiency, and even more so in financing instruments for energy efficiency investments might be low.
- Ability and willingness of sufficient female technical experts to become an energy advisor

During the development of the standardised logframe, the formulation of the components identified in the component analysis was used as a basis and restructured if seen as relevant.

- The new **component 1** focuses on the implementation of demonstration measures at partner /pilot companies, where UNIDO supports the implementation of energy savings measures directly. This is equivalent to component ⑥ from the component analysis.
- All training interventions for companies (pilot /partner companies and also the so-called light-intervention companies - component ⑤) are in **component 2**.
- The awareness raising components ①, ②, ③, ④ addressing the energy-using companies are now summarised in **component 3**.
- **Component 4** represents the activities and outcomes to increase the capacity of independent consultants and the service professional community as well as of equipment manufacturers and vendors (former component ⑧). This was completed by an outcome focusing on the capacity building of educators and trainers.
- **Component 5** focuses on the finance community so that increased financing for EE investments, services, equipment and trainings is available (former component ⑨).
- **Component 6** targets government regulators and agencies to support the development of a political framework that supports and requires industrial EE and summarizes the former components ⑩ and ⑪.

For a new programme, a standardised logframe can be a guideline for project managers and the design of future projects. Dependent on the focus of the specific projects, components should be selected as fit for purpose. For example, if the availability of financing instruments is not identified as a barrier in the design phase, this component should be excluded. Other components might be added if completely different program logics are intended. In such cases, it is important to note that institutional indicators (e.g. Key Performance Indicators, or indicators from the IRPF) should be integrated to the degree possible in such a standardized logframe.

Table 1: Reconstructed standardised logframe - objective / impact level

Level	Result	Indicators	Milestones / Target	Means of verification (<i>Examples</i>)
Objective / Impact	Sustainable reduction of GHG emissions of the industrial sector	Direct GHG emission reductions (sum from component 1 and 2)(tCO ₂ p.a. at project end and ¹⁴ cumulative over lifetime of investments but max. 20 years) ¹⁵	Target reduction of tCO ₂ p.a. at project end and cumulative over lifetime of investments but max. 20 years	Project Monitoring, based on survey among factories
		Direct post-project GHG emission reductions from investments supported by GEF-sponsored revolving financial mechanisms after project closure ¹⁶ (tCO ₂ for max. 20 years after project end)	Target reduction of tCO ₂ for max. 20 years after project end	Modelling on the basis of replication effect assessments
Higher-level Outcome	Reduction of industrial energy intensity on the macroeconomic level	Positive trend in normalized sector specific energy consumption (energy per unit of GDP) ¹⁷	Improvement of existing energy efficiency trend by target %	Government reports and statistics at project start and end
Intermediate Outcome 1	Transformation of EE "market", i.e. broad adoption of EE practices (EnMS, SO, others) and highly energy efficient equipment	Increased supply of EE equipment and services, e.g. more companies / experts offering equipment / services on the market as measured by a flagship EE product or service that is relevant for the project	Increase by target % (project specific market definition necessary)	Market analysis (e.g. survey among supply chain) at project start and end
		Increased demand of EE equipment and services, more companies are demanding equipment / services from suppliers	Increase by target % (project specific market definition necessary)	Market analysis (e.g. survey among companies) at project start and end
		Positive trend in EE investments as measured in a flagship energy efficiency product relevant to the project, e.g. efficient pumps	Expected EE investment in USD ¹⁸	Market analysis (e.g. survey among companies and financing institutions) at project start and end
Intermediate Outcome 2 ¹⁹	Gender	Gender mainstreaming: % of female staff among energy managers in companies	Increase by target % (milestones and end target)	Survey among companies

¹⁴ In a number of indicators, the recommendation is to report annual values and also cumulative figures, i.e. these are actually two indicators.

¹⁵ GEF Council (2015).

¹⁶ GEF Council (2015).

¹⁷ See section on "Limitations to this evaluation" for more explanation. Often this indicator will not be measurable or available to the project. Its underlying data will be available with a significant time lag and normalizing the sector specific energy consumption in order to exclude other influences requires significant statistical effort that is typically not feasible for projects. Better indicators would be less sensitive to external influences and exhibit a degree of inertia that is in line with the behavioral and capital stock changes that are triggered by the intervention.

¹⁸ This is the currency that has been used in most of the projects in the past – it is possible that UNIDO decides to switch to a different reference currency for all projects. Then that currency should be used here.

¹⁹ Dependent on the strategies and goals of the funding organization, additional indicators may be added as intermediate / higher-level outcome or as objective: i.e. increased investment volumes, job creation, enhanced competitiveness.

Table 2: Reconstructed standardised logframe - Component 1

Component 1: Pilot Companies implement energy efficiency demonstrations				
Level	Result	Indicators	Milestones / Target	Means of verification (<i>Examples</i>)
Outcome 1	Partner /pilot companies ²⁰ implement energy savings measures, resulting in direct savings and serve as a role model for others	Sum of energy savings among partner / pilot companies in USD p.a. and cumulative over lifetime of investments (Outcomes 1.1, 1.2, 1.3 etc.)	Target level of electricity savings in GWh p.a. and cumulative over lifetime of investments Target level of fuel savings in GJ p.a. (per fuel) and cumulative over lifetime of investments	Project monitoring / company reports
		Sum of energy cost savings among partner /pilot companies in USD p.a. and cumulative over lifetime of investments	Target amount of energy cost savings in USD p.a. and cumulative over lifetime of investments	Project monitoring / company reports or calculation using market energy and fuel prices
		EE technology investment of partner /pilot companies in USD, total over project period	Target amount of additional investment in EE technology and processes in Mio. USD	Project monitoring / company reports
		Number of companies who are aware of pilot companies' success story	Target number or share of aware companies	Survey among partner companies and /or peer networks
		Associated energy savings (electricity savings (in GWh), fuel savings in GJ /fuel type p.a. and cumulative over lifetime of investments	Target level of electricity savings in GWh p.a. and cumulative over lifetime of investments Target level of fuel savings in GJ p.a. and cumulative over lifetime of investments	Project monitoring
			Associated energy cost savings in USD p.a. and cumulative over lifetime of investments	Target amount of energy cost savings in USD ²¹ p.a. and cumulative over lifetime of investments
		Activities and output indicators	Supporting the certification of pilot companies with the system that is promoted by the project, e.g. with ISO 50001	Number of certifications (e.g. IS O 50001)
Supporting the implementation of EE	Number and type of EE measures		Target number and type of EE measures	Project monitoring / company reports

²⁰ Companies that receive direct technical and / or financial assistance.

²¹ This is the currency that has been used in most of the projects in the past – it is possible that UNIDO decides to switch to a different reference currency for all projects. Then that currency should be used here.

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Component 1: Pilot Companies implement energy efficiency demonstrations				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
	measures by pilot companies			
	Supporting the introduction of EnMS at pilot companies	Number of companies that implemented an EnMS	Target number of EnMS implemented	Project monitoring
Outcome 1.2	Companies enabled to serve as pilot companies through staff training	Number of pilot companies with trained staff	Target number of pilot companies with trained staff	
Activities and output indicators	Training staff from pilot companies	Number of trainings and number of participants	Target number of trainings and participants (gender disaggregated)	Project monitoring / company reports
	Gender	Number of participating female energy experts in trainings	Target in %	Project monitoring / company reports
	Supporting pilot companies in developing bankable proposals for EE measures	Number of implemented EE measures (separate for each type of measure)	Target number per EE measure type	Project monitoring
		Number of different proposal types	Target number of different proposal types	Project monitoring
		Number of pilot companies supported in pilot investments	Target number of pilot companies supported in developing bankable proposals	Project monitoring
	Volume of investments	Target investment volume	Project monitoring	
Outcome 1.4	Partner /Pilot companies serve as role models for other companies	Number of pilot companies perceived by others as role models	Target number of pilot companies	Project monitoring
Activities and output indicators	Supporting companies in outreach and in being a role model, e.g. through case studies	Number of outreach measures (separate for each type of measure)	Target number per type	Project monitoring
		Diversity of approaches / EE measures implemented by pilot companies	Target number of types	Project monitoring
	Gender	Representation of female employees in the outreach products	Published case studies and pictures should document women in at least 50 % of the pictures and descriptions at project end	Project monitoring / company reports

Source: own compilation.

Table 3: Reconstructed standardised logframe - Component 2

Component 2: Participating Companies²² are implementing energy efficiency savings measures				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 2	Trained experts enable companies ²³ to adopt UNIDO-promoted methodologies (e.g. SO, EnMS) and implement energy savings measures	Energy savings among participating companies in USD p.a. and cumulative over lifetime of investments	Target level of electricity savings in GWh p.a. and cumulative over lifetime of investments	(Online) Survey among training participants / companies
			Target level of fuel savings in GJ p.a. (per fuel) and cumulative over lifetime of investments	
		Energy cost savings among participating companies in USD p.a. and cumulative over lifetime of investments	Target amount of energy cost savings in USD p.a. and cumulative over lifetime of investments	calculation on basis of energy savings and energy prices
		Number of companies that have participated in trainings and are now implementing EE measures	Target number of implemented EE measures after training (EnMS / SOs; ISO 50001; others)	(Online) Survey among former training participants / companies in the context of project monitoring plan Selected in-depth interviews with companies, energy experts in the terminal evaluation
	Positive trend in EnMS implementation: % of large companies (not SMEs) that have an EnMS	Target % of large companies that have an EnMS	Market survey among large companies	
	Gender	acc. UNIDO gender strategy	Target in %	Project monitoring / company reports
Outcome 2.1	Participating companies are able to implement EE measures	Number of participating companies that implemented EE measures	Target number of companies that implemented EE measures	Interviews with companies, energy experts, local banks and financiers
		Number of EE measures implemented by participating companies	Target number of implemented EE measures	
Activities and output indicators	Trainings	Number of participants in trainings	Target number of energy experts in the partner companies (gender disaggregated)	Project monitoring / company reports
		Quality of training offered	Satisfactory level of training quality	Survey among training participants
	Gender	Number of participating female energy experts in trainings	Target in %	Project monitoring / company reports
	Supporting the certification of companies, e.g. with ISO 50001	Number of certifications (e.g. ISO 50001)	Target number of e.g. ISO 50001 certification	Project monitoring

²² Companies that are involved with UNIDO in the form of information-based engagement or training.

²³ Companies that are involved with UNIDO in the form of information-based engagement or training.

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Component 2: Participating Companies²² are implementing energy efficiency savings measures				
Level	Result	Indicators	Milestones / Target	Means of verification (<i>Examples</i>)
Outcome 2.2	Enhanced awareness for opportunities for implementing EnMS, SO, IEE activities among participating companies	Firms indicating interest in implementation of energy efficiency	Intermediate level, increased over initial level	Standardised surveys
			Target level (in absolute number of percentage of companies surveyed)	
Activities and output indicators	Awareness activities for participating companies	Number of activities disaggregated by type (e.g. walk throughs, visits to demonstration sites, etc.)	Target level of completed activities	Project monitoring / survey of participating companies
Outcome 2.3	Enhanced investments for implementation of EnMS, SO, IEE activities) among participating companies	Volume of investments	Target volume in USD	Project monitoring
		Investment proposals by participating companies	Target number of IEE investment proposals and separate by type	Project monitoring / survey of participating companies
		Number of approved loans for energy efficiency in participating companies	Target rate of applications for IEE financing instruments	Project monitoring / survey of participating companies
Activities and output indicators	Support activities for participating companies, e.g. training for development of bankable proposals	Number of activities disaggregated by type	Target level of completed activities	Project monitoring

Source: own compilation.

Table 4: Reconstructed standardised logframe - Component 3

Component 3: Energy-using industrial companies²⁴ are aware of the opportunities of energy efficiency				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 3	Energy using companies are aware of EE interventions like EnMS & SO, of high-energy efficient equipment and energy services and actively search for solutions	Decision makers who know about opportunities of energy efficiency measures, EnMS and SO in industry	Target level of awareness Target number of Website visitors / downloads	Market analysis (e.g. survey)
	Gender	acc. UNIDO gender strategy	Target in %	Project monitoring / company reports
Activities and output indicators	Provision of awareness raising tools (Website, national campaigns, events, recognition /prizes)	Availability of awareness raising tools (Website, national campaigns, events, recognition /prizes)	Target number of available awareness raising tools for the industry (for each tool separately)	Project monitoring
	Provision of information materials (guidelines / information or training material)	Availability of information materials (guidelines / information or training material)	Target number of available information material for the industry (for each separately)	Project monitoring
	Implement and coordinate Networks / round tables / EE events in order to sustain a level of interaction and knowledge exchange between companies even if project is ended	Number of networks / round tables / EE events available	Target number of existing networks / round tables	Project monitoring
	Gender	% of female participants in networks / round tables	Target % of female participants in networks / round tables	Project monitoring / company reports

Source: own compilation.

²⁴ Wider economy which includes the partner / pilot companies, the companies that are involved with UNIDO in the form of information-based engagement or training and all other companies in the market that are targeted by awareness activities of component 3.

Table 5: Reconstructed standardised logframe - Component 4

Component 4: Energy-using industrial companies can draw on competent advisory services and training opportunities				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 4	Energy-using industrial companies can draw on competent advisory services and training opportunities	Satisfaction of companies with the supply of EE services and equipment	Target level of satisfaction with supply of EE services and equipment in the market	Survey among / interviews with companies and service providers (project monitoring)
Outcome 4.1	Independent consultants and service professionals have enhanced capacity on technical and financial aspects regarding EnMS, SO, IEE activities and provision of services	Number of certified energy experts in the market (gender disaggregated)	Target number of certified energy experts in the market (gender disaggregated)	Survey among companies and service providers (project monitoring)
		Availability of high-quality services	Improved level of quality of offered EE services	Survey among / interviews with companies and service providers (project monitoring)
	Gender	% of certified female energy experts	Target % of certified female energy experts	Project monitoring / company reports
Activities and output indicators	Independent consultants and service professionals are trained	Number of and participation in trainings (gender disaggregated)	Target number of and participation in trainings	Project monitoring / company reports
		Quality of training offered	Satisfactory level of training quality	Survey among training participants
	Independent consultants and service professionals are certified as energy auditors	Number of certifications of energy auditors (gender disaggregated)	Target number of certifications for energy auditors	Project monitoring
	Gender	% of female participants in energy expert training	Target % or number of female energy experts	Project monitoring / company reports

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Component 4: Energy-using industrial companies can draw on competent advisory services and training opportunities				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 4.2	Enhanced capacity of educators and trainers on ENMs /SO /IEE (incl. financial aspects) and institutionalized course offering (stand-alone or part of university or technical school curricula)	Availability of high-quality trainings	Increased number of high-quality trainings	Evaluation (Interviews, survey of participants)
		Frequency and type of trainings offered	Target frequency and number of types of trainings offered	Project monitoring
Activities and output indicators	Train-the-trainers	Number of trainers	Target level of trainers	Project monitoring
		Number of successful trainees	Target level of trainees	
	Supporting a national institution to become a place for continued high-quality training	Courses offered	Target level of courses offered	Project monitoring
		Quality of training offered	Satisfactory level of training quality	
Gender	% of female participants in trainings	Target % of female trainers	Project monitoring	
Outcome 4.3	Enhanced capacity of equipment manufacturers / vendors on quality management, best practices and business development	Number of equipment manufacturers / vendors in the market	Target number of certified energy experts in the market (gender disaggregated)	Survey among companies and equipment manufacturers /vendors (project monitoring)
		Availability of high-quality equipment	Increased number of EE high-quality equipment	Survey among / interviews with companies and equipment manufacturers /vendors (project monitoring)
Activities and output indicators	Equipment manufacturers /vendors are trained	Number of and participation in trainings	Target number of and participation in trainings	Project monitoring / company reports
		Quality of training offered	Satisfactory level of training quality	Survey among training participants
	Provision of information materials (guidelines / information or training material)	Availability of information materials (guidelines / information or training material)	Target number of available information material for the industry (for each separately)	Project monitoring
	Gender	% of female participants in trainings	Target % of female trainers	Project monitoring

Source: own compilation.

Table 6: Reconstructed standardised logframe - Component 5

Component 5: Energy-using industrial companies can satisfy their financing needs for EE investments				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 5	Increased financing for EE investments / services / equipment / trainings	Availability of IEE tailored financing instruments	Target number of IEE-tailored financing instruments available	Market studies on financing situation for IEE investments, survey among companies and financial stakeholders
		GHG emission reductions resulting from investments (p.a. and cumulative over lifetime of investments)	Target GHG emission reductions resulting from investments (p.a. and cumulative over lifetime of investments)	Project monitoring / company reports
		Energy savings resulting from investments (p.a. at project end and cumulative over lifetime of investments)	Target level of energy savings resulting from investments (electricity savings in GWh / fuel savings in GJ / fuel type p.a. at project end and cumulative over lifetime of investments)	Project monitoring / company reports
		Sum of energy and fuel cost savings due to these investments (USD p.a. and at project end)	Target sum of energy and fuel cost savings due to these investments (USD p.a. and at project end)	Project monitoring / company reports
Outcome 5.1	Financial institutions have the necessary capacity to identify and process loans for IEE	Number of financial institutions accepting and evaluating energy efficiency investments	Target number of financial institutions who accept and evaluate EE loan applications	Project monitoring
Activities and output indicators	Training of professionals from financial institutions	Frequency and type of trainings offered	Target number for trainings for local banks and financiers	Project monitoring
		Number of participants (gender disaggregated)	Target number participants in trainings	Project monitoring
		Quality of trainings	Satisfactory level of training quality	Project monitoring
	Gender	% of female participants in financial expert trainings	Target % of trained female financing experts	Project monitoring
Outcome 5.2	A financial mechanism provides liquidity for investments into EE measures	Availability of financial mechanism	Functioning financial mechanism	Project monitoring
Activities and output indicators	Successful implementation of a financial mechanism	Volume of investments (USD p.a. and over whole project period)	Target volume of investment (USD p.a. and over whole project period)	Project monitoring / company reports
		Number of approved loans	Target number of approved loans	Project monitoring / company reports
		Volume of approved loans (USD p.a. and over whole project period)	Target volume of approved loans (D p.a. and over whole project period)	Project monitoring / company reports

Table 7: Reconstructed standardised logframe - Component 6

Component 6: Policy frameworks support or require energy efficiency measures from energy-using industrial companies				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 6	Political framework supports and requires industrial EE	Number of IEE policy instruments (new policies, reviews, supporting legal and regulatory instruments) developed and implemented (incl. gender equality considerations)	IEE policy, legal and regulatory framework that improves and supports the status of IEE in the country (incl. gender equality considerations)	Market studies, policy analysis in terminal evaluation
Outcome 6.1	Government regulators / agencies have sufficient capacity to design / implement / actively enforce IEE policies and strategies	Expressed level of confidence of government officials with details of EE regulations	Confidence high enough so that regulators / agencies feel capable to design IEE-relevant regulations and policies	Interviews with government, regulatory bodies, IEE experts
Activities and output indicators	Training for government officials	Participants in trainings (gender disaggregated)	Target number of participants	Project monitoring
		Quality of trainings conducted	Satisfactory level of training quality	Project monitoring
	Gender	% of female participants in trainings	Target % of female participants	Project monitoring
Outcome 6.2	Government regulators / agencies are designing and implementing and actively enforcing IEE policies and strategies	Implementation of new IEE policy instruments (i.e. competence standards for energy managers and auditors; certification standard; energy benchmarks etc.)	New / improved IEE policy, legal and regulatory instrument that improves and supports the status of IEE in the country	National EE Plans and policy documentation
Activities and output indicators	Supporting government through providing suggestions for general policies and regulatory measures	Number of IEE policy proposal(s)	Submission of drafts of new / improved regulatory measures to support IEE and market transformation	National EE Plans and policy documentation
	Gender	Gender consideration in the policy proposals	Gender considered in the policy proposals	National EE Plans and policy documentation

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Component 6: Policy frameworks support or require energy efficiency measures from energy-using industrial companies				
Level	Result	Indicators	Milestones / Target	Means of verification (Examples)
Outcome 6.3	Government regulators / agencies are designing / implementing / actively enforcing EnMS, standards and certification	National availability and accessibility of EnMS-standards and certification	Standards and certification fully available and enforced in the country	National EE Plans and policy documentation
Activities and output indicators	Supporting the establishment of certification protocols for energy auditors and energy managers	Availability of certification protocol for energy auditors and energy managers	Submission of draft proposals on certification protocols and mechanisms	Project monitoring
	Supporting the establishment of certification protocols for EnMS standards	Availability of certification protocol for EnMS standards	Target level of availability of certification protocol and mechanism	Project monitoring
	Supporting the establishment of a certification body for EnMS standards	Availability of certification body	Established certification body	Project monitoring
	Supporting the establishment of a marketing strategy and promotion of EnMS standards by certification body	Availability of marketing strategy	Established and active marketing strategy	Project monitoring
		Awareness about EnMS standards among energy-using companies	Target level of awareness among energy-using companies	Survey among energy-using companies

Source: own compilation.

Annex II.5 Evaluation question 2a: What are the factors affecting the achievement of impacts?

To answer evaluation question 2a “What are the factors affecting the achievement of impacts (positive and negative, intended and unintended)? Which ones are under the control of UNIDO and how they can be leveraged?” evidence was drawn from the following sources:

- the four evaluation case studies
- the ICMO analysis, and
- the expert survey (cf. Table 32 for the list of projects included in the respective analysis methods).

Regarding the survey, answers from the survey questions Q 6. “Which of the following instruments has the government implemented?”, Q 10. “How important were the following other factors for the development of IEE in your country in the past 5 years?” and Q 11. “Are there other factors that have contributed to changes in IEE?” were taken into consideration for the analysis on evaluation question 2a (see several Figures in Annex VII).

From the ICMO analysis, the contextual evidence found was used to answer evaluation question 2a. Even though, a different set of contextual factors seems to be relevant for each project, some are reoccurring in several projects. Generally, they can be categorized in factors that are already part of the programme logic and Theory of Change of the projects (e.g. barriers identified through the Theory of No Change), factors that related to the projects' management and implementation environment, and factors that are external conditions for the project.

Annex II.5.1 Factors that are part of the programme logic

Replication through increased networking

Replication is easier if **demonstration projects communicate** to other companies how financial benefits from energy efficiency can be leveraged. The ICMO analysis found in seven projects,²⁵ anecdotal evidence that pilot projects had a positive influence on other companies to adopt EnMS or EE measures, but this effect was not systematically followed up and monitored.

In the projects in Egypt and Philippines, peer networking was used successfully to increase the outreach to other companies.

Access to EE equipment

In some of UNIDO's IEE portfolio, projects addressed the access to EE equipment by inviting vendor and equipment suppliers to SO trainings. Though not prominent in the IEE projects, access to high-efficient EE equipment appears to be an important contextual factor.

In the expert survey, the **availability of EE equipment** was rated as “important” (rating: 2.9 on a 1 to 4 scale) (Figure 30 in Annex VI). Experts from India rated their availability as “very important” whilst experts from Iran and South Africa viewed them as “moderately important.”

²⁵ Project Countries: Cambodia, India, Malaysia, Moldova, Ukraine and Viet Nam.

In Ukraine – an outlier in the IEE portfolio because it also addressed RE – the government introduced a tax preference for EE equipment producers and temporarily abolished the value-added tax (VAT) on imported RE equipment.

Availability of financing for EE services and measures

Another factor which was mentioned by the surveyed experts and which was also found in the ICMO analysis is the **availability of finance**. In six countries, a lack of access to finance was seen as a negative contextual factor for the projects' success by the projects' evaluators.²⁶ At least for four of them (Cambodia – for small SMEs only, Ecuador, India and Ukraine – for the purchasing of RE), this seems particularly plausible as the project's target group were SMEs.

In the survey, the experts indicated that investments in new production facilities / upgrading of the industrial base are important for the development of IEE.

Data privacy concerns of participating companies

A hampering factor for monitoring but also for the publication of case studies and benchmarks was the **unwillingness of companies to share energy data** with the project and other companies. According to the ICMO analysis, the project management in Moldova, the Philippines and South Africa I, thus, had difficulties to measure the impact of the projects' activities on company level including with respect to behavioural change and net emission reductions. This also provided a challenge when the project or the counterpart ministry attempted to gather data for a benchmarking exercise.

Annex II.5.2 Factors affecting project management but not specific to energy efficiency

Fluctuations in government counterparts and their responsibilities

The ICMO analysis and the four case studies showed how frequent changes of focal points at government counterparts negatively affected UNIDO's projects and their sustainability. This was explicitly mentioned in the terminal evaluations for the projects in Moldova and Ukraine. This issue was also raised in the four case study countries. For example, Iran suffered from the **changes in focal points** and the connected loss of knowledge and continuity.

Another unfavourable situation arose when the project's counterpart ministries were not fully politically responsible for industrial energy efficiency or where the responsibilities for industrial energy efficiency shifted during project implementation, e.g. between governmental ministries and departments. For example, in Moldova, the institutional responsibility for energy policy shifted between ministries. In the case of Thailand, the counterpart ministry was **stripped of** most of its **IEE responsibilities** or never had those in the first place. In both, Thailand and Iran, an additional cooperation with **other ministries / government bodies** would have been beneficial for institutionalizing IEE trainings.

²⁶ Project Countries: Cambodia, Ecuador, India, South Africa I, Ukraine and Viet Nam.

Is IEE a priority for companies and consultants?

The ICMO analysis found in four projects a **lack of commitment** or unwillingness of partner companies to fully participate in project activities by the companies' management affecting the projects' achievements negatively (Egypt, Iran, Moldova and Ukraine). In Moldova this unfavourable situation was aggravated by several management changes within the partner companies leading to a weakening of attention for energy efficiency related topics in day-to-day management. In the survey, several experts also stated that a positive attitude and a high level of awareness are necessary, contributing factors for change.

On the other hand, in four projects, the **high motivation and ownership within industrial companies** is mentioned as positively influencing the projects' outcomes by the evaluators for Ecuador, Indonesia, Viet Nam and Ukraine. Yet, the findings in Ukraine are somewhat contradictory. On the one hand, the companies' senior level management was unwilling to adopt the concepts of increased energy efficiency and RE investments. On the other hand, the evaluator saw a strong motivation by the factory personnel within the companies to invest in energy efficiency measures. Therefore, the evaluator saw a risk that significant change within the company will be postponed until more modern managers which are open towards the adoption of energy management systems and investments in EE are working on the senior level. This can have negative effects on the dynamic of the IEE market transformation.

Additionally, an **unwillingness to pay** for EE services has been observed in at least three projects. In Cambodia, Egypt and India, companies are expecting that donor-funded programmes make EE services available free-of-charge. This affects the sustainability of demand for EE services after the project's end negatively.

At least two projects (Indonesia and South Africa I) had difficulties to find **suitable training participants** to become energy experts, so that, according to the ICMO analysis, this became a hampering factor for the successful completion of the trainings. In the South Africa I project, this was also partially due to the fact that trainings were seen as being too expensive and time-consuming.

Of course, whether or not IEE constitutes a priority is determined to a large degree by factors external to the project that are discussed in Annex II.5.3.

Annex II.5.3 Factors external to the project

Energy efficiency policies

The ICMO analysis as well as the expert survey both revealed that the implementation of policies in support of industrial energy efficiency was a **major factor for project success, enhancement of IEE and the development of markets for energy efficiency services and equipment**.

The expert survey showed that in 9 of the 12 surveyed markets government had introduced incentives / obligations for EnMS, followed by government subsidies / funding for energy efficient investments and incentives / obligations for energy audits or walk throughs. In 8 markets, the government had introduced incentives for energy service companies (ESCOs) and the development of EE services and published energy benchmarks or industrial Minimum Energy Performance Standards (MEPs). Only in four markets policy addressed energy pricing or incentivized EnMS certification (Figure 27 in Annex VI).

A new legislation in Egypt generated company interest in the IEE project because a newly passed obligation to purchase a license for the use of coal for in-company power generation which was connected with the obligation to pass a GHG emission reduction plan.

Similarly in Thailand, certification requirements existed and facilitated companies' interest in energy efficiency – even if that was not necessarily in the system promoted by UNIDO, as ISO 50001 could not be used to fulfil the legal requirements. Thus, policy and the project worked not in a strictly synergistic manner, and in cases, the policy regime constituted a disincentive for companies to acquire an ISO 50001 certification. Yet, the obligation for large consumers to introduce an energy management system was beneficial to IEE so that the regulatory requirement still supported the UNIDO project's impacts.

At least four TEs report that the lack of policy or a counteracting policy was negatively influencing the interest of companies in IEE.²⁷

Energy prices

Another factor that is important for the development of IEE markets, is the **increase in energy prices** or **volatility of energy prices**. In high-cost or highly price-volatile situations energy efficiency measures are more cost-effective for companies.

The expert survey showed that increases in energy prices was viewed among the **most-important factors to drive IEE** (Figure 30). The ICMO analysis confirmed this finding, in five projects the **reduction of the energy subsidies** was reported to have made a positive contribution to generate company interest in IEE.²⁸ At the same time though, phase out of energy subsidies or energy taxing was only witnessed by the experts in four markets (Egypt, Iran, Malaysia, South Africa) (Figure 27).

This evidence of high, increasing or volatile energy prices was also found in the ICMO analysis, where it was mentioned in the TEs of South Africa I, Thailand and Ukraine as a supporting element for the market development of EE. On the contrary, the (local) decrease of electricity prices in Cambodia, due to a new coal-fired power plant, had a negative effect on the cost-effectiveness of IEE measures and influenced the project's achievements negatively according to the terminal evaluation. The same applies to Ecuador, where low energy prices backed by subsidies decreased cost-effectiveness of EE measures and the companies' motivation towards EE.

Competitive pressure on companies and overall economic situation

The survey results of Q10 – important factors for IEE development – show, that the increase of competitive pressure among the companies to reduce their production costs is seen as **an important factor for the market development** in the countries (cf. Figure 30). The ICMO analysis confirms this, especially for Cambodia, Malaysia and Thailand.

Expectations from the customers that companies advertise their green image, i.e. in the form of environmental certifications were seen only as “moderately important” by the surveyed experts.

On the other hand, in at least five countries, companies were confronted with economic slow-down and instabilities so that energy efficiency topics were set aside by management.²⁹

²⁷ Project countries: Cambodia, Iran, Malaysia and Philippines.

²⁸ Project countries: Egypt, Iran, Malaysia, Moldova, South Africa I.

²⁹ Project countries: Iran, Moldova, South Africa I, Ukraine, Viet Nam.

Annex II.6 Evaluation question 3: What is the influence of the company selection strategy?

Initially it seemed that the projects had different approaches to select companies as pilots or as partners for their other company related interventions, including but not limited to awareness raising activities and trainings. During the scoping phase of the impact evaluation, the question arose which selection strategies can be found in the IEE portfolio and '**What is the influence of the company selection strategy**' on the project's success. Therefore, the question was later added to the set of evaluation questions from the ToRs as **Q 3**. The following chapter shows the different company selection strategies and subsequently discusses important aspects of each of them. In chapter Annex II.6.2, the QCA approach will be discussed. In conclusion, the findings will be summarised in chapter Annex II.6.3.

Annex II.6.1 Company selection strategies

The selection strategies have been analysed for 19 IEE projects in 17 different countries (cf. Table 32 in Annex VIII). The analysis of the TEs (if not indicated differently in Table 8) revealed that the UNIDO projects applied a combination of four different company selection strategies: **(1) specific sectors, (2) size of companies, (3) energy intensity of companies, (4) geographical cluster** (cf. Table 8):

- 16 projects included a sectoral focus. Additionally, Ecuador and Moldova developed such a focus during the project implementation, leaving only the project in Colombia without a sectoral focus.
- The size of the companies was relevant in 12 projects. While five projects focused exclusively on SMEs³⁰, three projects aimed their activities at large enterprises. In four projects (Ecuador, Malaysia, Myanmar and South Africa II), both company sizes were seen as relevant to achieve substantial GHG emission reductions.
- 10 projects had a focus on energy intensive enterprises.
- 4 projects focused on specific regions within the country (geographical clusters).

According to the information in the projects' documents the portfolio analysis shows that there does not seem to be a consistent selection strategy for targeted industry but rather a country specific approach with specific sectors targeted most frequently.

³⁰ Both Indian projects do not only focus on SMEs but also on micro-sized enterprises.

Table 8: Company selection strategy

	Specific sectors	Size of companies		Energy intensity of companies	Geographical cluster
		SMEs	Large		
Cambodia	x	x		x	
Colombia ¹					x
Ecuador	(x) ³	x	x		
Egypt	x		x	x	
India I ¹	x	x		x	x
India II ²	x	x		x	
Indonesia	x		x	x	
Iran	x			x	
Malaysia	x	x	x		
Moldova	(x) ³				
Myanmar ²	x	x	x	x	x
North Macedonia ²	x		x	x	
Philippines	x			x	
Russia	x	x			
South Africa I	x				
South Africa II ²	x	x	x		
Thailand	x				
Ukraine	x	x		x	
Viet Nam	x				x
Number of projects	18	9	7	10	4

¹ MTE / MTR used for analysis.

² Project documents used for analysis.

³ No preselection of sectors, but in the end, projects concentrated on specific sectors.

Source: own compilation.

Reasons given for selecting certain target sectors

Where terminal evaluations stated justifications for the choice in company target groups these reasons were diverse. For example, the following reasons were given:

- **TE Cambodia:** The sectors were chosen based on their **share of energy consumption** in the manufacturing sector, the end-use energy consumption and the source of primary energy used by these sectors. Additionally, the **number of enterprises** in the sub-sectors and the size of the enterprises in terms of **employees and output** were considered. Another reason for the selection of the sectors was the general economic performance and the **prospective growth rate** of the sector.
- **TE Egypt:** The focus on large companies in energy-intensive sectors was added in the inception phase of the project to address **government priorities**.
- **TE Indonesia:** The sectoral selection was based on the **governments priorities** to develop core industrial clusters.
- **TE Iran:** The sectors were chosen based on their share in total national energy consumption.
- **TE North Macedonia:** The project focuses on large companies taking explicitly into consideration a **complementary donor-funded projects** targeting SMEs.
- **TE Thailand:** Sectors were chosen based on national government priorities and the sector's share in total national energy consumption.

Textbox 5: Choice of light-house projects

In many cases pilot companies within the chosen sectors could not be carefully picked by the projects, but projects had to cooperate with whichever company was willing to engage with the project. The situation posed itself to be a buyers' rather than a sellers' market, particularly during ramp up phase of the projects.

Annex II.6.1.1 Sectors

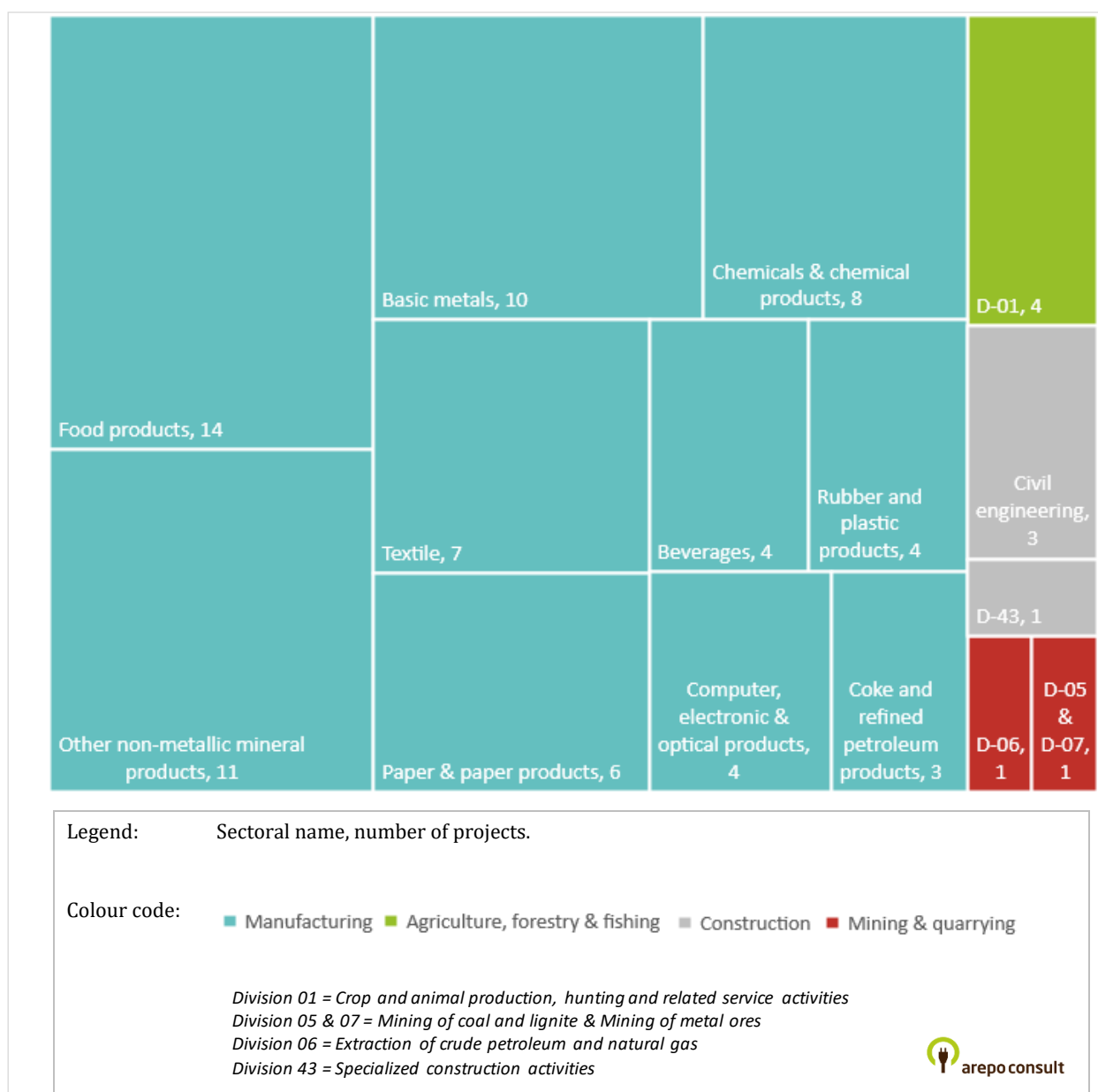
Since most projects focused on specific sectors, the evaluation team analysed which sectors projects most frequently concentrated on. For this analysis the sectors and sub-sectors mentioned in the project documents were harmonized and categorized according to the International Standard Industrial Classification of all economic activities (ISIC) of the Statistics Division of the UN Department of Economic and Social Affairs (cf. Annex I.10).³¹ Another four projects focus on sub-sectors of the construction sector (cf. grey coloured boxes in Figure 20) and two on sub-sectors of the mining and quarrying sector (cf. red coloured boxes in Figure 20).

Figure 20 shows the sectors targeted by the projects. The majority of the projects has **manufacturing** as its priority sector (cf. blue coloured boxes in Figure 20). The sub-sector that is addressed most frequently is '**manufacturing of food products**' (14 projects), followed by the sub-sectors 'other non-metallic mineral products' (addressed in 11 projects) and 'basic metals' (10 projects). Companies working in the 'manufacturing of chemicals and chemical products' sub-sector were chosen in eight projects, and ones that specialized in 'manufacturing of textile' were selected in seven projects as addressees of UNIDO activities. Other manufacturing sectors that were included by the projects are 'paper and paper products' (6), 'beverages' (4), 'rubber and plastic products' (4), 'computer, electronic and optical products' (4), and 'coke and refined petroleum products' (3).

Additionally, to the manufacturing sector, four projects address the **agriculture sector** (cf. green coloured boxes in Figure 20).

³¹ UN Department of Economic and Social Affairs. Statistics Division (2008).

Figure 20: Sector selection of 17 IEE projects, per sector³²



Source: own compilation according to the information in the projects' documents.

Figure 21 shows which project addresses which sectors and sub-sectors. The colour coding is aligned with Figure 20, meaning all blue bar segments represent sub-sectors of the manufacturing sector, the green bar segments of the agriculture sector, etc. It is interesting that the sectoral focus varies a lot among the portfolio in terms of the number of sub-sectors addressed. The Thailand project focuses on the most sub-sectors (8) of which all are in the manufacturing area. On the other hand, the Ukraine project is designed completely differently and focuses only on the aggro-food sector. On average UNIDO's IEE projects target four sub-sectors.

³² According to the project documents, the Colombia and India II projects have both a sectoral focus, but in the case of Colombia the project document and the mid-term review did not list any specific sectors and in the case of the India II project, the sectors were only determined at the beginning of the project.

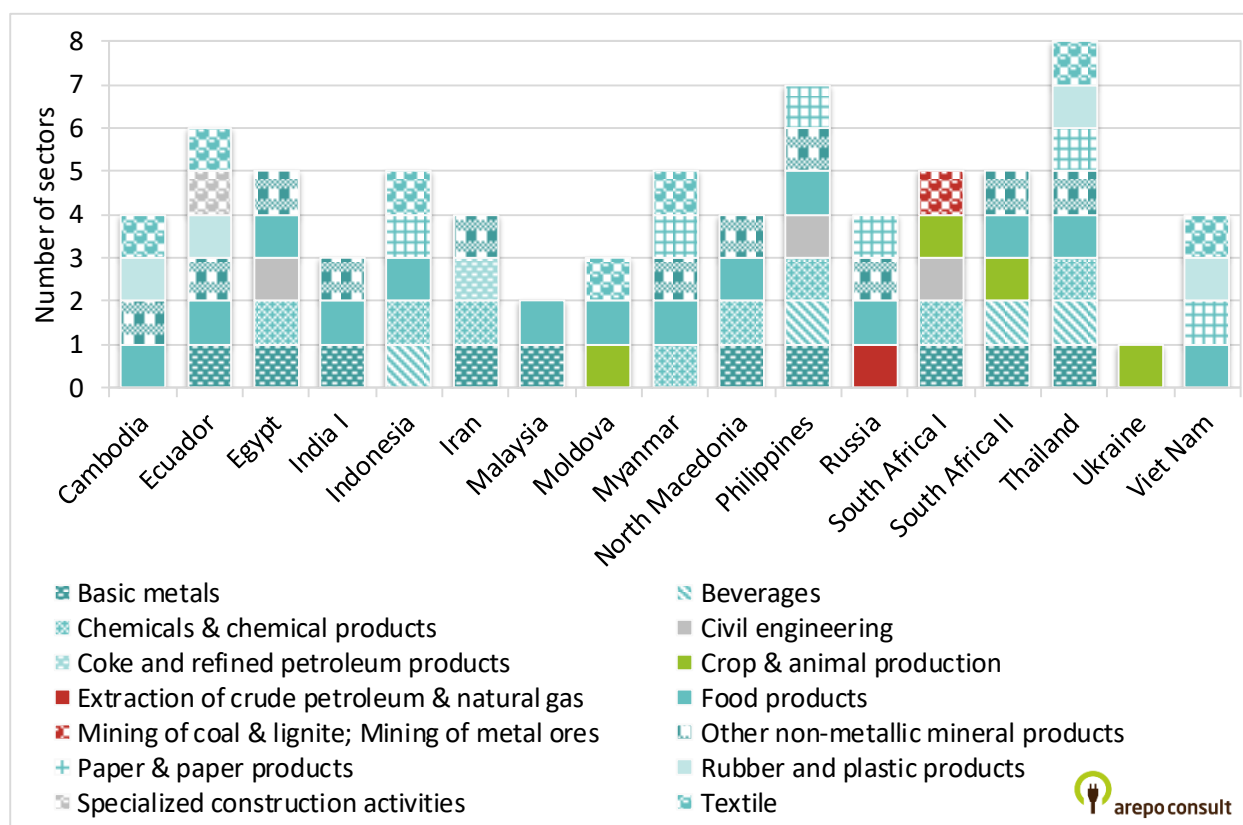
Textbox 6: Collaboration with fossil fuel industry

The selection of some of the target sectors is questionable in respect to their environmental sustainability: At least one project (Russia)³³ worked with fossil fuel extracting sectors and one project worked with petroleum refineries (Iran). This collaboration is facing two major sustainability issues:

Export of fossil fuel saved: At least one project design (Iran) explicitly included the intervention logic of *“freeing up indigenous gas and oil for export.”* If this is the intention of the project the net energy savings achieved have to be considered as 0 because all gross savings will result in higher oil and gas exports and ultimately GHG emissions.

Emission overshoot due to rebound effects: The project’s engagement in the fossil fuel industry contributes to production cost decreases (energy savings) which can be assumed to lead to price decreases of final oil products.³⁴ Price decreases for fossil fuels trigger increases in demand which are likely to be higher than the original energy savings in the production facility, therefore the risk of rebound overshoots for this kind of intervention is high and should be mitigated.

Figure 21: Sector selection of 17 IEE project, per country



Source: own compilation according to the information in the projects’ documents.

³³ In the South Africa I project, the mining sector was included related to governmental priorities. There was no definition included which sub-sectors will be included in the UNIDO project or if mining of fossil fuels may be excluded.

³⁴ These mechanisms are slightly distorted in the case of Iran where national energy prices are even below production cost.

Annex II.6.1.2 Company size and energy intensity

Next to a sectoral selection approach, 12 projects also focused on companies of a certain size and energy intensity (see above).

Focus on large companies

In the considered portfolio, three projects focused exclusively on large enterprises.³⁵ Four projects addressed both company types (large and small).³⁶

The evaluation team considers that the choice to work with larger enterprises is justified by the fact that they are more likely to have the resources to implement an EnMS in the long run, devote resources to it, and integrate EE into their business strategy. The evaluation team postulates, that if companies are energy-intensive, their approach to managing energy consumption can be more easily justified through the significant cost savings that will have a significant impact on the bottom line. Generally, it can be expected that these companies take a more "professional" and educated approach towards energy savings. Last but not least, the results in terms of energy savings can be expected to be large and noticeable in national statistics. Larger industrial companies can (though this is not guaranteed) function as light house examples and raise awareness and motivation. They are also likely to provide some sustainable demand for the energy services / consultancy market created through the projects.

Focus on SMEs

The evaluation team views the rationale to work with smaller enterprises rests on the fact that they need more external support for implementing good business practices and investing into better-grade technologies. Often, the majority of workers in a country are employed in SMEs. To improve their business practices thus has a more direct impact on development. In addition, often, these companies are not able to devote a lot of time and resources to energy management, so that it is important to give inputs from the outside and make the application of EE practices as easy as possible. Since there are large number of SMEs in certain (for example export oriented) sectors such as food or textiles in developing countries, the evaluation team concludes that the potential for demonstration and autonomous replication by others can be more significant. Five projects addressed SMEs,³⁷ while four projects addressed both company types.³⁸

Focus on energy-intensity of individual companies

Furthermore, with the aim to address energy intensive industries to maximize the reduction potential for GHG emissions, large enterprises may not be the only relevant target according to the opinion of the evaluation team. For example, food processing or the manufacture of textile is relatively energy intensive and is also carried out by SMEs. In the portfolio, five projects address energy extensive SMEs: Cambodia, both India projects, Myanmar and Ukraine.

³⁵ Project countries: Egypt, Indonesia, North Macedonia.

³⁶ Project countries: Ecuador, Malaysia, Myanmar, South Africa.

³⁷ Project countries: Cambodia, India I, India II, Russia and Ukraine.

³⁸ Project countries: Ecuador, Malaysia, Myanmar, South Africa.

Geographical cluster

The Colombia, India I, Myanmar and Viet Nam projects have restricted their activities to certain regions of the respective country to achieve the largest possible impact. In Viet Nam the geographical focus on the two major cities, Ho Chi Minh City and Hanoi, came naturally as more than 50 % of the country's companies are located in these two areas. In Myanmar, the regions with the highest industrial concentration were selected. In the India I project, the biggest agglomeration of companies of specific sectors in certain regions were considered for the selection of companies.

Annex II.6.2 Approach: Qualitative Comparative Analysis

At first, the evaluation team tried to approach the question which influence the different approaches of the company selection strategy had on the project's success with a Qualitative Comparative Analysis (QCA) (cf. Annex I.9). It intended to link the project selection strategies to an indicator representing the project success. Unfortunately, due to the lack of such an indicator for the project's success on programme level, the evaluation team could not complete the QCA. Various indicators have been tested to represent project success but no suitable indicator was available. The first proposal was to use the projects' "rating of effectiveness" from the terminal evaluations, but this turned out to be not useable because all but two projects had been rated 'satisfactory' (cf. Table 9). The evaluation team also considered to the GHG reductions relative to their target or relative to the number of pilot companies, monetary savings relative to their target or relative to the number of trainees as well as the number of energy experts still active in the market, or the number of replication cases. However, for none of these indicators, it was possible to make the indicator comparable on programme level due to the lack of standardization or its availability. For example, the GHG calculation is based on different time frames. The information about replication cases is only available for few projects.

Table 9: Example of a QCA result using the effectiveness rating as 'independent variable'

Project	Large enterprises	SMEs	Energy intensive enterprises	Sectoral cluster	Geographical cluster	effectiveness rating
Moldova	0	0	0	0	0	0
Thailand, South Africa I	0	0	0	1	0	1
Viet Nam	0	0	0	1	1	1
Iran, Philippines	0	0	1	1	0	1
Russia	0	1	0	1	0	1
Cambodia, Ukraine	0	1	1	1	0	1
Egypt, Indonesia	1	0	1	1	0	1
Ecuador	1	1	0	0	0	0
Malaysia	1	1	0	1	0	1
Outcome: 1						
# Implicants: 5						
large enterprises*SMEs	0 Russia, Cambodia, Ukraine					
LARGE ENTERPRISES*smes	0 Egypt, Indonesia					
ENERGY INTENSIVE ENTERPRISES	0 Iran, Philippines, Cambodia, Ukraine, Egypt, Indonesia					
SECTORAL CLUSTER	Thailand, South Africa I, Viet Nam, Iran, Philippines, Russia, 0 Cambodia, Ukraine, Egypt, Indonesia, Malaysia					
GEOGRAPHICAL CLUSTER	0 Viet Nam					
# Solutions: 1						
SECTORAL CLUSTER						

Effectiveness rating: '0' = moderately satisfactory; '1' = satisfactory. For all other categories '0' = no and '1' = yes.

Source: own calculation.

Annex II.6.3 Summary of evaluation question 3

The analysis showed, that there is no consistent company selection strategy across the portfolio. Instead country specific circumstances and priorities seem to guide the selection phase during the project design and implementation of the project. This was either due to the industrial structure of the sectors and their energy intensity or the setting of national priorities, i.e. Egypt, Thailand or Iran. A special case is Cambodia, where the combination of many different factors led to the selection of the sectors. In North Macedonia, synergies with other donor-funded projects were considered.

The sectoral selection is mainly focused on sub-sectors of the manufacturing sector with the processing of food products and the manufacturing of non-metallic mineral products being the most chosen sub-sectors throughout the analysed portfolio. The sectors Agriculture, Construction and Mining & quarrying are selected only in few projects.

Due to the lack of available success indicators, the evaluation team was not able to measure the effect of the selection strategy on the project's success.

Annex II.7 Evaluation question 4: How can the demand for energy efficiency services be sustained?

This evaluation has used two tools – the reconstructed Theory of Change (TOC) and the Theory of No Change-based barrier removal analysis – to link UNIDO's projects to market development. The reconstructed TOC shows that **an effective, sustainable energy efficiency services market is essential to broader adoption of SO, EnMS and general EE concepts**. The barrier analysis highlighted that UNIDO's activities focus strongly on removing barriers related to awareness and lack of expertise through campaigns and capacity building for several relevant stakeholder groups, but do not include a focus on enhancing the cost effectiveness of industrial energy efficiency opportunities (which could be done through lower costs for energy efficiency services or equipment, or through higher energy prices).

Initial barrier removal and sustained market development and transformation

The ICMO analysis and four case-study TEs confirmed that UNIDO IEE projects dedicate most of their effort to raising industrial awareness and confidence, developing technical skills, and building governmental and financial capacity.

These analyses, along with ISO 50001 global survey data and expert survey results, also showed (as discussed in Annex II.2) that UNIDO did have an important influence on IEE market transformation. 12 out of the 14 TEs rated project effectiveness as “satisfactory” and in the expert survey, the overall importance of UNIDO for observed market changes was rated as “important.”

The overall rate of IEE market development was rated lowest in Iran, Myanmar and highest in Viet Nam and India. The overall importance of UNIDO was rated lowest in Iran (rating: 1.7) with a rating of “**moderately important**” and highest in and India with “**very important.**” All other countries ranged UNIDO's importance for observed market changes as “**important.**” With the exception of Iran, UNIDO's intervention received high average ratings ranging between important to very important. The ratings were irrespective of the strength previously associated to the market development.

The expert survey identified the relative importance of various motivating and enabling factors for the development of IEE – and presumably, the EE service markets – in the past five years (see Figure 30 in Annex VI) Cost pressures, energy prices, UNIDO projects, and the availability of EE equipment and advisory services were viewed as the most important factors contributing to IEE development. Environmental certification and “green” image were viewed as moderately important.

The survey also showed the relative importance of UNIDO in key developments in the EE markets (see Figure 44 in Annex VI.1). UNIDO was viewed as most important in its direct work with industrial companies (i.e. gaining IEE importance among companies and increasing EnMS implementation). The projects were also important for developing policies and regulations, increasing EE investment and increasing companies providing EE services. And they were moderately important in improving the EE product range offered and improving access to external financing / loans.

Annex II.7.1 Increasing demand for EE services

Industrial awareness

The Theory of No Change postulates that one of the biggest barriers to more demand for energy efficiency goods and services is the lack of awareness of the opportunities offered by energy efficiency. While UNIDO IEE projects raise EE awareness among industrial companies during the project period, the effort must be reinforced and expanded afterwards if an effective EE services market is to develop. Those companies already receiving briefings and materials need to be reminded, established peer networks need to be supported, and companies in sectors / regions not reached by UNIDO must be introduced to EE concepts.

Strategies used by UNIDO to continually raise industrial awareness of and confidence in the viability of SO, EnMS and general EE concepts, and to increase peer motivation from industry leaders and competitors that have been applied are:

- In Egypt, Indonesia, Iran and Thailand, UNIDO is continuing to finance the project websites, so they remain online and functional (though not updated). Case studies remain online beyond the end of the project lifetime. In Malaysia, the website and the produced information material is no longer available. In Egypt, the Industrial Modernisation Centre indicated in the Post Project Strategy that it would be willing to not only host the portal after project completion, but also expand on the data and the information that is available and linked to it. A significant problem is that project finance needs to be closed after a project comes to an end. It is recommended to pay the required amount for website maintenance into a maintenance fund to finance websites / networking platforms for at least two to three years after project closure.
- In Thailand, the project team tried early to establish networking links between experts that were based on commercial social media platforms rather than UNIDO established platform which would cease to exist by the end of the project. Experts were encouraged to stay connected via LinkedIn and a LINE³⁹ / WhatsApp messaging group was started.
- In Egypt, the Industrial Modernisation Centre agreed in the Post Project Strategy to organize an annual event to recognize the companies who implement EnMS or ISO 50001.
- In Egypt, the Environmental Compliance Office of the Federation of Egyptian Industries agreed in the Post Project Strategy to focus on intensive awareness raising and technical training for the private sector and play a focal role in advertising and making industries aware of the sources of funding for IEE. The Egyptian Organization for Standardization and Quality also agreed to conduct awareness raising.

³⁹ LINE is a messenger service used in Thailand comparable to WhatsApp.

In addition, UNIDO could consider increasing peer motivation through concepts like local cross-sectoral peer learning networks (see textbox 8).

Textbox 7: Industrial Energy Efficiency Networks

Energy efficiency Networks were first established in Switzerland in 1987. EE-Networks now exist in many countries, e.g. the USA, Japan and China. Most EENs do share certain functions, e.g. the exchange of energy efficiency experiences in moderated meetings, and consultations with energy efficiency experts. A core concept of the EEN is to share energy efficiency plans and data, which creates competition, but companies are also able to provide each other with advice and share costs, e.g. for training from an external consultant. The EEN follow elaborate data security protocols, e.g. in some network competing companies do not participate in the same network. Sharing of information and experience is facilitated by regular moderated meetings in which the plans of individual companies are discussed, and advice is given.

Governmental capacity

Initially, the market itself is unlikely to build a thriving EE services sector. Government initiatives and policies will be necessary to increase the awareness, confidence, motivation, expertise and investment capital, especially in the early development of the EE services markets. As the market evolves, government's role should narrow to mostly ensuring that motivation and awareness are maintained.

Market and policy conditions (as shown in the Expert Survey) are the strongest motivators – or demotivators if pressure is weak – for companies to undertake EE improvements. In the EE context, markets act primarily through energy prices, energy costs and competitiveness pressures⁴⁰. Markets conditions can be volatile and can sometimes lose their power to motivate (e.g. if energy prices decline or if companies can pass prices rises through to customers), so additional motivation for EE improvements from strongly enforced government polices is usually necessary.

Market and policy conditions are difficult for UNIDO (and also other stakeholders) to influence directly and with certainty. UNIDO sometimes works on policies and strategies that might provide motivation for companies to improve their EE, but project time frames are difficult to align with policymaking timeframes, which are often tied to political transitions and current events. The vagaries of changing governments, changing ministers and changing priorities makes UNIDO's being in the right place at the right time to truly influence policy the exception rather than the rule. It is crucial that UNIDO maintain its policy relationships and offer ad-hoc policy assistance at key policymaking junctures development after the project period.

However, there are clear activities that UNIDO already does in the policy realm, which include capacity building with standardization bodies. In addition, however, there are a number of further government capacities that would be helpful to motivate and enable governments to sustain energy efficiency policies. These include data availability, links with international best practice communities, and maintenance of analytical and strategic tools, skills and relationships.

⁴⁰ Of course, market conditions are not independent of policy conditions (e.g. subsidy policy influences energy prices).

Strategies used by UNIDO to continually develop governmental capacity – analytical and strategic tools, skills and relationships – intended to support policy that will motivate industrial implementation of SO, EnMS and general EE concepts that have been applied are:

- In Egypt, the project partners agreed to specific continuing roles in the Post Project Strategy. The Egyptian Environmental Affairs Agency (EEAA) agreed to lead the coordination efforts, and lobby with MIFT, for policies resulting from the policy strategy developed by the project. This would include revisions to these policies in a timely manner. EEAA should also monitor and document demonstration projects as a part of its role to raise awareness.
- In Egypt, the National Cleaner Production Centre and the Industrial Development Authority agreed in the Post Project Strategy to coordinate and collaborate on the benchmarking activities. The former would work on verification and auditing functions; the latter would house the benchmarking database and conduct periodic updates of data for the 35,000 factories in its current database.

In addition, UNIDO has played a crucial role on the international level, for example in the establishment of the ISO 50001 standard, or in the IPEEC. These can provide important links between national and international stakeholders to help transfer international best practices to local decision making.

An area of continued neglect is the area of energy statistics. Although not limited to industrial energy use, sector-specific data on energy consumption and even energy costs or external costs of energy are often of poor quality at the country level. This impedes cost benefit analysis in policymaking and the identification of business opportunities through energy savings. The experience of the renewable energy sector – both nationally but also internationally with initiatives like REN21 – implies that transparency on the true costs of energy and true potential of energy savings might already help stabilize polity engagement and business interests in the issue.

Availability of external financing

External financing capacity is a particularly sensitive area – it is very important in some sectors (e.g. smaller SMEs) and less important in others (companies with substantial internal resources like). This evaluation has shown that this – for now – was the area where UNIDO left the smallest imprint (Figure 41 in Annex VI). Part of the reason was that the work might not have been timely. In many cases, after the awareness raising, UNIDO has (appropriately) promoted EE methodologies that first identify low-cost and no-cost measures that would not immediately require financing. However, in due course larger investments – particularly if EE is carried out in conjunction with RE – will be required, potentially needing bank loans and possibly types of investment that are not really run-of-the-mill in the respective banking operations.

Thus, financial needs will continue to develop after the project, and UNIDO projects should implement provisions that allow the stakeholders to continue working to increase the availability of external financing for implementation of SO and general EE concepts, but also and in particular RE.

Strategies used by UNIDO to continually increase the availability of external financing for implementation of SO, EnMS and general EE concepts that have been applied are:

- In Iran, UNIDO attempted to set up a Revolving fund mechanism. The lessons learned in this process, particularly in respect to development of TORs etc. should be considered if such an attempt is made again.

- In Egypt, the Environmental Compliance Office of the Federation of Egyptian Industries agreed in the Post Project Strategy to play a focal role in making industries aware of the sources of funding for IEE.
- In Indonesia, the project worked with the government to establish EE investment guidelines and get them adopted into the Financial Services Authority (OJK) Sustainability Finance Roadmap. The heart of the guidelines are harmonized criteria for evaluating the investment prospects of EE projects. The guidelines were handed over to the eight first mover banks on sustainable finance.

The needs for financing and what the roles for the government and financial sectors should be reviewed again at the end of the project to ascertain which next steps are possible and appropriate. It should be part of the EE services market strategy (see Annex II.7.3).

Annex II.7.2 Increasing supply of competent EE service providers

Technical skills

UNIDO projects train many national experts who could be potential SO, EnMS and general EE service providers. The trained personnel are considered a key legacy to continue having success after the project activities are over. During the project, their services are (partially) marketed through the project itself. After the projects' termination, they are expected to have sufficient motivation to market their skills, leading to continued EE advice to a larger group of companies and implementation of EE measures beyond the groups directly targeted by UNIDO activities.

However, the number trained is generally insufficient for the size of the EE service markets required for the IEE transformations desired in most countries. This is exacerbated by attrition (i.e. some national experts stop working in the IEE field) and some experts work in industrial enterprises (i.e. are not in the market of offering EE services to other companies). In addition, there might be needs for retraining, as well as an interest in learning more in the long run. As will be discussed in Annex II.7.3, training and other expertise-developing efforts should be tailored to the growth of the market. The timing for expertise development is crucial. The system for training EE service providers should try to continue developing the technical skills (i.e. training national experts) of potential SO, EnMS and general EE service providers. For that it is necessary to anticipate and align with the market demand for services, so that there are enough experts to serve the market, but not so many that too many leave the market because of too little work.

Since UNIDO has already provided the model, training additional experts and continuing to offer training should be relatively straight forward, assuming that local implementors and business models can be arranged.

Strategies used by UNIDO to continually develop the technical skills (i.e. training national experts) of potential SO, EnMS and general EE service providers that have been applied are:

- Institutionalization of training offering at local universities. In Thailand, UNIDO prepared a Master university course to integrate IEE in the vocational education of future employees. In Indonesia, the project supported the Ministry of Minerals and Energy Resources in EnMS Goes to Campus training sessions, which were attended by more than 1,200 engineering students, at six universities. This was part of an effort by the Ministry to integrate EnMS into the universities' curricula.

UNIDO is also encouraged to consider additional routes, e.g. through support to or establishment of national business associations for these experts, or a global collaboration platform for these associations which can provide transparency of international standards for energy experts which might help keep national standards high.

Business models

UNIDO projects' most common form of business development assistance for the national experts it trains is supporting country efforts to certify the experts as energy auditors, energy advisors and EnMS consultants. National certification systems are an important mechanism to give the markets confidence in the quality of the experts' skills, and to deter less qualified vendors from undermining the markets' trust. And consequently, they constitute an important asset for local energy experts. Such efforts were undertaken in at least Cambodia,⁴¹ Ecuador,⁴² Indonesia⁴³ and Moldova.⁴⁴

Other strategies to continually develop the business models for SO, EnMS and general EE service providers that have been applied are:

- The Egypt project's Sustainability Fund was created to provide short-term (three years) support to national experts starting in the commercial IEE advisory services market in the post-project period. The fund allocates money to support (through partial subsidies) the work of the trained energy experts until such time the market dynamics are active, and the market is able on its own to support the services of those experts in the industrial energy management activities.
- The Indonesia project supported the establishment of the Indonesia Energy Foundation (Yayasan Energi Indonesia, YEI) to institutionalize the trained national experts' network. It helped YEI develop a detailed business plan, including the scope of the mandate, the websites, their services and budget and financing of their operation. The members of the YEI are the national experts, and YEI functions as an expert's pool, rather than a services provider competing against the member experts. The members finance the foundation through membership fees. YEI's first project was a business-to-business scheme with a group of 7 NIKE's suppliers, involving five national experts with a contract value of over USD 100,000. The establishment and support of the YEI to mainstream the cadre of national experts not only nurtured the nascent market for commercial EE services, but developed an institution that could provide post-project training services and serve as a repository for the Project materials and resources.

UNIDO or its government partners are also encouraged to maintain a continuously available database of UNIDO experts and intervention companies as a platform for networking, referrals, tracking of activity and sharing data.

⁴¹ "During 2015, the project made substantial progress on output 2.2 by seeking international advice on setting up certification programs for industrial energy experts who can implement IEE measures for industrial SMEs in Cambodia." (TE Cambodia: p. 39).

⁴² "The project team proposed an accreditation norm for acquired expertise, but it had not approved by authorities before the end of the project." (TE Ecuador: p. 27).

⁴³ "At the request of the Indonesian government, the Project worked to further the sustainability of the EnMS expertise and services market by helping the government adopt ISO 50001 as SKKNI (national personnel competence standard) for energy managers and ISO 50002 as SKKNI for energy auditors" (TE Indonesia: p. 17).

⁴⁴ "IEE Moldova Project resources originally earmarked for the development of the Industrial Energy Manager Certification Program were re-allocated to support the Energy Auditor Certification program, with strong consent from MAEE and the Ministry of Economy." (TE Moldova: p. 41).

Annex II.7.3 Strategy for developing an EE services market

Long-term evolution

The evaluation team found no evidence of explicit work on strategies for developing the EE services and equipment markets in the long run.⁴⁵

The preconditions and elements mentioned in the previous two sections are all important to an effective, sustainable EE services market. However, they vary in their relative importance as the EE market grows and matures. Governments should have a strategy and a plan for when and how to address the various preconditions and elements – and remember that market transformation in the best of cases is a long-term dynamic process with constantly changing requirements.

For example, awareness building is most critical in the early period of the market, but efforts need to continue throughout the life of the market to reinforce the message and to reach sectors newly targeted for EE improvements. Efforts to boost confidence in the local technical and financial viability of EE improvement projects is most important at the beginning of the market. At some point, there will probably be enough EE leaders (e.g. champions) in each sector willing to give compelling testimonials in awareness-raising and recognition events and publications that proof-of-concept efforts are no longer needed.

Once awareness and motivation are built, and maybe the first low-hanging fruit are picked, it is important to keep up the momentum. Momentum can be kept up through enhancing the cost-effectiveness of energy efficiency intervention, including but not limited to change in the subsidy regimes.

In addition, training and other expertise-developing efforts should be tailored to the growth of the market. UNIDO trained a varying number of nation experts – the obvious suppliers of EE services – in each country. Ultimately more service providers will need to be trained if the market is to reach the scale needed to meet each country's EE aspirations for EE advancement. However, the timing for expertise development is crucial. The system for training EE service providers should try to anticipate and align with the market demand for services, so that there are enough experts to serve the market, but not so many that too many leave the market because of too little work.

As mentioned earlier, efforts to engage the financial sector in mobilising investment capital for EE improvements are important, but not crucial in the early period of the market. Because of the nature of EE projects (e.g. relatively small projects and collateralisation issues) that make traditional financing difficult, UNIDO's efforts to mobilise long-term sources of capital met with only moderate success. While efforts should proceed so that sufficient capital is available when the market begins pursuing larger, more costly EE opportunities, this difficult endeavour should not be a roadblock to the early development and growth of an EE services market.

⁴⁵ Though the Indonesia project's final report included Recommendations on Scaling Up and Replication Strategy, focusing on creating and maintaining EnMS and System Optimization market and on availability and access to national experts.

Annex III. Component analysis

Annex III.1 Approach

The evaluation team analysed the project components of 21 recently (or nearly) completed UNIDO projects typically aimed at promoting EnMS, SO, use of the UNIDO Cleaner Production Toolkit or similar approaches to improving IEE. The 21 projects included 16 IEE projects, three RECP projects and two ODS projects. A full list is presented in Annex I.

The purpose of the component analysis was to help the team better understand UNIDO's energy efficiency work and to begin identifying a manageable number of project components that are relevant and amenable: to 1) assessing the magnitude and nature of the work's current and expected impacts, and 2) yielding lessons for improving the impact of future work. In short, the component analysis exercise sought to develop a concise, but rich description of UNIDO's energy efficiency work and its aspirations in the various regions to serve as a frame for thinking about impacts and learning. In other words, it built the basis for the reconstruction of a joint TOC for the three programmes. The exercise was also useful in beginning to identify potential case studies (balancing project commonalities and distinctiveness) to address the learning aspect from as wide an angle as possible.

The analysis sought to classify and compare the types of interventions, stakeholders and the targeted outcomes common to all projects of the above three programmes, as well as those elements distinct to the IEE, RECP and ODS programmes. Some of the guiding questions were: ***What are the main lines of work and component work elements? Who are the main stakeholders? And what are their main roles in furthering IEE?***

Annex III.2 Findings

Even though the 21 projects were similar with respect to their goals and approaches, their project documents often use differing terminologies (e.g. outputs vs. outcomes vs. components) and differing levels of descriptive detail. This required an iterative process to produce a common terminology and component classification to support of the developments of *"a concise, but rich description of UNIDO's IEE work and its aspirations in the various regions to serve as a frame for thinking about impacts and learning."*

The iterative process ultimately led to classifying the projects according to seven major themes, with some projects having multiple themes (cf. Table 10).

Table 10: Main themes in the IEE, RECP and ODS programmes

UNIDO programmes	Main IEE themes	Assigned colour in this document for orientation
● Industrial Energy Efficiency (IEE)	● General Methods, practices & technologies	Turquoise
	● Energy Management Systems	
	● Energy Systems Optimization (SO)	
● Resource Efficient and Cleaner Production (RECP)	● General Methods, practices & technologies	Light green
	● Innovation & Entrepreneurship	
	● Eco-industrial Parks (EIP) Planning & management	
● Ozone-Depleting Substances (ODS)	● Refrigeration / Air Conditioning maintenance and equipment changes	Rose

Source: Own compilation.

It was found that the projects' components and activities could be classified according to their target stakeholders. The analysis found that these stakeholders could be grouped further into three major areas: industry (including targeted energy-using enterprises, national experts, service professionals, and equipment manufacturers and vendors), finance community, and policy and technical standards community (cf. Table 11). Most projects target more than one stakeholder group to achieve outcomes in several domains, in order to directly change companies' behaviour and improve the framework conditions supporting industrial energy efficiency.

Table 11: Main target stakeholders and supporting resources of the IEE, RECP and ODS programmes

Stakeholder group	Stakeholder subgroups	Assigned colour in this document for orientation
■ Industry	■ Wider economy (including non-intervention companies)	■ Purple
	■ UNIDO light-intervention companies	■ Light red
	■ UNIDO partner energy-intensive enterprises	■ Dark orange
	■ UNIDO partner small and medium-sized enterprises (SMEs)	
	■ National experts and service professionals (independent and within industrial companies)	■ Bright orange
■ Equipment supply chain (manufacturers and vendors, including innovators and entrepreneurs)		
■ Finance community	■ Banks and financial services institutions	■ Light green
■ Policy and technical standards community	■ Government / regulators / authorities	■ Light blue
	■ Technical Standards Community	

Source: Own compilation.

Under each of these stakeholder groups, the evaluation team found that there is a typical set of activities leading to typical UNIDO project outputs. The evaluation team refined and harmonised the project output descriptions and used this to classify the project components. The following tables show the project components classified by stakeholder groups (divided into four tables for better orientation):

- Table 13 for the stakeholder group industry (■-purple) covers the wider economy, light-intervention companies, partner energy-intensive enterprises and partner SMEs.
- Table 14 for the stakeholder group service and equipment supply chain (■-orange) covers national experts, service professionals and equipment manufacturers / vendors.
- Table for the stakeholder group finance community (■-light green) covers banks, financial services institutions and ESCOs.
- for the stakeholder group policy and technical standards community (■-light blue) covers government / regulators / authorities and standards organizations.

In the table the projects which have a certain component are indicated. They are abbreviated with single letters as listed in Table 12.

Table 12: Project codes for the component analysis

Number	Project code	UNIDO programme	Country	Project number
1.	A	● ODS	Gambia	120623
2.	B	● ODS	Viet Nam	120621
3.	C	● RECP	Indonesia	100224
4.	D	● RECP	South Africa	130129
5.	E	● RECP	Viet Nam	100052
6.	F	● IEE	Cambodia	104034
7.	G	● IEE	Ecuador	103017
8.	H	● IEE	Egypt	100349
9.	I	● IEE	India I	103029
10.	J	● IEE	Indonesia	103031
11.	K	● IEE	North Macedonia	120127
12.	L	● IEE	Malaysia	103042
13.	M	● IEE	Moldova	103043
14.	N	● IEE	Philippines	103049
15.	O	● IEE	Russia	103056
16.	P	● IEE	South Africa I	103097
17.	Q	● IEE	Thailand	103071
18.	R	● IEE	Viet Nam	103081
19.	S	● IEE	India II	120262
20.	T	● IEE	Iran	120506
21.	U	● IEE	South Africa II	120487

Source: Own compilation.

Table 13 to Table 16 show that there are typical activities that UNIDO is doing for several stakeholder groups. For example, outreach for raising awareness is targeting industrial enterprises, energy service providers, policy makers and in some cases financiers. Similarly, more detailed and technical advice and training is also provided to several stakeholder groups.

Table 13: Component outputs aimed at the stakeholder group industry

Outputs targeting stakeholder subgroups of the Industry ⁴⁶		General Methods, practices & technologies	EnMS	SO	General Methods, practices & technologies	Innovation & Entrepreneurship	Eco-industrial Parks Planning & management	Refrigeration / Air-Conditioning
		IEE			RECP			ODS
Wider economy								
Ⓐ	National awareness campaign and events	FGHIJLNO PQRU	GHIJLN OPQR	GHLP	C		E	AB
	<i>Occurrence in project portfolio [Number of projects]</i>	[12]	[10]	[4]	[1]		[1]	[2]
Ⓑ	Information systems (e.g. websites) and communications strategies for wide dissemination of resource materials developed for / with UNIDO partners and intervention companies (e.g. specifications, guidelines, case studies, software, benchmarking databases and tools, and training materials)	FGHIKLM OPTU	OP		C			AB
	<i>Occurrence in project portfolio [Number of projects]</i>	[11]	[2]		[1]			[2]
	Structures, tools and methodologies to monitor, track and benchmarking energy consumption and efficiency in industry	FHIM					E	A
	<i>Occurrence in project portfolio [Number of projects]</i>	[4]					[1]	[1]
UNIDO light-intervention companies								
Ⓒ	Awareness raising activities (e.g. workshops, study tours / knowledge exchange, peer networks and recognition activities)	GHIJKLM NOPQRST U	GHIJKL MNOP QRTU	GHJKL MRTU	C	D	E	AB
	<i>Occurrence in project portfolio [Number of projects]</i>	[15]	[14]	[9]	[1]	[1]	[1]	[2]

⁴⁶ Number of the ten most frequent components (Ⓐ to Ⓞ).

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Outputs targeting stakeholder subgroups of the Industry ⁴⁶		● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
		IEE			RECP			ODS
Ⓓ	Dissemination of resource materials supporting IEE / RECP / ODS practices / technologies (e.g. specifications, guidelines, case studies, software and training materials)	FIJNOPQR STU	GHIJKL MNOP QRTU	GHJKL MNQR TU		D	E	AB
	<i>Occurrence in project portfolio [Number of projects]</i>	[11]	[14]	[11]		[1]	[1]	[2]
	Creation / dissemination of benchmarking databases and tools	IJMOPTU						
	<i>Occurrence in project portfolio [Number of projects]</i>	[7]						
Ⓔ	Training to establish / support a self-sustaining cadre of trained national experts and service professionals with expertise in IEE / RECP / ODS technologies / practices and developing bankable projects	FJMNOP QSTU	FGINO PQRTU	FGNQR TU				A
	<i>Occurrence in project portfolio [Number of projects]</i>	[10]	[10]	[7]				[1]
	Needs assessments (quick scan / walk-through)	IOST						
	<i>Occurrence in project portfolio [Number of projects]</i>	[4]						
	Support for the development of investment proposals	I						
	<i>Occurrence in project portfolio [Number of projects]</i>	[1]						
	Technical assistance to industry in accessing financing	HKLTU	KL					
	<i>Occurrence in project portfolio [Number of projects]</i>	[5]	[2]					
	Gender initiatives	IKOTU						
	<i>Occurrence in project portfolio [Number of projects]</i>	[5]						

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Outputs targeting stakeholder subgroups of the Industry ⁴⁶		● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
		IEE			RECP			ODS
■ UNIDO partner energy-intensive enterprises								
	Training to establish / support a self-sustaining cadre of trained national experts and service professionals with expertise in IEE / RECP / ODS technologies / practices and developing bankable projects	0	0	0				
	<i>Occurrence in project portfolio [Number of projects]</i>	[1]	[1]	[1]				
	In-depth assessments of general IEE and EnMS & SO opportunities		HJMOQ R	HJMOQ R				
	<i>Occurrence in project portfolio [Number of projects]</i>		[6]	[6]				
Ⓕ	Adoption / implementation of IEE / RECP / ODS technologies / practices (with results documentation / published case studies)	FIJOTPS	GHJKL MNOP QRU	GHJKL MNOP QRU	C			
	<i>Occurrence in project portfolio [Number of projects]</i>	[7]	[12]	[12]	[1]			
	Certification of IEE practices	F	KM					
	<i>Occurrence in project portfolio [Number of projects]</i>	[1]	[2]					
	Support for the development of investment proposals	0						
	<i>Occurrence in project portfolio [Number of projects]</i>	[1]						

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Outputs targeting stakeholder subgroups of the Industry ⁴⁶	● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
	IEE			RECP			ODS
■ UNIDO partner small and medium-sized enterprises (SMEs)							
Energy audits and needs assessments	IOG	O	O			E	
<i>Occurrence in project portfolio [Number of projects]</i>	[3]	[1]	[1]			[1]	
Training to establish / support a self-sustaining cadre of trained national experts			OT				
<i>Occurrence in project portfolio [Number of projects]</i>			[2]			[1]	
Adoption / implementation of IEE / RECP / ODS technologies / practices (with results documentation / published case studies)		PU	U	C	D	E	AB
<i>Occurrence in project portfolio [Number of projects]</i>		[2]	[1]	[1]	[1]	[1]	[2]
Support for the development of investment proposals	OT	T	T				
<i>Occurrence in project portfolio [Number of projects]</i>	[2]	[1]	[1]				
Gender initiatives	U						
<i>Occurrence in project portfolio [Number of projects]</i>	[1]						

Project key: A=ODS Gambia 120623; B=ODS Viet Nam 120621; C=RECP Indonesia 100224; D=RECP South Africa 130129; E=RECP-EIP Viet Nam 100052; F=IEE Cambodia 104034; G=IEE Ecuador 103017; H=IEE Egypt 100349; I=IEE India I 103029; J=IEE Indonesia 103031; K=IEE North Macedonia 120127; L=IEE Malaysia 103042; M=IEE Moldova 103043; N=IEE Philippines 103049; O=IEE Russia 103056; P=IEE South Africa I 103097; Q=IEE Thailand 103071; R=IEE Viet Nam 103081; S=IEE India II 120262; T=IEE Iran 120506; U=IEE South Africa II 120487 (full project references appear in Annex I).

Ranking from Ⓐ to Ⓣ according to the highest number of occurrences in the project portfolio.

Source: own table.

Table 14: Component outputs aimed at the service and equipment supply chain

Outputs targeting stakeholder subgroups of the Industry ⁴⁷	● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air-Conditioning	
	IEE			RECP			ODS	
■ Total of service and equipment supply chain								
	<i>Occurrence in project portfolio [Number of projects]</i>			<i>[16]</i>			<i>[3]</i>	<i>[2]</i>
■ National experts and service professionals (independent and within industrial companies)								
	Awareness raising activities (e.g. peer networks)	F					A	
	<i>Occurrence in project portfolio [Number of projects]</i>	<i>[1]</i>					<i>[1]</i>	
	Creation / dissemination of resource materials supporting IEE practices / technologies (e.g. training materials)	L	LU	LU	C			
	<i>Occurrence in project portfolio [Number of projects]</i>	<i>[1]</i>	<i>[2]</i>	<i>[2]</i>	<i>[1]</i>			
Ⓒ	Training to establish / support a self-sustaining cadre of trained national experts and service professionals with expertise in IEE / RECP / ODS technologies / practices and developing bankable projects	FIJKNPQRST	FIJKLMNPQRTU	FJKLMNQRTU	C	D	E	AB
	<i>Occurrence in project portfolio [Number of projects]</i>	<i>[15]</i>	<i>[12]</i>	<i>[10]</i>	<i>[1]</i>	<i>[1]</i>	<i>[1]</i>	<i>[2]</i>
	Training to establish / support a cadre of accreditors	P	P					
	<i>Occurrence in project portfolio [Number of projects]</i>	<i>[1]</i>	<i>[1]</i>					

⁴⁷ Number of the ten most frequent components (Ⓐ to ⑩)

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Outputs targeting stakeholder subgroups of the Industry ⁴⁷		● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
		IEE			RECP			ODS
	Training to establish / support a self-sustaining cadre of trainers	OPT	GOPTU	GOTU				
	<i>Occurrence in project portfolio [Number of projects]</i>	[3]	[5]	[4]				
	Training to establish / support a self-sustaining cadre of company auditors / certifiers	PT	PTU	TU				A
	<i>Occurrence in project portfolio [Number of projects]</i>	[2]	[3]	[2]				[1]
	Gender initiatives	KU	U	U				
	<i>Occurrence in project portfolio [Number of projects]</i>	[2]	[1]	[1]				
	Awareness raising activities (e.g. peer networks)			H				A
	<i>Occurrence in project portfolio [Number of projects]</i>			[1]				[1]

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Outputs targeting stakeholder subgroups of the Industry ⁴⁷	● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
	IEE			RECP			ODS
■ Equipment manufacturers / vendors (including innovators and entrepreneurs)							
Awareness raising activities (e.g. workshops)	F		H				B
<i>Occurrence in project portfolio [Number of projects]</i>	[1]		[1]				[1]
Support for adapting technologies / contractual elements / information systems to local markets	FIOS		T		D		B
<i>Occurrence in project portfolio [Number of projects]</i>	[4]		[1]		[1]		[1]
Training to establish / support a self-sustaining cadre of trained equipment manufacturers / vendors	FO	O	JLNQR				
<i>Occurrence in project portfolio [Number of projects]</i>	[2]	[1]	[7]				

Project key: A=ODS Gambia 120623; B=ODS Viet Nam 120621; C=RECP Indonesia 100224; D=RECP South Africa 130129; E=RECP-EIP Viet Nam 100052; F=IEE Cambodia 104034; G=IEE Ecuador 103017; H=IEE Egypt 100349; I=IEE India I 103029; J=IEE Indonesia 103031; K=IEE North Macedonia 120127; L=IEE Malaysia 103042; M=IEE Moldova 103043; N=IEE Philippines 103049; O=IEE Russia 103056; P=IEE South Africa I 103097; Q=IEE Thailand 103071; R=IEE Viet Nam 103081; S=IEE India II 120262; T=IEE Iran 120506; U=IEE South Africa II 120487 (full project references appear in Annex I).

Ranking from Ⓐ to ⓙ according to the highest number of occurrences in the project portfolio.

Source: own table.

Table 15: Component outputs aimed at the finance community

Outputs targeting stakeholder subgroups of the finance community ⁴⁸	● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
	IEE			RECP			ODS
■ Banks, financial services institutions and energy service companies (ESCOs)							
	<i>Occurrence in project portfolio [Number of projects]</i>		[13]	[1]			[2]
	Creation / dissemination of resource materials supporting IEE practices / technologies (e.g. training materials)	GILN					
	<i>Occurrence in project portfolio [Number of projects]</i>	[5]					
Ⓜ	Training to increase the understanding of EE projects and methods for their appraisal	FIJKNQSU					
	<i>Occurrence in project portfolio [Number of projects]</i>	[8]					
	Harmonized IEE / RECP / ODS project finance documentation / appraisal methods / guidelines	JNQR					
	<i>Occurrence in project portfolio [Number of projects]</i>	[4]					
	Enhanced capacity to fund IEE / RECP / ODS projects (including new sources of funding and new instruments)	ST		C			AB
	<i>Occurrence in project portfolio [Number of projects]</i>	[2]		[1]			[2]

Project key: A=ODS Gambia 120623; B=ODS Viet Nam 120621; C=RECP Indonesia 100224; F=IEE Cambodia 104034; G=IEE Ecuador 103017; I=IEE India I 103029; J=IEE Indonesia 103031; K=IEE North Macedonia 120127; L=IEE Malaysia 103042; N=IEE Philippines 103049; O=IEE Russia 103056; Q=IEE Thailand 103071; R=IEE Viet Nam 103081; S=IEE India II 120262; T=IEE Iran 120506; U=IEE South Africa II 120487 (full project references appear in Annex I).

Source: own table.

⁴⁸ Number of the ten most frequent components (Ⓐ to ⑩)

Table 16: Component outputs aimed at the policy and technical standards community

Outputs targeting stakeholder subgroups of the policy and technical standards community ⁴⁹		● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air-Conditioning
		IEE			RECP			ODS
■ Government / regulators / authorities								
	<i>Occurrence in project portfolio [Number of projects]</i>	[14]			[3]			[2]
	Capacity building through project management	JU						A
	<i>Occurrence in project portfolio [Number of projects]</i>	[2]						[1]
	Advice / assistance to support the development / implementation of policies / standards / strategies / action plans / programs furthering IEE / RECP / ODS technologies / practices	LOTU	OP				E	
	<i>Occurrence in project portfolio [Number of projects]</i>	[4]	[2]				[1]	
①	Training to increase the understanding of EE projects and methods	FJKOSU	JOP				E	
	<i>Occurrence in project portfolio [Number of projects]</i>	[6]	[3]				[1]	
	Gender initiatives	KU						
	<i>Occurrence in project portfolio [Number of projects]</i>	[2]						
②	Policies / regulations / measures / incentives / strategies / action plans furthering IEE / RECP / ODS technologies / practices	FGHIMTU	HJKLN PU	HU	C	D	E	AB
	<i>Occurrence in project portfolio [Number of projects]</i>	[7]	[7]	[2]	[1]	[1]	[1]	[2]

⁴⁹ Number of the ten most frequent components (Ⓐ to ⑩).

Impact Evaluation of UNIDO's Industrial Energy Efficiency Programme

Outputs targeting stakeholder subgroups of the policy and technical standards community ⁴⁹	● General Methods, practices & technologies	● EnMS	● SO	● General Methods, practices & technologies	● Innovation & Entrepreneurship	● Eco-industrial Parks Planning & management	● Refrigeration / Air Conditioning
	IEE			RECP			ODS
Programs (e.g. ISO 50001 incentives) furthering IEE / RECP / ODS technologies / practices, with measuring and evaluation procedures	F	KP					A
<i>Occurrence in project portfolio [Number of projects]</i>	[1]	[2]					[1]
Standards organizations							
<i>Occurrence in project portfolio [Number of projects]</i>	[7]						
Adoption / implementation of locally-relevant management standards (e.g. ISO 50001)	F	HKMO P					
<i>Occurrence in project portfolio [Number of projects]</i>	[1]	[5]					
Adoption / implementation of a system for certifying industrial companies' compliance with EnMS		HLOP					
<i>Occurrence in project portfolio [Number of projects]</i>		[4]					
Adoption / implementation of a system for certifying energy managers practitioners' competence with EnMS		K					
<i>Occurrence in project portfolio [Number of projects]</i>		[1]					
Adoption / implementation of a system for accrediting certification bodies	F	MP					
<i>Occurrence in project portfolio [Number of projects]</i>	[1]	[2]					

Project key: A=ODS Gambia 120623; B=ODS Viet Nam 120621; C=RECP Indonesia 100224; D=RECP South Africa 130129; E=RECP-EIP Viet Nam 100052; F=IEE Cambodia 104034; G=IEE Ecuador 103017; H=IEE Egypt 100349; I=IEE India I 103029; J=IEE Indonesia 103031; K=IEE North Macedonia 120127; L=IEE Malaysia 103042; M=IEE Moldova 103043; N=IEE Philippines 103049; O=IEE Russia 103056; P=IEE South Africa I 103097; Q=IEE Thailand 103071; R=IEE Viet Nam 103081 (full project references appear in Annex I).

Ranking from Ⓐ to Ⓟ according to the highest number of occurrences in the project portfolio.

Source: own table.

Annex IV. Indicator analysis

For an impact evaluation, the major source of data will be the projects themselves. All projects are expected to have logframes and monitoring and evaluation plans that include SMART indicators for outputs, outcomes and impacts. GEF projects need to report on the GHG savings triggered through them as well as on market impacts. The evaluation team therefore analysed the monitoring frameworks / logframes of the projects for SMART indicators and their aggregability for the purpose of the impact evaluation.

As the programmes follow the same fundamental logic and implement the same components, there could be a common set of indicators that could measure most of the aspects of these components. In order to understand to what degree this is already the case, the 21 projects in the sample have been categorized and compared (see list of projects and their respective project numbers in Annex IX. The analysis was done separately for the three project portfolios of IEE, RECP and ODS. The impact indicators have been analysed for all three project portfolios (cf. Annex IV.1). Due to the larger sample of projects and hence larger evidence, only the outcome and output indicators of the IEE portfolio have been analysed (cf. Annex IV.2)

Annex IV.1 Impact indicators – higher efficiency and its metrics

Almost all IEE projects⁵⁰ formulate their objective around improving EE, e.g. North Macedonia describes its objective as “*the acceleration of market transformation for industrial energy efficiency.*” Yet, even though the objectives are generally aligned among the IEE projects, different indicators are used for measuring the achievements in increasing IEE:

A: Direct vs. indirect GHG emission savings⁵¹

- All 16 projects have the reduction of direct CO₂ emissions (from pilot enterprises) as an impact indicator
- Eight projects also list indirect CO₂ emissions as indicator.

B: Energy savings in different units

- In line with the formulation of the programme objective, 8 projects mention energy savings (e.g. energy savings in Gigajoule or power savings in megawatt hour) as an additional impact indicator.
- Another five projects assess reductions in electricity and fuel consumption by industry or selected sectors / enterprises (in MWh and Gigajoule). One project (Iran) also includes the indicator energy savings in monetary terms with reference to international prices included in its logframe. Two projects measure the increase in efficiency in the form of energy consumption of certain sectors or enterprises (energy use per ton / unit of output).

C: Other impacts:

- North Macedonia tracks the number of enterprises that implement EnMS within the UNIDO project.

⁵⁰ An exception is the Philippines and the Iran project that do not include this objective in their logframes, but only in their project descriptions.

⁵¹ Cf. GEF GHG accounting methodology.

- North Macedonia also traces gender impacts on the impact level.⁵²
- four projects track increased investment on the impact level
- South Africa II tracks the creation of additional jobs (South Africa II) on the impact level
- India I tracks influence on the policy framework on the impact level.

The three RECP projects generally aim to improve resource efficiency and cleaner production but have very different formulations for their objectives. All measure the reduction of emissions. Besides GHG emissions, Viet Nam (100052) and Indonesia (100224) list also other chemical, water and waste pollutants. South Africa (10129) and Indonesia (100224) have additional impact indicators, e.g. stakeholder engagement and establishment of networks or increase of investments.

The two ODS projects included in the analysis (Viet Nam-120621) and Gambia-120623) use direct and indirect GHG equivalent (converted from R404) emission reductions as their impact indicators.

Table 17 presents a summary of the analysis showing the frequency of impact indicators used among the three project portfolios. For the purpose of comparability, the indicators have been simplified to fit into indicator types.

Table 17: Frequency of impact indicators in the three project portfolios

IEE			RECP			ODS		
Direct CO ₂ emissions	FGHISJTKL MNOPUQR	16	Emission reductions	EDC	3	Direct CO ₂ emissions	AB	2
Indirect CO ₂ emissions	FGHKLMPU	8	Increased resource efficiency	C	1	Indirect CO ₂ emissions	AB	2
Energy savings	HISTL NOP	8	Stakeholder engagement and network established	DC	2			
Electricity and fuel consumption	JGQRU	5						
Energy consumption	FM	2						
Energy savings in monetary terms	T	1						
Investment	HITO	4	Investment	DC	2			
Implementation of EnMS	K	1	Number of SMS as members of the national platform	D	1			
Job creation	P	1	Policy	C	1			
Policy & Governance	I	1						
Gender	K	1						

Project key: A=ODS Gambia 120623; B=ODS Viet Nam 120621; C=RECP Indonesia 100224; D=RECP South Africa 130129; E=RECP-EIP Viet Nam 100052; F=IEE Cambodia 104034; G=IEE Ecuador 103017; H=IEE Egypt 100349; I=IEE India I 103029; J=IEE Indonesia 103031; K=IEE Macedonia FYR 120127; L=IEE Malaysia 103042; M=IEE Moldova 103043; N=IEE Philippines 103049; O=IEE Russia 103056; P=IEE South Africa I 103097; Q=IEE Thailand 103071; R=IEE Viet Nam 103081; S=IEE India II 120262; T=IEE Iran 120506; U=IEE South Africa II 120487.

Source: own compilation.

⁵² Though North Macedonia is the only project that included gender on impact level, other projects such as South Africa II (120487) track gender but only on output level.

Annex IV.2 Outcome and output indicators

For the analysis of the outcome and output indicators, the whole set of output and outcome indicators in the projects' logframes were compared across projects. This allowed to identify two different styles of logframes (see Table 18):

- Group 1 – consisting of eight projects – are using a standardized logframe with more or less similar (or even the same) indicators for the different components.
- Group 2 projects – also consisting of eight projects – use a larger variety of indicators, not as easily comparable. Within this second group, subgroups can be formed with significant similarities of the usage and wording of indicators, for example, Russia and Iran or Cambodia and Moldova.

Besides the fact, that indicators of Group 1 are more standardized among different projects and the variety of indicators used in Group 2 is much higher, another difference is the layout of the logframes themselves. Group 1 does not include any outcome indicators but merely output indicators. Whilst Group 2 includes both outcome and output indicators (except Iran, which has only formulated output indicators, but which are not comparable to Group 1).

The projects of both groups have been designed and approved in different years so that it cannot be assumed that they are similar because they belong to a time-dependent cohort and the differences were a “flavour of the day.” Also, it is not necessarily a question of the style of the project manager. For example, the Cambodian and the Moldovan project were not developed by the same project manager. An explanation could be that during the design of the projects the project teams were supported by external consultancies who had been working on the projects that show similarities. This could not be traced and evidenced by the evaluation team. Still, for the current analysis, these similarities have advantages which will be exploited here.

Table 18: Project Groups for IEE countries on the basis of similarities in indicator formulation

Group 1			Group 2		
Country	Project number	Project code	Country	Project number	Project code
Ecuador	103017	G	Cambodia	104034	F
Egypt	100349	H	India I	103029	I
Indonesia	103031	J	North Macedonia	120127	K
Malaysia	103042	L	Moldova	103043	M
Philippines	103049	N	Russia	103056	O
Thailand	103071	Q	South Africa I	103097	P
Viet Nam	103081	R	Iran	120506	T
India II	120262	S	South Africa II	120487	U

Source: own Compilation from project documents.

The comparison allowed to pool similar indicators together in each group to provide a harmonized basis for the analysis. In a third step, the indicators used by the projects were mapped to the same stakeholder groups and output categories used in the component analysis. This provides a structured

overview what indicators are used or can be used for the outputs and outcomes of the projects, and the derivation of recommendations.

After having mapped the indicators to the component categories, the most often used or most general phrasing of an indicator was taken as representative in the compilation (see compilation tables in the following chapters). As explained above, there is hardly standardized formulation of indicators throughout the projects, especially in the more diverse Group 2. For example, the Iranian indicator *"Fully developed training materials for EnMS training"* is used as representative indicator in the compilation for the other projects that used a similar expression like *"EnMS course modules and teaching support materials exist"* or *"Fully developed set of training materials for energy management system implementation training, including build-up of systems optimisation library."*

Other overall observations of the indicator analysis:

By international convention, there is a clear difference between output and outcome indicators. An output indicator is a direct result of a project activity, and fully under the control of a project. An outcome is less directly under the control of the project (Woerlen 2012). In the UNIDO projects, the handling is not fully consistent. For example, the Cambodian and North Macedonian projects use the same indicators, e.g. *"resources invested in EnMS / SO / EE implementation"*, on output as well as on outcome level. In the Iran project, the indicator *"Government capacity to design and implement an effective industrial EE policy enhanced"* is used as output indicator; however, the formulation would imply to see it on the outcome level since it might be considered outside of the project's direct accountability. The same *"government capacity"* indicator is also used in the Russia project, but at outcome level.

Overall, the analysis showed that Group 1 projects used on average 18 different indicators, while Group 2 projects used 32. However, the fact that only Group 2 projects included outcome indicators in their logframes needs to be kept in mind. In Group 1, the Ecuador project used the smallest number of indicators (14) and Indonesia the highest (22). In Group 2, the Cambodian project is the top-runner with 43 indicators in its logframe while South Africa has "only" 26. Malaysia, Egypt, and Ecuador (all Group 1 projects) used indicators that were not formulated according to international conventions. Most of them were neither specific, measurable, attainable nor timebound (SMART). For example, *"improved information services"*⁵³, *"status of energy management and EnMS training"*⁵⁴ or *"status of post project action plan"*⁵⁵. On the other hand, North Macedonia and Indonesia, for example, use indicators that are well-formulated and are SMART (specific, measurable, attainable, relevant and timebound), like *"number of factories registered for peer-to-peer network"* or *"number of local energy efficiency and environment professionals trained."*

In the following chapters the results of the analysis are discussed in more detail and for each stakeholder group (industry, finance community, policy and technical standards community) separately.

⁵³ This indicator is used in the Egypt (100349) and Malaysia projects.

⁵⁴ This indicator is used in the Ecuador project.

⁵⁵ This indicator is used in the Ecuador and Egypt projects.

Annex IV.2.1 Output and outcome indicators related to the wider economy

This section compares the indicators used for project outcome and output directed at all industry, including the companies UNIDO is not in contact with. Table 19 clusters the indicators in indicator categories and states the projects in which they are used.

The first component addressing the wider industry is the implementation of national awareness campaigns and events. 12 of the 16 project countries included indicators addressing this component. Seven of these are in Group 1 and use more or less the same expression for the promotion of energy efficiency via national campaign, but the indicators of the five projects from Group 2 vary. For example, Russia uses *“Information campaign implemented”*, Cambodia included the indicator *“Number of awareness programmes conducted on IEE benefits.”* Egypt additionally included three output indicators that are actually outcome indicators as they all refer to the achievement of enhanced awareness⁵⁶ (i.e. the result rather than the project's products), either regarding energy management / auditing, systems optimisation or sources of IEE financing.

A second typical component is the development and implementation of information systems (e.g. websites) and communications strategies for wide dissemination of resource materials. Here, three projects in Group 1 have used an indicator along the lines of *“improved information services”*, the others have not included indicators for this component. The projects have included these indicators as output indicators even though they are actually more formulated in the form of outcome statements and do not fulfil the SMART-criteria. The indicators in Group 2 are more diverse and meet the international evaluation standards. Besides including an indicator for the development of a communication strategy in three projects⁵⁷, seven projects included an indicator to establish a website for disseminate training material, case studies, etc. For the development of a website, Cambodia included similarly phrased indicators on the output and outcome level.⁵⁸ Three projects measure the preparation of outreach material with indicators. In Group 1, only Egypt used indicators for the development of structures, tools, and, methodologies to monitor, track and benchmark energy consumption and efficiency in the industry (*“Availability of benchmark data”* and *“Comprehensiveness of energy-related databases”*). In Group 2, Cambodia and Moldova included indicators to implement these structures, tools, and methodologies and India I has a special focus on biomass and planned to collect data regarding biomass via a survey.

Table 19: IEE indicators addressing the wider economy (including non-intervention companies)

Indicator category	Group 1		Group 2	
	Indicator	Project	Indicator	Project
■ National awareness campaign and events	National campaign provided information to industry to adopt ISO 50001	GHJLN QR	Number of Awareness programmes conducted on IEE benefits	FIOPU

⁵⁶ For example: “Enhanced awareness in industry on energy management and energy auditing.”

⁵⁷ „Communication strategy in place three months after programme start. Specific strategies in place through liaison with Cluster forums.”

⁵⁸ Outcome level: “Web page on the project populated with relevant information and manual is in place.” Output level: “Dedicated web page for IEE is in place and populated for training material, information and links with relevant web sites.”

Indicator category	Group 1		Group 2	
	Indicator	Project	Indicator	Project
	Enhanced awareness in industry on energy management and energy auditing (Energy managers, energy service providers and other technical staff)	H	Industry and practitioners of Environmental Management Systems (EnMS) informed about the EnMS	P
	Enhanced awareness in industry on systems optimization (energy managers, energy service providers and other technical staff)	H		
	Enhanced awareness on sources of IEE financing	H		
■ Information systems (e.g. websites) and communications strategies for wide dissemination of resource materials developed for / with UNIDO partners and intervention companies (e.g. specifications, guidelines, case studies, software, benchmarking databases and tools, and training materials)	Improved information services	GHL	Communication strategy in place three months after programme start. Specific strategies in place through liaison with Cluster forums.	IPU
			Web page on the project populated with relevant information and manual is in place.	F
			Dedicated web page for IEE is in place and populated for training material, information and links with relevant web sites.	FIKMOP T
			Number of editorials and media releases of various formats	FUT
■ Structures, tools and methodologies to monitor, track and benchmarking energy consumption and efficiency in industry	Availability of benchmark data	H	Structures, tools and methodologies to monitor, tracking and benchmarking energy consumption and efficiency in industry	FM
	Comprehensiveness of energy-related databases	H		
			A survey conducted on locally available biomass resources and sustainability of biomass supply determined. (In the Foundry and Brass Sectors)	I

Source: own compilation.

Annex IV.2.2 Output and outcome indicators related to UNIDO light-intervention companies

This section compares the indicators used for project outcome and output directed at companies UNIDO is engaging with in a light way during the project duration. Table 20 clusters the indicators in indicator categories and lists their occurrence in the project logframes.

The projects include different activities and therefore also indicators for raising the awareness of companies with which UNIDO engages on a low level of intervention (see also component analysis, chapter Annex III.2). Most projects expected to establish peer-to-peer networks (seven projects in Group 1 and three projects in Group 2), while additionally three projects (Group 1) track the number of factories or participants registered for these networks and two projects (Group 2) the attendance in these forms of events. Only North Macedonia, which is the only project that aims to achieve a gender specific impact, included an indicator for measuring the *“Number of women managers attending.”* Eight projects measure *“Recognition program for participating companies established based on successful achievements”* (in this or a very similar wording). Another activity is the implementation of workshops or study tours. In Group 2, five projects have included a certain number of workshops or conferences as indicator. In Group 1, only India II planned to conduct workshops.

Another component is the creation and dissemination of resource materials, like guidelines or training material. In each Group, four countries planned to develop and provide training material on energy management as well as on system optimisation to industrial enterprises. South Africa II developed additional training material for other SO disciplines, including gender sensitive planning and facilities. Three countries in Group 1 expected to develop training material relating to financing, while only South Africa II (Group 2) planned to publish *“guidelines for financial development and evaluation of IEE projects.”* Furthermore, indicators tracking the development of additional guidance material in general but also specifically for certain technologies are included by several projects, with India I using the most detailed indicators. Cambodia planned to publish best practice case studies.

Only projects of Group 2 have included indicators on the dissemination of benchmarking databases and tools in their logframes. Five countries planned the development of benchmark databases with Iran and Russia additionally introducing these benchmarks to a certain number of sectors. India I is also conducting detailed techno-economic studies at the company level.

Most projects have included indicators that reflect the training component. Only Egypt, Malaysia and North Macedonia do not have trainings for light-intervention companies. Four projects in Group 2, conduct trainings on the energy manager level. Cambodia is the only project, that also has an indicator for Chief Executive Officer (CEOs) / factory owners (*“Number of CEOs / owner attended clinics”*). In each Group, five countries have included trainings for factory personnel on energy management, and four countries on systems optimisation. Thailand, Russia, and South Africa II only do energy management trainings, India I only trainings on systems optimisation. While in Group 1, the projects used the same indicators, the formulations in Group 2 vary, with Cambodia and Moldova using the same indicators, and Russia and Iran partly as well. Four countries in Group 1 and three countries in Group 2 also have indicators about trainings concerning financing / project development. Overall, most countries have used their own formulated indicators, including determining a particular number of anticipated participants.

Three projects in Group 2 (India I, Russia and Iran) and one project in Group 1 (India II), which all have a focus on SMEs, conduct needs assessments, quick audits or general walk-throughs for a specific number of companies. By far the highest number of audits is done by the Iran project. The same projects of Group 2 have also included case studies for UNIDO light-intervention companies in the project design.

Three projects included indicators regarding the support for the development of investment proposals. India I supports the development of bankable proposals and set a target for the number of applications for financial assistance. Like Russia and Iran, they also set a target for the amount of investment facilitated in EE / RE technologies. Egypt and Malaysia of Group 1 and three projects of Group 2 included indicators regarding the technical assistance to industry in accessing financing.

As mentioned above, North Macedonia included a gender-related indicator for the number of women participating in the peer-to-peer networks. South Africa II included two gender-related indicators regarding training material to increase awareness of women's roles in the industry as well as number of women participating in qualification workshops.

Table 20: IEE indicators addressing UNIDO light-intervention companies

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
<p>■ Awareness raising activities (e.g. workshops, study tours / knowledge exchange, peer networks and recognition activities)</p>	Workshops conducted after validation of energy savings is completed	S	Number of regional seminars and workshops	IKPUT
			At least 7 study tours / exchange visits carried out under a 'knowledge exchange program to share lessons and experiences among the various clusters.	IT
	Network established and used to support program recognition and present savings result from energy management	HJLNQRS	Discussion forum and Peer-to-Peer network established and operational;	IOU
	Number of factories registered for peer-to-peer network	JQR	Attendance of project seminars and round tables	KO
	Number of consultations between technology	S		

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
	vendors and enrolled MSME units			
			Establishment of professional body representing EnMS and SO professionals	U
	Recognition program for participating companies established based on successful achievements	GJNQR	Public recognition events	MOT
■ Dissemination of resource materials supporting IEE practices / technologies (e.g. specifications, guidelines, case studies, software and training materials)	Training material on energy management provided to industrial enterprises	JNQR	Fully developed training materials for EnMS training	OPUT
	Training material on systems optimization provided to industrial enterprises.	JNQR	Fully developed training materials for system optimisation	OPUT
			National Qualification Framework Occupational Qualification course module materials exist	U
			Training packages / curriculum for additional SO disciplines available (incl. gender sensitive planning and facilities)	U
	Training material relating to financing of EE project development are provided to industries.	JQR	Published guidelines for financial development / evaluation of IEE projects	U
	Status of UNIDO guide on ISO 50001 implementation	H	Guide for the Implementation of IEE & Energy Management in compliance	FIU

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
			ISO 50001 international standards is developed	
	Existence of a comprehensive tool kit for the identified technologies to help the implementation process.	S	Tools available for supporting EE in industry	FIMU
	Study capturing the best practices, incentive structures, implementation process, guidelines and industry feedback.	S	200 Detailed Project Reports prepared for MSMEs by Local Service Providers in 12 clusters	FI
■ Creation / dissemination of benchmarking databases and tools			Benchmarking developed and introduced in industrial sectors / sub-sectors	IOPUT
			Number of high energy intensity industry subsectors best practice benchmarked for EnMS and SO	I
■ Training to establish / support a self-sustaining cadre of trained national experts with expertise in IEE technologies / practices and developing bankable projects			Introductory training sessions to 100 managers in 50 large enterprises	FOPT
			Number of CEOs / owner attended IEE clinics	F
	Training of technical personnel of MSMEs	S	Formal training in EnMS and systems optimisation	OT
	Number of trained factory personnel on energy management	GJNQR	Number of companies participating in the project seminars (energy management)	FMOUT
	Number of trained factory personnel on system optimization	GJNR	Number of companies' personnel participating in the	FIMT

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
			project trainings (system optimisation)	
	Number of trained facility managers / personnel in IEE project development.	JQRS	Training workshops on proposals / financing for industry personnel	FUT
			Number of training programme conducted on IEE financial engineering	F
■ Needs assessments (quick scan / walk-through)	Identification and assessment of individual needs related to customization, and operational training;	S	Needs assessments for these 12 institutions for the implementation of Energy Management Cells within them	IOT
			40 system assessments prepared at 20 additional enterprises (large industries)	O
			General / walk-through audit finding reports for 600 industrial sites, including: (a) Identification of up to 30 % EE opportunities per site; (b) Practical (and part-costed) EE plan-of-action.	T
■ Support for the development of investment proposals			No. of applications for financial assistance (loans / investments) submitted by MSMEs with No. of additional funded.	I
			The development of around 200 bankable Detailed Project Reports which can be used for investment decisions.	I

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
<ul style="list-style-type: none"> Technical assistance to industry in accessing financing 	Status of technical assistance support to existing financial loan and credit guarantee schemes	HL	No. of applications received by commercial banks	KUT
<ul style="list-style-type: none"> Gender initiatives 			Investment facilitated into EE / RE technologies	IOT
			No. of women managers attending	K
			Training material incl. gender sensitive planning and facilities	U
			Promotion packages for National Qualification Framework qualifications to industry highlight women's roles; % of women participating	U

Source: own compilation.

Annex IV.2.3 Output and outcome indicators related to UNIDO partner energy-intensive enterprises

This section compares the indicators used for project outcome and output directed at partner energy-intensive enterprises of the IEE projects. Table 21 clusters the indicators in indicator categories and states the projects in which they are used.

For UNIDO partner energy enterprises, only Russia (Group 2) expected to set-up training additionally to the trainings conducted for the light-intervention companies, but overall six projects (four in Group 1 and two in Group 2) included indicators for in-depth assessments, mainly for steam system optimisation (*"Number of completed steam, pumping, and compressed air systems assessments"*). Several projects of Group 1 have included indicators for conducting and documenting case studies along with the implementation of EnMS and SO systems. Indonesia planned to conduct case studies in general. Malaysia and Viet Nam track the number of case studies for energy management and system optimisation separately, while Thailand only focuses on case studies for energy management (*"Number of case studies on energy management systems"*). Only in Russia (Group 2) UNIDO supported energy audits. India II used indicators for tracking the number of implementation and adoption of energy efficient technologies and also that the contracts between Energy Efficiency Services Ltd. (EESL) / Energy service companies (ESCOs), companies and technology providers are standardized. In the India I project, a certain number of clusters and MSMEs shall implement EE / renewable energy (RE) technologies and practices.

While in Group 1, indicators for tracking the number of implementations of energy management plans (seven projects) and system optimisation projects (six projects) are phrased very similar, the list of indicators in Group 2 regarding adoption and implementation of technologies and practices varies. In addition to the number of implemented projects, the North Macedonian and Russian projects also include indicators to get information about the value of investments, with North Macedonia using four different indicators and Russia one. Russia has set the goal to develop a certain number of EE investment plans.

As shown in Annex IV.1, 15 projects have included impact indicators regarding energy savings. On the output level, only Cambodia and Moldova track energy savings, while Cambodia additionally also included the estimation of “*anticipated savings in specific energy consumption (SEC) and GHG emissions.*” Three projects of Group 2 put a focus on the certification of IEE practices (Cambodia, North Macedonia and Moldova).

India I, South Africa I and Iran (all Group 2) have not included indicators for partner energy-intensive enterprises, because these projects have a focus on SMEs.

Table 21: IEE indicators addressing UNIDO partner energy-intensive enterprises

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Training to establish / support a self-sustaining cadre of trained national experts with expertise in			2-day training sessions to participating large enterprises staff delivered	0
			Extensive on-site EnMS training for 10 large enterprises;	0
			40-60 enterprise staff trained in systems optimisation at the 10 core enterprises (a total of 30 three-day workshops);"	0
■ In-depth assessments of EnMS & SO opportunities	Number of completed steam, pumping, and compressed air systems assessments	HJQR	No of systems optimisation assessments completed in large SMEs	MO
■ Adoption / implementation of IEE technologies / practices (with results documentation / published case studies)	Number of case studies	J	35 full case studies developed	IOT
	Number of case studies on energy management	LQR	Full energy audits for the 10 large enterprises carried out	0
	Number of case studies on system optimization	LR		
	Contracts between EESL / ESCOs with units and technology providers standardized.	S	Number of IEE pilot and quick scan projects are selected with co-financing commitments	FI

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
<ul style="list-style-type: none"> ■ Certification of IEE practices ■ Support for the development of investment proposals 	MSME units implementing technology demonstration of the identified technologies.	S	Number of pilot projects are implemented with direct support from the GEF project	FM
	Number of MSME units adopting EE technologies	S	No. of enterprises implementing low costs EnMS / SO / EE projects	KP
			Number of EE projects implemented annually	FKIM
	Number of factories with energy management plans implemented	GHJLNQR	Number of companies putting in place an EnMS	KMO
			Number of companies implementing energy management operational improvements	M
	Number of completed system optimization projects	HJLNQR	Number of steam system optimization projects implemented	M
			Resources invested in EnMS / SO / EE implementation	K
			No. of IEE investments supported (through technical assistance Facility)	K
			Rate of implementation of IEE investments supported	K
			Total value of IEE investments made	KO
			Anticipated savings in SEC and GHG emissions are estimated	F
			Energy savings megawatt hour achieved over the project lifetime	FM
			Number of EN16001 or ISO 50001 certified companies	FKM
			10 complete company EE investment plans developed	O

Source: own compilation.

Annex IV.2.4 Output and outcome indicators related to UNIDO partner small- and medium-sized enterprises (SMEs)

This section compares the indicators used for project outcome and output directed at partner small- and medium-sized enterprises of the IEE projects. Table 22 sorts the indicators into indicator categories and names the projects in which logframes they can be found. In the IEE projects with a focus on small and medium-sized enterprises, several projects work with SMEs as their partner companies.

In Group 1, only Ecuador has included an indicator for tracking energy needs assessments conducted and the status of implementation of system optimisation projects (*"Status of in-depth energy assessments"*). In Group 2, different indicators regarding energy audits and assessments have been included into the logframes. India I and Russia planned to conduct detailed energy audits / needs assessment. Russia and Iran planned additionally to train partner SMEs on SO or EnMS in general. The project South Africa I has set an indicator which not only specifies the number of enterprises implementing EnMS, but also in a certain timeframe, so that the achievements during the project can be well monitored and evaluated.⁵⁹ Only South Africa II included an indicator for tracking *"Energy and cost saving results from energy audits of EnMS and SO demonstration projects."* Iran is the only project that handed out direct financial support to four demonstration projects. In Russia, the development of investment plans was supported and measured with an indicator with a specific target of how many investment plans shall be developed by partner SMEs within the framework of the project. South Africa II is the only country that included gender sensitive indicators: *active promotion of participation and development of support tools for women, % increase in women participating in EnMS and SO trainings, and women's participation and leadership of EnMS teams.*

Table 22: Indicators addressing UNIDO partner small and medium-sized enterprises

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Energy audits and needs assessments	Status of in-depth energy assessments	G	At least 24 detailed energy audits conducted in various sectors	IO
■ Training to establish / support a self-sustaining cadre of trained national experts			25 large SMEs trained in systems optimisation	OT
■ Adoption / implementation of IEE technologies / practices (with results documentation /	Status of system optimisation projects	G	Minimum of 75 Industrial enterprises (or 15 % of ISO 14000 registered companies) use EnMS by 2011 and minimum 25 % or 5 Companies uses EnMS by 2013	P

⁵⁹ "Minimum of 75 Industrial enterprises (or 15 % of ISO 14000 registered companies) use EMSEnMS by 2011 and minimum 25 % or 5 Companies uses EnMS by 2013."

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
published case studies)			Energy and cost saving results from energy audits of EnMS and SO demonstration projects	U
■ Support for the development of investment proposals			Direct financial support for up to 5 “demonstration” / “pilot-scheme” projects.	OT
■ Gender initiatives			Active promotion of participation and support tools for women as EnMS / SO trained industry technicians / operators.	U
			% Increase in women participating in courses (at engineer level)	U
			Women participation in, and leadership of, enterprise EnMS energy management teams.	U

Source: own compilation.

Annex IV.2.5 Output and outcome indicators related to national experts and services professionals (independent / within industrial companies)

This section compares the indicators used for project outcome and output directed at national experts and service professionals working independently as well as within industrial companies. Table 23 clusters the indicators in indicator categories and states the projects in which they are used.

While in general the indicators of Group 1 mainly focus on the projects' training components and use the same indicators, Group 2 has a higher number of and more diverse sets of indicators.

Regarding the component of awareness raising, Cambodia (Group 2) is the only project, that aims at establishing a network for service providers with regular meetings. In the training material component, only Malaysia (Group 1) and South Africa II (Group 2) have included indicators regarding the creation of training material.

Most projects have included indicators that address the training component. In Group 1, five projects differentiate between training on EnMS and system optimisation: “*Number of trained national experts on*” IEE India II included the non-measurable indicator “*training of local service providers.*” In Group 2, even though Cambodia and Moldova conduct trainings for service delivery experts, they are using output indicators that do not focus on the participants of the trainings but on the experts in general: “*number of energy management system experts in the market*” and a same indicator for system optimisation. Additionally, like three other projects in Group 2, Cambodia also tracks in general the “*number of energy efficiency experts.*” Four projects trace the “*number of service providers providing energy management system services.*” Actually, the indicators are formulated as outcome

indicators, because they refer to the general market and not only to the activities of the UNIDO projects. However, in the projects they are used on the output level and either a target for a certain number of experts trained (e.g. Cambodia) or a scoring scale (North Macedonia) has been set.

The IEE India I project included an indicator tracking the number of technologies and practices offered by local service providers. Cambodia and Moldova monitor the number of IEE service contracts stipulated by service providers.

South Africa I is the only project that trains accreditation to assessors so that they are able to accredit auditors in a certain time frame. Of the Group 1 projects, only Ecuador has included an indicator for the component training to establish / support a self-sustaining cadre of trainers (“*status of energy management (EM) training of trainers*”). In Group 2, four country projects train trainers. Russia is the only project, that not only tracks the number of trainers trained during the project, but also set the outcome goal to achieve increased capacity of the trainers with increased knowledge resources and training skills. Three projects of Group 2 (South Africa I, South Africa II 120487 and Iran) explicitly train auditors.

Regarding gender, North Macedonia tracks the number of female service providers that participated in the trainings and South Africa II tracks the number of female participants in the train-the-trainer courses.

Table 23: IEE indicators addressing national experts and service professionals

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Awareness raising activities (e.g. peer networks)			Formal set up of IEE expert network in the country	F
			Network facility with specific area of specialization of experts is available and Network is meeting regularly to exchange / share IEE developments / concerns	F
■ Creation / dissemination of resource materials supporting IEE practices / technologies (e.g. training materials)	Status of EM training materials	L	Updated South African National Standard (SANS) / ISO 50001 Lead Auditor and Training Course Providers training course	U
■ Training / mentoring to establish / support a self-sustaining cadre of trained service delivery professionals with expertise in IEE			Number of IEE and energy management (EM) experts in the country.	F
			15 Local Service Providers / industry associations in 12 clusters identified for training and assistance in implementing the new technologies / Best Operating Practices	I

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
technologies / practices and developing bankable projects			EnMS and SO courses available	U
			No. of local EE and environment professionals trained	FKPU
	Number of trained national experts on energy management	JLNQR	Number of EnMS experts in the market	FM
	Number of trained national experts on system optimization	JLNR	Number of energy system optimization experts in the market	FM
			SO Expert Level Graduates benefitting from mentoring	U
			Specific training for technical equipment: 10 National consultants with up to 15 different types of kit.	T
	Training of Local Service Providers	S	No. of EE consultants attending the training	FK
			Number of service providers providing EnMS services	FIKU
			No. of local EE consultants / service providers offering CASO and SSO services and type of services	K
			Number of technologies and practices adapted for local MSMEs - target 12 adapted technologies or practices being offered by local service providers	I
			Number of IEE service contracts stipulated by Energy Management and Steam System Optimization national experts trained by the GEF project	FM
	■ Training to establish / support a cadre of accreditors			4 assessors are trained and are ready to accredit auditors within less than 3 months waiting period
■ Training to establish / support a self-sustaining cadre of trainers	Status of EM training of trainers	G	No of national trainers trained in EnMS and systems optimisation	OPUT
			Average "trainers capacity score" increased4 – target x4 by project mid-term compared to start of project status	O

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Training to establish / support a self-sustaining cadre of company auditors / certifiers			30 auditors / consultants in EE are trained in EnMS and System optimization.	PUT
			Centres of training for Monitoring & Verification (M&V) Auditors under SANS 50010 delivering courses	U
■ Gender initiatives			No. of women EE consultants / service provided trained	K
			Train-the-trainer courses with active promotion of women; % women training staff	U

Source: own compilation.

Annex IV.2.6 Output and outcome indicators related to equipment supply chain (manufacturers and vendors)

In this section we analyse the indicators tracking outcomes and outputs targeted at equipment manufacturers and vendors. Table 24 groups the indicators in indicator categories and lists their occurrence in the project logframes.

Egypt is the only project that included an indicator for “*Enhanced awareness in industry on systems optimization*” among manufacturers and vendors. The indicator seems mismatched regarding its level and would be better suited at the outcome level. The Egypt project has not included any further output indicators for the stakeholder group equipment manufacturers and vendors, therefore; it is unclear how in the project logic chain awareness is promoted by the project.

Four UNIDO projects have included activities to support equipment manufacturers / vendors for adapting technologies, contractual elements, and / or information systems to local markets. India II is the only country of Group 1 that planned to support “*modifications to the technical parameters, warranties, etc. and back-to-back arrangements to ensure technical performance guarantee of the technology.*” In Group 2, UNIDO supports the introduction of EE / RE technologies in India I. Russia and Iran track the development of a data bank on EE technologies and Cambodia planned assisting suppliers in collaborating with foreign technology suppliers.

Three projects in Group 1 and the Cambodian project of Group 2 have included a combined training indicator for equipment vendors / suppliers on energy management and system optimisation. Viet Nam (Group 1) is the only country that tracks the number of trained persons on energy management and system optimisation separately. Malaysia and Russia only conduct trainings regarding system optimisation. The indicators used are all suitable to track and measure the achievements, except Malaysia which uses the indicator “*Level of info of vendors / suppliers on opportunities in systems optimisation.*”

Table 24: IEE indicators addressing equipment manufacturers / vendors

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Awareness raising activities (e.g. workshops)	Enhanced awareness in industry on systems optimization	H		
■ Support for adapting technologies / contractual elements / information systems to local markets	Modifications to the technical parameters, warranties, etc. and back-to-back arrangements to ensure technical performance guarantee of the technology;	S	Adjustment of existing technologies for the introduction of at least 12 emerging / improved EE / RE technologies and / or Best Operating Practices to be introduced.	I
			Data bank on EE technologies developed	OT
			Number of suppliers assisted in collaboration / agents of foreign technology suppliers.	F
■ Training to establish / support a self-sustaining cadre of trained equipment manufacturers / vendors	Number of trained equipment vendors / suppliers	JNQ	Number of local suppliers trained for providing IEE services	F
	Number of trained vendors on energy management	R		
	Number of trained vendors on system optimization	LR	40 Russian equipment suppliers trained in optimisation of six types of systems (twelve three-day workshops)	O

Source: own compilation.

Annex IV.2.7 Output and outcome indicators related to the finance community

Another stakeholder group to some IEE projects are banks and financial services institutions. In this section we analyse the indicators that track outcome and outputs targeted at banks and financial service institutions. Table 25 groups the indicators in indicator categories and lists their occurrence in the project logframes.

Three projects in Group 1 included output indicators stating that the projects develop training material / guidelines on financing EE projects. In Group 2, only India planned to support the creation of templates and examples for the financial assessment of EE / RE projects. The training of financial institutions component is covered by the highest number of indicators for both groups. Four projects

in Group 1 and five in Group 2 put a focus on training of financial institutions and bank personnel to increase their capacity in the assessment of EE projects. While all these indicators are formulated after the SMART-criteria, Russia uses an outcome formulation as output indicator (*“Enhanced capacity of local banks to identify and process loans for industrial energy efficiency”*).

Ten country projects have included indicators regarding financing methods and instruments in their logframes (seven in Group 1 and three in Group 2). In Group 1, four projects planned to harmonize the evaluation criteria within financial institutions. India II and Iran are the only projects to implement a revolving fund as a new instrument to enhance the capacity of funding IEE projects. While India II used five different indicators that show the different steps of establishing and implementing the fund, Iran only used one indicator which focuses only on the establishment of the fund itself.

Table 25: IEE indicators addressing banks and financial services institutions and energy service companies

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Creation / dissemination of resource materials supporting IEE practices / technologies (e.g. training materials)	Availability of training materials on financing EE projects	GLN	Templates and examples for financial assessment of EE / RE projects developed for use in training and dissemination	I
■ Training to increase the understanding of EE projects and methods for their appraisal	Number of financial institutions and local banks personnel trained to understand main features of EE projects and better appraise EE projects proposals.	JNQS	Number of trained staff from financial industry and Government providers of financing	FIKOU
	Number of persons trained on the support for packaging for IEE projects.	N	No. of lending officers attending the training	FK
			No. of EE consultants attending the training	F
■ Harmonized IEE / RECP / ODS project finance documentation / appraisal methods / guidelines	Evaluation criteria are harmonized within financial institutions to help them select best EE projects	JNQR		

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
<p>■ Enhanced capacity to fund IEE projects (including new sources of funding and new instruments)</p>	Establishment of the EESL MSME Revolving Fund with successful repayments occurring;	S	<p>“Revolving fund”: By end 2011 / 12, to have an ESCO-type loan scheme system in place, with initial input from the GEF / UNIDO / Industrial Energy Efficiency Program of >USD 7 million</p>	T
	Portfolio of financial products.	S		
	Finalization of the institutional structure of the EESL-MSME Revolving Fund	S		
	Finalization of working methodology of EESL-MSME Revolving Fund	S		
	Identification of additional donor / lending funds for the EESL-MSME Revolving Fund	S		

Source: own compilation from project documents.

Annex IV.2.8 Output and outcome indicators related to the policy and technical standards community

This section compares the indicators used for project outcome and output directed at the policy and technical standards community. Table 26 sorts the indicators into indicator categories and names the projects in which they can be found.

Most IEE projects included the cooperation with the policy and technical standards community in their design, which can be split into three categories: the stakeholder groups (1) government / regulatory / authorities; (2) policies; and (3) technical standards. Again, the list of indicators of Group 2 shows a larger variety than of Group 1.

Indonesia (Group 1) and South Africa II (Group 2) are the only projects that included an indicator on capacity building through project management of the UNIDO IEE project. While Indonesia traces the “*number of government staff in the PMU*”, South Africa II focuses on the establishment of “*interdepartmental IEE project coordination*”

In the component “advice / assistance to support the development and implementation of policies” etc., Malaysia is the only project of Group 1 that included indicators. Though found at output level, the indicators are formulated as outcome indicators and monitor the development of capacity in specific technical areas. Four projects in Group 2 aim to increase the capacity of governmental

institutions to design and implement IEE policy in general. Again, the formulation indicates the level of an outcome rather than an output indicator. However, Russia is the only project that has in fact used the indicator as an outcome indicator in their logframe; the other projects used it at output level.

Within several of the projects, trainings to increase the understanding of EE projects and methods are conducted. In Group 1, Indonesia tracks its number of workshops / meetings carried out and India II monitors the number of government officials trained in promotion of EE equipment, evaluation, and investment in IEE projects. In Group 2, four projects carried out training sessions for the policy and technical standards community. Whilst most of the trainings are addressing the implementation of IEE and its supporting policies, Russia additionally trained experts of the energy agency on communication. South Africa II also tracks the number government personal trained on financing to increase the capacity of developing and enhancing funding mechanisms, incentives and credit streams for industrial companies. Both, North Macedonia and South Africa II have included a gender focus and track the number of females from policy bodies trained. South Africa, additionally, monitors a more overarching gender indicator: *“gender equality issues identified for IEE and enhanced policy tools to promote women in IEE.”*

While five projects of Group 1 and almost all projects of Group 2 monitor indicators regarding policies. But this is one of the areas, where indicators are very diverse in particular in Group 2. Three projects track the *“status of policy paper on how to implement industrial policy.”* Another three projects monitor the development of *“post-project action plans.”* Ecuador, additionally, included the indicator *“status of national EnMS”*, pursuing the aim to set a national ISO-compatible standard for EnMS. Five out of six projects in Group 2 support the development of IEE policy frameworks (policies, regulations, programmes) and monitor if they are implemented during the duration of the project. Additionally, two of these projects track the extent to which these policies are adopted and enforced. Three projects have included indicators regarding legal issues. North Macedonia undertakes activities to further the implementation of bylaws for energy management practitioners / IEE, South Africa I promotes the adoption of an Energy Bill and in Iran energy agreements with the industry were expected to be negotiated. Three projects intend to establish a roadmap for supporting EE on end-user and supply side. Other indicators that were only included by one country respectively are, for example, the development of standards for biomass use (India I), the increased role for IEE in other energy related policies (Cambodia), or the *“extent to which an Industrial Energy Data Management Framework”* is developed.

Two project logframes of Group 2 (North Macedonia and South Africa I 103097) included indicators dealing with financial incentives. In North Macedonia the financial incentive is linked to the ISO 50001 certification, South Africa I promotes the development and implementation of an incentive system for energy management measures in general.⁶⁰ Cambodia is the only project that has included an indicator that links IEE to its United Nations Framework Convention on Climate Change commitments.

Many of the output indicators that the projects used in their logframes at design stage are formulated as outcome indicators. A good example of an outcome indicator formulation used in the Cambodia project is *“Increased role for IEE in energy, industry and environmental policies at national levels.”*

⁶⁰ “Financial incentives system developed and submitted to national treasury in order to support transformation and use of industrial energy management system.”

Table 26: IEE indicators addressing government / regulators / authorities

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Capacity building through project management	Number of government staff in the project management unit	J	Interdepartmental IEE project coordination established	U
■ Advice / assistance to support the development / implementation of policies / standards / strategies / action plans / programs furthering IEE technologies / practices			Technical assistance and capacity building programme supporting Government institutions established	OPUT
			Proposals for selection and approval of projects submitted to the new federal target programme delivered	0
			Proposals delivered to rural energy agencies on data collection and analysis structure	0
	Level of capacity of SIRIM and SIRIM QAS ⁶¹	L		
	Level of capacity GreenTech M.	L		
■ Training to increase the understanding of EE projects and methods	Number of workshops / meetings	JS	No. of Govt. Staff trained in IEE / EM implementation support	FKOP
			Number of training programme conducted on IEE	F
			Experts of the energy agency trained in information campaigns and the use of the web site and its tools	0

⁶¹ SIRIM and SIRIM QAS is the Standard and Industrial Research Institute of Malaysia and its subsidiary.

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
			Number of trained staff from Government providers of financing to develop, enhance access and evolve funding mechanisms, incentives and financial packages / credit streams for industrial enterprises implementing EnMS and SO measures	U
■ Gender initiatives			No. of women officials trained	KU
			Gender equality issues identified for IEE and enhanced policy tools to promote women in IEE	U
■ Policies / regulations / measures / incentives / strategies / action plans furthering IEE technologies / practices	Status of post-project action plan	GHJ	Energy Bill and appropriate regulations that facilitates use of industrial energy management system and prevents importation of non-compliant equipment and products	KPT
	Status of national EnMS	G	Industrial climate change response strategy incorporating the industrial energy consumption and management in place.	IPU
	Status of policy paper on how to implement industrial policy	GLN	Number of IEE policy programs developed and put in operation	FIKMP
	Status of development of industrial EE	G	Increased role for IEE in energy, industry and environmental policies at national levels	FK
			Increased role for IEE in other energy related policies	F
			Sustainability standards developed for biomass use.	I
			Extent to which Industrial Energy Data Management Framework is developed (score of 0 to 4)	K

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
			No. of Performance-based financial rewards granted	K
■ Programs (e.g. ISO 50001 incentives) furthering IEE technologies / practices, with measuring and evaluation procedures			Extent to which Financial incentive for ISO 50001 Certification is introduced (score of 0 to 4)	KP
			IEE opportunities are recognised and utilised for achieving United Nations Framework Convention on Climate Change commitments.	F

Source: own compilation from project documents.

In both country groups, six projects (one project of Group 1 and five projects of Group 2) have included indicators to monitor the adoption of regulatory measures regarding IEE. Egypt specifically promotes the adoption of a National Energy Management Standard. For the implementation of a system to certify industrial companies' compliance with EnMS, two projects in Group 1 aimed to implement a monitoring and verification structure. The indicator "*status of M&V structure*", as presented in the original logframe is not SMART. In Group 2 South Africa I included the indicator "*national structure in place for measurement and verification of compliance with EnMS.*" Other specific indicators regarding the implementation of an accreditation system for different stakeholders can only be found in the logframes of Group 2. Russia and South Africa I included additional indicators for the certification of companies and North Macedonia for the certification of energy management practitioners. However, the phrasing of the indicator "*extent to which ...*" with a scale from 0 to 4 is not specific and difficult to measure. Three projects (Group 2) monitor the accreditation of certification programs, while in Cambodia and South Africa I a national accreditation body has to be set up first.

As already described in other chapters, some projects have formulated output indicators as outcome statements. This is also the case for indicators addressing technical standards: "*adoption of regulatory measures to support IEE implementation and market transformation*" (Cambodia and Moldova) is actually an outcome indicator, because UNIDO and the project has no influence over the realisation of this indicator.

Table 27: IEE indicators addressing standards organisations

Indicator category	Group 1		Group 2	
	Indicator	Projects	Indicator	Projects
■ Adoption / implementation of locally-relevant management standards (e.g. ISO 50001)	Status of adoption of National Energy Management Standard (EnMS)	H	Adoption of regulatory measures to support IEE implementation and market transformation	FKMOP
■ Adoption / implementation of a system for certifying industrial companies' compliance with EnMS	Status of M&V structure	HL	National structure in place for measurement and verification of compliance with EnMS	P
			Voluntary certification scheme prepared	O
			Recommendations prepared for certification scheme of IEE equipment;	O
			Number of certified enterprises to be compliant with EnMS	P
■ Adoption / implementation of a system for certifying energy managers practitioners' competence with EnMS			Extent to which Certification Program for energy management practitioner is established (score of 0 to 4)	K
■ Adoption / implementation of a system for accrediting the certification body			National accreditation body in place	FP
			List of professional certification programs accredited by national relevant body	FMP

Source: own compilation from project documents.

Annex V. Barrier analysis

For its barrier analysis the evaluation team adapted the Theory of No Change (TONC) by Woerlen et al. (2011). The TONC is a systematic approach to barrier analysis, based on a large number of observations of market developments and project interventions. It structures the challenges the different stakeholders face to fulfil their role in the energy efficiency market.

The TONC starts with the four main groups of stakeholders which can influence the effectiveness of projects or programmes in the energy policy field: the users, the providers of goods and services (“supply chain”), the financiers and the policy makers. All of these have a role to play in order for the project or programme to be effectively implemented, and if they do not play this role, this constitutes a barrier to project success.

The barriers to market transformation, identified by the Theory of No Change (Woerlen et al., 2011), i.e. the barriers that prevent energy consumers (like enterprises) from adopting more energy efficient behaviours are **lack of motivation / interest**,⁶² **lack of awareness**, **lack of expertise**, **lack of access to the technology**, **lack of cost-effectiveness**, and **lack of affordability**. A number of these barriers cannot be influenced by the energy users themselves but by stakeholders that provide (or fail to provide) enabling conditions for energy efficient behaviour. These secondary stakeholders – service and equipment providers, financiers and policy makers – may themselves encounter barriers to facilitate industrial energy efficiency.⁶³ These barriers can be described in the same six barrier types: Policy makers, suppliers and financiers might equally i. **lack the motivation** (and commitment) to change market conditions, e.g. policy makers might not place a high priority on mitigating the negative environmental effects of production processes and therefore refuse to apply policy instruments that increase the price of energy. Secondary stakeholders such as the financial sector might not even be aware that they have a role to play as enablers of industrial energy efficiency (ii. **“lack of awareness”**). Stakeholders might not have the right means to facilitate energy efficiency because they iii. **“lack expertise”** (e.g. on available best practices for technologies, management models, but also policy schemes) or iv. **“lack access to the technology.”** Finally, it might not be v. **cost-effective** or vi. **Affordable** to them to provide the conditions or services.

The evaluation carried out the following analysis to deduct how the project is addressing barriers to transformation of the industrial energy efficiency market. In this process the evaluation team assessed (i) which stakeholders UNIDO is addressing and (ii) what type of activities UNIDO is carrying out. The analysis is based on the component analysis of the IEE, RECP and ODS project portfolio.

i. Stakeholders addressed

UNIDO targets the energy-using enterprises (■) directly as well as indirectly via the secondary stakeholders. The technical services and equipment supply chain (*), the finance community (◆) and policy makers (●) are equipped with skills or are motivated to improve the framework conditions for EE behaviour by the industry (indirect barrier removal). In the TOC this effect is situated in the higher-level outcome section.

The component analysis showed that all of the 21 projects addressed the energy-using enterprises directly and the workforce / the technical services and equipment supply chain (*). 19 projects

⁶² This barrier can also include organizational interests like managerial priority or staff time and capacity.

⁶³ Not all stakeholders face all of the six barriers.

addressed policy makers and the technical standards community (●) and 16 projects addressed the finance community (◆).

ii. Types of activities carried out

The analysis of the activities carried out by the projects showed that certain components occurred particularly frequently in the portfolio (numbering followed the listing in the component analysis):

- Ⓐ **National awareness campaign** and events addressing all companies in the economy (■) (16 projects).
- Ⓑ **Information systems** (e.g. websites) and **communications strategies** for wide dissemination among all enterprises (■) of resource materials developed for / with UNIDO partners and intervention companies (e.g. specifications, guidelines, case studies, software, benchmarking databases and tools, and training materials) (14 projects).
- Ⓒ **Awareness raising activities** (e.g. workshops, study tours / knowledge exchange, peer networks and recognition activities) specifically for light-intervention companies (■) (identified in 20 of the projects).
- Ⓓ **Dissemination of information materials** supporting IEE / RECP / ODS practices / technologies (e.g. specifications, guidelines, case studies, software and training materials) for light-intervention companies (■) (identified in 20 projects).
- Ⓔ **Training among UNIDO light-intervention companies** (■) to establish / support a self-sustaining **cadre of trained national experts and service professionals** with expertise in IEE / RECP / ODS technologies / practices and the development developing bankable projects (included in 14 projects).
- Ⓕ **Adoption / implementation of IEE / RECP / ODS technologies / practices** (with results documentation / published case studies) in UNIDO partner enterprises (■) (included in 17 of the project projects).
- Ⓖ **Training among the technical services and equipment supply chain** [*] to establish / support a self-sustaining **cadre of trained national experts and service professionals** with expertise in IEE / RECP / ODS technologies / practices and the development developing bankable projects (included in 18 projects).
- Ⓗ **Training of the finance community** (◆) to increase the understanding of EE projects and methods for their appraisal (nine projects).
- Ⓘ Training and awareness raising workshops for government / regulators / authorities (●) to increase the understanding of EE projects and methods (eight projects).
- Ⓝ **Policies / regulations / measures / incentives / strategies / action plans** furthering IEE / RECP / ODS technologies / practices for government / regulators / authorities (●) (included in 17 projects).

For the analysis of the barrier removal activities of the UNIDO intervention the Theory of *No Change* (TONC) barrier framework of energy efficiency transformations presented in Woerlen (2011 and 2012) was used. The TONC focuses on the roles of different stakeholders that are necessary to effectively implement projects. During the project, the stakeholders face several barriers to fulfil their roles, e.g. lack of awareness, lack of expertise, lack of affordability. The TONC puts forward

hypotheses regarding why certain causal linkages are broken or why interventions cannot (yet) work in identified circumstances.

According to the TONC, there are five generic types of barriers that might hinder the development of an energy efficiency market:

1. Lack of awareness,
2. Lack of motivation (including due to a lack of proven energy efficiency concepts and confidence in their technical and financial viability),
3. Lack of expertise (internally to the companies, as well as with external advisors and stakeholders),
4. Lack of investment capital which would be necessary to afford energy efficiency investments, and
5. Lack of cost-effective intervention options.

These most frequently occurring components (A) to (J) were matched with the barriers of the TONC. Table 28 shows how the UNIDO interventions are addressing the barriers to improve industrial energy efficiency.

Table 28: Barriers addressed by UNIDO interventions

Barriers of secondary stakeholders	Barriers of energy-using companies	UNIDO intervention	Desired market state
n / a	Lack of Awareness	(A)(B)(C) Energy-using enterprises are addressed with national awareness campaigns and events, set-up information systems (e.g. websites) and communications strategies and awareness raising activities	Awareness for EE-concepts
n / a	Lack of affordability	(E) Energy-using enterprises are addressed with facilitating the access to financial resources by training staff on how to develop bankable projects	Affordability of financing for IEE concepts

Barriers of secondary stakeholders	Barriers of energy-using companies	UNIDO intervention	Desired market state
n / a	Lack of expertise	ⒹⒺ Energy-using enterprises are addressed with: Ⓓ dissemination of information materials (e.g. specifications, guidelines, case studies) and Ⓔ by training to establish / support a self-sustaining cadre of trained national experts and service professionals with expertise in IEE / RECP / ODS technologies / practices	Inhouse Institutional Capacity
n / a	Lack of access to technology / concept	ⒻⒹ Energy-using enterprises are addressed with: Ⓕ the adoption / implementation of IEE / RECP / ODS technologies / practices of UNIDO partners and intervention companies and the Ⓓ wide dissemination via information systems and communications strategies	Availability of EE concepts
Lack of expertise	→ Lack of awareness → Lack of expertise → Lack of access to technology / concept,	Ⓒ The technical services and equipment supply chain is addressed by dissemination of information materials (e.g. specifications, guidelines, case studies) and by training to establish / support a self-sustaining cadre of trained national experts and service professionals with expertise in IEE / RECP / ODS technologies / practices	Availability of trusted, local expertise on IEE concepts
Lack of Awareness	→ Lack of cost-effectiveness	Ⓑ The technical services and equipment supply chain is addressed by set-up of information systems (e.g. websites) and communications strategies	
Lack of awareness & Lack of expertise	→ Lack of affordability	Ⓕ Financial institutions are addressed by: Training to increase the understanding of EE projects and methods for their appraisal.	Affordability of financing for IEE concepts

Barriers of secondary stakeholders	Barriers of energy-using companies	UNIDO intervention	Desired market state
Lack of awareness & Lack of expertise	<ul style="list-style-type: none"> → Lack of motivation / interest → Lack of awareness → Lack of cost effectiveness → Lack of affordability → Lack of expertise 	①② Policy makers and the technical standards community are addressed by training and awareness raising workshops	Favourable framework conditions, e.g. sufficiently high price signals, access to special credit lines, obligations for industrial certification or minimum energy performance

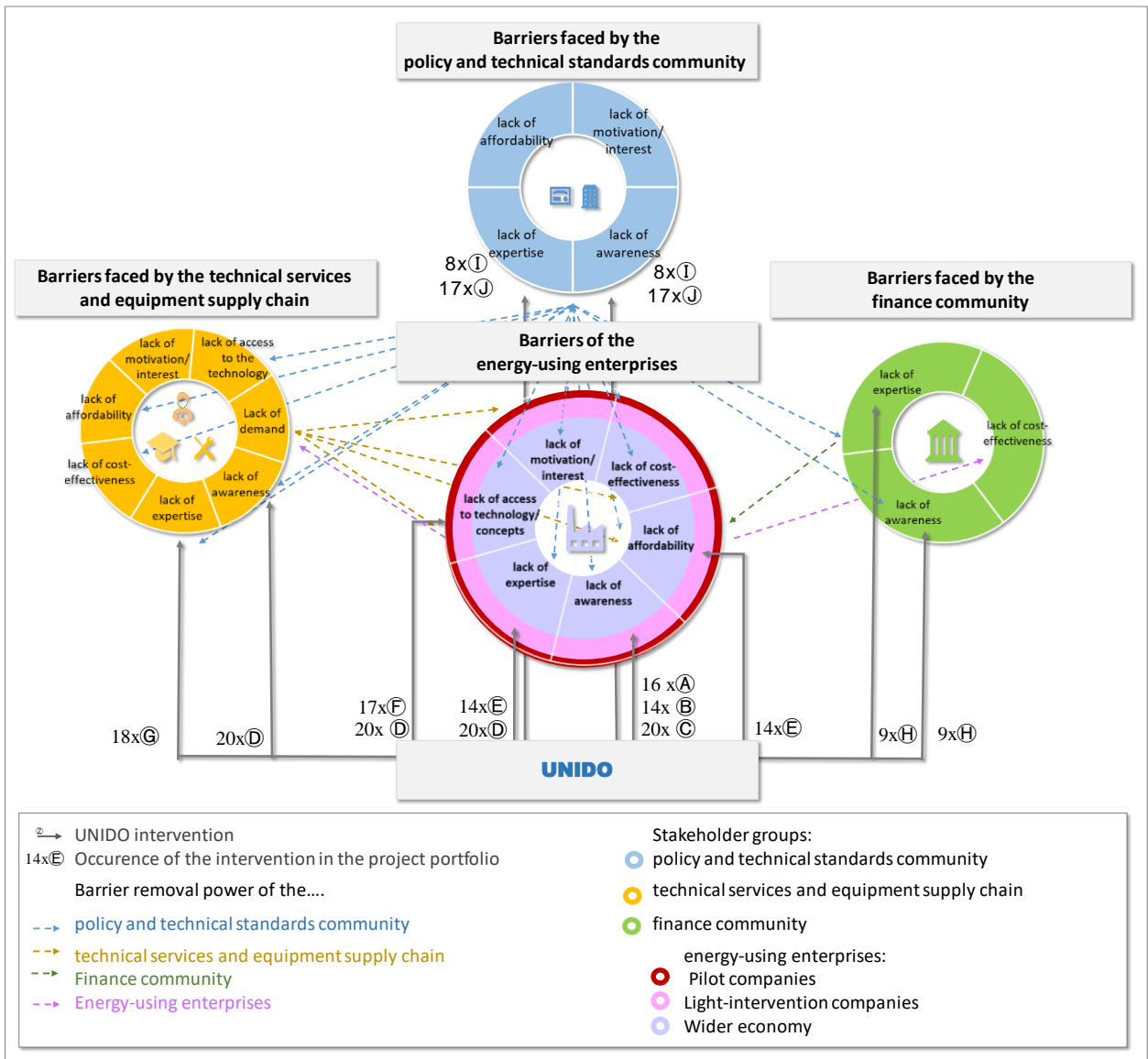
Source: own compilation.

The analysis of the barrier removal strategy of the ten most frequently occurring interventions shows that UNIDO projects mostly addresses barriers of the energy-using companies (Figure 22). Two barriers of energy using enterprises are not addressed by UNIDO directly: “lack cost-effectiveness” for IEE interventions and “lack of motivation / interest.” Of these two barriers particularly “lack of cost-effectiveness” could possibly be decisive for market transformation and its importance must be analysed further in the course of the project.

A series of barriers of the secondary stakeholders are not addressed strongly by UNIDO intervention. The barriers “lack of demand” among the technical services and equipment supply chain and the equivalent for the finance community (“lack of cost-effectiveness”) depend on the demand by energy-using companies, so on the market development itself.

Other secondary stakeholder barriers are only addressed if policy makers decided to alter framework conditions, among these barriers are for the technical services and equipment supply chain “cost-effectiveness”, “lack of affordability”, “lack of access to the technology” and “lack of motivation / interest.”

Figure 22: Barrier removal activity of the ten most frequent UNIDO interventions



Source: own graph.

Annex VI. Cross-country survey amongst energy experts

An expert survey was conducted to collect expert opinions on whether a transformation of the industrial energy efficiency market was observed in the relevant intervention countries and whether UNIDO's IEE projects had a relevant impact contributing to this development. The survey was designed to help answer the following evaluation questions: **1a) Have the projects influenced market transformation**, and **2a) What are the factors affecting the achievement of impacts (positive and negative, intended and unintended)**.

Twelve IEE intervention countries participated in the survey, namely Egypt, India, Indonesia, Iran, Malaysia, Moldova, Myanmar, North Macedonia, Philippines, South Africa, Thailand and Viet Nam. The target group of the survey were IEE experts in the respective country.

The survey was sent out to experts that had participated in the UNIDO expert training for whom e-mail addresses were available to the evaluation team. Another share of experts was picked by project managers and project coordinators (PM / PC) based on the experts' professional expertise in the IEE market. Project managers / project coordinators picked experts from different backgrounds, e.g. government / public sector, private sector, education / academia and possibly other viewpoints.

The survey faced several limitations:

- i. **Selection bias of experts:** 89 % of experts had direct contact with the UNIDO project⁶⁴ and only few independent experts could be acquired to participate (Figure 24).
- ii. **Timeliness of the survey:** Some of the projects were still ongoing while others had already ended.
- iii. **Regional bias:** the survey covered seven countries in Asia,⁶⁵ two countries in the Middle East,⁶⁶ two European countries⁶⁷ and one African country (South Africa), therefore providing only limited regional representativity.
- iv. **Low response rate from some countries:** From Malaysia, Myanmar and Moldova less than ten experts participated (Figure 23).

Response Rate

The survey was programmed as an online questionnaire in English using the *Survey Monkey software*. The questionnaire was sent out to 570 energy efficiency experts. The number of responses was 162, which is a satisfactory response rate of 28 % (Figure 23).

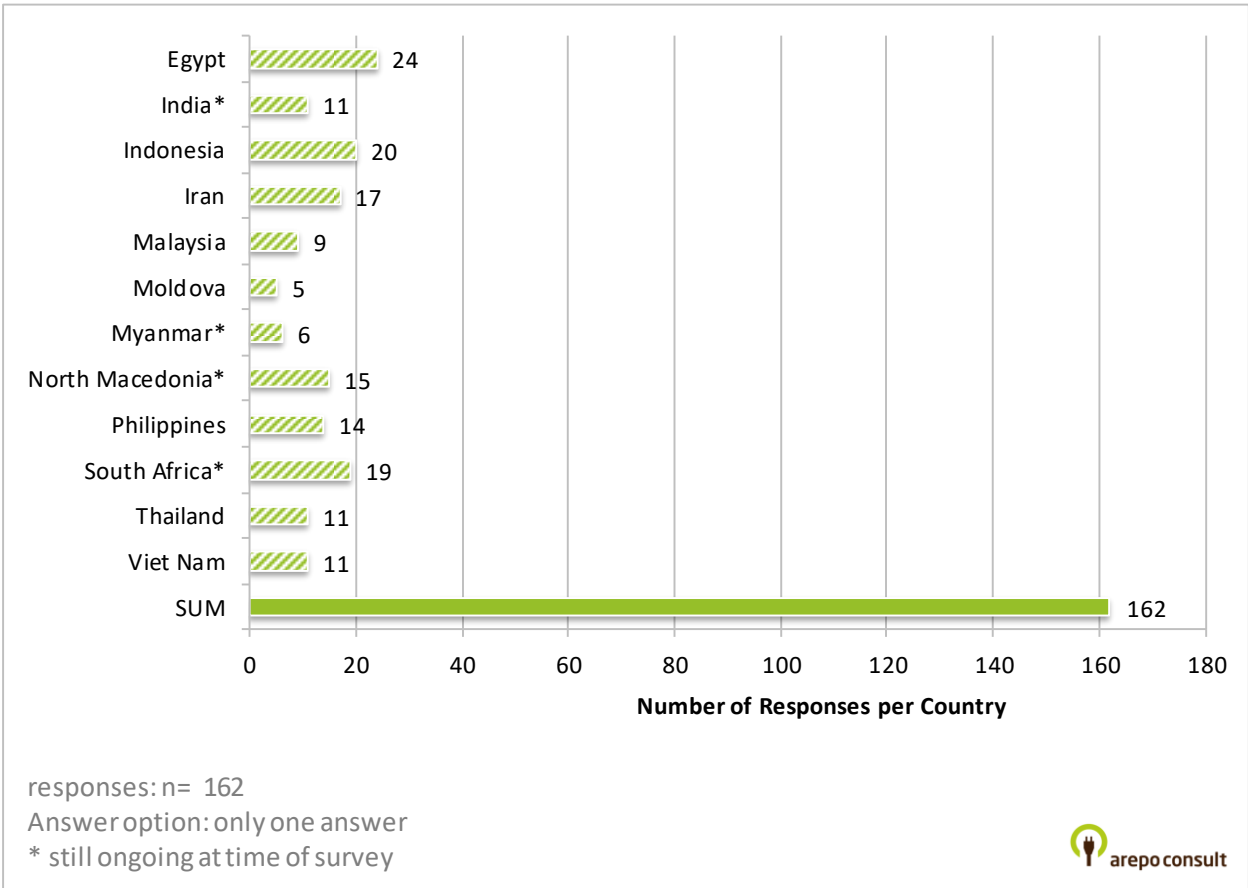
⁶⁴ Direct involvement with the project: a) participant in "in-depth" UNIDO training, b) contractual relationship with UNIDO or the project or c) participant in "light" UNIDO training.

⁶⁵ Project countries: India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Viet Nam.

⁶⁶ Project countries: Egypt and Iran.

⁶⁷ Project countries: Moldova and North Macedonia.

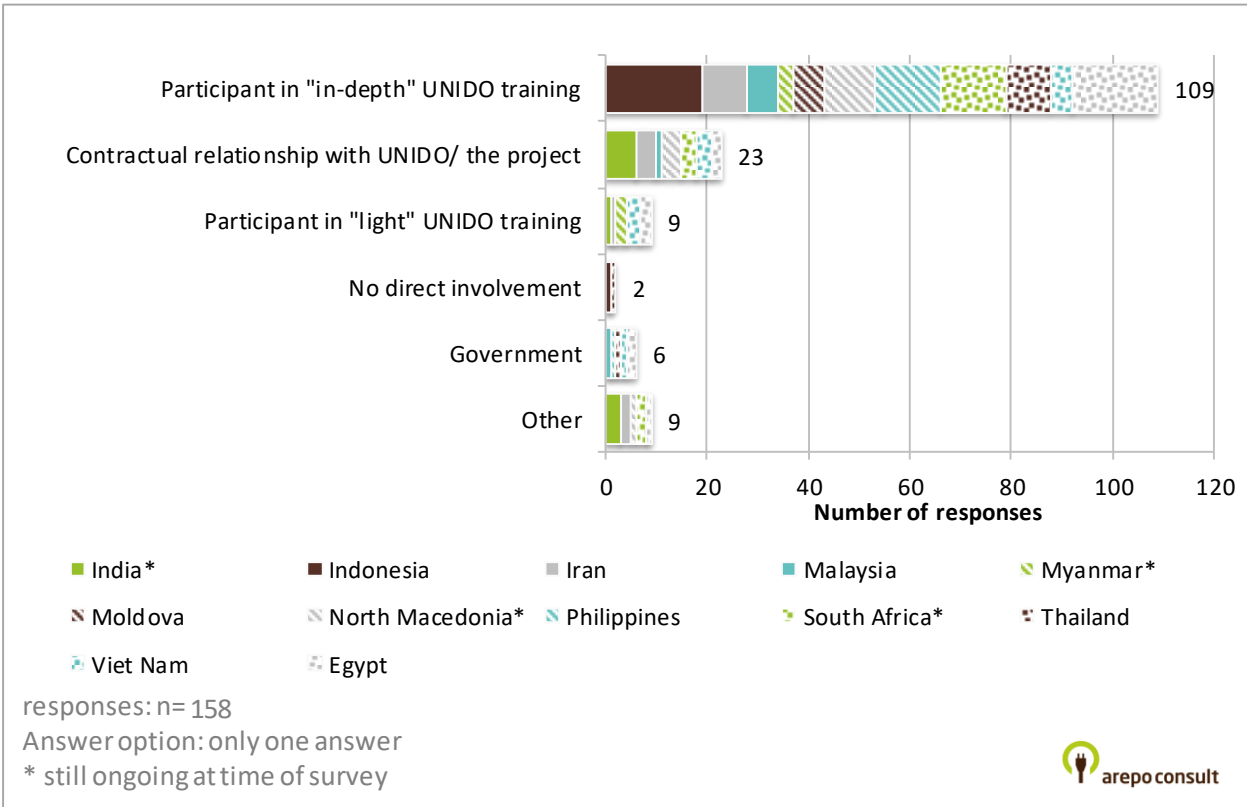
Figure 23: Q 1. “For which UNIDO project are you answering this questionnaire?”



Source: own graph.

Figure 24 shows the type of involvement with the UNIDO project of survey respondents.

Figure 24: Q 2 “Involvement with the UNIDO project of survey respondents”

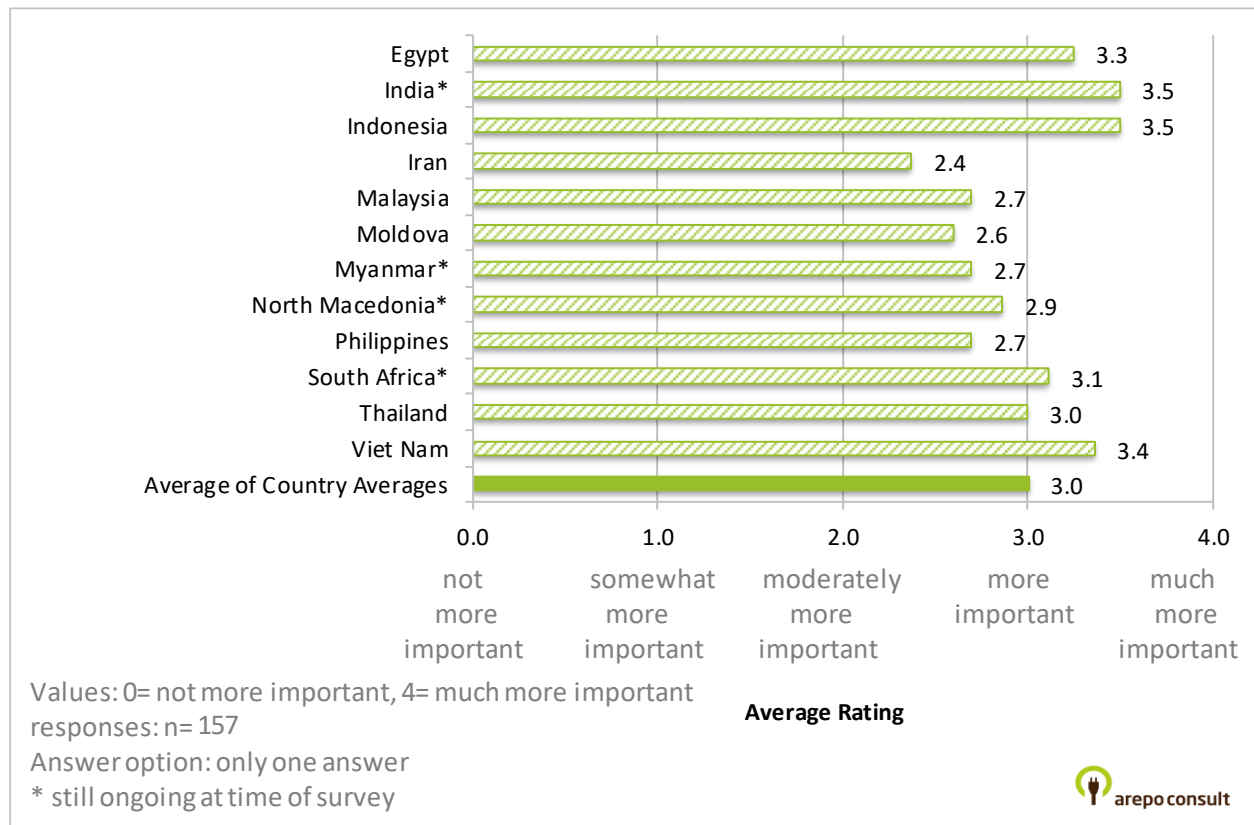


Source: own graph.

Survey Findings

Survey question Q 3 asked for the experts’ opinion regarding overall importance industrial companies paid to EE (Figure 25). On average, country ratings were “more important” which is an equivalent to a rating of 3.0 on a 0 to 4 scale.

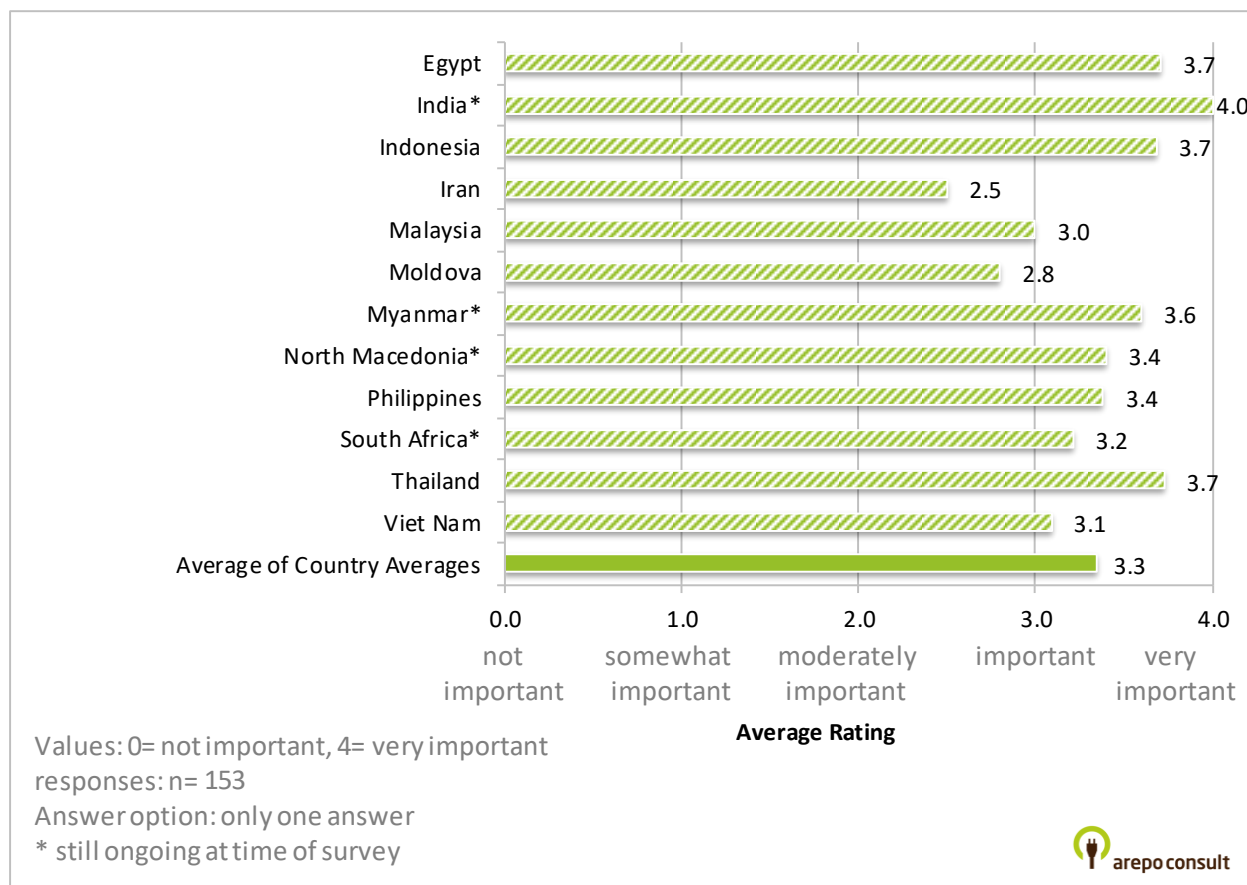
Figure 25: Q 3. “In the last 5 years, has energy efficiency become more important for industrial companies in your country?”



Source: own graph.

Question Q 3 was paired with the survey question 4 on how important UNIDO’s IEE project was for the observed increase in importance of IEE (Figure 26). Only those experts that had observed such a development were asked to rate UNIDO’s contribution. Survey question Q 4 received an average country rating of “important” (rating: 3.3). The ten responses from India anonymously rated UNIDO’s contribution as „very important.“ The ratings from experts from Iran (15 responses to this question) were slightly less enthusiastic and gave the project an average rating of „moderately important“ (rating: 2.5) (Figure 26).

Figure 26: Q 4. "How important was the UNIDO project for this development [the increase in EE importance for industrial companies]?"

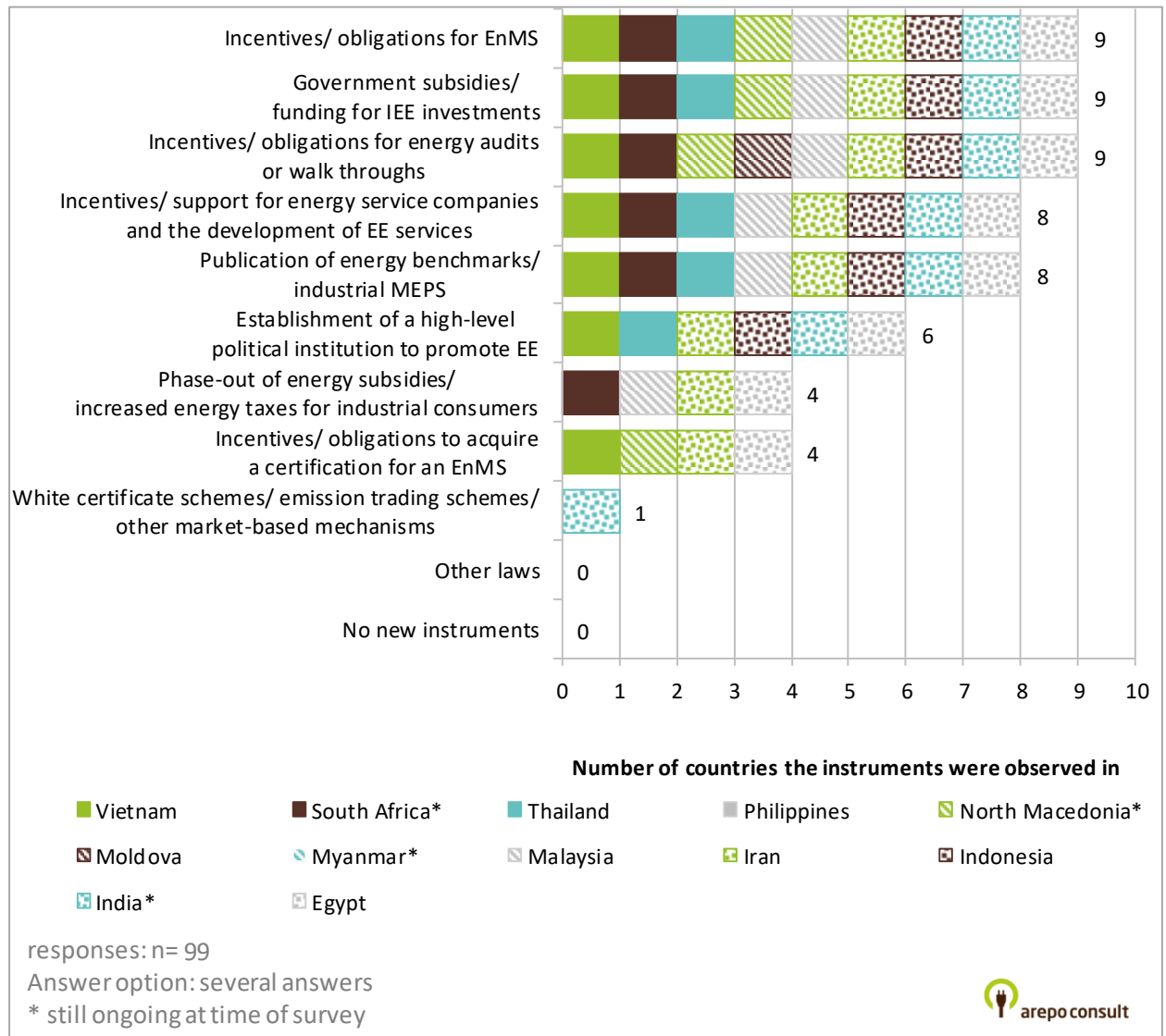


Source: own graph.

Experts were requested to name the instruments implemented by their respective government to improve IEE. If two or more experts had identified the implementation of an instrument in their country, the instruments were rated as "observed in country X." The following ranking of policy instruments resulted from the survey (Figure 27):

- In eleven of the twelve countries, experts had observed the introduction of "incentives / obligations for EnMS." Ten countries had introduced "government subsidies / funding for IEE investments."
- Nine countries had implemented "incentives / obligations for energy audits or walk throughs."
- In eight countries, experts observed the introduction of "incentives / support for energy service companies" and the "publication of EE-benchmarks / industrial MEPS."
- Six countries had established "high-level political institutions to promote EE."
- Only four countries had started the "phase-out of energy subsidies or increased energy taxes."
- Only four countries had passed "incentives / obligations to acquire a certification for an EnMS."
- Only in one country "white certificate schemes / emission trading or other market-based mechanisms" had been introduced.

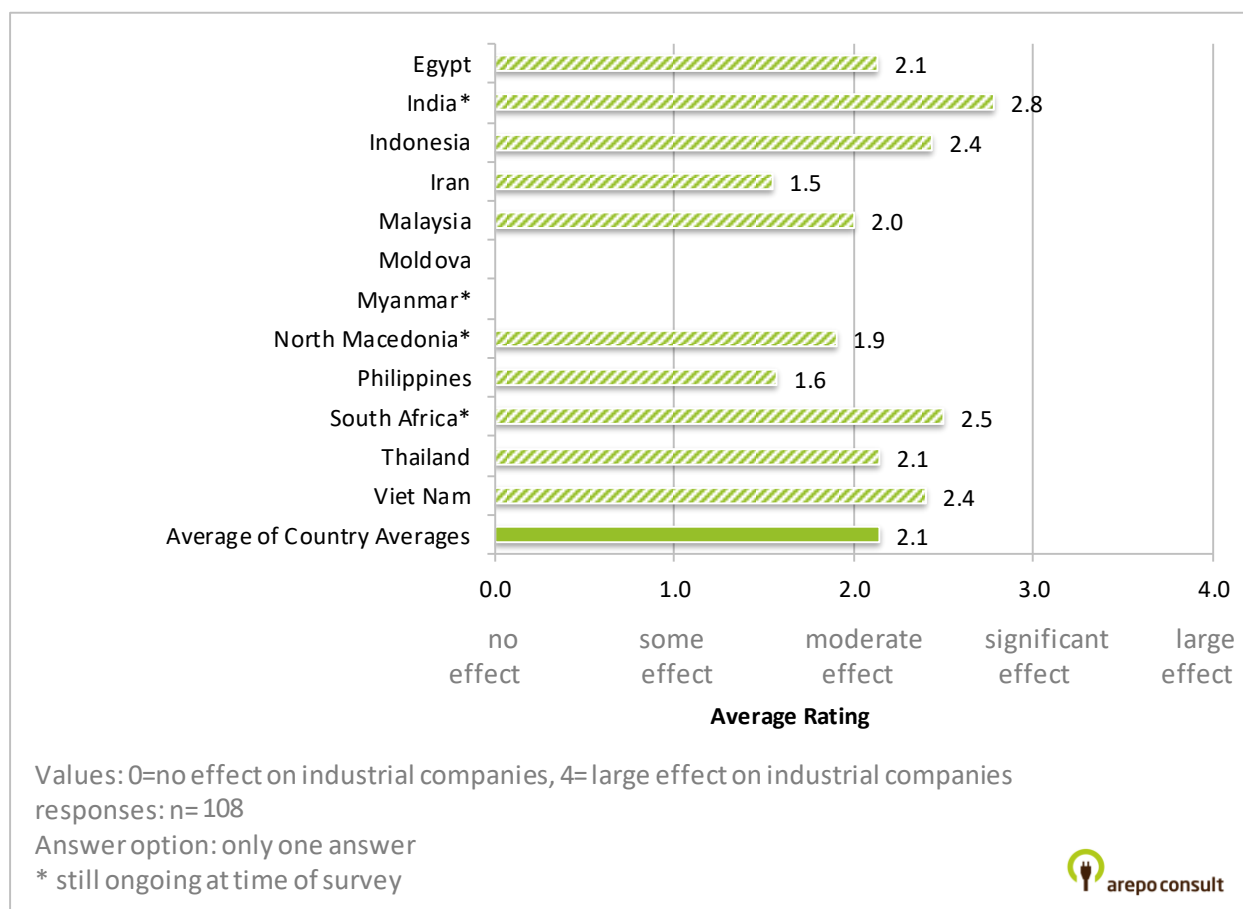
Figure 27: Q 6. “Which of the following instruments has the government implemented?”



Source: own graph.

On average, experts rated the effectiveness of the instruments as “moderately effective” (average rating: 2.1). Only stakeholders in India and South Africa viewed the instruments as having a “significant effect.” In the Philippines and Iran, the introduced policies were rated as particularly poor. Insufficient numbers of responses from Myanmar and Moldova led to the exclusion of their ratings (Figure 28).

Figure 28: Q 7. “In the last 5 years, how effective were the instruments introduced by the government in fostering the development of industrial energy efficiency in your country?”

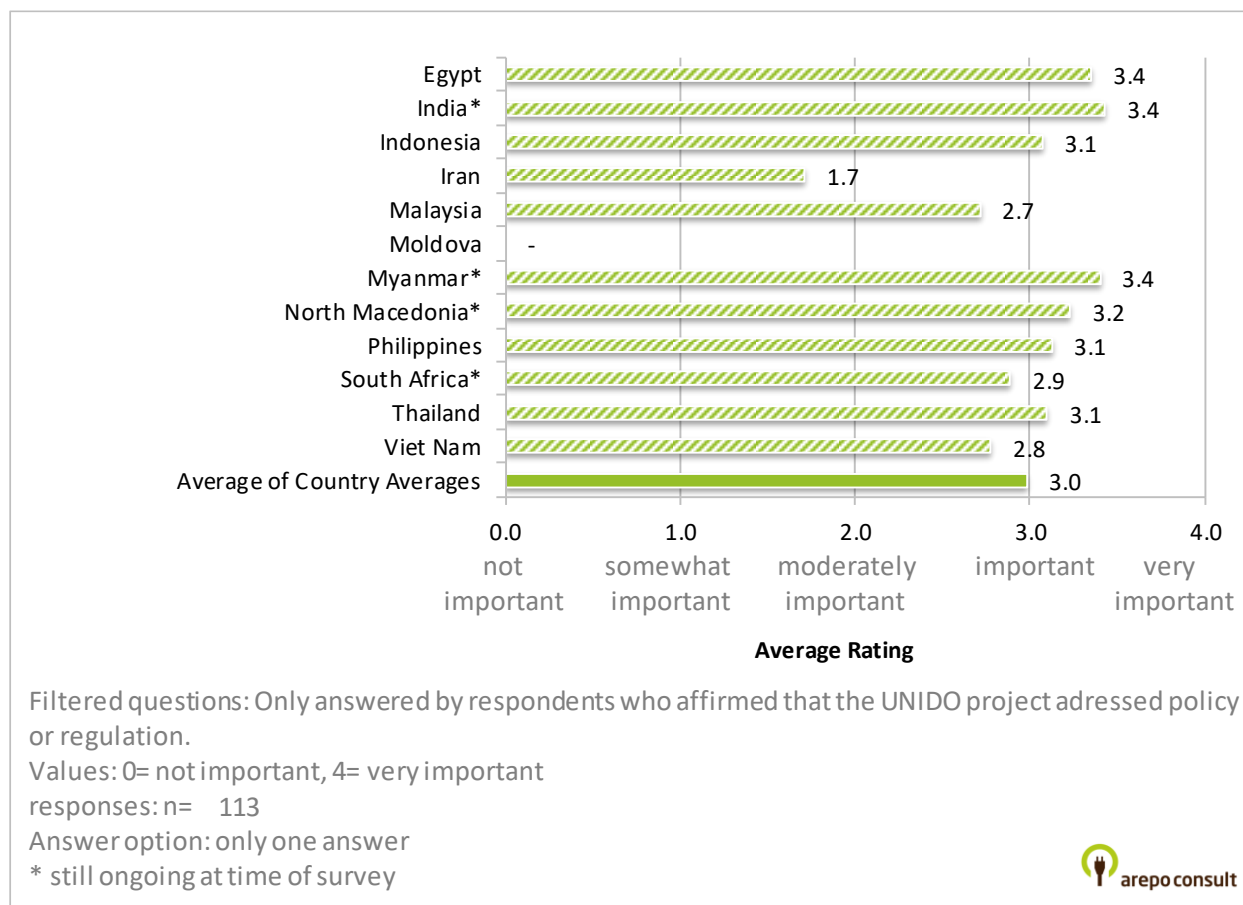


Source: own graph.

Figure 29 shows the responses to survey question Q 9. “How important was the UNIDO project to the development of the policies or regulations addressing IEE in your country?” The question was asked only to experts who were aware of the projects policy component.⁶⁸ On average, the UNIDO project received the rating “important” for the development of policies or regulations addressing IEE in the respective country (rating: 3.0). A considerable outlier were the ratings from Iran with an average rating of “somewhat important” (rating: 1.4).

⁶⁸ Surevy question Q 8. “To your knowledge, did the UNIDO project address energy efficiency policy or regulation?”

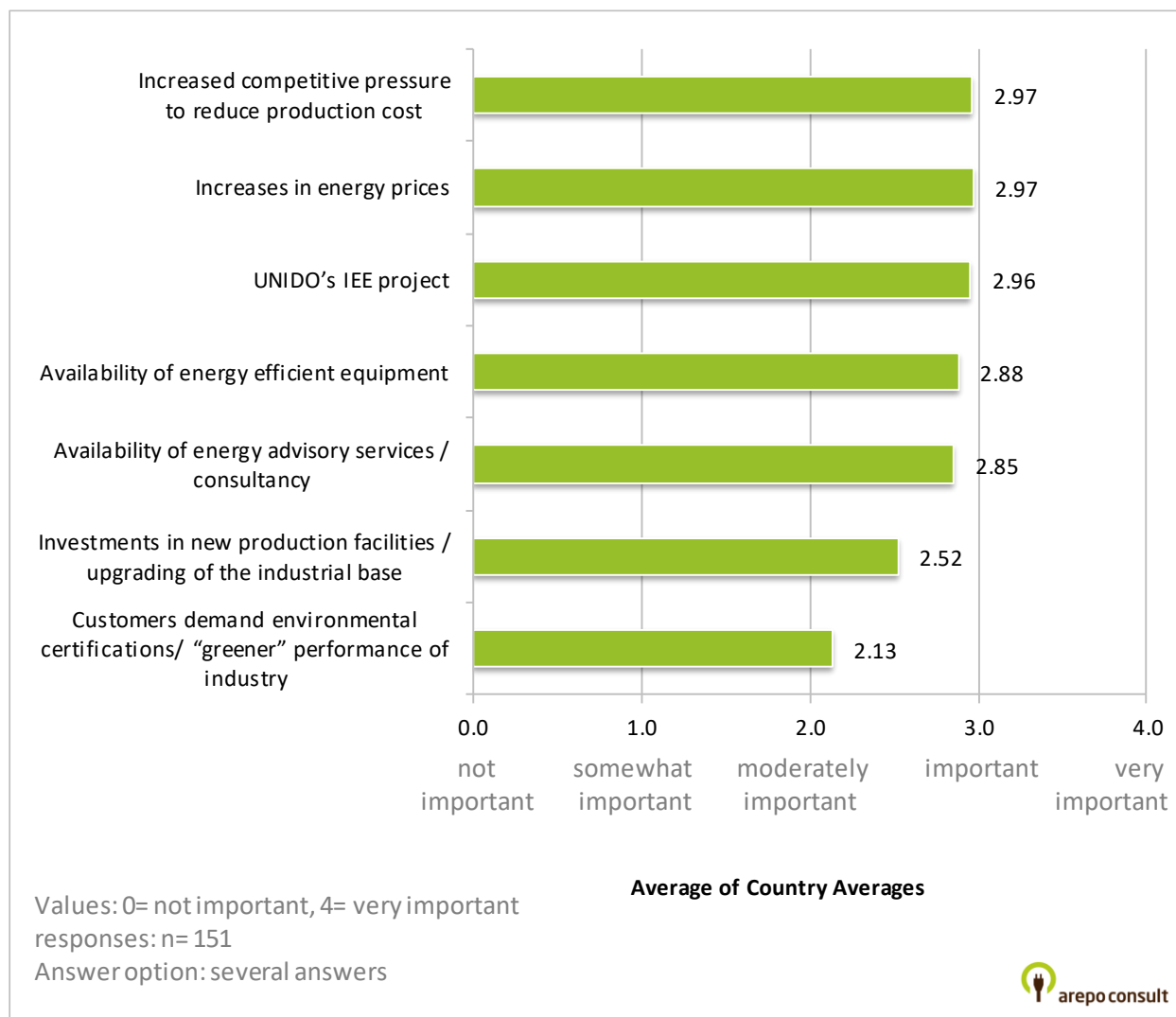
Figure 29: Q 9. “How important was the UNIDO project to the development of the policies or regulations addressing IEE in your country?”



Source: own graph.

Figure 30 shows the responses to Q 10. “How important were the following other factors for the development of IEE in your country in the past 5 years?” Most of the options offered received the average rating “important” (values 2.6-3.0): “Increased competitive pressure to reduce production cost” (rating: 3.0), “The UNIDO IEE project” (rating: 3.0) and “Increase in energy prices” (rating: 3.0) were the highest rated factors for the development of IEE in the countries. The least important factor was the option “Customers demand for environmental certifications / “greener” performance of the industry” which was considered as only “moderately important” (rating: 2.1).

Figure 30: Q 10. “How important were the following other factors for the development of IEE in your country in the past 5 years?”



Source: own graph.

Table 29 shows the responses to Q 11. “Are there other factors that have contributed to changes in IEE?” which was an optional question.⁶⁹ In total, 31 experts responded to this question. The responses were group by the evaluation team in six categories: policy, awareness / managerial behaviour, price pressure, availability of finance, availability of national experts and other. Most responses given were related to policy, awareness and availability of finance. The grouped responses can be seen as an addition to the answers provided to Q 10.

⁶⁹ The question is an addition to Q 10. “How important were the following other factors for the development of IEE in your country in the past 5 years?”

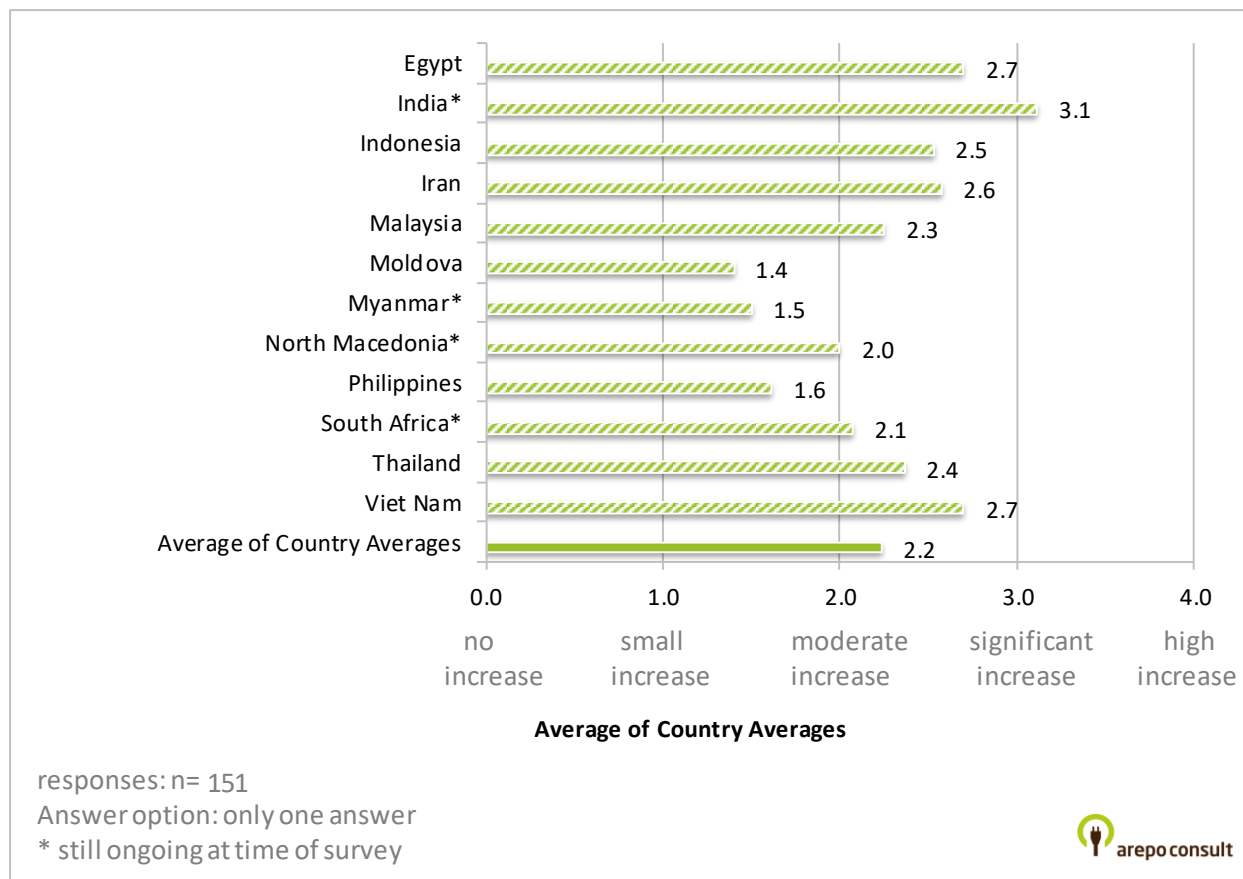
Table 29: Open-text-field responses to Q11. "Are there other factors that have contributed to changes in IEE?"

Policy	Awareness / Change in managerial behaviour	Price pressure	Availability of finance	Availability of national experts	Other
<ul style="list-style-type: none"> • One national expert was appointed as Undersecretary of the Dept of Energy • Government reinforces IEE • Governmental fines and obligations for energy-intensive companies • Incentive from government policy • Regulation and government policies are important to drive the energy efficiency program in the country • Regulations on Energy Management • 2008 national energy load shedding • The drafting of a new EE act for Malaysia 	<ul style="list-style-type: none"> • Increased level of awareness • Awareness of staff • Awareness due to UNIDO project • Attitude • Capacity building, training, awareness raising and working to change the culture are the most important required interventions in Iran • Increasing industrial top management awareness and commitment • Knowledge and management attitude on benefits of IEE 	<ul style="list-style-type: none"> • Increase in fuel cost like diesel, petrol and coke • Exchange rate and U.S sanctions • Some factors are not applicable, like energy price increase since there wasn't any price adjustment because of economic situation 	<ul style="list-style-type: none"> • Finance, viable technologies, trained manpower • Financing for EE and green production • Financing support to implement EE project • For promotion energy efficiency replacement technology by giving financial help to unit owner make replacement of machines faster 	<ul style="list-style-type: none"> • Availability of national experts to set up energy management system and conduct optimization system (steam system, compressed air system and pump system) in industries • The attention of the consultant to make the system develop effectively 	<ul style="list-style-type: none"> • Availability of supply • Contribution of women in energy in different industrial sectors • Electricity shortages / outages • Punishment for ignoring energy loss • Environmental concerns

Source: own compilation.

Figure 31 shows the responses to survey question Q 12. “In the last 5 years, has the number of industrial companies that are using an energy management system (EnMS) increased in your country?” The average rating among countries was that there was a “moderate increase” in EnMS introductions (rating: 2.2). The variance among countries is quite noticeable with Moldovan experts seeing only a “small increase” (rating: 1.4) and Indian experts observing a “significant increase” (rating: 3.1).

Figure 31: Q 12. “In the last 5 years, has the number of industrial companies that are using an energy management system (EnMS) increased in your country?”

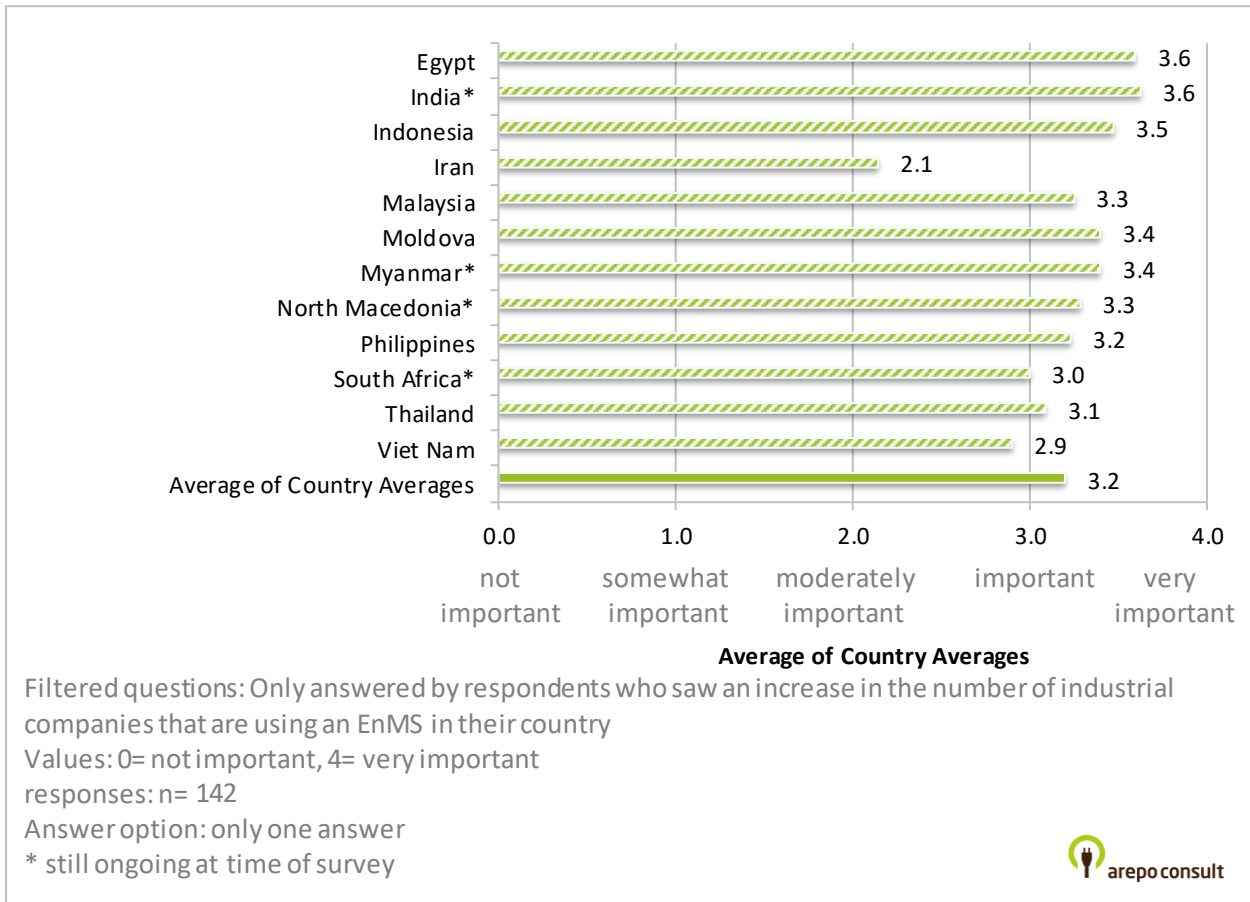


Source: own graph.

Figure 32 shows the responses related to the importance of UNIDO for the “increase in EnMS implementation” The question was filtered and only answered by experts who saw an increase in the use of EnMS (survey question Q 12).⁷⁰ On average, experts rated UNIDO’s impact as „important“ (value 3.2). Iran formed an outlier and rated the UNIDO project as „moderately important“ (rating: 2.0).

⁷⁰ Q 12. “In the last 5 years, has the number of industrial companies that are using an energy management system (EnMS) increased in your country?”

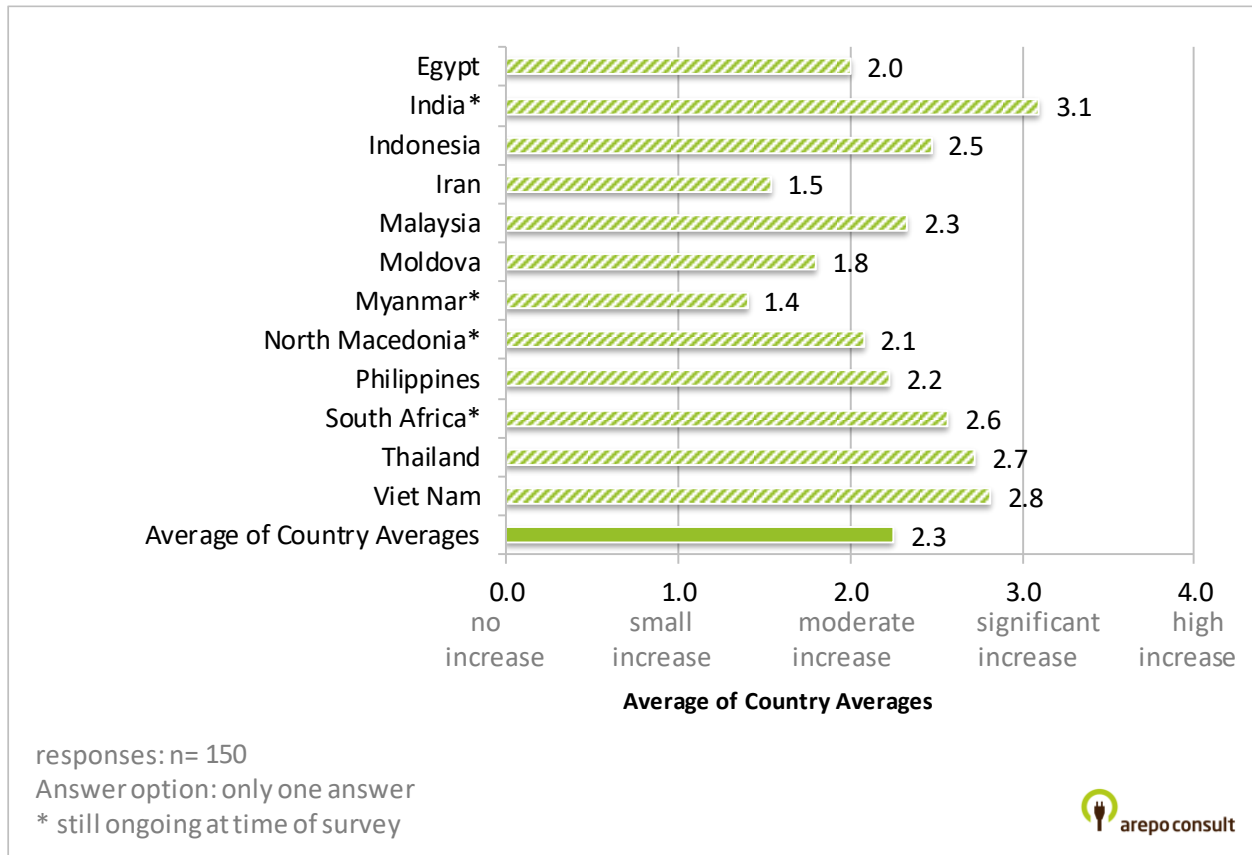
Figure 32: Q 13. “How important was UNIDO’s project for the increase of energy management systems (EnMS) implemented?”



Source: own graph.

Survey question Q 14 addresses the development of the industry’s EE investment. On average, only a “moderate increase” was attested (rating: 2.3). A spread in the answers consisted due to answers from Myanmar and India were respectively small and significant increases in investments were observed (Figure 33).

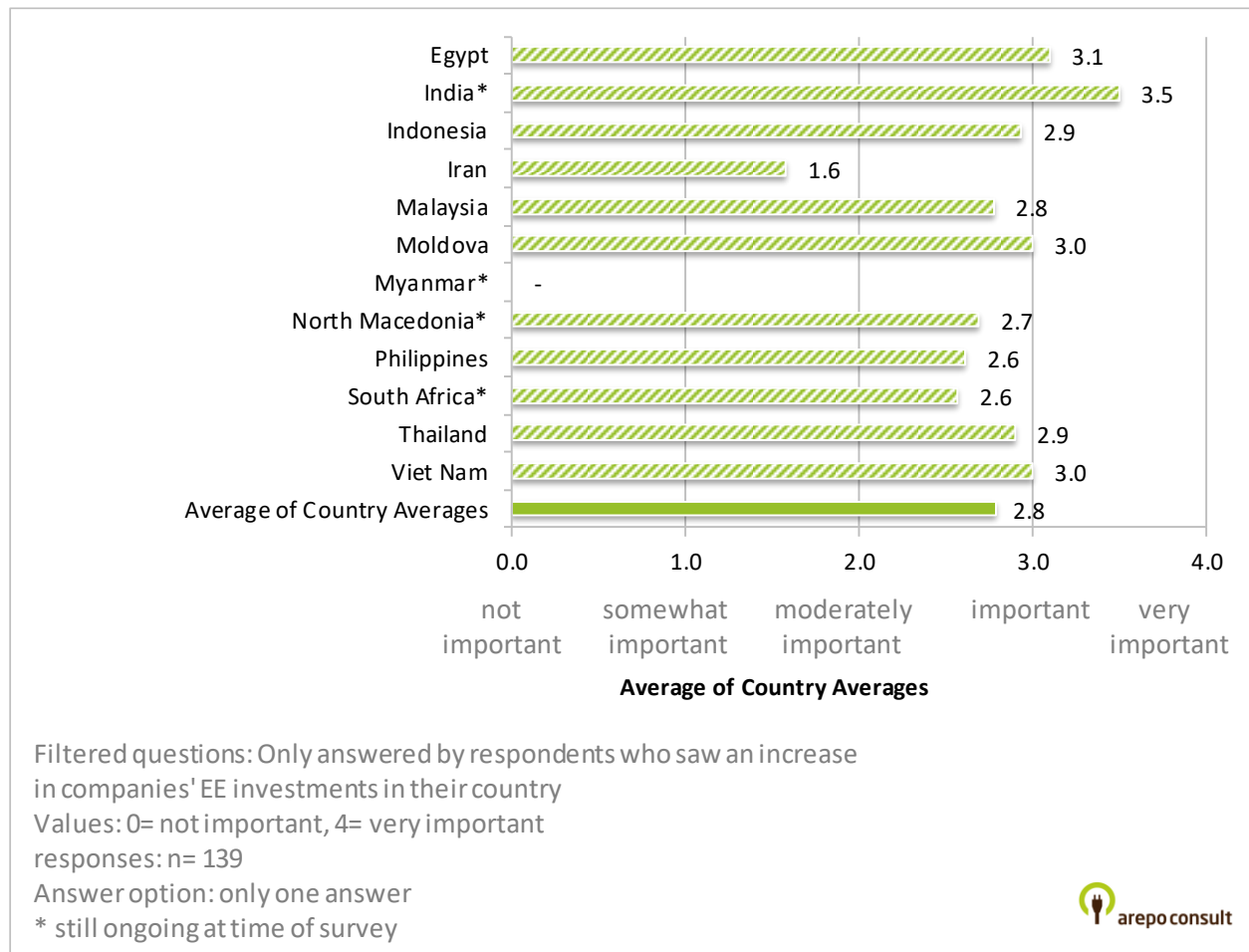
Figure 33: Q 14. “In the last 5 years, have companies’ investments to make their production more energy efficient increased?”



Source: own graph.

Following the development of industrial EE investment, experts were asked to rate UNIDO’s importance to the changes. On average, respondents rated the UNIDO project’s impact as “important” (rating: 2.8). Outliers formed Iran and India with furthest diverting from the average of country averages. The responses from Myanmar were insufficient.

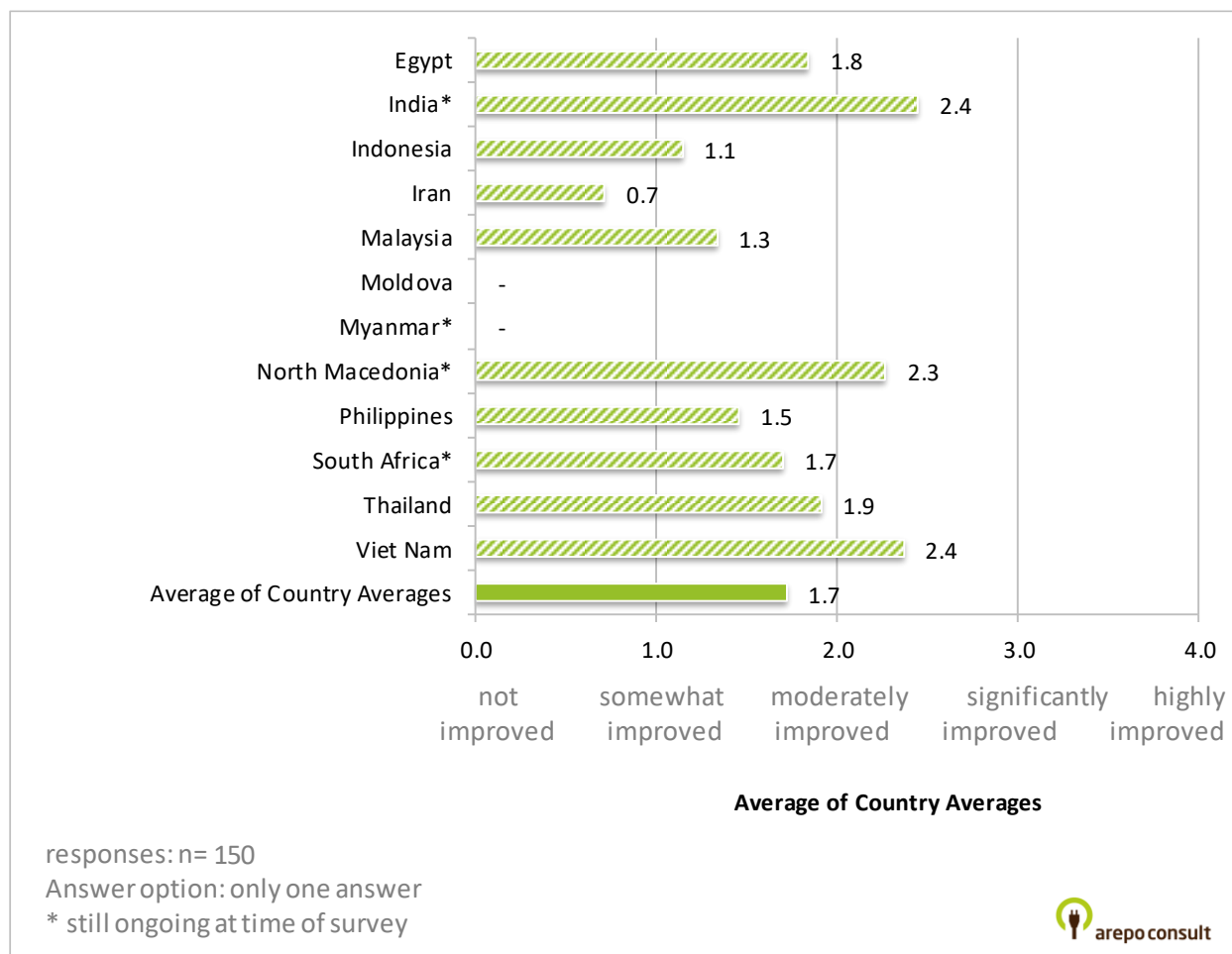
Figure 34: Q 15. “How important was UNIDO’s project to the increase in investment in IEE?”



Source: own graph.

The average of country ratings for Q 16. “In the last 5 years, has it become easier to receive external financing or bank loans for investments in energy efficiency?” shows that access to external financing or bank loans for investments in EE had only “moderately improved” (value 1.7) (Figure 35). In Iran, Indonesia and Malaysia ratings were closer to the rating “somewhat improved” (for Moldova and Myanmar the number of responses was insufficient, <5).

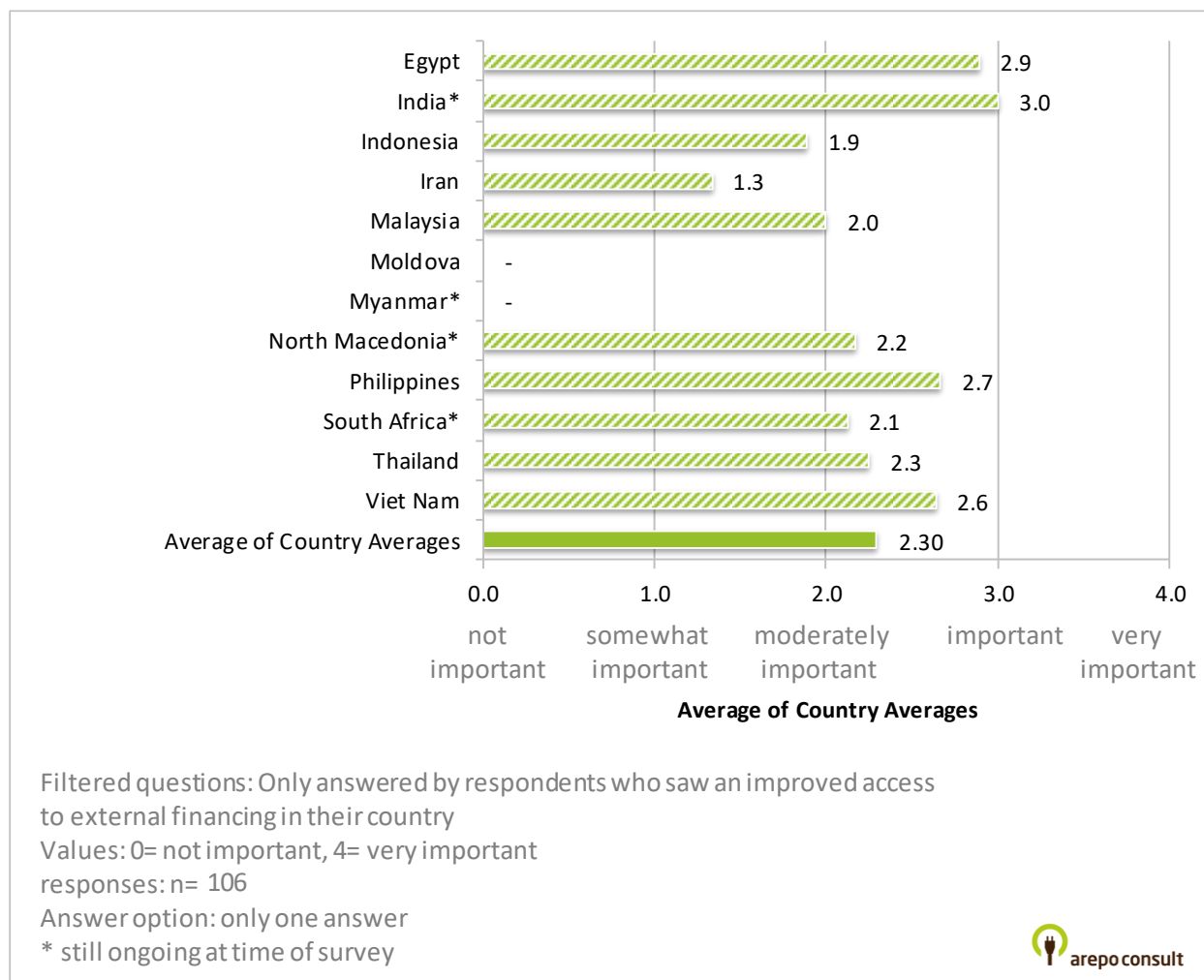
Figure 35: Q 16. “In the last 5 years, has it become easier to receive external financing or bank loans for investments in energy efficiency?”



Source: own graph.

In several countries, experts identified an improvement in market changes. They were then asked to evaluate UNIDO’s importance to this development. In the case of access to finance, only 81 % of respondents rated UNIDO’s importance. UNIDO’s project received average country ratings ranging from “moderately important” to “important” for the improvements in access to external financing in their country (Figure 36), with an average country value of 2.4.

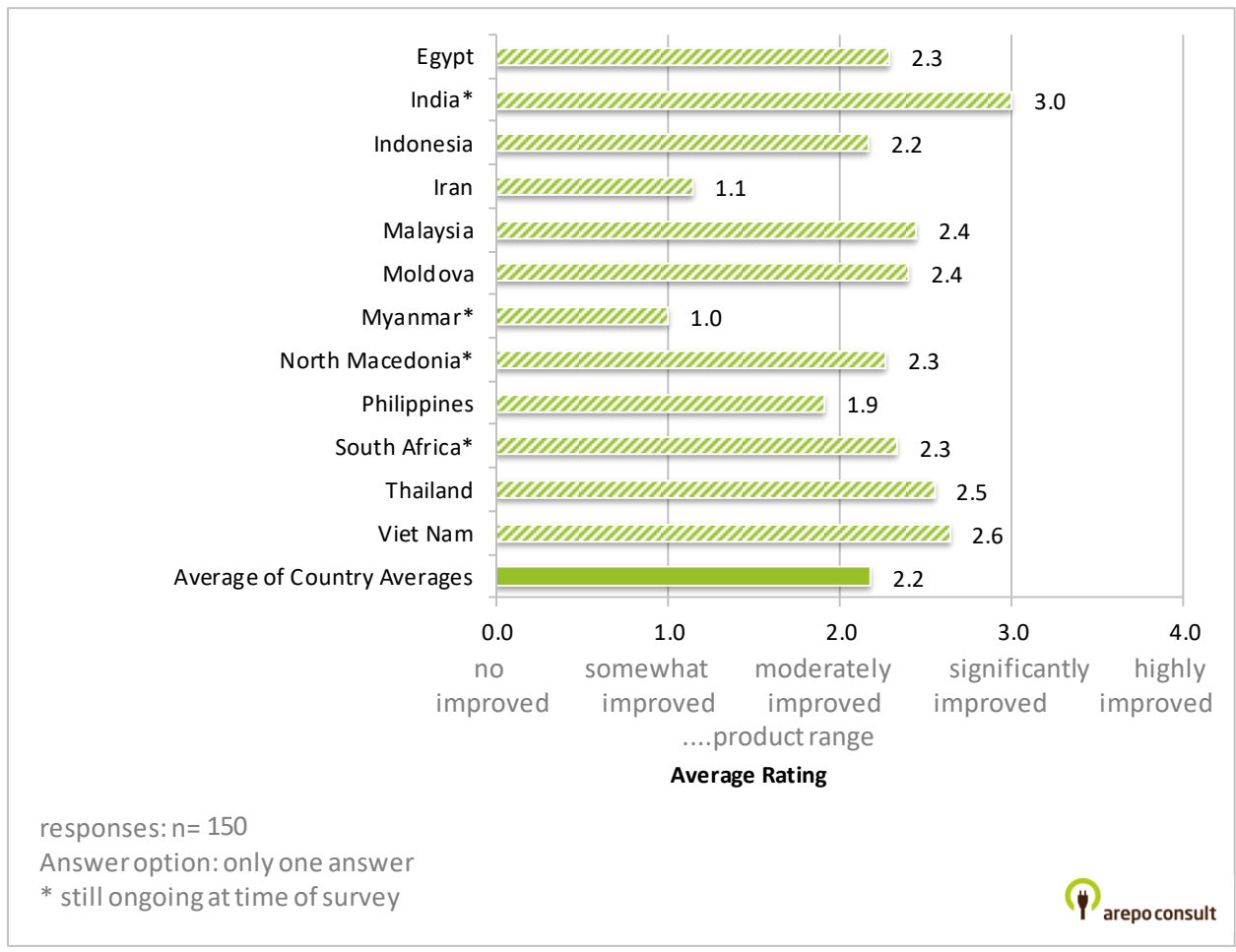
Figure 36: Q 17. “How important was UNIDO’s project to the improvement of access to external financing or loans?”



Source: own graph.

Figure 37 shows the responses to Q 18. “Has the product range offered by vendors of high-efficiency equipment improved in the last 5 years?” On average the improvement of product range offered by vendors of high-efficiency equipment was observed to have “moderately improved” in the previous five years (average rating: 2.2). Outliers were the assessments from Myanmar and Iran where experts viewed improvement in product range as less than “somewhat improved” and India where experts saw “significant improvements.”

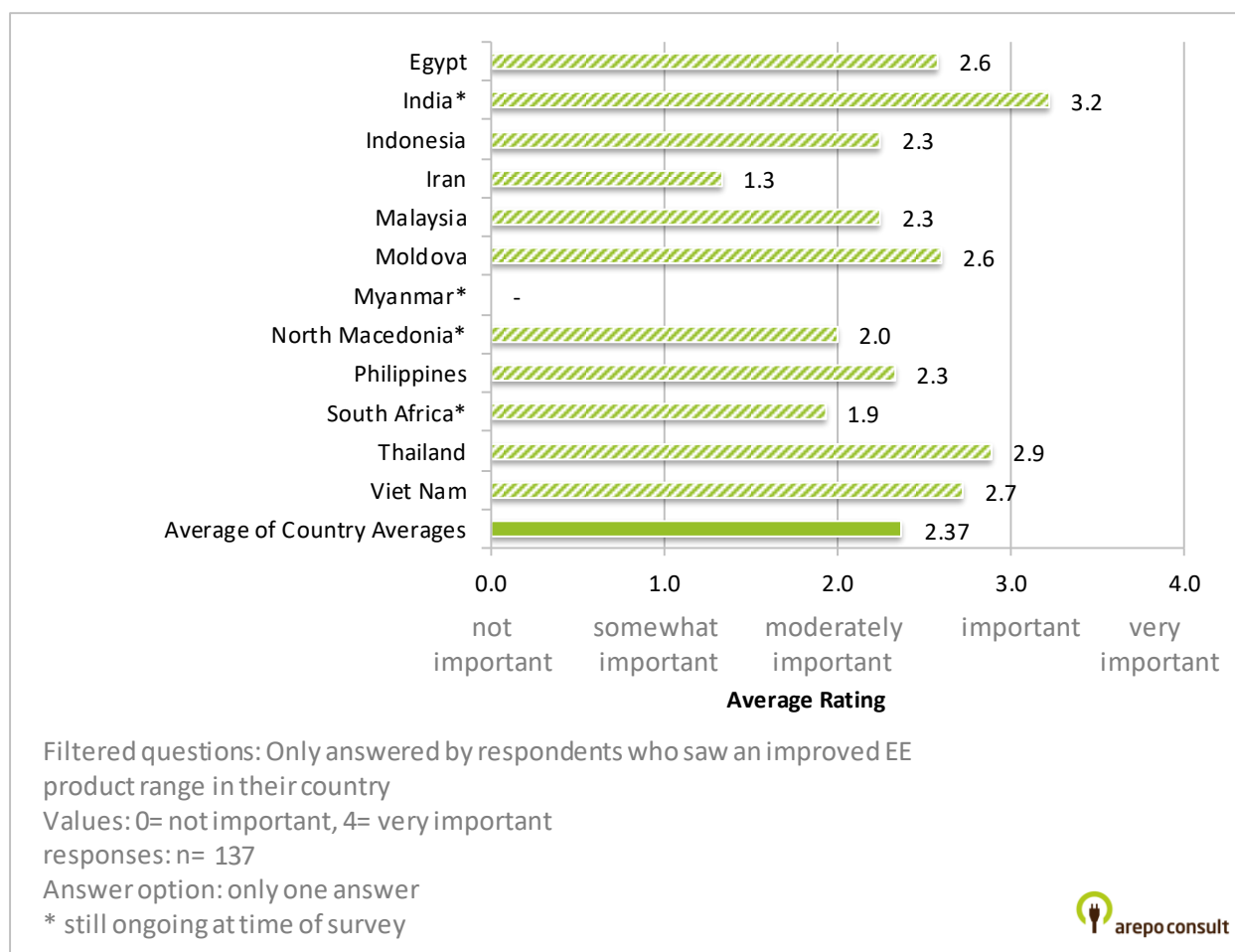
Figure 37: Q 18. “Has the product range offered by vendors of high-efficiency equipment improved in the last 5 years?”



Source: own graph.

Figure 38 shows the responses to survey question Q 19. “How important was UNIDO’s project to the improvement of the product range offered?” On average, the country ratings were somewhat better than “moderately important” (rating: 2.4). Experts in Iran and India saw the project’s impact as less, respective more important.

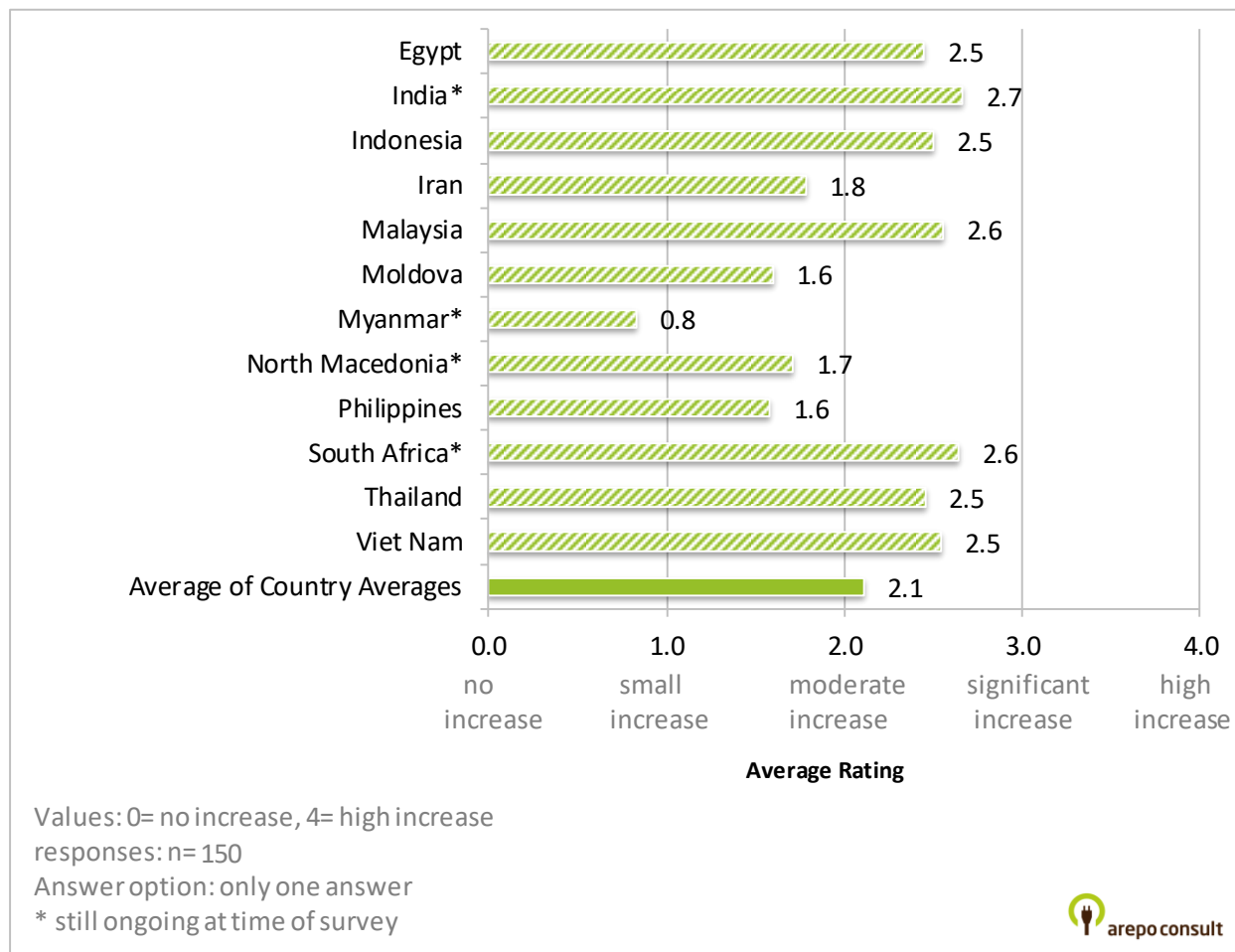
Figure 38: Q19. “How important was UNIDO’s project to the improvement of the product range offered?”



Source: own graph.

Survey question Q 20 addressed the EE market development in respect to the number of companies providing EE services, such as consultancy, energy audits or in-house visits (Figure 39). On average, the country ratings saw only a “moderate increase” in such companies (average rating: 2.1). Particularly the market in Myanmar had not yet developed.

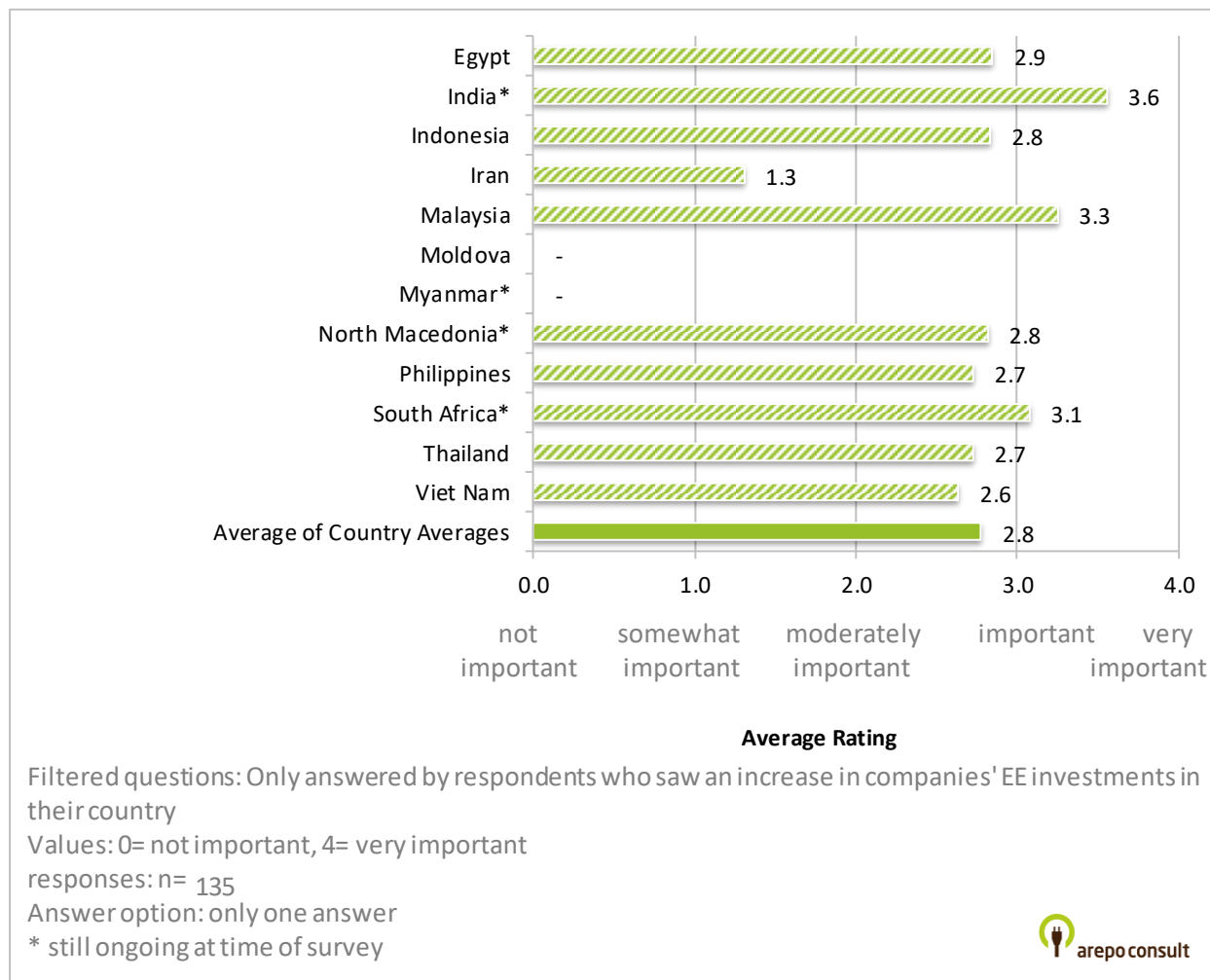
Figure 39: Q 20. “In the last 5 years, has the number of companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits) increased?”



Source: own graph.

UNIDO’s projects were rated on average across countries as “important” for the perceived development of the EE- service sector (Figure 40) (rating: 2.8). Experts in India perceived the UNIDO project much more important than the other country experts, experts in Iran as significantly less important. There was an insufficient number of ratings (<5) from Moldova and Myanmar to consider in the analysis.

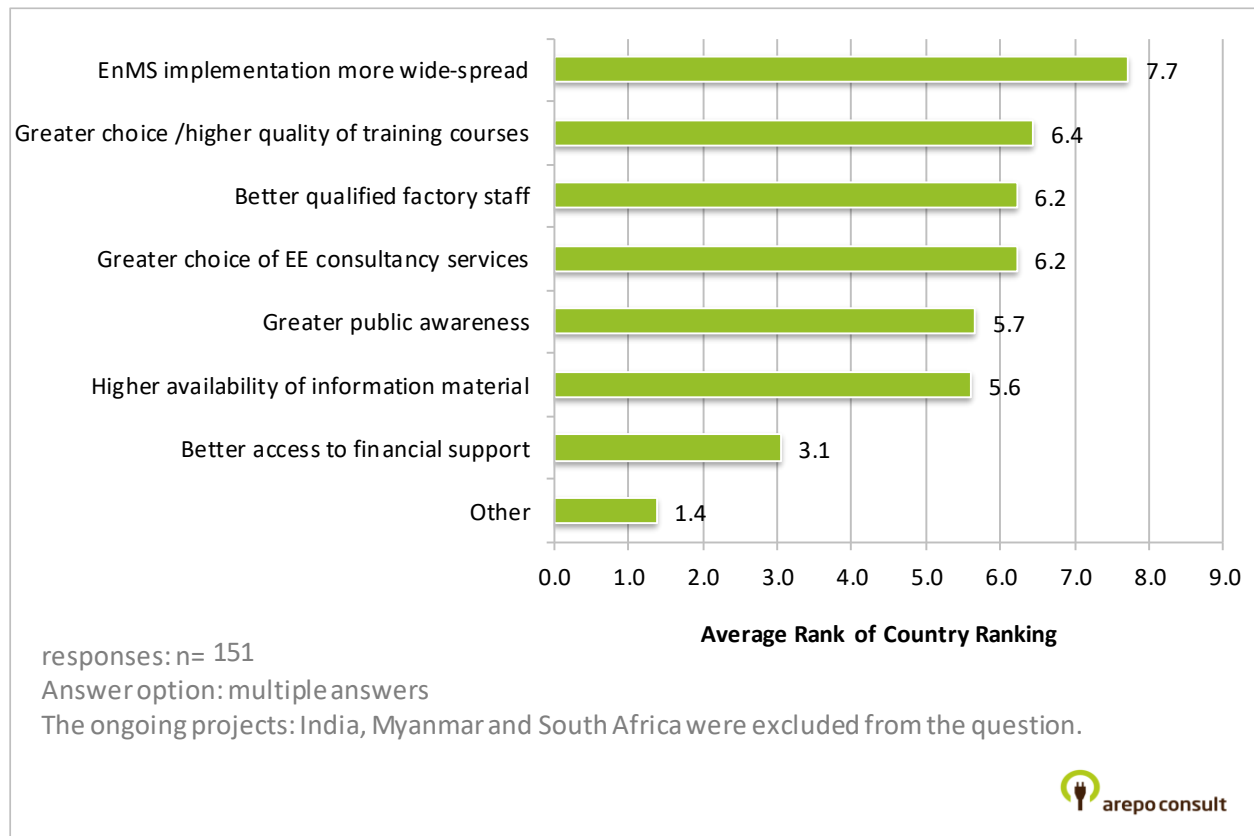
Figure 40: Q 21. “How important was UNIDO’s project for this increase in companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits)?”



Source: own graph.

Survey question Q 22 asked, which aspects are available at a better level after the UNIDO project than before. Figure 41 ranks the options by average country rating. The options “*more widespread EnMS implementation*”, “*better qualified factory staff*”, “*greater choice / higher quality of training*” were selected most frequently. “*Greater choice of EE consultancy services*”, “*higher availability of information materials*” and “*greater public awareness*” formed a middle field. “*Better access to financial support*” was not seen as an important remainder of the UNIDO projects.

Figure 41: Q 22. "After the UNIDO project's closure, which of the following will be available at a better level than before?"

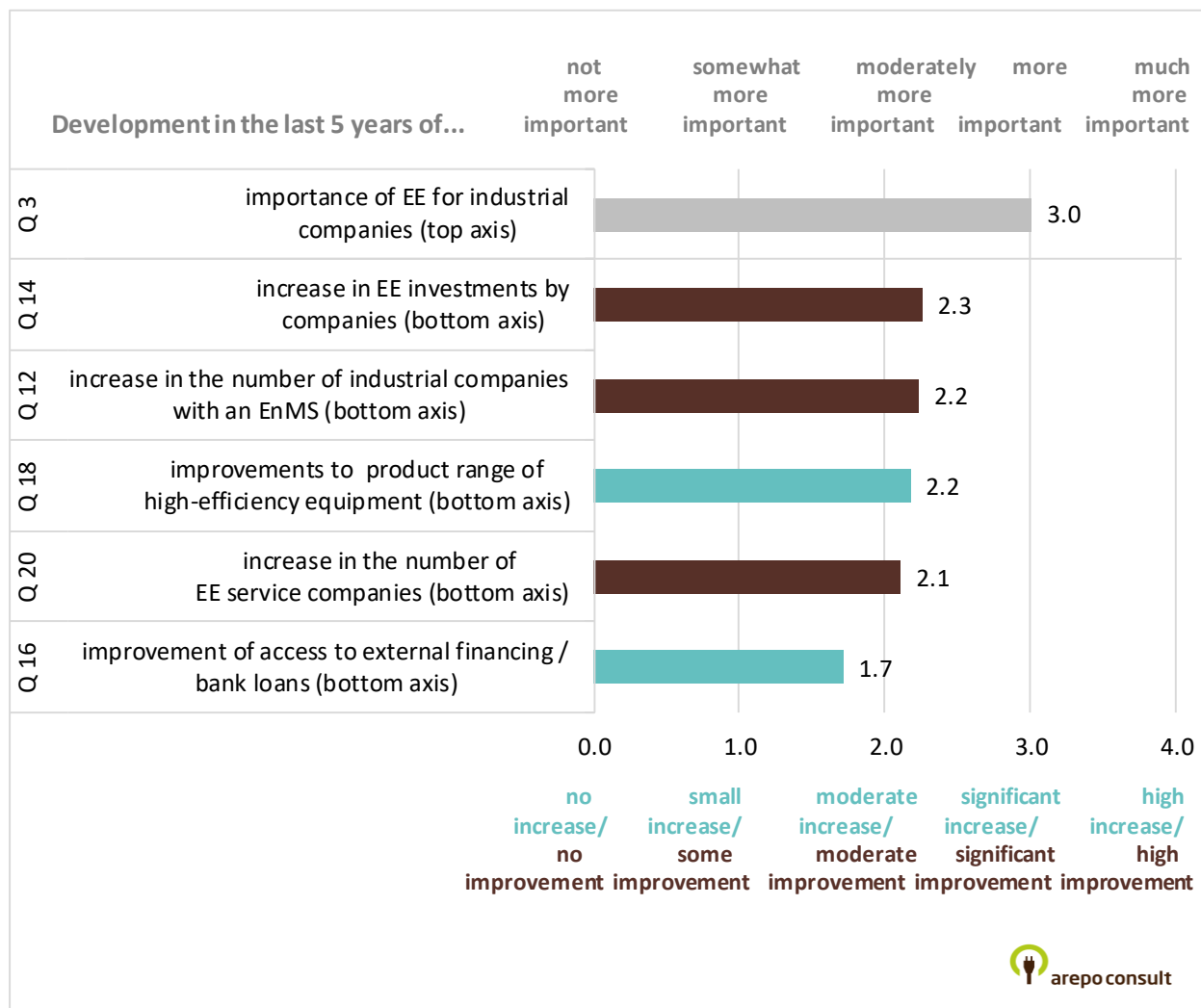


Source: own graph.

Annex VI.1 Comparison of answers across the questionnaire

Figure 42 presents all the assessments of the energy efficiency experts regarding changes of the markets for energy efficiency services and technologies, comparing Q 3, Q 12, Q 14, Q 16, Q 18, Q 20.

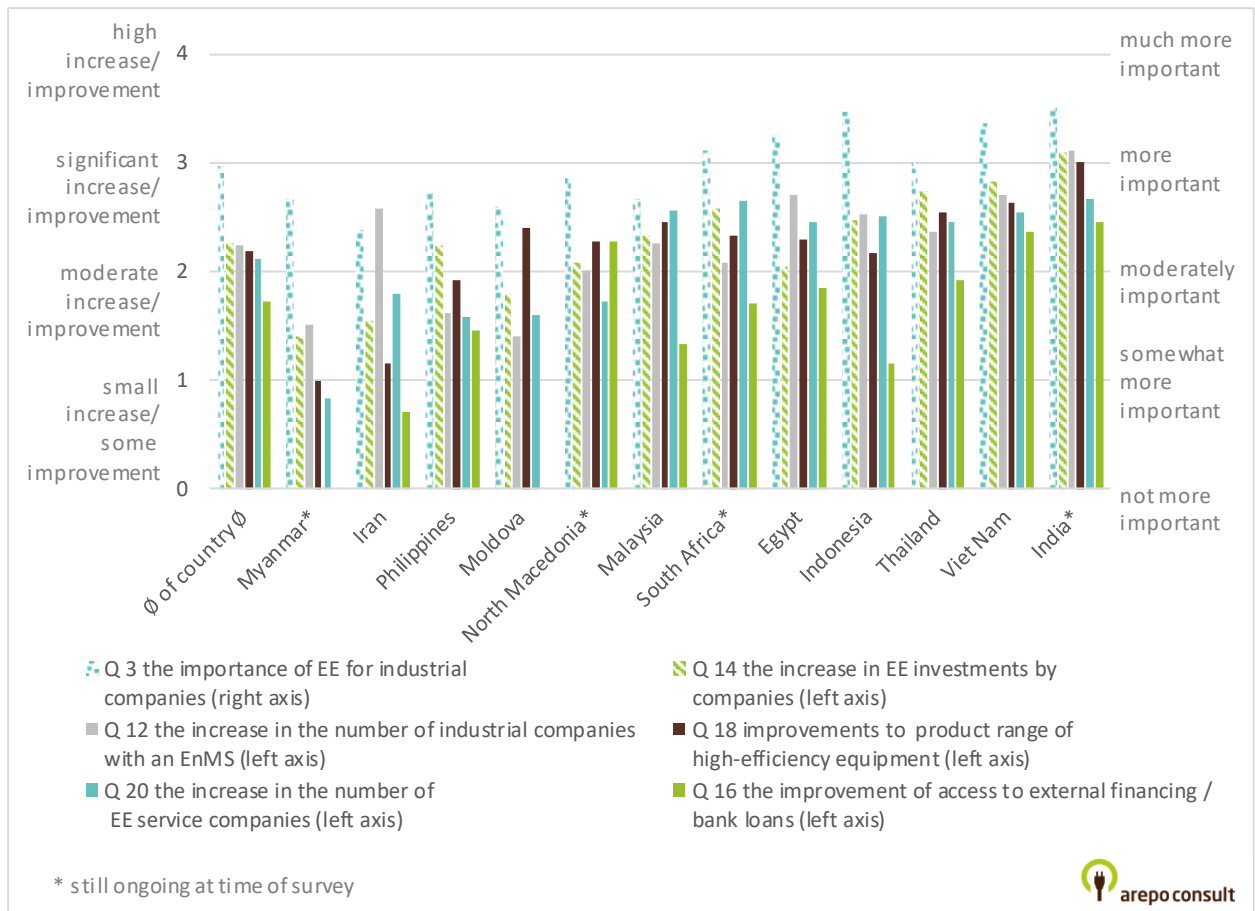
Figure 42: Question comparison: Average of country averages of observed market changes in the previous five years



Source: own graph.

Figure 43 shows all the average country answers for the observed market changes. The overall market development was rated lowest in Iran and Myanmar and highest in Viet Nam and India.

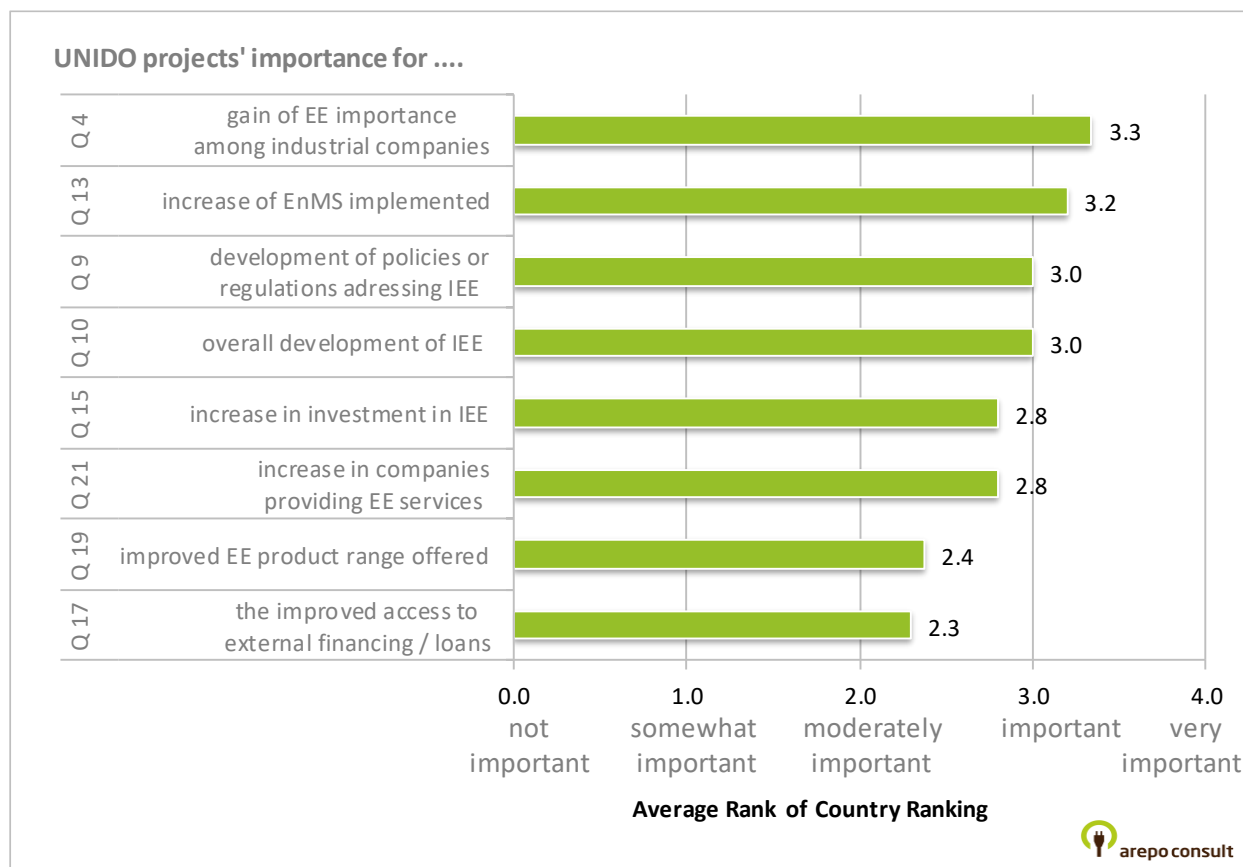
Figure 43: Question comparison: Average of country answers for observed market changes in the previous five years



Source: own graph.

Figure 44 summarizes the average ratings of UNIDO's importance for the observed changes in the market state, comparing Q 4, Q 9, Q 10, Q 13, Q 15, Q 17, Q 19 and Q 21. UNIDO was rated most importantly for the *gain of EE importance among industrial companies* and the *increase of EnMS implemented*. UNIDO was rated only as "moderately important" for *improvements to the EE product range offered* and for *improved access to external financing / loans*.

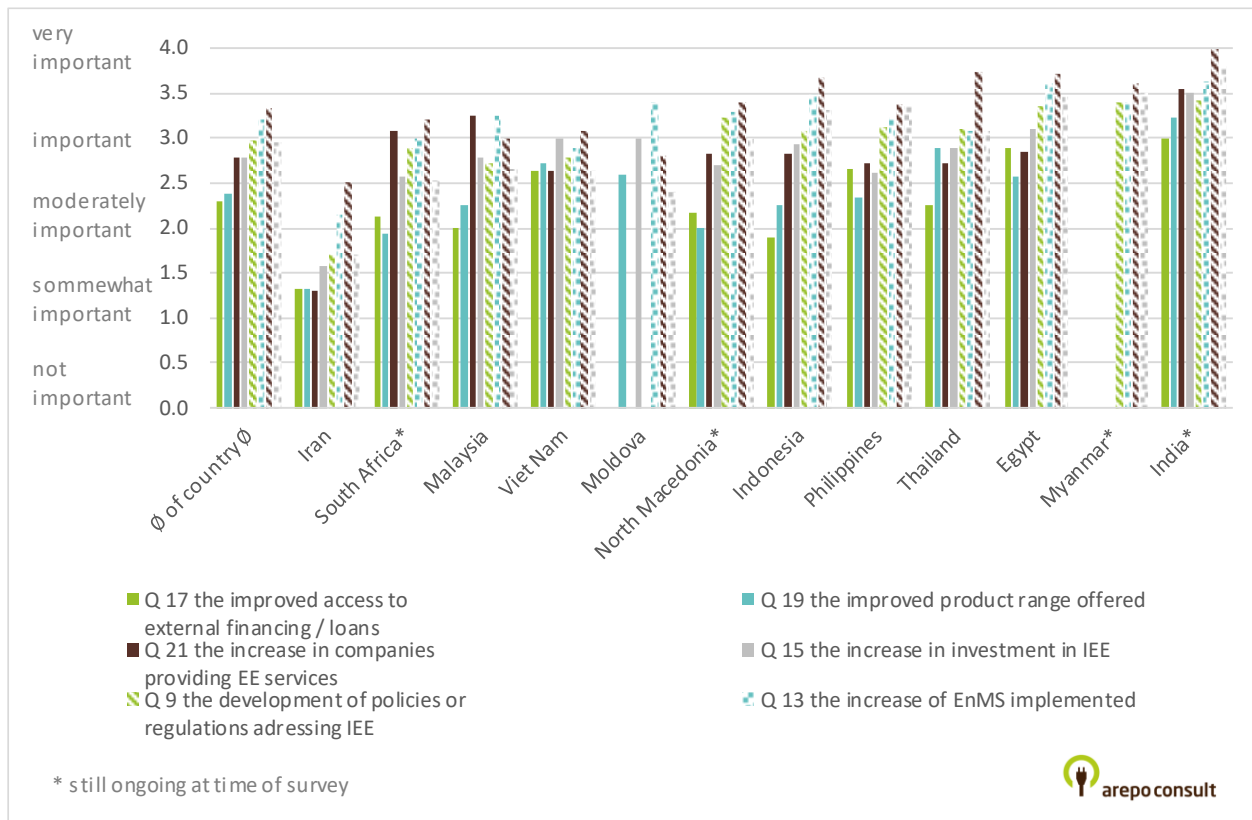
Figure 44: Question comparison: Average of country averages of ratings of UNIDO’s importance for key developments of the EE-Market



Source: own graph.

Figure 45 shows the average country ratings for the importance of UNIDO for the various observed market changes. The overall importance of UNIDO was rated lowest in Iran (rating: 1.7) with a rating of “moderately important”, and highest in and India (rating: 3.52) as “very important.” All other countries ranged UNIDO’s importance for observed market changes as “important” (ratings between 2.67 and 3.48) (cf. Table 30).

Figure 45: Question comparison: Average of country answers for the ratings of UNIDO’s importance for key developments of the EE-Market



Source: own graph.

Table 30 shows how on average countries rated the observed market change and how on average they rated UNIDO’s importance for the observed changes. The average country ratings on strength of the market development, did not correlate with the average country ratings of UNIDO’s intervention, e.g. though market development in the Philippines was viewed as less than “moderate improvements”, UNIDO’s importance was still viewed as “important.”

Table 30: Average degree of observed market changes and average rating for UNIDO importance to observe market changes

Average degree of observed market changes		Average rating for UNIDO importance to observed market changes (only if any observed)	
Country	Average rating	Country	Average rating
Myanmar*	1.48	Iran	1.70
Iran	1.69	South Africa*	2.67
Philippines	1.92	Malaysia	2.74
Moldova	1.96	Viet Nam	2.80
North Macedonia*	2.20	Moldova	2.84
Malaysia	2.26	North Macedonia*	2.82
South Africa*	2.41	Indonesia	2.93
Egypt	2.41	Philippines	2.93
Indonesia	2.42	Thailand	2.97
Thailand	2.50	Egypt	3.17
Viet Nam	2.74	Myanmar*	3.48
India*	2.97	India*	3.52
Average of country averages	2.25	Average of country averages	2.84

Source: own compilation.

Annex VII. Survey of energy efficiency experts in UNIDO intervention countries

UNIDO Survey of Energy Efficiency Experts

Dear Energy Efficiency Expert,

The United Nations Industrial Development Organization (UNIDO) is implementing industrial energy efficiency projects in many countries. Arepo Consult has been contracted by UNIDO for an evaluation of their impacts.

You have been nominated by UNIDO to participate in a short survey that will take about eight minutes. The survey asks your opinion on the development of industrial energy efficiency and UNIDO's impact in your country.

This survey is fully anonymous. We have no means for tracing back your responses. If you have any questions regarding the impact evaluation or this survey, please contact Ms. Sarah Rieseberg at unido.ieesurvey@arepo-consult.com.

Thank you for your participation.

The following questions deal with the situation in the UNIDO project country for which you are answering.

*** 1. For which UNIDO project are you answering this questionnaire?**

- Cambodia "Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector" (2011-2015)
- Colombia "Promoting industrial energy efficiency in Colombian Industries" (2015-ongoing)
- Ecuador "Industrial Energy Efficiency in Ecuador (IEEE)" (2011-2015)
- Egypt "Industrial Energy Efficiency" (2011-2016)
- India IEE Programme (2011-ongoing)
- Indonesia "Promoting industrial energy efficiency through system optimization and energy management standards in Indonesia" (2011-2017)
- Iran "Industrial Energy Efficiency in Key Sectors" (2012-2017)
- Malaysia "Industrial Energy Efficiency for the Malaysian Manufacturing Sector (IEMMS)" (2011-2016)
- Moldova "Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector in Moldova" (2010-2014)
- Myanmar "Improvement of Industrial Energy Efficiency in Myanmar" (2014-ongoing)
- North Macedonia "Catalyzing market transformation for industrial energy efficiency and accelerate investments in best available practices and technologies" (2015-ongoing)
- Philippines "Industrial Energy Efficiency in the Philippines" (2011-2017)
- Russia "Market Transformation Programme on Energy Efficiency in Greenhouse Gas-intensive industries in the Russian Federation" (2010-2015)
- South Africa IEE Programme (2010-2019)
- Thailand "Industrial Energy Efficiency" (2011-2017)
- Ukraine "Improving energy efficiency and promoting renewable energy in the agro-food and other small and medium enterprises (SMEs) in Ukraine" (2011-2016)
- Vietnam "Promoting Industrial Energy Efficiency through System Optimization and Energy Management Standards in Vietnam" (2010-2015)
- Other (please specify the country)

IEE: industrial energy efficiency

2. What has been your involvement with the UNIDO project?

- Participant in "light" UNIDO training, e.g. awareness workshops or user training
- Participant in "in-depth" UNIDO training, e.g. certified EnMS/SO expert
- Contractual relationship with UNIDO or the project, e.g. as consultant
- I am part of a unit in the government that deals with UNIDO
- No direct involvement with the UNIDO project in question
- Other (please specify)

*** 3. In the last 5 years, has energy efficiency become more important for industrial companies in your country?**

not more important	somewhat more important	moderately more important	more important	much more important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 4. How important was the UNIDO project for this development?**

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 5. To your knowledge, in the last 5 years, has the government implemented any policy instruments or regulations which would favour industrial energy efficiency (IEE)?**

- Yes
- No
- No answer / don't know

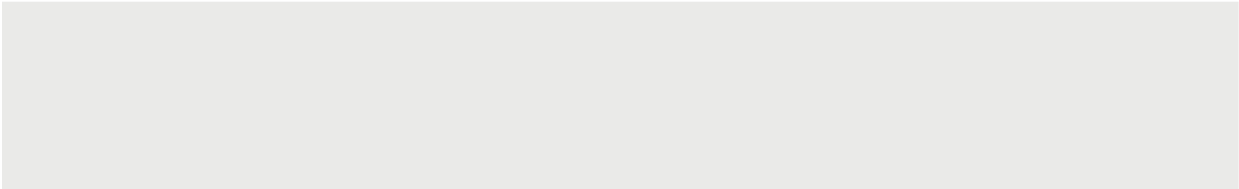
*** 6. Which of the following instruments has the government implemented?**

- Incentives or obligations to conduct energy audits or walk throughs
- Incentives or obligations to implement an energy management system (EnMS)
- Incentives or obligations to acquire a certification for an EnMS
- Government subsidies or funding for energy efficiency investments in industrial facilities
- Phase-out of energy subsidies or increased energy taxes for industrial consumers
- Publication of energy benchmarks or minimum energy performance standards for industrial processes or industrial equipment
- White certificate schemes, emission trading schemes or other market-based mechanisms
- Incentives or other types of support for energy service companies and the development of energy efficiency services (e.g. energy efficiency performance contracts, software providers, advisory services)
- Establishment of a high-level political institution to promote energy efficiency strategy and policy
- No answer/ don't know
- Other new laws or initiatives with the objective of higher IEE (please specify)

IEE: industrial energy efficiency
EnMS: energy management systems

*** 7. In the last 5 years, how effective were the instruments introduced by the government in fostering the development of industrial energy efficiency in your country?**

no effect on industrial companies	some effect on industrial companies	moderate effect on industrial companies	significant effect on industrial companies	large effect on industrial companies	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



*** 8. To your knowledge, did the UNIDO project address energy efficiency policy or regulation?**

- Yes
- No
- No answer/ don't know

*** 9. How important was the UNIDO project to the development of the policies or regulations addressing IEE in your country?**

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

IEE: industrial energy efficiency

*** 10. How important were the following other factors for the development of IEE in your country in the past 5 years?**

	not important	somewhat important	moderately important	important	very important	not applicable / don't know
Increases in energy prices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increased competitive pressure to reduce production cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customers demand environmental certifications, a "green" image or "greener" performance of the industry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Investments in new production facilities / upgrading of the industrial base	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability of energy efficient equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability of energy advisory services / consultancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UNIDO's industrial energy efficiency project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Are there other factors that have contributed to changes in IEE? (optional)

IEE: industrial energy efficiency

*** 12. In the last 5 years, has the number of industrial companies that are using an energy management system (EnMS) increased in your country?**

no increase	small increase	moderate increase	significant increase	high increase	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 13. How important was UNIDO's project for the increase of energy management systems (EnMS) implemented?**

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 14. In the last 5 years, have companies' investments to make their production more energy efficient increased?**

no increase	small increase	moderate increase	significant increase	high increase	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 15. How important was UNIDO's project to the increase in investment in IEE?**

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

IEE: industrial energy efficiency

16. In the last 5 years, has it become easier to receive external financing or bank loans for investments in energy efficiency?

no improved access to financing	somewhat improved access to financing	moderately improved access to financing	significantly improved access to financing	highly improved access to financing	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. How important was UNIDO's project to the improvement of access to external financing or loans?

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Has the product range offered by vendors of high-efficiency equipment improved in the last 5 years?

no improved product range	somewhat improved product range	moderately improved product range	significantly improved product range	highly improved product range	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. How important was UNIDO's project to the improvement of the product range offered?

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 20. In the last 5 years, has the number of companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits) increased?**

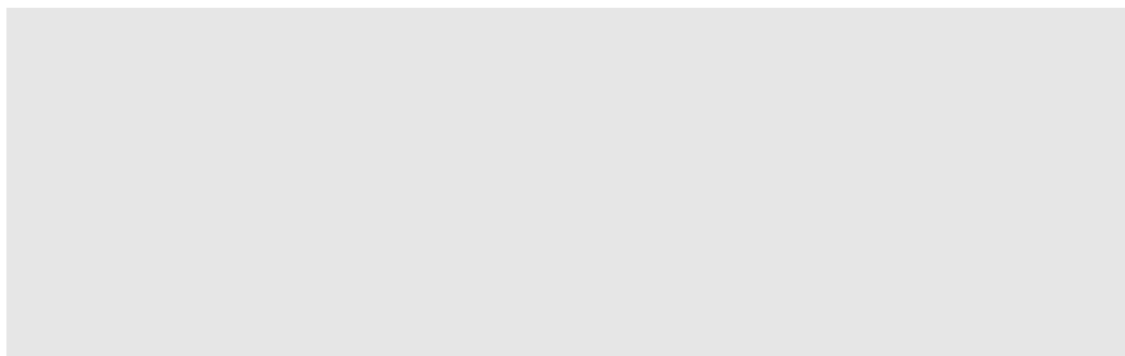
no increase	small increase	moderate increase	significant increase	high increase	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 21. How important was UNIDO's project for this increase in companies providing energy efficiency services (e.g. consultancy services, energy audits, in-house visits)?**

not important	somewhat important	moderately important	important	very important	no answer / don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 22. After the UNIDO project's closure, which of the following will be available a better level than before?**

- Public awareness: market actors are more attentive to industrial energy efficiency
- Training courses: greater choice and / or higher quality
- Factory staff: staff better qualified to assess energy efficiency measures
- Consultancy services: greater choice of qualified external consultants to assess energy efficiency measures
- EnMS implementation is more wide-spread
- Information material: more/ better availability of case studies, training materials, etc.
- Financial support: greater access to loans for industrial energy efficiency investments
- No answer/ don't know
- Other (please specify)



UNIDO Survey of Energy Efficiency Experts

Thank you for your participation and your contribution to the impact evaluation of UNIDO's industrial energy efficiency program.

Annex VIII. Draft survey of participants in UNIDO IEE training

The following survey draft is intended to be programmed as an online questionnaire in the local language. The survey splits into separate branches depending on the type of participant: **Factory staff**, **Independent energy consultant** and *Lecturer / Academia*. The participant types are colour coded to orient more easily through the text.

1. In which UNIDO training(s) did you participate?

[This section needs to be adapted in line with the actual course names assigned by the project team, the list includes only examples]

- User training Energy Management (2-3 days classroom)
- User training System Optimization (compressed air, motors, steam, pumps, fans)
- National expert Energy Management (multiple classroom and implementation session over extended period)
- National expert System Optimization (multiple classroom and implementation session over extended period)
- Benchmarking
- Financing
- Other in-depth training on Energy Management
- Other in-depth training on System Optimization

Answer option: multiple answers

2. If the training had not been offered by UNIDO, what would you have done?

I would have....

- Participated in an alternative free training provided by other training providers
- Paid for a training with a commercial provider
- Engaged in self-training.
- Not undertaken any training.
- Does not apply / no answer

Answer option: multiple answers (if possible) between 1 and 2

3. Additionally to EnMS and SO, which topics should future IEE trainings cover?

- Introductory course to energy efficiency
- (Business) communications, sales, presentation
- Participation in an energy efficiency network with other factories
- Training on
 - ... renewable energy
 - ... resource efficiency (water, material etc)
 - ... sustainable transport

- ... ozone depleting substances
- ... recycling
- ... sustainable procurement
- ... business models of energy efficiency / economic analysis
- no other topics suggested

Answer option: multiple answers, if possible: shuffle

4. In which contexts have you applied your knowledge on energy efficiency?

- Equipment and Systems medication in factories
- EnMS in factories
- Consultation of factories
- Lecturing / teaching / training / awareness raising
- Energy auditing (general)
- Energy auditing in conjunction with ISO 50001 certification
- Energy efficiency policy and regulation
- Energy efficiency research and development
- other, _____
- Have not used the UNIDO training in my professional context
- Does not apply / no answer

Answer option: multiple answers

5. What improvements to the trainings and services provided by UNIDO would address your needs working on energy efficiency?

- More in-depth technical training
- Communications / presentation (soft skills)
- Financial elements (analysis and calculations)
- Matching of companies and external consultants
- Matching of companies and finance providers (banks, energy service contractors)
- other, _____
- Does not apply / no answer

6. Are you still working in the field of energy efficiency up to this day?

- yes
- no **[End of survey]**
- Does not apply / no answer

Answer option: one answer only

7. Which of the following positions best describes your main professional engagement in energy efficiency currently?

- Factory staff**
- Independent energy consultant**
- Lecturer / Academia*
- Governmental staff
- Researcher
- Other: _____
- Does not apply / no answer

Answer option: one answer only

8. Independent Consultant:

8.1. When did you participate in the last industrial energy efficiency-training with the UNIDO program?

- 2019
- 2020
- 2021
- 2022

Answer option: one answer only

8.1. Independent Consultant: *Since your training have you received additional training and certification as*

- Energy auditor
- Lead energy auditor
- Energy assessor

Answer option: one answer only

8.2. Independent Consultant: **[Apart from your UNIDO training site (if applicable)] How many factory sites have you advised since your last industrial energy efficiency-training with the UNIDO?**

- number of customers / factory sites: _____
- No answer

8.3. Independent Consultant: How do you rate the following aspects: UNIDO's training improved my abilities ...

	To a Great Extent	Somewhat	Very Little	Not at All		Does not apply / no answer
...In customer acquisition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
...To carry out high quality energy audits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
...To offer systematic energy efficiency approaches to companies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
...To offer financing models to companies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
...To better assess financial benefits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
...To better communicate options and benefits to top management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

Answer option: one answer per row, shuffle rows

8.4. Independent Consultant: Apart from energy cost savings, what are other benefits your clients reap from the IEE projects you have managed / implemented?

- Reduction of labour cost
- Increase in productivity
- Increase in production quality
- Increase in output
- Environmental benefits
- Prestige / recognition for social responsibility
- Other: _____

Answer option: multiple answers

8.5. Independent Consultant: How important are energy cost savings in relation to other cost-reduction and benefits to your costumers?

Energy cost savings ...

- Are highly important.
- Are moderately important.
- Have a minor importance.
- Does not apply / no answer

Answer option: one answer

8.6. Independent Consultant: How do you rate the growth potential for the following energy efficiency activities in your country...

	Very Optimistic	Rather Optimistic	Rather pessimistic	Very pessimistic	no answer
...ISO 50001 certifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...investment in energy efficiency measures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...in-house expertise to acquire highly energy-efficient technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Answer option: one answer per row, shuffle rows

8.7. Independent Consultant: What are the drivers for companies investing in energy efficiency

	Very Important	Moderately Important	Not Important	Does not apply
UNIDO engagement in the sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy price increases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental consciousness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policy, e.g. standards and regulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market pressure to decrease production costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Answer option: one answer per row, shuffle rows

[End of survey for Independent Consultant]

9. *Lecturer:*

9.1. [Filtered question] *Lecturer:* Who are you providing training to?

- Students / academics
- factory staff / energy managers / factory managers
- consultants / auditors / inspectors
- policy makers / certification or accreditation bodies
- others_____
- Does not apply / no answer

Answer option: multiple answers

9.2. [Filtered question] *Lecturer:* How often are you using UNIDO training materials in lectures or trainings?

- Always
- Very Often
- Sometimes Rarely
- Never
- No answer

Answer option: multiple answers one answer

[End of survey for Lecturer]

10. **Factory employee:** When did you participate in the last industrial energy efficiency-training with the UNIDO program?

- 2015
- 2016
- 2017
- 2018

10.1. [Filtered question] Factory employee: What effect did the training have on the capacity to carry out energy efficiency measures at your factory?

The training helped to increase...

	To a great Extent	Somewhat	Very Little	Not at All		Does not apply / no answer
...managerial motivation to carry out energy-efficiency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
....in-house expertise for implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
....in-house expertise to acquire highly energy-efficient technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
...managerial motivation to engage in additional training of in-house staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
... managerial motivation to hire external service professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
....in-house expertise to acquire external financing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
... quality of financial assessments and calculations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

Answer option: one answer per row, shuffle rows

10.2. [Filtered question] Factory employee: Since you received training has your company engaged in any of the following activities?

- Carrying out energy efficiency measures
- Hiring of an external consultant to assist you on energy efficiency work
- Hiring additional staff responsible for energy efficiency
- Tracking energy consumption and setting targets?
- Carrying out system optimization
- First time implementation or plan to implement an EnMS
- Sharing of experiences and knowledge on energy efficiency with companies within the company group
- Sharing of experiences and knowledge on energy efficiency with outside companies
- No changes at company level.
- Does not apply / no answer

Answer option: multiple answers

10.2.1. [Filtered question: first 4 answers] Factory employee: Would you have carried out these energy efficiency activities without the training you received from UNIDO?

- Yes, the energy efficiency activities would have been carried out the same way.
The activities would have been carried out
-at a later point.
- Only partially.
- ... at a lower quality
- Using different methodologies / technologies
- The activities would not have been carried out without the UNIDO support.
- Does not apply / no answer

Answer option: one answer

10.2.2. [Filtered question] Factory employee: Could you realize energy savings and of which magnitude?

- 1-10 % in energy cost savings
- 10-25 %
- 25-50 %
- More than 50 %
- No energy savings realized

10.2.3. Filtered question. "Sharing of experiences and knowledge on energy efficiency with companies within the company group"] Factory employee: Have other subsidiaries / branches / production sites of your company group replicated your energy efficiency measures or the energy management system of your site?

- Yes
- No
- I don't know
- Does not apply / no answer

Answer option: one answer

1.1.1. [Filtered question "10.2. First time implementation or plan to implement an EnMS"] Factory employee: Has your company already implemented an EnMS?

- Yes, EnMS has been implemented and certified according to ISO 50001 (at least one certification).
- Yes, EnMS has been implemented internally.
- EnMS implementation is ongoing / in the process.
- EnMS implementation is planned.
- No, EnMS has not been implemented.
- Does not apply / no answer

Answer option: one answer

10.2.4. *[Answer option: one answer [Filtered question] IF: Has your company implemented an EnMS? Yes, EnMS has been implemented. EnMS implementation is ongoing. EnMS implementation is planned.]* **Factory employee:** How important were the following factors for implementing energy management system at your factory site?

	Very Important	Moderately Important	Not Important		Does not apply
Committed management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Customer requirement / suggestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Parent company requirement / suggestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Other factories of the corporate group suggestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Complying with policy regulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

No answer

10.3. *[Filtered question]* **Factory employee:** Which of the following management systems are in use at your company?

- Quality Management System - ISO 90001
- Environmental Management System - ISO 140001
- Occupational Health and Safety Management System - OHSAS 18001
- Energy Management System – ISO 50001
- EMAS environmental management
- Other management systems
- No management system is in place
- No answer

10.4. *[Filtered question No, EnMS has not been implemented.]* **Factory employee:** Why has your company not implemented an EnMS yet?

- Lack of time
- Lack of interest by the management
- Lack of in house expertise
- Lack of financial resources
- It does not seem economically viable
- No answer

[End of survey for factory employees]

Annex IX. Interviewees and list of evaluations considered

Table 31: List of projects analysed in the first report (Data collection phase I)

UNIDO programme	Country	Project number	Project code	Group of the output indicator analysis
● ODS	The Gambia	120623	A	/
	Viet Nam	120621	B	/
● RECP	Indonesia	100224	C	/
	South Africa	130129	D	/
	Viet Nam	100052	E	/
● IEE	Cambodia	104034	F	Group 2
	Ecuador	103017	G	Group 1
	Egypt	100349	H	Group 1
	India I	103029	I	Group 2
	Indonesia	103031	J	Group 1
	North Macedonia	120127	K	Group 2
	Malaysia	103042	L	Group 1
	Moldova	103043	M	Group 2
	Philippines	103049	N	Group 1
	Russia	103056	O	Group 2
	South Africa I	103097	P	Group 2
	Thailand	103071	Q	Group 1
	Viet Nam	103081	R	Group 1
	India II	120262	S	Group 1
	Iran	120506	T	Group 2
South Africa II	120487	U	Group 2	

**Table 32: List of evaluations considered for the impact evaluation
(Data collection phases II and III)**

UNIDO programme	Country	Project number	Selection strategy analysis	ICMO analysis	Expert survey
● IEE	Cambodia	104034	x	x	
	Colombia	140122	x		
	Ecuador	103017	x	x	
	Egypt	100349	x	x	x
	India I	103029	x	x	x
	India II	120262	x		
	Indonesia	103031	x	x	x
	Iran	120506	x	x	x
	North Macedonia	120127	x		x
	Malaysia	103042	x	x	x
	Moldova	103043	x	x	x
	Myanmar	130042	x		x
	Philippines	103049	x	x	x
	Russia	103056	x	x	
	South Africa I	103097	x	x	x
	South Africa II	120487	x		
	Thailand	103071	x	x	x
	Ukraine	103078	x	x	
	Viet Nam	103081	x	x	x
Total			19 projects	14 projects	12 countries

Source: UNIDO (2015), UNIDO (2016 a), UNIDO (2016 b), UNIDO (2016 c), UNIDO (2017 a), UNIDO (2018 a), UNIDO (2018 b), UNIDO (2018 c), UNIDO (2018 d), UNIDO (2018 e), UNIDO (2018 f), UNIDO (2018 g), UNIDO (2018 h), UNIDO (2018 i), UNIDO (2018 j), UNIDO (2019).

Table 33: List of interviews conducted for the impact evaluation

Interviewee	Function	Organisation	Location, Date
Stephan Sicars	Director	Department of Environment, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017
Michele Clara	Senior Coordinator	Research and Industrial Policy Advice Division, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017
Adot Killmeyer-Oleche	Chief	UNIDO Institute	Inception workshop, Vienna, 23-24. Oct 2017
Nicola Cantore	Officer	UNIDO Institute	Inception workshop, Vienna, 23-24. Oct 2017
Rana Ghoneim	Project Manager	Industrial Energy Efficiency Division, Department of Energy, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017
Marco Matteini	Project Manager	Industrial Energy Efficiency Division, Department of Energy, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017 Several phone calls in Oct 2017 and Aug 2019
Bettina Schreck	Project Manager	Industrial Energy Efficiency Division, Department of Energy, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017
Christian Susan	Project Manager	Industrial Resource Efficiency Division, Environment Department, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017
Riccardo Savigliano	Project Manager,	Montreal Protocol Division, Environment Department, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017
Akos Koszegvary	Project Manager	Montreal Protocol Division, Environment Department, UNIDO	Inception workshop, Vienna, 23-24. Oct 2017

Interviewee	Function	Organisation	Location, Date
José de Bettencourt	Terminal evaluation team leader of ODS Gambia 120623 and ODS Viet Nam 120621	International evaluation consultant (based in Portugal)	Phone, 14 Nov 2017
Mr. Roland Wong	Terminal evaluation team leader of Moldova IEE project	International evaluation consultant (based in Canada)	Phone, 7 Nov 2017
Mr. Montague	Assisting UNIDO develop its Integrated Results and Performance Framework	Evaluation consultant (based in Canada)	Phone, 15 Dec 2017
Javier Guarnizo	Director	Independent Evaluation Division, Office of Independent Evaluation and Quality Monitoring, UNIDO	Vienna, 23. Oct 2017 Vienna, 12. Apr 2019
Marco Matteini	Industrial Development Officer	Industrial Energy Efficiency Division, Department of Energy, UNIDO	Phone, 30 Nov 2017 Phone, 25 Jan 2018
Nicola Cantore	Research and Industrial Policy Officer	Department of Policy Research and Statistics Group, UNIDO	Phone, 7 Nov 2017
Robert Williams		Retired staff of Industrial Resource Efficiency Division, Environment Department, UNIDO	5 April 2019

Source: own compilation.



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