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LinkedIn: Copenhagen Centre on Energy Efficiency

ISBN: 978-87-93130-51-7

This report can be downloaded from www.energyefficiencycentre.or.

Please use the following reference when quoting this Report:

Copenhagen Centre on Energy Efficiency (2015). Accelerating Energy Efficiency: Initiatives and Opportunities - Southeast Asia. Copenhagen Denmark

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Foreword

The Sustainable Energy for All (SE4ALL) initiative was launched jointly in 2011 by the UN Secretary-General and the President of the World Bank. The initiative has three global, interlinked objectives for 2030, to:

1. provide universal access to modern energy services;
2. double the global rate of improvement in energy efficiency; and
3. double the share of renewable energy in the global energy mix.

Meeting these ambitious goals will require the mobilisation and partnership of governments, private sector, civil society and other stakeholders, and numerous activities are under way in all three areas.

The Copenhagen Centre on Energy Efficiency (C2E2) was established in 2014 and serves as the Energy Efficiency Hub of SE4ALL. One of the core activities of the Centre is to analyse and promote opportunities for accelerating energy efficiency uptake globally. As part of this broad mandate the Centre has engaged four regional partners in a detailed assessment of current energy efficiency policies, priorities and opportunities in selected countries in each region with the dual objectives of identifying key opportunities for support and at the same time being able to share experiences and best practice examples.

The regional partners are:

- The Asian Institute of Technology in Thailand for the Southeast Asia Region;
- The Bariloche Foundation in Argentina for the Latin America and Caribbean Region;
- The Centre for Energy Efficiency (CENef) in Moscow for Eastern Europe, the Caucasus and Central Asia; and
- The Energy Research Centre at the University of Cape Town in South Africa for the African Region.

This report, prepared by the Asian Institute of Technology, Thailand provides observations on existing energy efficiency policies and initiatives in five Southeast Asian countries. The report analyses the barriers and opportunities and provides recommendations on future activities that would accelerate energy efficiency in these countries. Energy demand in Southeast Asia will rise significantly in the coming decades as a result of population growth, enhanced economic activity and increased energy access. It is therefore extremely important to ensure that energy efficiency opportunities are fully utilised.

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Acknowledgement

We kindly acknowledge the inputs from Professor Sivanappan Kumar of AIT. In addition, we appreciate the contributions of Lucy Ellen Gregersen and Annahita Nikpour to the layout and format of the report. Jacob Ipsen Hansen and Thomas Thorsch Krader have reviewed the report. We acknowledge all other contributors to this report. We would like to thank Thomas Thorsch Krader for coordinating the publication of the four regional reports. We are also grateful to Mette Annelie Rasmussen and Surabhi Goswami of the UDP Communication team for their professional guidance in publishing the reports.

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Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BAU	Business-as-Usual
CFC	Chlorofluorocarbon
CFL	Compact Fluorescent Lamp
CO ₂	Carbon Dioxide
DANIDA	Danish International Development Agency
DEDE	Department of Alternative Energy Development and Efficiency
DOE	Department of Energy
DOST	Department of Science and Technology
EE	Energy Efficiency
EE&C	Energy Efficiency and Conservation
EECP	Energy Efficiency and Clean Production
EI	Energy Efficiency Index
EnMS	Energy Management Systems
EPC	Energy Performance Contracting
ESCO	Energy Service Company
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	German International Cooperation
ICA	International Copper Association
kWh	Kilowatt Hour
ktoe	Kilo Tonne of Oil Equivalent
MEMR	Ministry of Energy and Mineral Resources
MEPS	Mandatory Energy Performance Standard
MRV	Measuring, Reporting and Verification
Mtoe	Million Tonnes of Oil Equivalent

NGO	Non-government Organisation
SE4ALL	Sustainable Energy for All
SMEs	Small and Medium-sized Enterprises
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organisation
VNEEP	Vietnam National Energy Efficiency Program

Executive Summary

The growth observed in the global demand for energy in the past few decades is expected to continue into the future as the need for energy grows due to increases in demand, population, energy access and developmental needs. The Sustainable Energy for All (SE4ALL) initiative aims to double the global rate of improvement in energy efficiency by 2030, besides its targets of increasing energy access and promoting renewable energy. Improving energy efficiency (EE) can reduce greenhouse gas (GHG) emissions and substantially reduce investments in power generation. This report presents an assessment of energy efficiency opportunities in the Asian region with a particular focus on Indonesia, Malaysia, the Philippines, Thailand and Vietnam, as well as summarizing the potential interventions that would further strengthen EE promotion in the region. The assessment was done through literature reviews, expert consultations, questionnaire surveys and in-country stakeholder consultation workshops.

Regional overview of energy efficiency

Many institutions and organisations, such as, UNIDO, the ASEAN Centre for Energy, GIZ, UNDP and the EU, are actively promoting energy efficiency in this region by implementing sector-specific programmes. Many of these programmes have focused on improving energy efficiency in the industrial sector. Examples of interventions in the industry sector include the capacity building of energy management systems, including training on ISO 50001, the development and promotion of high efficiency motors, the harmonization of standards for air-conditioners, and the sharing of knowledge and success stories.

Energy efficiency status in selected countries

Energy efficiency and conservation have been on Indonesia's national agenda since 1982. A number of supportive plans and policies have been developed to facilitate improvement in energy efficiency, including setting a target of 26% GHG emissions reductions by 2020 through the implementation of renewable energy technologies and improving energy efficiency. To this end, the government has been working with local institutions and regional agencies through a number of programmes which include initiatives such as awareness raising, the development of the local capacity of energy management systems (EnMS) and ISO 50001, as well as the development of energy managers in factories and companies. Energy efficiency programmes are also being implemented with the support of both government and external agencies, e.g. UNIDO and DANIDA, targeting the industrial (e.g. textiles and garments, food and beverage, pulp and paper, and chemical industries), building, residential and commercial (e.g. tourism) sectors. Support for the industrial sector is primarily in the form of capacity development focusing on energy management systems (EnMS) and ISO 50001. For the commercial sector, the programmes offer energy auditing services, while the residential sector benefits from the free distribution of CFLs (limited to selected target groups).

The Malaysian Government has been actively promoting energy efficiency through a number of programmes and initiatives. High-energy consumers (with energy consumption of 3 million kWh in six months) are required to demonstrate energy management in their operations, for example, by appointing an energy manager. The Energy Efficiency Rating Labelling programme requires all manufacturers of selected commercial appliances and equipment to affix the EE labels onto their products. There are also financial incentives for companies (e.g. income tax exemptions, import duty exemptions on certain goods, etc.) to support EE interventions in companies. Programmes implemented with the support of local and regional agencies focus on the industrial, building, transport and commercial sectors. Types of intervention include the implementation of national energy management standards, the application of system optimization in manufacturing industries, energy efficiency improvements in buildings through retrofitting, and stimulating the sales of energy-efficient vehicles. The Government of Malaysia is working on the National Energy Efficiency Plan to introduce mandatory requirements to achieve energy efficiency in all sectors. The draft plan is now going through a stakeholder consultation process.

The Department of Energy (DOE) of the Philippines is actively promoting energy efficiency in the country through various programmes, e.g. reduction of energy consumption in government buildings and operations by 10% annually. The Philippines has yet to introduce a national policy to enforce EE activities in the country. However, enactment of the Energy Efficiency and Conservation Bill is expected sometime soon. There are multiple programmes currently being implemented with support from donors and regional agencies, including the improvement of EE through capacity building training for industries, the replacement of CFC based chillers with energy-efficient non-CFC chillers, and the promotion of high-energy efficient motors for the sugar industry.

The Department of Alternative Energy Development and Efficiency (DEDE) is the key agency driving EE in Thailand. The recent introduction of 20-Year Energy Efficiency Development Plan 2010-2030 aims to achieve 20% reductions in final energy consumption by 2030 compared to the base year of 2010. The government has designated about 2,800 buildings and 5,400 factories which are required to reduce and report their energy consumption on a regular basis. The government implemented a Revolving Fund to strengthen the capacity of commercial banks to finance EE projects, developed the ESCO fund to enable smaller companies to access EE financing, and works with the Bureau of Investment to provide tax and duty exemptions for EE products. The private sector in Thailand provides energy efficiency services. The government also supports the organisation of energy fairs and the drawing up of promotional materials targeting energy efficiency improvements.

Vietnam's Energy Efficiency Conservation Law 2010 is a regulatory framework that mandates strict requirements for all sectors to improve their energy efficiency. The Vietnam National Energy Efficiency Programme (VNEEP) sets out a comprehensive plan to implement measures for improving energy efficiency and conservation across the economy. The government is also implementing a number of energy efficiency and conservation programmes, with support from donors and regional agencies, including the Energy Efficiency Promotion in the building sector, the Energy Efficiency and Clean Production

(EECP) program, and the Improvement of Energy Sector Program, which aims to build new transmission lines and to introduce a smart grid.

Challenges and opportunities to energy efficiency implementations

Barriers to EE interventions have been observed to be very similar in these countries and to cover a wide spectrum, including policy, institutional, technical, financial and social aspects. Two barriers that have been found to be common in all countries are: (a) a lack of interest by the top management of companies and factories to agree on EE investment; and (b) a lack of awareness about EE technologies and the benefits they can offer. While these two are somewhat interconnected, the first one is mainly due to the lack of knowledge that EE investment can make a good business case. Some barriers are country- or industry-specific, including:

- The low energy price (e.g. in Indonesia, Malaysia and Thailand) is a disincentive for the industries and companies to undertake EE measures.
- The lack of a regulatory framework in the Philippines inhibits the wider implementation of EE measures.
- The absence of an appropriate institutional mechanism (e.g. in Thailand and the Philippines) to provide long-term support for EE implementation.
- Insufficient capacity of governments and private sectors (e.g. in Indonesia) to deliver EE programmes and services.
- The lack of financial support to offset high capital investment for smaller companies (e.g. in Indonesia, the Philippines and Vietnam) to undertake EE measures.
- The lack of quality testing infrastructure, e.g. appliance and equipment testing laboratories in Indonesia and the Philippines, to implement standards and labelling programmes effectively.

Potential for support and interventions

To address the barriers that have been identified and to reap the opportunities that exist in the priority sectors in the selected countries, the following actions are recommended (in no particular order).

- Provide targeted capacity-building support to engage top management.
- Support to developing a targeted, long-term and result-driven awareness programme to increase knowledge about energy efficiency.
- Technical assistance with demonstrations of energy-efficient technologies.
- Support capacity-building programmes to develop energy managers and energy auditors.
- Deliver capacity-building programmes for ESCOs.
- Provide financial support to assist with capital investment.
- Capacity development for government employees.
- Establish quality testing infrastructure.
- Develop an enabling policy environment.
- Create a central repository of information on energy efficiency.
- Support the development of energy efficiency programmes for the transport sector.
- Develop energy efficiency programmes for the building sector.

While the selected countries are making progress in EE, there are opportunities to provide support to help them improve it further. However, these are sector- or industry-specific and, most importantly, supports should be tailored to suit specific target groups. Most of the past and existing programmes have focused on the industrial sector, with limited attention being given to the transport and building sectors. While there are minor needs for financial and technical support in specific sectors and industries, much support is needed in the form of capacity development in order to overcome institutional and cultural barriers.

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1. Introduction and background

Background

Energy demand in Asia during the past decade has been significant due to increased economic and industrial development, mainly in China and India. This is expected to continue in the future, with an increase of over 80% by 2035¹. The *Energy Outlook for Asia and the Pacific*, published by the Asian Development Bank (ADB), projects that demand for energy in this region will grow by 2.1% per year between 2010 and 2035, compared to global growth of 1.5%². Among other adverse impacts, this will lead to an increase in CO₂ emissions of 2% per year, reaching 22,112.6 Million tonnes of CO₂ in 2035³.

The transport sector is expected to grow the fastest, with an increase of 2.7% per year, mainly due to income growth and the subsequent demand for convenience and comfort in mobility. Other sectors, including residential, commercial, and agriculture and fisheries, will see an annual increase of 2.5%, while the industrial sector will experience a slower increase of 1.5%⁴. Under the BAU scenario, this rapid increase in energy demand in the Asia-Pacific region will require a cumulative investment of about USD11.7 trillion in the energy sector during this period. This calls for immediate action to increase the efficiency of energy use in different sectors, as improving energy efficiency can help the region meet rising energy demand in a cost-effective and sustainable way⁵.

Improvements in energy efficiency can also help to reduce both GHG emissions and the size of the investment needed in energy generation. The co-benefits of energy efficiency include the creation of jobs, fostering economic growth and improvements in energy security. In this context, the Sustainable Energy for All (SE4ALL) initiative aims to double the global rate of improvement in energy efficiency between 2010 and 2030. This report presents a summary of the energy efficiency status of five selected Asian countries, discusses existing EE policy instruments in the region and the need for policy advocacy, and recommends a future plan of action for the SE4ALL initiative.

Scope of the study

The Asian Institute of Technology was engaged by the Copenhagen Centre on Energy Efficiency (C2E2) to undertake an assessment of the current status of energy efficiency in Southeast Asia with a focus on Indonesia, Malaysia, the Philippines, Thailand and Vietnam. The scope of the study was as follows:

¹ IEA 2013

² Asian Development Bank (ADB) 2013

³ ADB 2013; IEA 2013.

⁴ ADB 2013

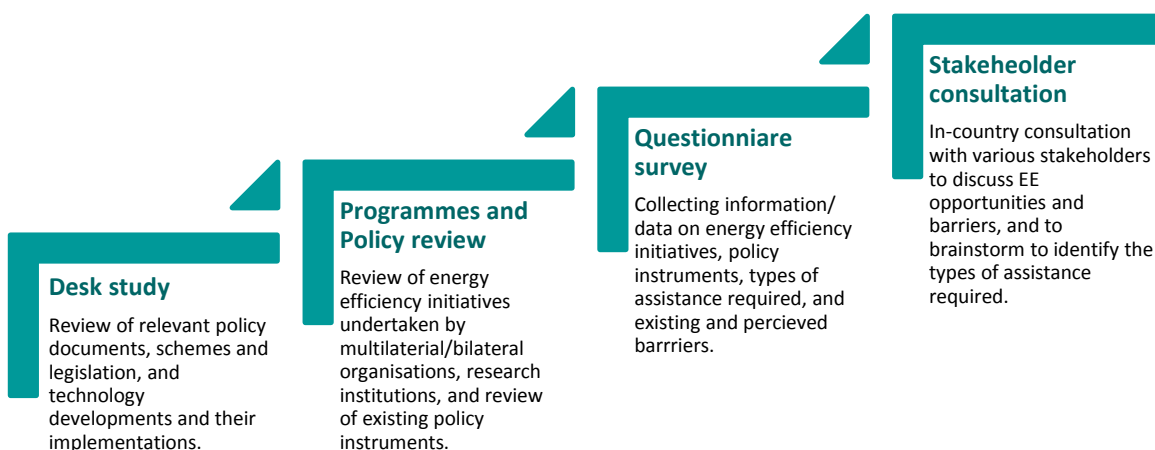
⁵ Ibid.

- Identification of past successful energy efficiency initiatives and activities that have commenced or have a planned commencement date
- Identifying the barriers that need to be addressed at both the regional and country levels
- Prioritizing countries in the region based on energy efficiency opportunities
- Identification of at least five countries in the region (preferably but not limited to SE4ALL countries) that would be targeted for support. This should be based on the energy efficiency potential in various sectors, the respective government’s interest and likely commitment with regard to accelerating energy efficiency, the need for assistance, etc.
- Conducting consultations with relevant countries and organisations to develop an action plan to support these countries in identifying opportunities for new and existing EE policies and programmes

Methodology

The study was carried out in four different, but inter-related, steps. Figure 1.1 presents a quick summary of these steps, the details of which are given below.

Figure 1.1 Major methodological steps involved in the study



Desk study. A review was undertaken to identify EE initiatives that are being or have been implemented by government, the private sector, multilateral agencies, bilateral organisations, academic institutions and research organisations. This review improved understanding of the status of energy use, applications of energy efficient technologies and practices, energy efficiency indicators, and legislation.

Programmes and policy review. Relevant policy documents, schemes and legislation, as well as technological developments and their implementation modalities in the focus countries, were examined. This review helped to identify the factors that either facilitate or impede EE.

Questionnaires. Information on energy efficiency status in the region, existing policy measures regarding EE, barriers to EE implementation and opportunities for future EE measures were collected using questionnaires. Two types of questionnaire were drawn up: (i) for national agencies, including government, NGOs, research institutions and private sectors; and (ii) for regional agencies, including donors, regional associations, etc. to capture the relevant information. A total of 66 questionnaires were sent out to over 40 institutions in 16 countries. Thirteen responses were received, i.e. a 20% response rate. Figures 1.2 and 1.3 present the distribution of questionnaires sent and responses received. Copies of the questionnaires are available in Appendix A.

Stakeholder Discussions. Consultation workshops were held in Indonesia, the Philippines, Thailand and Vietnam with the participation of representatives from government agencies, the private sector, NGOs, professional associations, education and research institutes and regional/donor agencies. Various issues, such as EE opportunities and barriers, the effectiveness of existing policies and future programme or policy directions were discussed. The workshop also brainstormed to help identify the types of assistance that would be appropriate in further improving energy efficiency in these countries.

Figure 1.2 Distribution of questionnaires by stakeholders

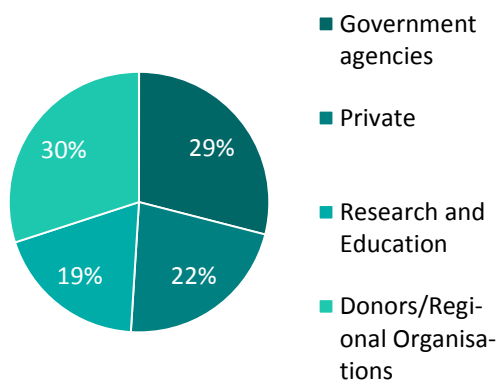
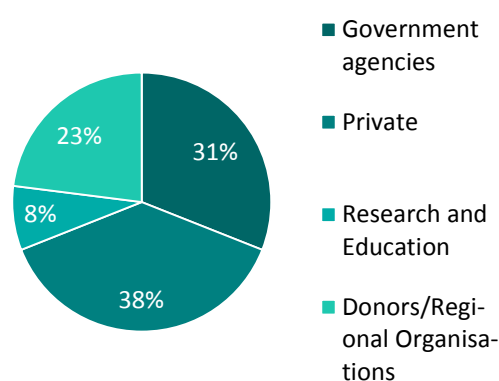


Figure 1.3 Responses received from different sectors



Data sources. A wide range of credible data sources were consulted wherever appropriate, including ADB reports, United Nations (UNEP, UNIDO, UNDP) publications, materials from national energy agencies, publications from international organisations, journal articles, the proceedings of conferences and workshops.

2. Energy Efficiency Status in Asia

Regional overview

Demand for energy in Asia and the Pacific is projected to grow at 2.1% per year over the period 2010 to 2035 – faster than the projected world annual average growth of 1.5% during the same period. Growth in primary energy demand will differ by region and by country, reflecting regional diversity in economic development and population growth⁶. Selected regional initiatives that aim to improve energy efficiency in Asia are discussed below.

ASEAN Energy Efficiency and Conservation Sub-Sector Network

The ASEAN Centre for Energy (ACE) has been carrying out a regional programme since 2010 to reduce the energy intensity of its member states by at least 8% by 2015 compared to 2005 levels (ACE 2014). This programme is being implemented in all ASEAN member states, including Indonesia, Malaysia, the Philippines, Thailand and Vietnam. It supports a number of activities in the region, including workshops, conferences, capacity building (on-the-job training, multi-country programmes, etc.), energy audits, certification programmes, publications, information sharing, standards and labelling, the development of EE tools (technical directory for buildings and industry, online ASEAN energy management system, etc.), policy development, EE awards, and the identification of potential EE as mitigation actions. This programme has been successful in the sense that it is on track to meeting the collective target of an 8% reduction by 2015.

Regional Energy Efficiency Programme South Asia

The Regional Energy Efficiency Programme South Asia was implemented by the German Agency for International Cooperation (GIZ) in 2011-2013 in Bangladesh, India and Nepal⁷. It included capacity development measures for energy efficiency experts and multipliers, as well as promoting the sharing of international know-how through training courses, regional and international conferences, and study tours.

ASEAN Standards Harmonization Initiative for Energy Efficiency (ASEAN SHINE)

Funded under the EU SWITCH-Asia affiliated program, ASEAN SHINE aims to increase the market share of energy-efficient air-conditioners in ASEAN through the harmonization of test methods and energy efficiency standards, the adoption of common Minimum Energy Performance Standards, and changing consumer purchasing attitudes in favour of energy-efficient air-conditioners. The program's activities will lead to improved efficiency in demand side management in the residential sector; reduced emissions of greenhouse gases in ASEAN, the removal of non-tariff barriers to trade within ASEAN, and enhancements of regional market integration. This is a four-year programme being implemented by the International Copper Association Southeast Asia in all ASEAN member

⁶ ADB 2013

⁷ GIZ 2012

states, including Indonesia, Malaysia, the Philippines, Thailand and Vietnam, with 80% of funding (EUR 1.8 million) from the European Union.

Energy Efficiency Statuses in Selected Southeast Asian Countries

The questionnaire survey that was undertaken for this study provided information on the programmes and initiatives being implemented, priority sectors in terms of energy efficiency opportunities, the barriers to implementing energy efficiency, and the types of assistance that would help these countries make further progress in energy efficiency initiatives. A summary of this information is presented in Table 2.1. Industry is seen to be the prime sector in most countries, due to its high energy consumption and the projected increase in industrial activities.

Table 2.1 Energy efficiency status and opportunities in selected Asian countries

Existing initiatives (I)	Industry	I,O	I,O	I	I	O	Opportunities (O)
	SMEs	O	O	I,O	O	O	
Transport			O	O	O		
Residential & commercial	I			O	I	I,O	
Building			I,O				
Agriculture							
Energy generation	O					O	
Barriers (B)	Technical						Assistance required (A)
	Policy	B,A	B,A	B,A	A	B,A	
	Institutional (capacity building)	B,A	B,A	B,A	B,A	B,A	
	Financial	B,A	B,A		B,A	B,A	
Countries		Indonesia	Malaysia	Philippines	Thailand	Vietnam	

In Thailand, Malaysia and Indonesia, the industry sector's importance is driven by the fact that future economic growth will lead to further demand in energy consumption in this sector. This is followed by the small and medium-sized enterprise (SME) sector, as the number of SMEs in these countries is also increasing rapidly. While there is a significant opportunity in the transport sector, little attention has been given to improving energy efficiency in the SME sector. For example, in the Philippines, the transport and industry sectors both come top in national energy consumption, and it is expected that the transport sector will surpass the industry sector by 2030 under the BAU scenario.

In terms of the barriers to implementing energy efficiency measures, appropriate policy and institutional mechanisms were found to be lacking in Asia, followed in significance by the financial barriers. While some countries have national plans to conserve energy in the medium to short terms, appropriate regulatory frameworks to enforce measures effectively appear to be absent. This problem is compounded by the absence of a responsive measuring, reporting and verification (MRV) mechanism to ensure that targets will be achieved in real terms. The high subsidy level in the energy sector

creates a significant disincentive for consumers—particularly in the industrial and SME sectors—to invest in energy-efficiency technologies and/or services, as the cost of such measures are often higher than the artificially low expenditure on energy.

The International Energy Agency (IEA), together with the Asian Development Bank (ADB), has developed policy recommendations that address energy efficiency opportunities, barriers and policy needs in Southeast Asia⁸. These cross-sectoral barriers include:

- Lack of information among stakeholders;
- Subsidized energy prices;
- Lack of experience and knowledge on energy efficiency technologies,
- Lack of understanding the benefits and risks among financial stakeholders;
- Scarcity of affordable funding options;
- Lack of technical capacity to implement projects; and
- Lack of clarity over the division of labour between relevant agencies.

Indonesia

Energy and Status Outlook of Indonesia

Primary energy demand in Indonesia was 207.8 Mtoe in 2010, and this is expected to reach 445.5 Mtoe in 2035⁹. The share of the primary energy supply in 2025 is expected to be as follows: natural gas 22%, coal 30%, oil 25%, and new and renewable sources 23%. Under the BAU scenario, final energy demand in Indonesia is expected to grow from 156.4 Mtoe in 2010 to 305.2 Mtoe in 2035, representing an annual growth of 3.8%¹⁰. The National Energy Policy (under government regulation No. 79/2014) aims to reduce energy intensity by 1% per year, reduce the energy elasticity to less than 1, and optimize renewable energy use in the country. Indonesia's energy elasticity in 2009 was 2.69, which compares with Thailand's 1.4 and Singapore's 1.1. With the gradual decrease in gas production, unless new fields start production, Indonesia will face difficulties in meeting the unprecedented energy demand. Energy efficiency improvements must be prioritized to handle the growth in oil demand and the resulting need to import petroleum products¹¹.

Transport sector. Energy consumption in the transport sector represented 40.4% (in 2012), the highest energy-consuming sector in Indonesia¹². In line with the country's continued economic development, Indonesia's demand for transport energy will grow, nearly doubling the 2010 level in 2035. Vehicle ownership will increase, as it has not yet reached saturation level. Many of the country's transport energy needs will be met by oil, which will account for 96% of transport energy demand in 2035¹³.

⁸ IISD 2014

⁹ ADB 2013

¹⁰ Romandhi 2014; IEA 2013

¹¹ ADB 2013

¹² Romandhi 2014

¹³ ADB 2013

Industry sector. As the second largest consumer of energy in Indonesia, the industry sector represented 39.7% of total national consumption in 2012¹². Energy demand in this sector is expected to double between 2010 and 2035 at an annual growth rate of 3.6%¹³. This is due to increased economic activities, mainly in the manufacturing sector, including food-processing, textiles and footwear, cement and non-metallic minerals, iron and basic steel and transportation equipment.

Energy efficiency initiatives in Indonesia

The Ministry of Energy and Mineral Resources (MEMR) is responsible for dealing with matters related to energy, including energy efficiency and conservation. MEMR's responsibility in energy efficiency and conservation is entrusted to the Directorate of Energy Conservation, which is technically the national focal point for energy conservation¹⁴. The Ministry of Industry and the Ministry of Public Works also work with MEMR in implementing the mandates for energy efficiency and conservation that fall under their responsibility. A number of programmes and policies have been developed and are being implemented in Indonesia to promote energy efficiency and conservation. A summary is provided in Table 2.2, and further details are given in Appendix B.

The roadmap for the development of energy conservation policy in Indonesia was initiated in 1982 by a Presidential Instruction, and in 1995 the country introduced a master plan for National Energy Conservation. Since then, a number of regulations have been notified, and in recent years, MEMR has issued notifications on energy saving, electricity use, water saving, labelling and electricity tariffs, with the most recent 79/2014 being on National Energy Policy. This has a strong reference to energy conservation efforts in Indonesia. A Master Plan for Energy Conservation is currently being drafted.

Table 2.2 Energy efficiency programmes and policies in Indonesia

	Title	Details	Sectoral coverage
POLICIES	Instruction on Central and Regional Government to implement EE&C: 10/2005	Implementing energy efficiency in government offices (lighting, AC, electricity equipment, official vehicles) and buildings.	Building
	Procedure for EE&C Implementation	Regulating energy efficiency measures in government offices, households, commercial buildings, industries, transportation and other activities.	All sectors
	National Action Plan for Reducing Greenhouse Gas Emissions (RAN-GRK) 61/2011	The plan aims to achieve a 26% reduction in GHG emissions below the "Business-as-Usual" level by 2020, based on unilateral actions, and a further reduction of up to 41% below "Business-as-Usual" if adequate international support were made available to the Government of Indonesia. The activities to reduce GHG emissions will include, among others, the conservation and efficient management of energy ¹⁵ .	All sectors

¹⁴ APEC 2012

¹⁵ Indonesian Government 2011

	Title	Details	Sectoral coverage
	Indonesia's 2003-2020 National Energy Policy	This policy includes an action plan targeting EE&C e.g. increasing use of energy-saving appliances and equipment standards and labelling in the household and commercial sectors; promoting cogeneration and introducing demand side management (DSM) in industry; and applying EE standards to motor vehicles.	Industrial, commercial and domestic
	Energy Conservation 30/2007	This stipulates that EE&C is the responsibility of all energy users and that incentives will be offered to efficient users and to producers of efficient appliances ¹⁶ .	All sectors
PROGRAMMES	Environmental Support Program	Supported by DANIDA, this programme is in its third phase. It has three main components that target improving the environmental performance of the country. Measures include support to the national and regional levels of government in implementing and monitoring energy efficiency, energy conservation and renewable energy ¹⁷ .	All sectors
	Public-Private Partnership Programme on Energy Conservation	This programme is a government-funded energy audit programme that is available to industries and commercial buildings. Participating industries and commercial buildings are required to implement the recommended energy-saving measures identified in the energy audit ¹⁸ .	Building, commercial and industrial
	Energy-efficient lighting programme in the residential sector	This is primarily a demand side management (DSM) programme. This programme provides subsidies, and in certain cases, free CFLs to eligible households ¹⁹ .	Building, residential
	Sustainable Tourism through Energy Efficiency with Adaptation and Mitigation Measures (STREAM)	Supported by STREAM, this project aims to strengthen local structures for the sustainability of Pangandaran, a popular tourist destination in Indonesia. Measures include, among others, the adoption of an energy efficiency approach in all tourist services ²⁰ .	Commercial
	Promoting Energy Efficiency in the Industries through System Optimization and Energy Management Standards	Supported by UNIDO, this programme targets four priority industrial sectors, i.e. textiles and garments, pulp and paper, foods and beverages, and chemicals. The programme aims to achieve energy efficiency in the industrial sector through capacity-building in both skills development and improvements in financial capacity ²¹ .	Industrial

¹⁶ Hutapea 2013

¹⁷ DANIDA 2014

¹⁸ APERC 2014

¹⁹ Ibid.

²⁰ STREAM 2014

²¹ UN 2014

The activities of energy efficiency and energy conservation include human resource development, creating public awareness, implementing standards and labelling, reducing GHG emissions, implementing ISO 50001, drafting a master plan on energy conservation, developing partnerships, developing energy investments and reducing energy intensity.

Capacity building training has been provided to more than 1,700 participants (government, the private sector, the training centre, factory managers, factory personnel, vendors, banks, financial service authorities and auditors of certification bodies) with the support of UNIDO, targeting textiles and garments, foods and beverages, pulp and paper, and chemical industries.

An Energy Management System (EnMS) has been piloted in twenty factories which have now adopted ISO 50001, and another four factories have been certified with ISO 50001 in 2013. Besides, four case studies of EnMS have been conducted, with energy savings ranging from 7% to 11.3% in the first year of implementation. The Ministry of Environment is working on a project on Cleaner Production and Sustainable Consumption and Production (SCP), with a ten-year program, including green procurement. The possibility of developing a waste-to-energy project is also being examined in central Java.

Priority sectors for energy efficiency in Indonesia

The transport and industrial sectors were identified as the most high-priority sectors in Indonesia, mainly due to their expected growth in energy demand, which is expected to nearly double by 2035 compared to 2010. A summary of priorities in the different sectors is presented in Table 2.3 The level of priority in the building and energy sectors was found to be medium.

Table 2.3 Priority sectors for energy efficiency in Indonesia

Sectors	Priority level	Remarks
Transport	High to medium	<ul style="list-style-type: none"> Represents 40.5% of national consumption (2012) Will nearly double by 2035 compared to 2010 Oil is and will remain the major fuel in this sector (96% in 2035), a major concern in terms of both declining oil production and its contribution to GHG emissions
Industrial and SMEs	High to medium	<ul style="list-style-type: none"> Large industries and SMEs together represent 39.7% of national consumption (2012) Expected to double by 2035 compared to 2010 Future growth in GDP will put more pressure on energy demand in this sector
Energy generation	Medium	<ul style="list-style-type: none"> Very low use of new and renewable energy sources (only 4%) High potential for PV, biomass, biofuel, geothermal, micro-hydro
Building	Medium to low	<ul style="list-style-type: none"> The building sector represents 12% of national consumption Development of an energy-efficient building code will help to reduce energy consumption in this sector
Commercial	Low	<ul style="list-style-type: none"> Very low consumption Standard and labelling are already in place in the commercial sector

Malaysia

Increased economic growth in Malaysia has led to a rapid increase in energy demand. National energy consumption in Malaysia is expected to rise by 60% by 2035 compared to 2010 in line with the increase in GDP, which is expected to more than double by 2035 to USD 419.8 billion (constant 2000 \$) compared to USD 147.3 billion in 2010.

Energy status and outlook of Malaysia

Malaysia has been experiencing steady growth in GDP at a rate of 4.3% per year, and per capita GDP is expected to reach USD 10,721 (constant 2000 \$) in 2035, which is more than double compared to the 2010 level of USD 5,185. This creates an enormous demand for energy use in both the power and industry sectors²². Under the BAU scenario, Malaysia's final energy demand is projected to increase from 43.3 Mtoe in 2010 to 68.9 Mtoe in 2035, with an annual growth rate of 1.9%.

Industry sector. Final energy demand of the industry sector is projected to reach 27.6 Mtoe in 2035. Under the BAU scenario, the industry sector will surpass the transport sector and become dominant at 40.1% of national energy consumption in 2035. The share of commercial energy in the industry sector in 2035 will be natural gas at 33.4%, electricity at 28.2% and oil at 28.1%.

Transport sector. Energy demand in the transport sector in Malaysia is expected to show a modest annual growth rate of 1.4% under the BAU scenario, reaching 20.6Mtoe in 2035. While the demand

²² ADB 2013

for petroleum products will continue to dominate this share, the demand for natural gas and biofuels is also expected to grow significantly.

Other sectors (agriculture, building, non-energy). The final energy demand in other sectors is projected to grow at an average annual rate of 2%, reaching to 15.8 Mtoe in 2035.

On-going EE initiatives (with both national and regional support)

A number of energy efficiency programmes and policies are ongoing in Malaysia, as shown in Table 2.4.

Table 2.4 Energy efficiency programmes and policies in Malaysia

	Title	Details	Sectoral coverage
POLICIES	MEPS and EE Rating Labelling (STAR Rating) for electrical appliances	This initiative is based on the Electricity Regulation 1994 ²³ regulation 101A (3). The initiative requires all manufacturers of televisions, refrigerators, domestic fans and air conditioners to affix energy efficiency labels onto the products before the can be sold to customers ²⁴ .	Commercial
	Efficient Management of Electrical Energy Regulations (EMEER)	This initiative requires certain energy consuming and generating facilities, exceeding 3,000,000 kWh for six months, to implement measures for the efficient management of electrical energy. Among others, the regulation also requires such facilities to appoint an Electrical Energy Manager (EEM) to facilitate an accountable energy efficiency management process. The facility also needs to ensure that the EEM has access to a Continuous Development Programme ²⁵ .	Commercial/ industrial
	Fiscal incentives for EE & REE projects	This initiative provides financial incentives to companies that deliver energy conservation services and sales or manufacture energy efficient equipment. The incentives include, for example, income tax exemption, import duties and sales tax exemptions on energy conservation equipment that is not produced locally, and investment tax allowances ²⁶ .	Commercial
	Energy Performance Contracting (EPC) Projects for Government Buildings	This initiative came into effect in January 2013 to overcome the capital costs and financing barriers in implementing cost-effective energy efficiency measures, and to provide customers with a set of energy efficiency, renewable energy and distributed generation measures.	Building

²³ Amendments 2013

²⁴ Energy Commission Malaysia 2013b

²⁵ Energy Commission Malaysia 2013a

²⁶ Energy Commission Malaysia 2013c

	Title	Details	Sectoral coverage
PROGRAMMES	Sustainability Achieved via Energy Efficiency (SAVE)	This program, funded by the Malaysian Government under the Economic Transformation Programme, aims to stimulate the economy. It focuses on five key areas: (a) government taking the lead in energy efficient practices, (b) stimulating sales of energy efficient appliances, (c) making co-generation economically viable, (d) improving regulation on building insulation, and (e) stimulating sales of energy-efficient vehicles.	
	Building Sector Energy Efficiency Project (BSEEP)	This initiative aims to make energy-efficient low carbon buildings, to achieve 55% energy efficiency implemented in buildings by 2015, to develop a market for energy retrofits for existing buildings by 2015, and to promote a general acceptance of EE principles in the building industry ²⁷ .	Building
	Industrial Energy Efficiency for Malaysian Manufacturing Sector	This is a GEF-funded programme implemented by UNIDO. The programme aims to promote energy efficiency improvements in the Malaysian manufacturing sector through the implementation of national energy management standards and the introduction of system optimization. The programme ensures that two essential criteria are met: (i) it must reflect national priorities and have the support of the country; and (ii) it must improve the global environment or improve the prospects of reducing risks to it ²⁸ .	Industry

Energy efficiency initiatives in Malaysia

Draft National Energy Efficiency Master Plan (NEEMP)-2009-2011. The National Energy Efficiency Plan was drafted in 2009 and has been going through a series of consultations, the latest one being held in September 2014.

Priority sectors for EE in Malaysia

As in Indonesia, the transport and industrial sectors are also the priority sectors for energy efficiency in Malaysia. Table 2.5 presents a summary of the priority sectors in Malaysia. It is expected that together these two sectors will require about 70% of national energy supply by 2035.

Table 2.5 Priority sectors for energy efficiency in Malaysia

Sectors	Priority level	Remarks
Industrial and SMEs	High to medium	<ul style="list-style-type: none"> ▪ Highest energy consuming sector – will represent 40% of national consumption in 2035 ▪ There is no legal or regulatory framework or enforcement measures ▪ Need to develop a Monitoring and Verification (M&V) mechanism

²⁷ Kristensen 2012

²⁸ IEEMMS 2014

Sectors	Priority level	Remarks
Transport	High to medium	<ul style="list-style-type: none"> Another top consumer of energy, expected to reach 30% of national consumption in 2035 Number of vehicles and other transportation equipment is increasing steadily Need for regulatory and financial instruments to conserve energy in this sector
Energy generation	Medium to low	<ul style="list-style-type: none"> This sector is fairly well regulated Sufficient acts and regulations are in place
Building	Medium to low	<ul style="list-style-type: none"> Under BAU, energy demand is expected to grow in this sector A Green Building Index has been developed, but still needs an enforcement mechanism
Agriculture	Low	<ul style="list-style-type: none"> Very low consumption, and expected to remain low

The Philippines

The rate of increase in energy demand in the Philippines is slow compared to other countries in the region. The country's primary energy demand was 40.5 Mtoe in 2010, an increase of 4% from 2002, although the country experienced a massive 50% growth in GDP during this period.

Energy status and outlook of the Philippines

The Philippines' GDP is projected to increase from \$128.7 billion (constant 2000 \$) in 2010 to \$388.6 billion in 2035 at an annual rate of 4.5%²⁹. This economic growth, coupled with population growth of 1.5% per year during this period, is expected to increase the country's primary energy demand from 40.5 Mtoe in 2010 to 82.9 Mtoe in 2035, at an annual rate of 2.9%. In 2035, the share of coal will be 37.5%, oil 36.5%, new and renewables 19.9% and natural gas 7.9%³⁰. As about 75% of fossil fuel is imported, the Philippines' energy policy agenda needs to consider ensuring the security of supply, such as by conserving energy³¹.

Transport sector. The fastest growth in energy demand will be in the transport sector: 3.5% per year, accounting for 38% of final energy demand by 2035. The sector's energy demand will reach 18.8 Mtoe in 2035, increasing from 8.4 Mtoe in 2010. Oil products will be the main fuel for the transport sector, accounting for 96% in 2035, with the remainder taken up by natural gas³².

Industry sector. Energy consumption in the industry sector is about one-quarter of national consumption, and will grow at about 3% per year from 2010 to 2035 under the BAU scenario. The food and tobacco, and non-metallic minerals subsectors are responsible for most of the energy consumption in the industry sector. The energy demand of the industry sector is largely met by coal³³. Figure

²⁹ ADB 2013

³⁰ Ibid.

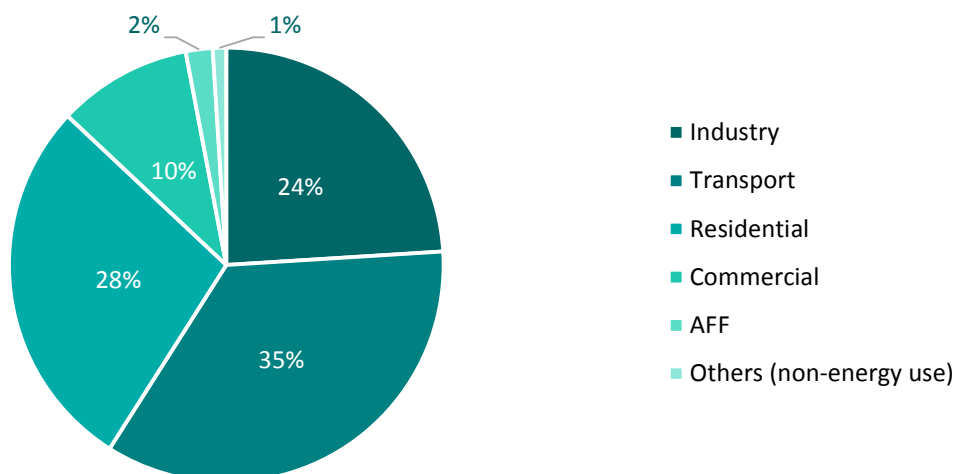
³¹ Ibid.

³² ADB 2013

³³ Ibid.

2.1 provides the share of energy consumption in different sectors, averaged over the period from 2005 to 2011³⁴.

Figure 2.1 Share of energy consumption in different sectors in the Philippines



Energy efficiency initiatives in the Philippines

The Department of Energy (DOE) is the main government agency for delivering EE programmes and policies. The government's Energy Management Programme aims to reduce monthly consumption of electricity in government buildings and the use of petroleum products in government-operated vehicles by at least 10% on an annual basis through various measures, including efficient lighting, air-conditioning retrofitting and switching to fuel-efficient vehicles. DOE and the Department of Science and Technology (DOST), in collaboration with a number of government and private organisations, is implementing a standards and labelling programme for households and commercial sectors. This program, currently being implemented on voluntary basis, has already developed and implemented standards for refrigerators and air-conditioners, and is expected to include television in the near future. In addition, DOE is also involved with other EE programmes that are being delivered in the country by various agencies. The government has drawn up an Energy Efficiency and Conservation Roadmap 2012-2030 to drive EE measures in the country. The Energy Efficiency and Conservation Bill 2014 will be the first policy or regulatory instrument to enforce EE in the country once it passes through the parliament.

The United Nations Industrial Development Organisation (UNIDO)-supported Philippines Industrial Energy Efficiency Programme assists industries to improve energy efficiency through a range of activities, including capacity building i.e. training on ISO 50001. The GEF-funded Philippines Chiller Energy Efficiency Programme is being implemented by the Department of Environment and Natural Resources, which aims to replace inefficient CFC-based chillers with new and efficient non-CFC chillers. The High Energy Efficiency Motors (HEM) programme of the EU's SWITCH-Asia Programme is being implemented by a consortium consisting of the Institute of Integrated Electrical Engineers (IIEE), the International Copper Association (ICA) and the Asia Society for Social Improvement and Sustainable

³⁴ Reyes 2013

Transformation (ASSIST). This programme aims to showcase and promote high-efficiency motors and drive systems in the sugar industry. It also demonstrates that investment in EE motors can make a good business case, as often the simple payback period for such investments is less than one year.

The International Copper Association (ICA), in collaboration with the Philippine Chamber of Commerce and Industry (PCCI) and the Department of Trade and Industry (DOTI), is delivering the ASEAN Standards Harmonization Initiative for Energy Efficiency (ASEAN SHINE) to harmonize standards in ASEAN countries, including the Philippines, as well as encouraging the development of national policy roadmaps. In addition, the ICA is also working with electrical utilities to improve the energy performance of distribution transformers.

The Climate Technology Initiative: Private Financing Advisory Network (CTI-PFAN) helps to connect investors and clean energy businesses, including with reference to energy efficiency. In the Philippines, CTI-PFAN has supported sugar mill industries in accessing the finance needed to implement energy efficiency. Table 2.6 presents a summary of on-going programmes and policies in the Philippines. The Philippines Appliance Industry Association (PAIA), in partnership with DOE and DOST, is implementing a standards and labelling programme for residential and commercial sectors. Also, multiple capacity-development programmes are being delivered by different organisations. These include:

- Training programmes for energy management experts by IIEE. The programme provides knowledge of energy management techniques and the ISO 50,001 standard;
- The Energy Efficiency Practitioners Association of the Philippines (ENPAP) is delivering training programmes to develop and certify energy managers who are expected to undertake EE measures in their organisations; and
- The training of electricians to educate them on using EE products during electrical installation, retrofitting and replacements in all sectors. This programme is being carried out by ASSIST.

Table 2.6 Energy efficiency programmes and policies in the Philippines

	Title	Details	Sectoral coverage
POLICIES	Energy Efficiency and Conservation Bill 2014 (upcoming)	The Philippines has not yet established an Energy Efficiency policy. The Energy Efficiency and Conservation Bill has been in the discussion for the past few years and is expected to be enacted soon.	All sectors
PROGRAMMES	Information, Education and Communication Campaign	This programme aims to increase awareness about EE in the country through a range of targeted approaches, including media programmes, seminars, workshops, etc.	All sectors
	Standards and Labelling for Household Appliances	DOE and DOST, in collaboration with a number of government and private organisations, is implementing a standards and labelling programme for households and commercial sectors.	Residential and commercial
	Government Energy Management Programme (GEMP)	This programme is aimed at reducing the monthly consumption of electricity and transport petroleum products of all government offices and vehicles by at least 10% on annual basis.	Building and transport
	Philippine Industrial Energy Efficiency Project (PIEEP)	This is a UNIDO-GEF funded project (2011–17) implemented with co-financing from DOE and national commercial banks. It aims to introduce an ISO 50001 Energy Management System Framework along with a system optimization approach for the improvement of industrial energy efficiency in the Philippines.	Industrial
	Philippines Chiller Energy Efficiency Program	The GEF-funded Philippines Chiller Energy Efficiency Programme is being implemented by the Department of Environment and Natural Resources and aims to replace inefficient CFC-based chillers with new and efficient non-CFC chillers.	Industry
	High Efficiency Motor program	The High Energy Efficiency Motors (HEM) program, funded by USD1.9 million from the EU's SWITCH-Asia Programme, is being implemented by a consortia of a number of organisations, including IIEE, ICA, and ASSIST. This programme aims to showcase and promote high-efficiency motors and drive systems in the sugar industry.	Industry

Priority sectors for EE in the Philippines

In the absence of an energy efficiency policy, the Philippines has yet to appropriately identify priority sectors for energy efficiency. The workshop participants stated that the most work in energy efficiency is being undertaken around the industrial sector. While some initiatives have been noted in the transport and building sectors, there are no large-scale programmes targeting these sectors. Table 2.7 presents a summary of the priority sectors in the Philippines.

Table 2.7 Priority sectors for energy efficiency in the Philippines

Sectors	Priority level	Remarks
Industrial and SMEs	High to medium	<ul style="list-style-type: none"> ▪ Second highest energy-consuming sector (28%) ▪ Need to develop a systematic monitoring and verification (M&V) mechanism ▪ Need to demonstrate new and advanced technologies
Transport	High to medium	<ul style="list-style-type: none"> ▪ The top energy-consuming sector ▪ No significant activities undertaken ▪ Growing number of vehicles and other transportation equipment
Building	Medium	<ul style="list-style-type: none"> ▪ Energy demand is high and expected to grow ▪ Building code and standards are absent ▪ Reduction potential is low compared to the industry and transport sectors
Commercial	Medium to low	<ul style="list-style-type: none"> ▪ Relatively low energy consuming sector ▪ Standards and labelling programme in place ▪ Need for a quality testing infrastructure
Agriculture	Low	<ul style="list-style-type: none"> ▪ Very low consumption, and expected to remain low

Thailand

Energy status and outlook of Thailand

Thailand's GDP is expected to increase from USD 187.5 billion (constant 2000 \$) in 2010 to USD 573.5 billion in 2035 at an average annual growth rate of 4.6%. Under the BAU scenario, this will require the primary energy demand of the country to grow from 117.4 Mtoe in 2010 to 204.8 Mtoe in 2035 at an average annual growth rate of 2.2%³⁵. Final energy demand will increase from 84.6 Mtoe in 2010 to 147.9 Mtoe in 2035. Thailand has adopted a twenty-year energy efficiency development plan 2011-2030, which aims to reduce final energy consumption by 20% (and reduce energy intensity by 25%) by 2030 compared to the 2010 level. This will help limit final energy consumption to about 124.5 Mtoe in 2030 compared to the BAU case of 162.7 Mtoe³⁶.

Industry sector. The industry sector is one of the two highest energy-consuming sectors in Thailand, the other being the transport sector. Final energy consumption in the industry sector in 2013 was 36.2%³⁷. Increased industrial production to meet export needs has led to a huge demand for energy, which is projected to grow at an average annual rate of 2.4% between 2010 and 2035³⁸.

Transport sector. Final energy consumption in the transport sector was 35.8% in 2013, which is expected to grow by 2.1% per year between 2010 and 2035, mainly due to increases in vehicle numbers and in Vehicle Kilometres Travelled (VKT).

³⁵ ADB 2013

³⁶ DEDE 2013

³⁷ DEDE 2013

³⁸ ADB 2013

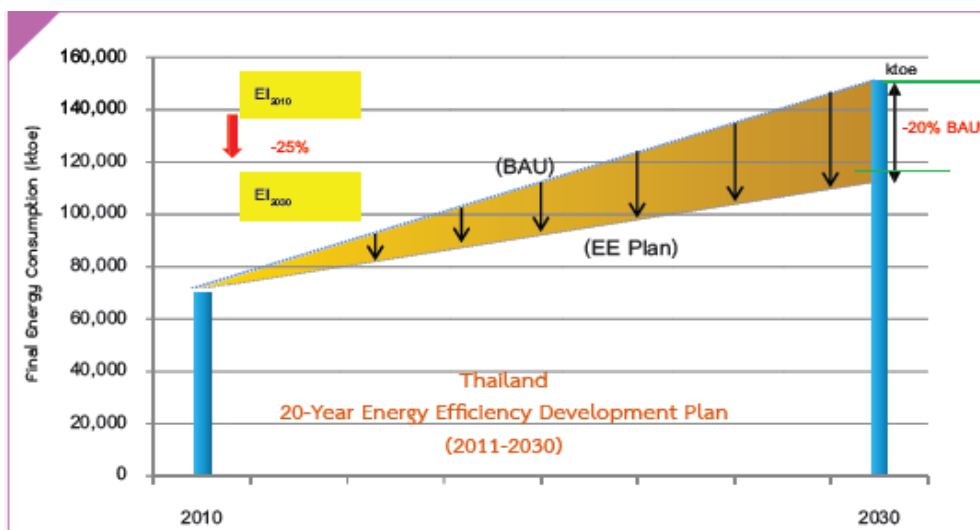
Other sectors. Energy consumption in other sectors in 2013 include residential 15.1%, commercial 7.7% and agriculture 5.2%³⁹. Energy demand in other sectors will increase by an average annual growth rate of 2.7% between 2010 and 2035⁴⁰.

In the final energy mix in 2013, petroleum products accounted for 47.8%, electricity 19.4%, traditional renewable energy 10.7%, new renewable energy 7.1%, natural gas 7.1% and coal 7.9%⁴¹.

Energy efficiency initiatives in Thailand

The Department of Alternative Energy Development and Efficiency (DEDE) is the key agency driving energy efficiency initiatives in Thailand, having been working in this area since the passing of the Energy Conservation and Promotion Act in 1992. The recent introduction of Thailand’s Twenty-Year Energy Efficiency Development Plan 2010-2030 in 2010 aims to achieve an ambitious 20% reduction in final energy consumption by 2030 compared (Figure 2.2) to the base year of 2010. This translates into a reduction of 38.2 Mtoe of final energy demand by 2030 and a reduction of energy intensity from 15.6Ktoe/billion baht in 2010 to 11.7Ktoe/billion baht in 2030. This plan includes the following initiatives: standards and regulations, technical assistance/capacity building, financial incentives, creating awareness, and energy efficiency networking⁴².

Figure 2.2 Energy demand reduction plan of Thailand by 2030⁴³



Energy Management for Designated Buildings and Factories has been a major programme under this plan, which encourages and supports high energy consuming buildings to reduce their energy consumption. The Plan also provides financial assistance for capacity building and energy efficiency awareness programmes. DEDE also works in partnership with other institutions, e.g. the Thai Cham-

³⁹ DEDE 2013

⁴⁰ ADB 2013

⁴¹ DEDE 2013

⁴² Ibid.

⁴³ Achavangkool 2014

ber of Commerce, the Federation of Thai Industries, etc., to address sectoral needs in improving energy efficiency. The establishment and implementation of a revolving fund has been successful in supporting initial investments in energy efficiency and in creating a self-sustainable market by encouraging the involvement of commercial banks in this area. This fund was initiated in 2003 to attract investments in energy efficiency, create confidence among entrepreneurs and promote ESCOs as a vehicle to improve energy efficiency. The fund was made available by DEDE with financial support from the Department of Energy. The total budget for five phases of the fund was USD 245.1 million. Phase 5 of the fund ran from June 2010 to May 2013. During the first phase (2003-2006), the fund was made available to commercial banks without interest, though an interest rate of 0.5% was introduced from Phase 2, being continued at the same rate through to Phase 5. Facility owners, ESCOs and project developers are eligible to borrow from this fund for a maximum of seven years for EE and Renewable Energy (RE) projects. The single loan size was capped at about USD 1.56 million and an interest rate of 4%. Until 2013, 295 project proposals were received (60% EE projects and 40% RE projects) for a total investment of USD 498.7 million, of which USD 226 million was contributed from this fund and the remaining supported by financial institutions⁴⁴. Some banks (e.g. K-Bank) have now included energy efficiency in their financial products list. The ESCO fund was created to allow access to financing for smaller businesses, who would otherwise be unable to receive funding from commercial banks. DEDE works with the Revenue Department to facilitate tax incentives for the purchase of EE products. It also cooperates with the Board of Investment (BOI) to offer exemptions from corporate income tax and import duties for EE purposes.

UNIDO, with funding support from GEF, is supporting industries in Thailand to improve energy efficiency at the factory level. Activities include helping with the establishment of an Energy Management System (EnMS), providing technical knowledge, offering training on ISO15001 and helping with system and process optimization. DEDE's Energy Efficiency Development Plan has been the major driver of this program, as industries are able to access capital funding under the DEDE Plan. UNIDO also supports SMEs by providing technical support, e.g. training on ISO 15001. However, the number of trainings (about twenty per year) is very low compared to the needs and large opportunities for energy reductions in this sector.

Examples of EE measures in the commercial sector include private initiatives that support energy efficiency in hospital buildings through benchmarking (e.g. energy uses per patient-day). This programme has identified hospitals as large consumers of air-conditioning energy, therefore there is a strong need to conserve energy in this sector without compromising the quality of the services provided to patients.

In relation to the effectiveness of the programmes, it can be observed that the market penetration of EE is increasing. Many consumers are focusing on changing equipment and appliances, instead of implementing a system approach e.g. energy management. Table 2.8 summarizes EE programmes and policies in Thailand.

⁴⁴ Ibid.

Table 2.8 Energy efficiency programmes and policies in Thailand

	Title	Details	Sectoral coverage
POLICIES	High energy efficiency standard for equipment and machinery	This policy requires the supply market to offer energy efficient equipment and machinery through the implementation of standards and labelling programmes.	Commercial
	Energy management in designated buildings in factories	About 2,800 buildings and 5,400 factories have been designated that are required to implement energy efficiency measures and submit an annual report to DEDE to demonstrate on-going improvement in EE.	Industrial
	Persons Responsible for Energy (PRE)	All companies that meet an energy consumption threshold are required to appoint staff to oversee the development and management of energy efficiency programmes.	Industrial and commercial
	Building energy code (upcoming)	This policy aims to introduce special building codes for new buildings to ensure efficient energy use in them. This policy is currently being developed.	Building
	Tax incentives	DEDE works with the Revenue Department to facilitate tax incentives for the purchase of EE products. It also cooperates with the Board of Investment (BOI) to exempt corporate income tax and import duties for EE purposes. This is done on ad hoc basis, and there is no ongoing support.	Industry and commercial
PROGRAMMES	Technical assistance	The government provides support, through the Energy Conservation Promotion Fund, to a range of capacity-building activities, including seminar and training, demonstration projects on advanced technologies, in-depth energy audits for buildings and industries, establishing an energy display centre, and a practical training centre.	All sectors
	Energy efficiency networking	Through a voluntary agreement with major corporates (such as the Thai Chamber of Commerce, the Federation of Thai Industry, commercial banks, etc.), the government develops public-private partnerships (PPP) to strengthen EE promotional activities.	All sectors
	Creating awareness	Under this program, the government supports the organisation of energy fairs and develop promotional materials for the media. The government also provides annual awards to high achievers of energy efficiency.	All sectors
	Revolving fund	This fund supports energy investors concerning capital investments in energy efficiency and encourages commercial banks to include energy efficiency in their list of financial products. Following the success in creating a sustainable market, DEDE has now exited from this programme.	All sectors

	Title	Details	Sectoral coverage
	Energy management auditor	The government aims to develop an accreditation process for energy auditors to provide EE services to all sectors. This policy is currently being developed.	All sectors
	Government co-investment programme (ESCO fund)	The ESCO fund was created to allow access to financing for smaller businesses, which would otherwise be unable to obtain funding from commercial banks. Thailand now has an ESCO Association that allows networking among ESCOs.	Industry

Priority sectors for EE in Thailand

The priority sectors for energy efficiency in Thailand are the building, industrial and transport sectors, due to their very high energy demands, which are expected to continue in the future. Table 2.9 presents a summary of priority sectors in Thailand. Over 5,000 buildings and about 3,000 factories have been identified and designated for continuous energy efficiency improvements.

Table 2.9 Priority sectors for energy efficiency in Thailand

Sectors	Priority level	Remarks
Industrial and SMEs	High to medium	<ul style="list-style-type: none"> ▪ Highest energy consuming sector ▪ Expected to grow rapidly to support future GDP growth ▪ The government is seriously considering energy conservation in this sector under the EE Plan 2010-2030
Transport	High to medium	<ul style="list-style-type: none"> ▪ Another top consumer of energy. ▪ Growing numbers of vehicles and increasing amount of kilometres travelled. ▪ No significant action has been undertaken in this sector
Building	High to medium	<ul style="list-style-type: none"> ▪ Many high energy consuming buildings ▪ The government is already taking actions through the Energy Conservation Promotion Act. ▪ Building energy codes are currently being developed to regulate new buildings.
Residential and commercial	Medium to low	<ul style="list-style-type: none"> ▪ Relatively low energy consuming sector ▪ Standards and labelling programme is in place

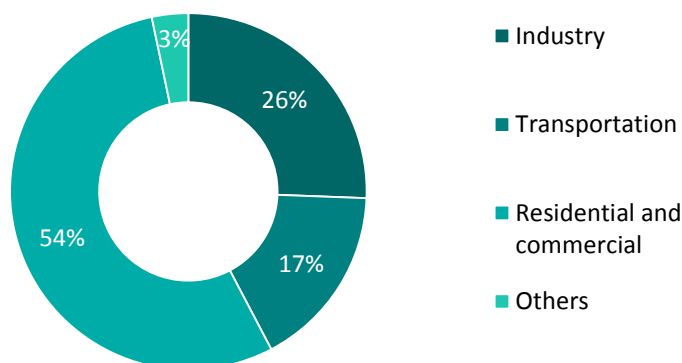
Vietnam

Energy status and outlook of Vietnam

Vietnam's GDP is projected to increase at an annual rate of 6.3% and is expected to reach USD 290.7 billion (constant 2000 \$) in 2035. The country's primary energy demand in 2010 was 67.7 Mtoe, which is projected to increase to 186.0 Mtoe in 2035 at an annual growth rate of 4.1%. Oil is the largest source of primary energy supply, which accounted for 24.3% in 2010, followed by coal

(22.8%) and natural gas (12.5%)⁴⁵. Figure 2.3 provides a sectoral distribution of energy consumption in Vietnam.

Figure 2.3 Sectoral energy consumption of Vietnam in 2010 (ADB 2013)



Residential and commercial sectors. These sectors together consumed the highest share of energy in Vietnam (54.4%) in 2010. About 80% of this demand was met by non-commercial energy sources.

Industry sector. Energy consumption in the industry sector was about 26% in 2010, the bulk of this energy demand being met by coal.

Transport sector. Energy demand in the transport sector was 17% in 2010, which is expected to increase at 3.3% per year through to 2035. Oil is the main energy source for the transport sector, which accounted for about 90% in 2010 and is expected to maintain this level through to 2035.

Energy efficiency initiatives in Vietnam

A number of energy efficiency programmes and policies are in place in Vietnam. Table 2.10 presents a summary of the on-going programmes and policies in the country.

Table 2.10 Energy efficiency programmes and policies in Vietnam

	Title	Details	Sectoral coverage
POLICIES	Vietnam Power Development Plan 2011-2020	The Vietnam Power Development Plan (Power Master Plan VII) 2011-2020 provides a clear and measurable target for a 2030 vision for country’s power development. It sets out six directions and four targets, listed in Appendix E. The plan puts strong emphasis on energy security, energy efficiency, renewable energy development and power market liberalization. The targets, in relation to improving energy efficiency, include reducing the average energy elasticity ratio from the current 2.0 to 1.5 in 2015 and 1.0 in 2020.	All sectors

⁴⁵ ADB 2013

	Title	Details	Sectoral coverage
	National Energy Efficiency Programme ⁴⁶	The Vietnam Energy Efficiency Programme (VNEEP) is a ten-year program, approved in April 2006 by the Prime Minister of the Socialist Republic of Vietnam. It is a targeted national programme and the first-ever comprehensive plan to implement measures for improving energy efficiency and conservation across all sectors of the Vietnamese economy. The overall aim of the programme is to make initial savings of 3–5% in 2006–2010 and a further 5–8% in 2011–2015.	All sectors
PROGRAMMES	Energy Efficiency Promotion in the Building Sector	The USAID Vietnam Clean Energy Programme – Energy Efficiency Promotion in the Building Sector supports the Government of Vietnam’s (GVN) Green Growth Strategy and related action plan. The project partners with the Ministry of Construction (MOC) to reduce electricity consumption in the country through improved energy efficiency in the building sector by implementing the Vietnam Energy Efficiency Building Code (VEEBC) and promoting a green building programme.	Building
	Vietnam Energy Efficiency and Cleaner Production Financing	Funded by the IFC, the Vietnam Energy Efficiency and Cleaner Production (EECP) Financing Programme aims to reduce greenhouse gas emissions and improve resource utilization by increasing the financing available for cleaner production and energy efficiency investments. The project works with selected commercial banks to build market strategies and tailored financial products, and targets enterprises looking to upgrade their production systems and technologies to achieve greater energy efficiency, cost savings, productivity, and environmental performance.	Industry
	Energy efficiency improvement project by WB	The State Bank of Vietnam and the World Bank signed a US\$ 500 million loan for a US\$ 731.25 million operation in support of Vietnam’s energy sector. The investment will fund the construction of over 1,000 kilometres of transmission lines and implement smart grid technologies to improve the reliability and quality of electricity supply.	Power sector

Priority sectors for EE in Vietnam

The industrial sector has been identified as the priority sector in Vietnam, as this sector is growing rapidly and is expected to put substantial pressure on energy supply in the future. Table 2.11 presents a summary of priority sectors in Vietnam. While the building sector has been identified as of

⁴⁶ Ministry of Industry and Trade 2006

medium priority, the recent development of a building code offers enormous opportunities for energy efficiency in this sector.

Table 2.11 Priority sectors for energy efficiency in Vietnam

Sectors	Priority level	Remarks
Industrial and SMEs	Medium to high	<ul style="list-style-type: none"> ▪ Rapidly growing sector that will put pressure on national energy supply ▪ Energy efficiency needs to be promoted for the key export-oriented sectors e.g. the apparel industry
Transport	Medium	<ul style="list-style-type: none"> ▪ Second highest energy consumption (31.7% in 2012) ▪ Oil is the main fuel, opportunity for GHG emissions reductions exists
Building	Medium	<ul style="list-style-type: none"> ▪ An energy efficiency building code has been developed by the Ministry of Construction ▪ Need for assistance with implementation of the building code
Residential and commercial	Medium	<ul style="list-style-type: none"> ▪ The lowest energy consuming sector (14.9% in 2012) ▪ No significant programme exists in this sector. ▪ There are opportunities for standardization and benchmarking.

Summary

Industry sector. This is rated as high importance for most countries covered in this study, particularly due to its high levels of energy consumption, the existence of old and inefficient technologies and rapid expected growth in energy consumption in the future. Governments, private sector actors and international and regional agencies are working to expand energy efficiency in this sector.

Transport sector. While energy demand in this sector is high, little progress has been made to date to improve energy efficiency within it. It is important to develop an integrated framework for energy efficiency improvements in the transport sector.

Building sector. Buildings, despite a high potential for energy savings, have been identified as medium to low. This could be due to the fact that the building sector was not represented in the consultation workshops. Prospects and opportunities are discussed in the following section.

Other sectors. Energy consumption in the residential, commercial and agricultural sectors is found to be low compared to other sectors within this study. Therefore, these sectors have a low priority in energy efficiency terms.

3. Challenges and Opportunities for Promoting EE Initiatives in Asia

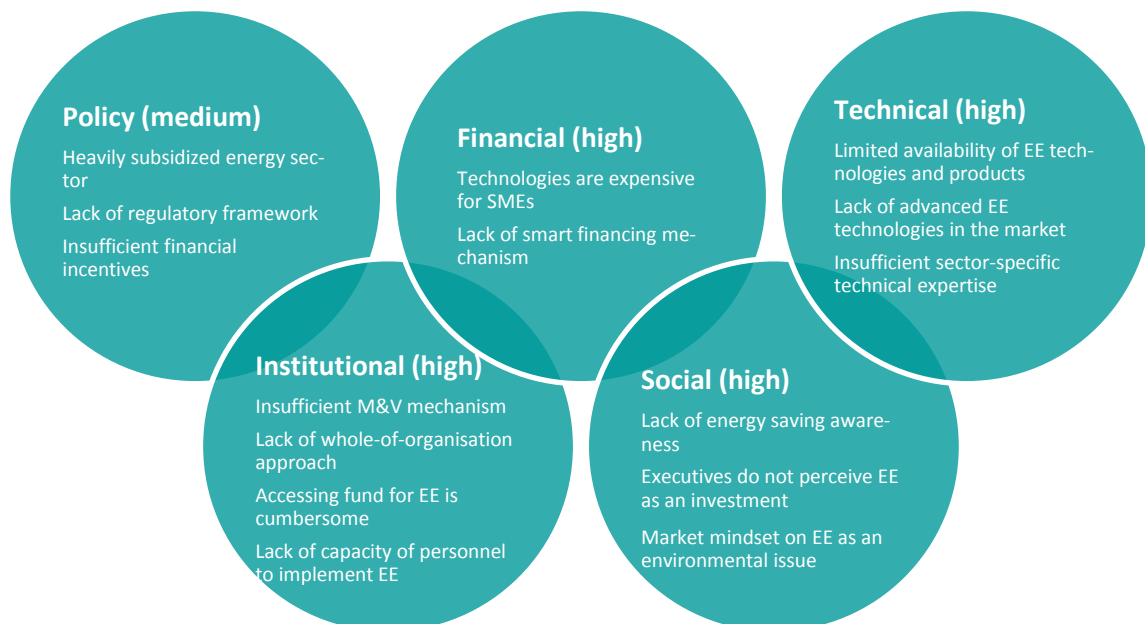
Barriers to implementation of energy efficiency

Barriers to energy efficiency interventions in the five Asian countries were found to be very similar in both nature and extent. High energy subsidies constitute a serious barrier to attracting investments in energy efficiency, as high energy consumers find it more cost effective to continue with a business-as-usual scenario than to undertake energy efficiency measures. In addition, executives and business owners are less interested in sustainable energy use primarily due to their focus on increasing productivity. While energy efficiency policies exist in most of these countries, the absence of effective enforcement mechanisms limits the outcomes of these policies. There is also a lack of in-house capacity in industries and businesses to identify energy efficiency opportunities and implement the appropriate measures.

Barriers to EE in Indonesia

The stakeholder consultation workshop that was held in Jakarta in November 2014 explored and identified a number of barriers to implementing EE in Indonesia. A summary of these barriers is presented in Figure 3.1.

Figure 3.1 Barriers to Energy Efficiency in Indonesia



Policy barriers. The absence of a mandatory requirement for cleaner production and sustainable consumption and production allows industries and businesses to ignore the need for improvements to energy efficiency. For example, there is no policy on sustainable waste management in Indonesia, which provides no incentives to invest in waste-to-energy projects.

Financial barriers. Energy-efficient technologies and equipment are, in general, expensive, and financial support with which to purchase them is limited. On the other hand, energy is relatively cheap due to subsidies, which discourages high energy consumers from investing in new and efficient technologies.

Technical barriers. The availability of energy-efficient technologies and equipment is very limited in domestic markets. In most cases, such technologies and equipment need to be imported, an obstacle for industries and businesses in implementing EE measures. Furthermore, knowledge and the capacity to incorporate EE measures in the local government sector is very low and there is also a lack of technical knowledge to address or reduce losses from the electricity transmission and distribution system, which affects EE uptake in the electricity sector.

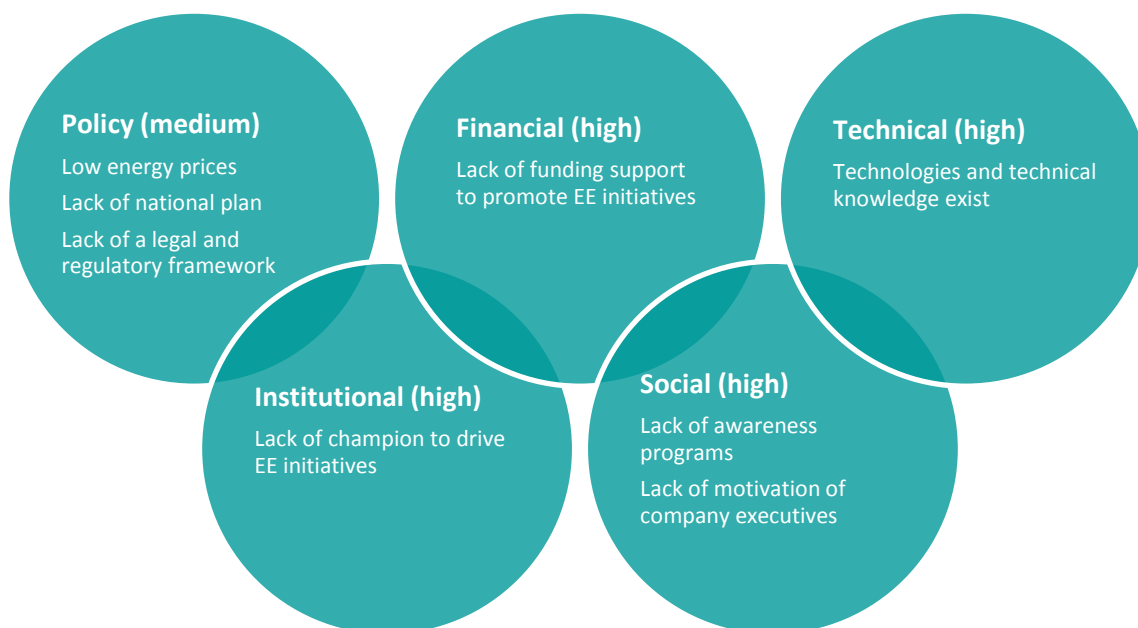
Institutional barriers. There is no institutional framework to monitor energy conservation activities, which prevents Indonesia from assessing its achievements in improving energy efficiency. Additionally, there is lack of appropriate skill and knowledge in industries and businesses about determining the financial and qualitative benefits of energy efficiency. This fails to help owners and executives take informed decisions on implementing energy efficiency measures. Finally, obtaining loans and funding for energy efficiency is a complex process, which discourages investors from investing in energy efficiency.

Social and cultural barriers. The focus of industries and companies is on production; energy efficiency is not seen as an appropriate business investment while market attitudes toward energy efficiency make it hard to convince business owners to make EE investments.

Barriers to EE in Malaysia

Energy efficiency in Malaysia faces policy and institutional rather than technological barriers. There is a lack of a clearly articulated planning to drive EE in the top energy-consuming sectors, i.e. industry and transportation. While there have been a number of policy statements from the Government, there remains a lack of constructive, targeted, results-oriented and law-enforcing instruments. The Government's difficulties in obtaining stakeholder endorsement of the Draft National Energy Efficiency Plan may be one manifestation of this. Figure 3.2 presents the specific barriers in the different areas. Low energy prices provide little or no incentive for consumers to save energy, as investment in EE measures is not perceived as cost effective, at least in the short-term. This problem is also compounded by the lack of financial support from the Government to create a long-term sustainable EE market.

Figure 3.2 Barriers to Energy Efficiency in Malaysia

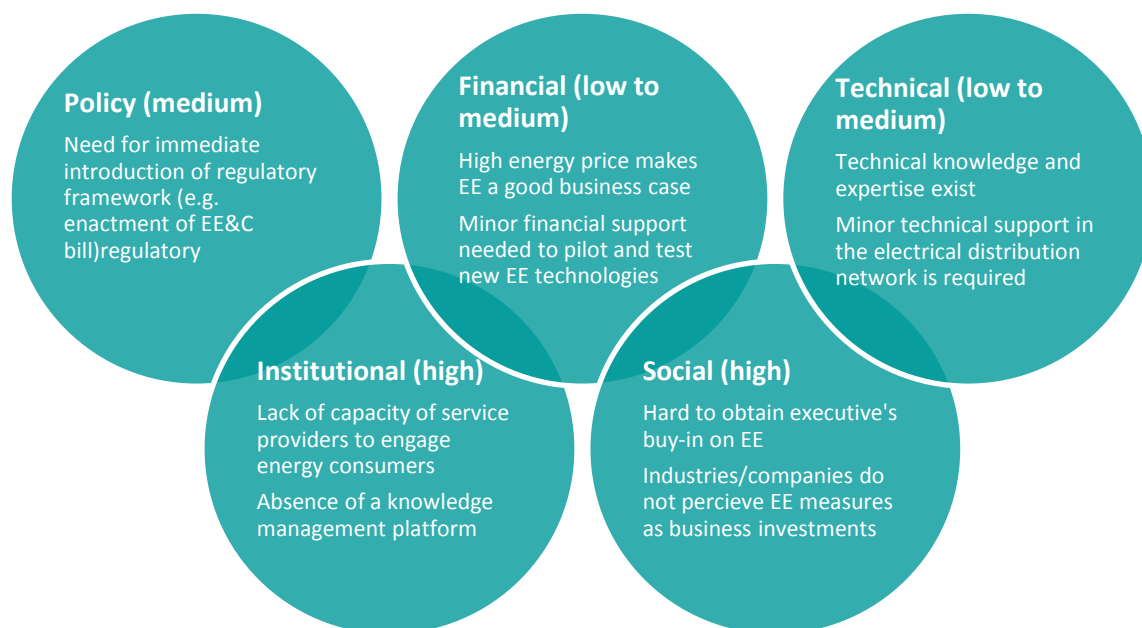


No regulatory framework exists to enforce EE measures in targeted sectors. Programmes and initiatives to create general awareness of the needs and benefits of energy efficiency in the country also need to be rolled out. This would help to create a strong bottom-up approach to drive energy efficiency in Malaysia. The introduction of *energy efficiency ambassadors* can also be effective. The technological barriers to implementing energy efficiency are very low. This is primarily due to the rapid technological developments in Malaysia in recent years and the presence of various international companies in the local market, which provide the country with easy access to state-of-the-art technologies.

Barriers to EE in the Philippines

The following barriers were identified during the consultation workshop with EE stakeholders in the Philippines, held in November 2014. Figure 3.3 illustrates these barriers.

Figure 3.3 Barriers to Energy Efficiency in Philippines



Technical barriers. Technological obstacles in the Philippines are seen to be very low. There is sufficient technical expertise in the country, including professionals with previous experience of EE in large corporations, who would be able to adopt new and emerging technologies easily.

Financial barriers. These barriers are not very high, as industries and companies can afford to make their own investments. In addition, the payback period for EE investment is short enough to make a good business case.

Policy barriers. While EE has been promoted in the Philippines for a long time, progress in energy efficiency uptake has been low. This is primarily due to the absence of an effective institutional and regulatory mechanism to support the implementation of EE programmes and activities. Currently, there is no energy efficiency policy in the Philippines to enforce the implementation of an EE plan or roadmap. This is a major impediment, as most programmes are being implemented voluntarily (e.g. the standards and labelling programme).

Technical barriers. There is insufficient knowledge across all sectors in the Philippines about the needs and benefits (e.g. financial savings) of implementing energy efficiency. This creates a lack of motivation for executives and CEOs to implement energy efficiency and to make an informed-decision on EE investments.

Institutional barriers. While there is sufficient technical capacity among EE professionals, the expertise and capacity of professionals to develop EE interventions as a business case to top management is missing.

Cultural and social barriers. This is a key barrier that severely limits the progress of EE in the Philippines. It is very hard to acquire buy-in from top management for energy efficiency investments, be-

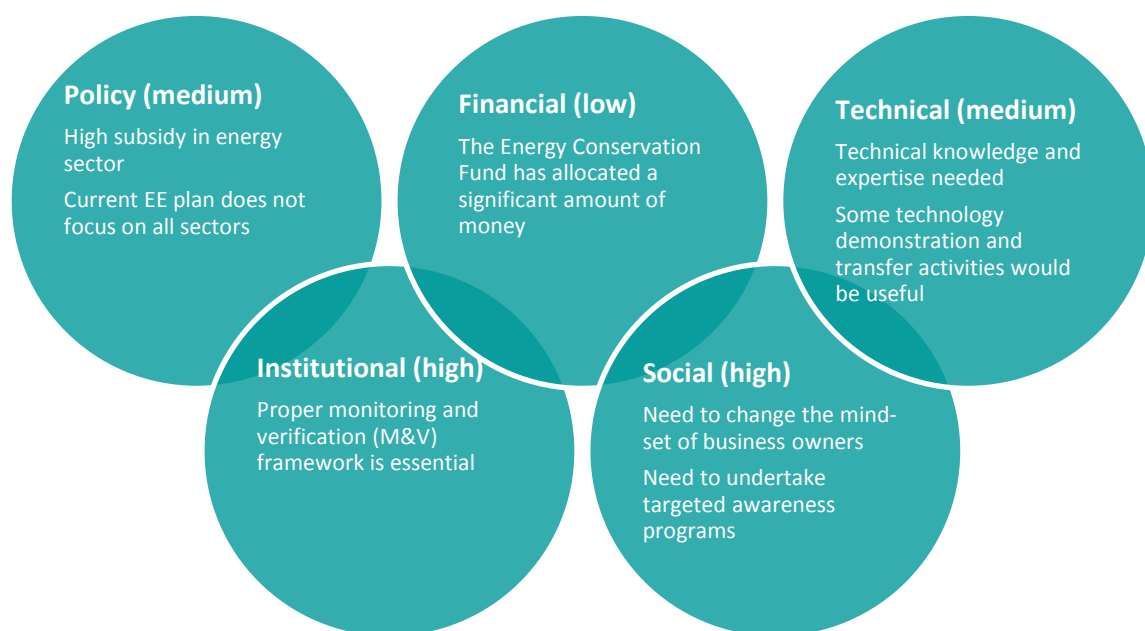
cause EE action is not perceived as an investment opportunity but only as an expenditure item. The experiences of trying to engage sugar mills in EE measures show that it takes 2-3 years before management decides to sign an ESCO contract. This is mostly due to the lack of motivation, which can also be linked to lack of awareness.

Other barriers. The Philippines lacks infrastructure to support the implementation of EE measures. For example, a national testing laboratory to assess the performance of energy products is absent; and while the DOE, in collaboration with other government and private organisations, is delivering a number of initiatives, the resources to do so, both financial and human, are insufficient. The operational budget for the DOE, to drive EE measures, is low, and therefore there is a limit to what it can deliver.

EE barriers in Thailand

The following barriers to energy efficiency measures in Thailand were identified during the stakeholder consultation workshop. Figure 3.4 provides an illustration of these barriers.

Figure 3.4 Barriers to Energy Efficiency in Thailand



Policy barriers. The low energy tariff (highly subsidised energy sector) is a major barrier to improvements in energy efficiency, as businesses have no incentive for investment in efficient technologies and services.

Financial barriers. The financial barriers to implementing EE measures in Thailand were identified to be low, as investors have easy access to finance from commercial financial institutions.

Technical barriers. There is a lack of in-house capacity, particularly for new employees in energy agencies. There are not enough initiatives to train them in EE technologies and services and there is

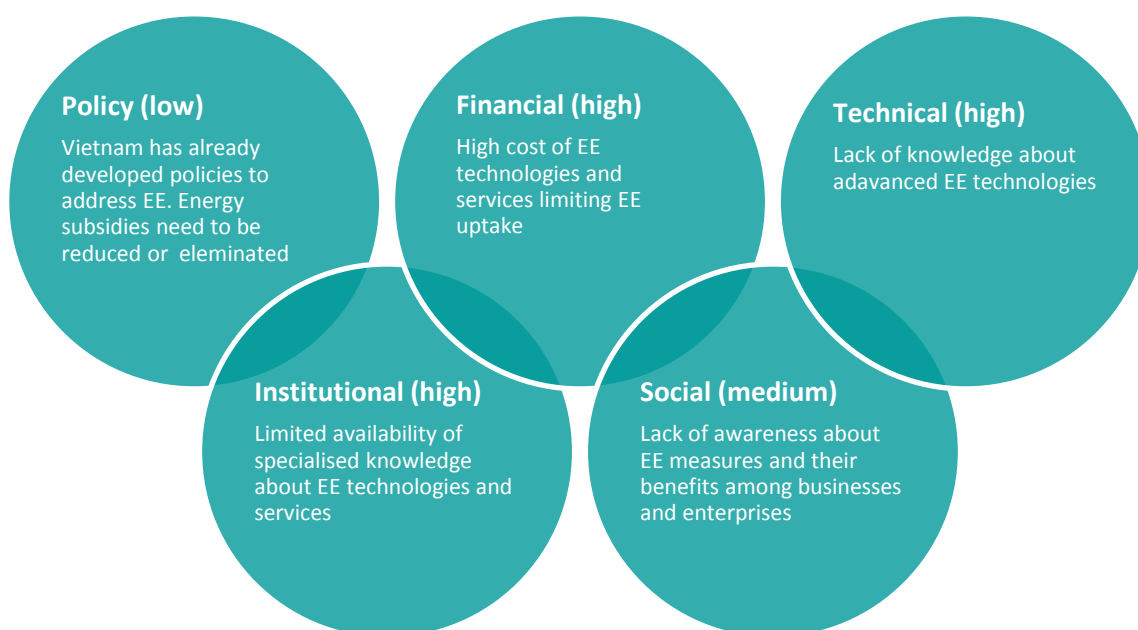
a lack of capacity to analyse energy data properly to assist in identifying EE opportunities or to make strategic decisions on future EE programmes and initiatives.

Social and cultural barriers. Business owners perceive energy efficiency improvement as an environmental activity only, and do not see it as having any business or monetary benefit.

EE barriers in Vietnam

Vietnam established more than 14 energy conservation and 40 industrial promotion centres⁴⁷ to promote energy efficiency through direct consulting for businesses. These centres are responsible for advising People's Committees about energy saving plans in local areas and auditing energy use to find out where and how much energy is wasted in the production process. However, only half of these centres have carried out their key function of helping businesses to change and use energy more safely and efficiently. A lack of professional capability, superficial knowledge of technology and equipment and inequalities among centres has severely limited the achievement of outcomes. Other specific barriers to energy efficiency measures, as discussed by workshop participants in Hanoi, is presented in Figure 3.5

Figure 3.5 Barriers to Energy Efficiency in Vietnam



Policy barriers. The high energy subsidies discourage energy efficiency and conservation efforts and there are no on-going national support mechanisms, either technical or financial, to implement energy efficiency measures.

Financial barriers. High initial investment and difficulties in accessing finance from commercial banks prevents industries and businesses from investing in energy efficiency.

⁴⁷ VNEEP 2014

Technical barriers. Knowledge and capacity regarding energy-efficient technologies in Vietnam is low. There is also a paucity of quality energy efficiency service providers in the country. Additionally, Vietnam uses very low-grade coal (e.g. anthracite), which prevents the energy efficiency of boilers and other combustion applications from being improved and there is a lack of targeted capacity development programmes for specific sectors and consumers, e.g. brick kilns, boilers, air conditioners, etc.

Institutional barriers. Initiatives for research and development regarding energy conservation are very limited in Vietnam, there is no legal framework to enforce energy efficiency measures and there is no one-stop information service to provide knowledge about energy efficient technologies and services.

Social and cultural barriers. Level of awareness of and willingness to implementing energy management is low.

Energy Efficiency Opportunities

EE opportunities in Indonesia

Table 3.1 provides a summary of the energy conservation targets set by the Indonesian government. This clearly indicates that there are significant opportunities for energy efficiency in Indonesia, particularly in the industry and transportation sectors.

Table 3.1 Energy conservation target of Indonesian Government⁴⁸

Sectors	Energy Consumption Per Sector Year 2012 (Mtoe)*	Potential of EC	Target of Energy Conservation Sectoral (2025)
Industry	42.7 (39.7%)	10 – 30%	17%
Transportation	43.5 (40.4%)	15 – 35%	20%
Household	12.9 (12%)	15 – 30%	15%
Commercial	4.8 (4.4%)	10 – 30%	15%
Other (agriculture, construction and mining)	3.6 (3.4%)	25%	-

* Excluding biomass and non-energy use

An in-country stakeholder consultation workshop was held in Jakarta in November 2014. The following energy efficiency opportunities were identified:

Technical support

- The Government of Indonesia has developed guidelines for energy smart street lighting. There is, however, a need to develop programmes to support implementation of these guidelines.
- Given the High Energy Efficiency Index⁴⁹ of about 250 kWh/m²/year, together with the fact that about 30-40% emissions are from buildings, there is a substantial potential for energy

⁴⁸ Source: Rhomandhi (2014)

⁴⁹ EEI is a measure of the weighted average of energy consumption across different types of energy users in a given sector. For the building sector, EEI serves as a good performance indicator for energy efficiency, allowing building owners to know where they stand compared to other buildings.

efficiency in the building sector. An initiative on developing building ratings was initiated in 2009. Progress has been slow and needs support to be accelerated.

Financial issues

- Dialogue and consultation are under way with the Ministry of Finance/Fiscal Policy Agency, Indonesia Financial Services Authority (OJK), to formulate smart financing mechanisms for energy efficiency projects such as soft loans and a revolving fund.

Policy formulation

- Policy advocacy support needed to increase energy prices by phasing out energy subsidies;
- Policy development needed to offer incentives for the implementation of EE projects; and
- Regulation is required to make energy service companies (ESCOs) more effective.

Awareness and capacity-building

- Public awareness programmes need to be undertaken through schools, workshops and energy efficiency advertisements in the electronic and print media;
- Existing training programmes for energy managers and auditors need to be expanded (so far 96 energy managers and 54 energy auditors have been certified);
- Need for capacity building on ISO 50015 to improve organisational energy performance and institutionalize an MRV system;
- Capacity development programmes for more energy management system (EnMS) experts targeting all four sectors in Indonesia;
- Executive briefing for more companies in four targeted sectors and other energy-intensive industrial sectors; and
- A Regional Certification Programme for ISO 50001 needs to be undertaken to develop a lead auditor position.

Other

- Best practices on ISO 50001 should be showcased in regional events, e.g. in the award-winning regional competition event; and
- Knowledge-sharing programmes should be developed. This should include learning from other countries about financing energy-efficiency initiatives.

Prospects, challenges and support required for Indonesia is presented in Table 3.2.

Table 3.2 Challenges, opportunities and support matrix for Indonesia

	Description	Assistance required
OPPORTUNITIES	High energy consumption in industrial and transportation sectors. Expected to grow in future.	Technical and financial
	The Government is aiming for ambitious GHG emissions reductions through the implementation of renewable energy technologies and energy efficiency.	Financial and technical
	The Government has developed guidelines for energy smart street lighting. Financial support is needed for the implementation of this programme.	Financial
	There are significant opportunities to develop governmental and public sector capacity to provide effective EE services.	Capacity development
CHALLENGES	Limited domestic production of EE technologies and products. Also a lack of energy-efficient technologies in the market.	Technical
	Technology and energy-efficient equipment in general are expensive, and the financial mechanisms needed to purchase them are limited.	Financial
	Energy prices are relatively cheap due to energy subsidies.	Policy
	Policies on cleaner production and sustainable consumption and production are not mandatory.	Policy
	A lack of financial incentives, especially for SMEs.	Policy
	Policy and implementation mechanisms are not decentralized for a large country like Indonesia.	None
	A lack of mandatory requirements for sustainable waste management is a barrier to waste-to-energy initiatives.	Policy
	Evaluation and monitoring of energy conservation programmes is weak.	Institutional
	A lack of information and understanding of the financial and qualitative benefits.	Capacity development
	Obtaining loans or funds for energy efficiency is a cumbersome process.	Institutional
	The focus of the top management of industries and companies is entirely on production. Energy efficiency is not seen as a strategic business investment.	Capacity development
	Knowledge and capacity to implement EE measures in local government are very low.	Capacity development

EE opportunities in Malaysia

The ADB's Energy Outlook indicates that Malaysia has the potential to save about 16.0 Mtoe in 2035, which represents a 14.6% reduction compared to 2010 scenario⁵⁰. The power sector is projected to demonstrate the biggest energy-saving potential of 6.8 Mtoe i.e. a 27.9% reduction. The thermal efficiency improvement of natural gas and coal-fired power plants could lead to most of the estimated energy savings. The industry sector follows with a savings potential of 3.9 Mtoe. Energy-intensive industries will contribute 22.3% of the estimated savings potential in this sector. The transport sector's energy savings will result from the shift toward using more efficient vehicles such as hybrid and electric vehicles. In 2009, the Government of Malaysia launched the National Green Technology Policy, which includes transport as one of the key areas and encourages the use of elec-

⁵⁰ ADB 2013

tric vehicles. Table 3.3 provides a summary of the opportunities and the types of assistance required for Malaysia.

Malaysia needs to invest a significant amount of its national budget in the exploration and production of oil and gas, as well as for importing LNG to meet the demands of the industry and power sectors. In response, it is important for the country to focus on strengthening and widening its energy efficiency programmes and initiatives.

In terms of technical assistance, Malaysian energy efficiency efforts could benefit from demonstration projects implemented in government buildings and intensive energy-using sectors. The introduction of the National Energy Efficiency Policy and National EE Master Plan with a comprehensive framework is very essential. Specialized training should be arranged for the monitoring and verification (M&V) of ESCOs, EE practitioners and technical officers in the government. The Government and private sector appear to have the resources for EE investments. However, the creation of an EE fund with specific criteria for EE projects, such as using an energy performance contracting (EPC) model for funding applications, would be useful.

Table 3.3 Challenges, opportunities and support matrix for Malaysia

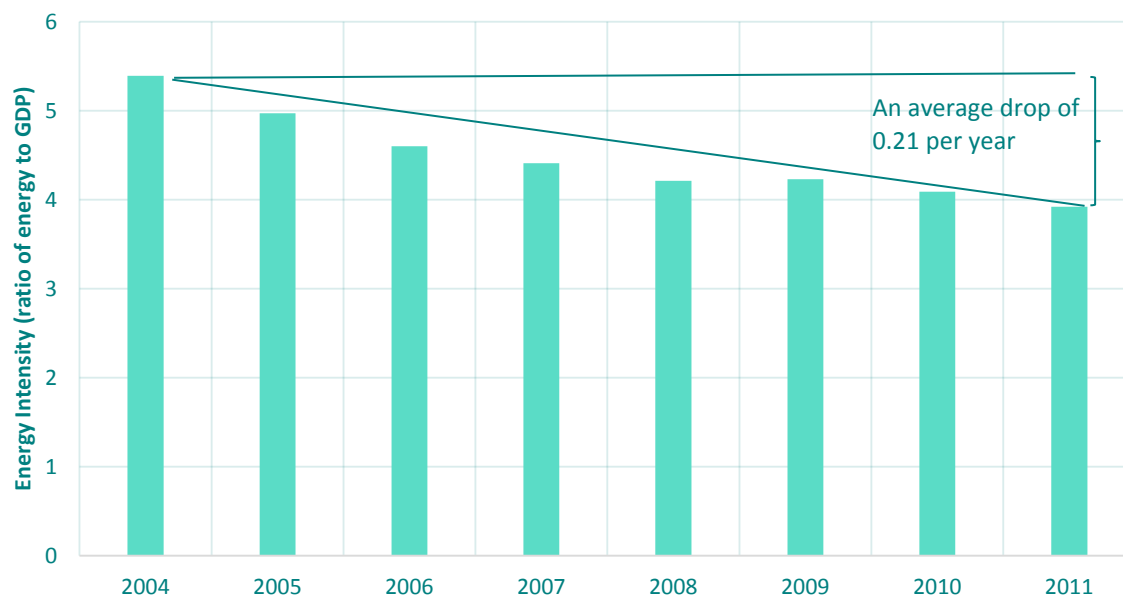
	Description	Assistance required
OPPORTUNITIES	There are many energy-intensive industries. Energy consumption in the industry sector will grow in future in line with the country's economic growth.	Technical and financial
	Need to demonstrate EE technologies for all three sectors (industrial, residential and commercial, and transport).	Technical
	The large number of vehicles and transportation equipment in the country, which are increasing.	Technical
	The power sector is well regulated but represents a high energy saving potential through shifts in fuel.	Technical
	Industries and businesses have affordability in EE investment, and just need the right motivation.	Awareness and capacity-building
CHALLENGES	Low energy prices resulting from high energy subsidy.	Policy
	Insufficient skill of government employees to develop and monitor EE programmes.	Capacity development
	The lack of a proper M&V mechanism to drive results.	Institutional
	The lack of a solid national plan backed by a regulatory framework.	Policy/institutional
	A lack of funding support to promote EE initiatives.	Financial

EE Opportunities in the Philippines

Energy efficiency opportunities in the Philippines are very high due to (i) future increases in energy demand – final energy demand will double by 2035 compared to demand in 2010, (ii) high energy prices and (iii) the fact that large energy consumers are able to afford the required EE investments. In the absence of a regulatory framework, the Philippines has been experiencing progress since

2004. Figure 3.6 shows that energy intensity⁵¹ was 5.39 in 2004 and had fallen to 3.92 by 2011. The future passage of an Energy Efficiency and Conservation (EE&C) bill will further improve the enabling environment for EE opportunities in the country.

Figure 3.6 Achievement in reduction of energy intensity for the Philippines⁵²



The energy price in the Philippines is very high (electricity USD 0.18/kWh, gasoline USD 1.2/litre, diesel USD 1.0/litre, natural gas USD 1.2/litre)⁵³ compared to other countries in Asia. This is an important incentive for the implementation of energy efficiency in all sectors. It is important to extend the standards and labelling initiative to cover more products in the market. All products should have energy performance labelling at the point of sale. Most EE programmes and initiatives are being supported by external agencies. A well-constructed, targeted and on-going support mechanism needs to be established to educate stakeholders from all sectors. The opportunities that have been identified in the consultation workshop held in Manila are provided in Table 3.4.

Financial support. The need for financial support has been identified as low to medium, as energy prices in the Philippines are high enough to make EE investment a good business case. In addition, industry and business owners have sufficient resources (or easy access to finance) to invest in EE measures. The following minor forms of financial support may be useful:

- Financial support to pilot and test selected EE technologies would be useful to convince CEOs and executives of their benefits. This would also set the groundwork for future upscaling.

⁵¹ Energy intensity is the ratio of energy to GDP.

⁵² Reyes 2013

⁵³ Approximate 2013 figures.

- The introduction of electric vehicles would address energy consumption in the transport sector. The Philippines has existing expertise in developing high energy efficient motors, which would be useful in manufacturing or assembling electric vehicles.

Policy support. The immediate introduction of an EE and conservation policy is seen as the right vehicle to catalyse EE initiatives in the Philippines. Policy advocacy support to accelerate enactment of the EE&C Bill 2014 would also be useful.

Technical support. There is believed to be sufficient technical capacity in the country to provide EE services. Some technical assistance to minimize system loss in the electricity distribution network effectively would be useful.

Other support. The emphasis in most of the assistance from multilateral and bilateral agencies is on human resource capacity-building on the technical and institutional aspects. Support is also needed to develop quality infrastructure, e.g. laboratories for testing EE appliances and equipment.

Capacity-building support

- The capacity, both technical and financial, of ESCOs and energy auditors needs to be further improved so that they are able to present the EE case to executives in a way that is both technically sound and financially attractive.
- A 'knowledge management platform' that would provide a good inventory of programmes, initiatives, technologies and services pertaining to EE would be very useful. Such a database would be a one-stop source of information for all stakeholders, including funding agencies, energy consumers and EE service providers. DOE is in the process of developing a databank to include energy consumption information concerning government facilities and services. This could be a starting point for developing a nationwide platform.
- Support to develop capacity-building programmes for CEOs would be useful. Such programmes should consider introducing an EE campaign through EE ambassadors.
- The training of energy managers, such as the programme that is being delivered by the Energy Efficiency Practitioners Association of the Philippines (ENPAP), would need to be expanded to cover staff from smaller companies. Financial support to make these trainings affordable to SMEs would be useful.
- Support to improve energy efficiency in the building sector would be useful. Interventions may include training for the building association and relevant government departments to improve their capacity to develop appropriate building codes.

Table 3.4 Challenges, opportunities and support matrix for the Philippines

	Description	Assistance required
OPPORTUNITIES	Many large corporates with the financial capacity to invest in energy efficiency.	None
	Need for the piloting and testing of advanced technologies.	Financial & technical
	High energy prices make a good business case for EE and will be the market driver.	None
	A need to expand the existing standards and labelling programme to cover more appliances.	None
	A well-constructed, targeted and on-going support mechanism needs to be established to educate stakeholders from all sectors.	Institutional
	The introduction of electric vehicles would be an appropriate measure to address high energy consumption in the transport sector. The existing capacity to develop high efficiency motors can be useful in assembling and manufacturing electric vehicles.	Financial
	The training of energy managers, as in the programme being delivered by ENPAP, would need to be expanded to cover staff from smaller companies. Financial support to make such training affordable to SMEs would be useful.	Financial
CHALLENGES	The absence of a regulatory framework is hindering progress in EE implementation.	Policy development
	Support from bilateral and multilateral agencies is mostly in the form of technical and institutional capacity-building.	Others
	A lack of capacity of EE service providers: capacity-building, both technical and financial, for ESCOs and energy auditors needed.	Capacity-building
	The lack of a systematic information portal for EE is hindering potential users in implementing measures.	Institutional
	There are no capacity-building programmes for CEOs to improve their understanding of energy efficiency.	Capacity-building
	Insufficient available expertise to implement EE measures in the building sector.	Capacity development
	Lack of awareness across all sectors in the Philippines of the needs and benefits of implementing energy efficiency, e.g. financial savings.	Capacity-building
	It is difficult to convince top management to make energy efficiency investments because they do not perceive EE actions as an investment opportunity but only as an item of expenditure.	Capacity-building
	Lack of an effective institutional or regulatory mechanism to support the implementation of existing programmes is limiting the progress of EE implementation.	Institutional
	Energy-efficient appliances are expensive, and are not affordable for residential consumers.	Financial
	Insufficient expertise of technical staff to present EE intervention as a business case to top management.	Capacity-building

EE opportunities in Thailand

Energy efficiency opportunities in Thailand are significant as (i) the country is a net energy importer and therefore needs to conserve energy, (ii) its growing GDP is demanding more energy, and this will continue to rise in the short-to-medium term and (iii) the 20-Year Energy Efficiency Development Plan provides an enabling environment. Energy efficiency opportunities that have been identified in Thailand are discussed below, and a summary is provided in Table 3.5.

- There are many large corporates in Thailand that have sufficient resources to make energy efficiency investments but require a form of incentive.

- A systematic approach needs to be developed that can increase interested companies' exposure to more advanced technologies.
- While more focus has been put on industries (medium to large), SMEs also need to be targeted. Although they consume less energy, the number of SMEs in Thailand is high and in aggregate they consume significant amounts of energy. Support to identifying low hanging fruit would be the most appropriate approach for SMEs.
- Given the fact that about 6,000 buildings and factories have been designated by law to monitor and bring about energy efficiency, the opportunity for providing EE support in Thailand is enormous. Appropriate policy developments, e.g. the establishment of an energy consumption index (i.e. energy use m²) and moving towards net zero energy buildings, would further strengthen the energy conservation plan.
- DEDE has so far focused on industries and buildings. However, opportunities also exist in the transport sector. Support from SE4ALL in identifying the needs and the development of an integrated framework to address energy efficiency in this sector would be very useful.
- While DEDE is helping industries and buildings with EE measures, mostly through technical assistance and financial support, there are other areas that would be useful to look at. These include enhancing knowledge of advanced tools, innovative policy mechanisms, etc. to support further progress of the EE Development Plan.
- Though data collection on energy consumption has and is being done, there is a need to analyse the data and interpret it to improve (reduce) overall energy efficiency efforts (consumption).
- There is a lack of in-house capacity, particularly for new employees in energy agencies, who need to be well-trained on EE technologies and services.
- Awareness programmes to educate the wider community about energy efficiency in need to be developed and delivered.
- A rich and efficient database system needs to be developed on energy efficiency technologies and systems, e.g. efficient lighting systems, advanced industrial technologies, sources and prices of different EE equipment and measures, etc.
- Tailored capacity-building programmes need to be developed nationally for different groups of stakeholders. This may include organising courses, seminars and workshops, increasing the capacity of companies and factories to collect and analyse their energy consumption data, and developing the necessary skills of the Person Responsible for Energy, etc.

Table 3.5 Challenges, opportunities and support matrix for Thailand

	Description	Assistance required
OPPORTUNITIES	Many large corporates with the financial capacity to invest in energy efficiency.	None
	Need for demonstration of advanced technologies.	Technical
	Less support has been offered to SMEs and the transport sector compared to large industries.	Financial & technical
	The government alone may not be able to support 6,000 designated buildings and factories. External support would be helpful.	Financial & technical
	It is important to implement targeted capacity-building programmes to complement DEDE’s financial support programme.	Capacity-building
	The companies and factories need to be provided with advanced knowledge of data analysis and management practices.	Capacity-building
CHALLENGES	High subsidies in the energy sector are a disincentive to business owners to invest in energy-efficient technologies and services.	Policy development
	Business owners think that EE is only a matter of environmental welfare and that it does not have any financial benefits. This attitude needs to be changed.	Capacity-building
	Hard to obtain buy-ins from executives for energy efficiency investments.	Capacity-building
	A targeted programme needs to be developed and implemented.	Capacity-building

EE opportunities in Vietnam

The high energy consumption (54%) in the residential and commercial sectors in Vietnam provides great potential for improvements in energy efficiency. Awareness of EE technologies and services in the country is mostly low, which makes it hard to implement EE measures in Vietnam. The demonstration of new and advanced technologies in selected sectors and industries would be useful to lift the level of awareness. Within the industrial sector, the focus should be given to export-oriented industries (e.g. apparel factories, Vietnam being one of the world’s top ten apparel exporters)⁵⁴ to make them more competitive in the market. The Vietnamese government is working actively towards improving energy efficiency in the country, but it needs support to make further progress in EE implementation. The Government has developed a new building code for energy-efficient buildings.⁵⁵ Mandatory energy saving requirements for new buildings are to be introduced. SMEs account for 45% of total energy consumption and therefore provide great potential for energy efficiency in this sector.

⁵⁴ Drejet & Rappaport 2014

⁵⁵ Danish Energy Agency 2015

Table 3.6 Challenges, opportunities and support matrix for Vietnam

	Description	Assistance required
OPPORTUNITIES	National target to reduce energy elasticity to 1.0 by 2020.	Policy
	There are still a number of old coal-fired thermal power plants that have lower efficiency. A significant number of coal fire thermal power plants will be constructed. Selection of suitable technology will be required to improve energy efficiency.	Technical
	Large numbers of traditional brick ceramic kilns using coal or wood as a fuel with low efficiency are in use. Most of these cement factories have huge thermal waste in the form of kiln flue gas without proper use of waste heat, e.g. through cogeneration.	Technical
	Boilers in Vietnam mostly using coal, oil and biomass as a fuel and working at low efficiency.	Technical
	There is a need to demonstrate EE technologies in three principal sectors (industrial, residential and commercial and transport).	Technical
	Vietnam’s export-oriented industries (e.g. apparel factories – Vietnam is one of the world’s top ten apparel exporters) ⁵⁶ should be supported with EE to make them more competitive in the world market.	Financial & technical
	A need to create awareness, on a national basis, of the importance and benefits of conserving energy. Development of a “knowledge management” centre for energy efficiency to allow sharing of information, ideas and best practices.	Institutional
	A need for the development of standards for appliances and equipment to promote energy efficiency in the residential and commercial sectors.	Technical and institutional.
	Financial support, in the form of soft loans, is needed to help industries, particularly SMEs, implement energy efficiency measures. This can be done by introducing a revolving fund and engaging commercial banks in the mechanism.	Financial
	The government has developed a new building code for energy efficient buildings. ⁵⁷ Mandatory energy saving requirements for new buildings are to be introduced.	Policy and technical
CHALLENGES	Lack of professional capability, superficial knowledge of technology and equipment and the inequality of EE service providers have led to underperformance of EE in Vietnam.	Capacity development
	Energy management in industries has improved in recent years, but most of enterprises still do not apply energy management standards such as ISO 50001.	Institutional, financial
	There is a lack of awareness about energy efficiency and conservation measures.	Institutional
	High capital cost of EE technologies puts a limit on sector-wide EE measures.	Financial
	There is a lack of information on energy-efficient technologies and services to large energy consumers.	Institutional
	Limited energy management and conservation expertise.	Capacity development
	Energy prices need to reflect the market price to turn energy efficiency interventions into a good business case, and to enable executives make informed decisions to implement energy efficiency measures.	Policy (advocacy)

⁵⁶ Drejet & Rappaport 2014

⁵⁷ Danish Energy Agency 2015

4. Action Plan for Way Forward

Summary of Actions

Based on the above discussions and findings, a set of actions have been identified to assist the selected countries in improving energy efficiency

Table 4.1 Action plan to further strengthen EE in the region

Support area	Action	Description	Applicable countries
Awareness and capacity-building	Provide targeted capacity-building support to engage top management.	Innovative programmes need to be developed and delivered to engage top management and executives. This should be done by involving a global role model (e.g. an EE ambassador). Domestic experts are unlikely to have the required influence on executives. Communications should use business language to provide a clear message that energy efficiency is a solid business investment capable of meeting targeted IRR/payback.	All
	Support to develop a targeted, long-term and result-driven awareness programme to increase knowledge about energy efficiency.	This programme should be tailored to provide information to different sectors. It is important to involve relevant stakeholders in the process to understand the cultural and social orientation of the target group and to design and deliver the message appropriately. Special attention should be given to the language of communication. For example, to engage business entities, monetary savings should be highlighted more than energy and/or greenhouse gas emissions reductions.	All
	Capacity development for government employees	Capacity development programmes to be delivered to empower government employees to enable proper monitoring and evaluation of the implementation of government program, as well as to develop new programmes to address sectoral specific needs. The training programme should include technical and financial knowledge, learning from other countries, information about advanced technologies, monitoring and evaluation, and basic knowledge about ISO and other certifications. Accredited ISO certification training is not seen to be essential for this target group.	All

Support area	Action	Description	Applicable countries
	Support capacity-building programmes to develop energy managers and energy auditors	Capacity-development programmes to be developed to build the expertise of energy managers of industries and companies who are responsible for driving EE improvements. They should be trained in EnMS, ISO 50001 and ISO 50015. Specific programmes need to be developed and delivered based on the needs of target sectors and industries. Training programmes needed to be conducted to develop certified energy auditors to provide services to assess energy efficiency opportunities. For increased credibility, a nationally recognized accreditation programme should be established for the energy auditors.	All
	Deliver capacity-building programmes for ESCOs	Capacity-development programmes are to be delivered to empower ESCOs. These programmes should focus on improving their technical capacity to assess EE needs appropriately and formulate an effective solution, provide clients with a proper financial analysis of their investment, and undertake monitoring and evaluation (M&E) of the entire process.	All
Technical and financial	Assistance in the demonstration of energy-efficient technologies	Support to demonstrate new and advanced technologies designed for specific target groups would be very useful. Demonstration systems for priority sectors and industries (for example, sugar mills in the Philippines) would lead to the development of case studies, which would increase knowledge across the sector or industry. Lessons learned from the demonstration systems should be documented for future reference.	All
	Support the development of energy-efficiency programmes for the transport sector	The transport sector has been identified as one of the major energy-consuming sectors in all countries except Vietnam. While programmes are available to support the industrial, residential and commercial sectors, no significant activities have been noticed in this fast-growing sector. For example, in the Philippines, energy consumption in the transport sector is set to exceed the industrial sector to become the most highly energy-consuming sector. The number of vehicles in most countries is expected to increase in future as the affordability of personal vehicles increases. Types of intervention may include the introduction of electric vehicles, switching to biofuel and improving access to public transport.	Indonesia, Malaysia, the Philippines and Thailand
	Develop energy-efficiency programmes for the building sector	While the building sector is one of the major energy-consuming sectors in all countries, a complete building code to drive energy efficiency effectively in this sector is only available in Vietnam. Support should be provided to develop building codes to introduce mandatory energy performance requirements for all new buildings and retrofitting measures for existing buildings. This work should be undertaken with the relevant government departments and the relevant building or construction association.	Indonesia, the Philippines and Thailand

Support area	Action	Description	Applicable countries
Financial	Provide financial support to assist with capital investment	Financial assistance to offset high capital investments should be provided for smaller companies (e.g. SMEs). This is particularly important because this group has limited access to commercial financing and is thus unable to make the required capital investments.	Indonesia, the Philippines, Vietnam
Policy	Support to develop an enabling policy environment	Appropriate policy advocacy is needed to reduce the energy subsidy and to reflect the true cost of energy. This is very essential as the subsidised energy cost is a disincentive to businesses in undertaking EE measures. If energy tariffs reflect the true cost of generation, EE investments will make a good business case and will help motivate the stakeholders from all sectors.	Indonesia, Malaysia, Thailand and Vietnam
Institutional	Support to develop a central repository of information on energy efficiency	A central database needs to be developed with information on programmes, initiatives, technologies and services. Such a database would be a one-stop source of information for anyone seeking support to implement EE measures. This database should also include information about EE service providers, including accredited professionals. Such a database could be administered by government agencies or a recognized body of professionals with various anchor points around the country to feed in with updated information.	All
	Support to establish a quality testing infrastructure	The establishment of a quality infrastructure, such as an appliance testing laboratory, is important for all countries to effectively promote a standards and labelling programme. This would help countries test electrical and electronic products against their name plate specifications.	All

5. Conclusion

Selected countries in the Asia region are making progress in improving energy efficiency through the implementation of sector- or industry-specific programmes and policies. Their governments are also committed to saving energy, as indicated by the energy efficiency policies that have been put in place. However, given the high potential for energy conservation and the future growth in energy demand in these countries, achievements to date have been limited, which suggests a significant opportunity for support. Sector- and industry-specific programmes should be delivered to overcome existing barriers and, most importantly, support needs be tailored to suit specific target groups. In addition, most past and existing programmes have focused on the industrial sector, with limited attention going to the transport and building sectors.

While there are minor needs for financial and technical backing in specific sectors and industries, the balance of support is needed in the form of capacity development to overcome the institutional and cultural barriers. The capacity of local organisations and institutions needs to be developed to ensure a long-term sustainable programme driven by the market. The lessons and successes of past programmes should be built into existing and future programmes to avoid any duplication of work that has already been carried out. Future programmes should follow a holistic approach in addressing any specific barriers, i.e. not just focusing on a particular segment of a sector or industry, but including both upstream and downstream obstacles in the support programme. The stakeholder workshops were useful, as the workshop participants provided a wealth of information on the barriers to energy efficiency in respective countries, as well as on the EE opportunities that exist in each country. However, not all sectors were represented leading to a lack of information about some branches of the energy economy (for example, EE opportunities in the building sectors of most countries have been identified as low—and they were not represented in the workshops).

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Annexes

Annex I. SEE4ALL Energy Efficiency Consultation Workshop Indonesia

Summary of workshop report

Introduction. The United Nations Sustainable Energy for All (SE4ALL) initiative establishes three global objectives to be achieved by 2030: ensure universal access to modern energy services, double the global rate of improvements in energy efficiency, and double the share of renewable energy in the global energy mix. Under the SE4ALL initiative, the Asian Institute of Technology (AIT) is assisting the UNEP-DTU Collaborating Centre in supporting selected Asian countries in developing an Action Plan in Energy Efficiency through a regional Energy Efficiency (EE) Programme.

Organisation of the workshop. As part of this programme, a national Energy Efficiency Consultation Workshop was held in Jakarta on 25 November 2014 to discuss current and future programme and policy directions, and the possible roles of SE4ALL in energy efficiency in Indonesia.

Objectives. The objectives of the workshop were to:

- Review existing programmes and policy measures
- Understand the barriers to EE and identify measures to address them
- Identify the potential of EE in Indonesia
- Identify the supports needed for Indonesia to progress further in EE.

Summary of discussion/consultation. A summary of the discussion addressing the above objectives is given below:

1. Status of EE in Indonesia

The discussion on Indonesia's energy use and energy efficiency status revealed the following:

- Indonesia's GDP in 2009 was 2.177 trillion Indonesian Rupiah (IDR), and this is expected to increase to 3.943 trillion IDR in 2019, an annual increase of 6.1%. In response to the increase in population, which is expected to be 256 million (an annual increase of 1.11%), the primary energy demand is expected to be 1,316 million boe, a 7.1% annual increase during 2010 – 2019.
- 2012 primary energy use excluding biomass was 1,260 million barrels of oil equivalent (boe). The share of the primary energy supply in 2025 compared to 2012 is expected to be as follows: natural gas 22% (21% in 2012), coal 30% (27% in 2012), oil 25% (48% in 2012) and new and renewable sources 23% (4% in 2012). The National Energy Policy (under Government Regulation No. 79/2014), which has set its target for 2025, is based on reducing energy intensity by 1% per year, reducing energy elasticity to less than 1, and optimizing renewable energy use in the country.
- Energy intensity (primary and final energy, excluding biomass) shows a mixed trend. At about 523 boe/billion IDR in 2000, primary energy intensity steadily fell by 2008 to 470, and then increased during 2009-2010 (to 509). Since then it has shown a declining trend, reach-

ing 481 in 2012. The final energy intensity showed a similar trend, though the slope was flatter. In 2000, it was 366 boe/billion IDR, falling to 302 in 2008, increasing to 343 in 2010, and was 335 in 2012.

- According to the Draft National Energy Conservation Master Plan (RIKEN) 2013, the energy conservation potential has been estimated as follows: industry (10-30%), transportation (15-35%), household (15-30%), commercial (10-30%), and other (agriculture, mining and construction) (25%). The master plan targets specific sectors, aiming at the following savings in 2025: industry (17%), transportation (20%), household (15%) and commercial (15%).
- The roadmap for the development of energy conservation policy in Indonesia was initiated in 1982 by a Presidential Instruction and in 1995 launched a Master Plan on National Energy Conservation. Since then a number of regulations have been notified, and in recent years, the Ministry of Energy and Mineral Resources (MEMR) has issued notifications on energy saving, electricity use, water saving, labelling and electricity tariffs. The most recent 79/2014 relates to National Energy Policy. This has a strong reference to energy conservation efforts in Indonesia. A Master Plan for Energy Conservation is currently being drafted.
- The implementation of energy efficiency and energy conservation by the Ministry of Energy and Mineral Resources (MEMR) involves human resource development, creating public awareness, implementing standards and labelling, reducing greenhouse gas emissions, implementing ISO50001, drafting a master plan on energy conservation, developing partnerships, developing energy investments and reducing energy intensity. The Ministry works with many institutions and organisations like UNIDO, USAID, UNDP, GIZ, DANIDA, JICA, etc.
- Capacity-building training has been provided to more than 1,700 participants (government, private sector, training center, factory managers, factory personnel, vendors, banks, the financial services authority and auditors from the certification body) with the support of UNIDO targeting textiles and garments, foods and beverages, pulp and paper, and chemicals industries.
- An Energy Management System (EnMS) has been piloted with 20 factories that have now adopted ISO 50001, and another four factories were certified with ISO 50001 in 2013. Besides, four case studies on EnMS have been developed with energy savings ranging from 7% to 11.3% in the first year of implementation. The Ministry of Environment is working on Cleaner Production and Sustainable Consumption and Production (SCP) areas and has launched a ten-year programme on SCP, including green procurement. The possibility of developing a waste-to-energy project is also being examined in central Java.
- Other energy efficiency activities include:
 - Use of Municipal solid waste (MSW) for energy is being pursued in central Java.
 - Energy efficiency activities are being promoted in the hotel industry, especially in Jakarta and Bali. In some cases, free energy audits and carbon feasibility studies are being conducted to assist hotel industry.

2. Barriers to improving EE in Indonesia

Overview of discussion about the barriers that need to be addressed to strengthen energy efficiency measures in Indonesia:

Technical barriers

- Limited domestic production of EE technologies and products. Also a lack of energy efficient technologies in the market.
- A lack of technical knowhow of EE on the supply-side and transmission and distribution losses.

Financial barriers

- Technology and energy-efficient equipment are, in general, expensive and financial support to purchase them is limited. A smart financing mechanism is needed for energy efficiency projects.

Policy barriers

- Energy prices are relatively cheap due to energy subsidies.
- Policies on cleaner production and sustainable consumption and production are not mandatory.
- Lack of financial incentives, especially for small and medium-size industries.
- Policy and implementation mechanisms need to be decentralised for a large country like Indonesia.
- The lack of a mandatory requirement for sustainable waste management is a barrier to waste-to-energy implementation.

Institutional and capacity barriers

- Evaluation and monitoring of energy conservation efforts need to be strengthened.
- There is lack of information and understanding of the financial and qualitative benefits.
- Knowledge of energy efficiency is very often with individuals rather than with the company or organisation. This creates a sustainability risk when the employee leaves the organisation.
- Capacity-building of personnel to implement energy efficiency activities is needed, as most work is done through rule of thumb approach.
- Obtaining loans or funds for energy efficiency is a very cumbersome process and needs to be simplified.

Social and cultural barriers

- Absence of adequate technical skills for developing and implementing EE measures and projects, especially for small and medium-size industries.
- Lack of awareness of the opportunities, technologies, services and benefits connected with EE.
- The focus of the top management of industries and companies is on production. Energy efficiency is not seen as a logical business investment.
- Market attitudes to energy efficiency make it hard to convince business owners to make EE investments.

- EE knowledge and the capacity to implement EE measures in the local government sector are very low.

Other barriers

- The municipal solid waste sector has enormous potential that could be tapped. However, the barriers to promoting waste to energy include the difficulties in getting cities interested, the lack of coordination between ministries and the lack of a mandatory requirement to practice sustainable waste disposal, and a lack of awareness about the potential to generate energy from waste.

3. Opportunities in EE in Indonesia

The discussion of the identification of opportunities for energy efficiency in Indonesia produced the following suggestions:

Awareness and capacity-building

- Public awareness programmes are to be undertaken through schools, workshops, and energy efficiency advertisements in the electronic and print media.
- Existing training programme for energy managers and auditors needs to be expanded (so far 96 energy managers and 54 energy auditors have been certified).
- Need for capacity-building on ISO 50015 to improve organisational energy performance and institutionalize the MRV system.
- Capacity development programmes for more energy management system (EnMS) experts targeting all four sectors in Indonesia.
- Executive briefing for more companies in four targeted sectors and other energy-intensive industrial sectors.
- A Regional Certification Programme for ISO 50001 needs to be undertaken to develop A lead auditor.

Technical Support

- The Government of Indonesia has developed guidelines for Energy Smart Street Lighting. Programmes to be developed support the implementation of these systems.
- In the building sector, EEI is about 250 (high), and 30-40% emissions are from buildings, so there is considerable potential. An initiative to develop buildings ratings was initiated in 2009. The progress has been slow, and needs support to be speeded up.

Financial issues

- Intensifying dialogue, consultation and discussion with the Ministry of Finance/Fiscal Policy Agency, Indonesia Financial Services Authority (OJK), to formulate smart financing mechanisms for energy efficiency projects such as soft loans and a revolving fund.

Policy formulation

- There is a need for policy advocacy support to increase energy prices by phasing out energy subsidies.
- Need for policy development to offer incentives for EE implementation projects.
- Regulations to empower energy service companies (ESCO) need to be developed.

Other

- Best practices on ISO 50001 should be showcased in regional events, e.g. in the award-winning regional competition event.
- Knowledge sharing programmes to be developed. This should include learning from other countries about financing energy-efficiency initiatives.
- The buildings sector (hotels, commercial, hospitals, residences) comes under the purview of different ministries (Health, Tourism, Energy, Environment, etc.), and so effective coordination between ministries is important.

To move forward. The type of assistance required to make use of opportunities should include the following:

- Support should be provided to finance energy efficiency projects. In all cases, it is important to work with the Ministry of Finance and to take them on board and convince them.
- Need to develop benchmark indicators for different industries and ensure they are appropriately implemented.
- Incentives should not only focus on providing financial support, they also need to include raising their reputations.
- Capacity development in the building sector should include vendors, financial institutions, etc.
- Support should be provided to develop and maintain laboratories for technology assessment and verification.
- Energy efficiency projects with good replicability potential should be encouraged.
- In terms of technology transfer, Indonesia's Agency for the Assessment and Application of Technology (BPPT) has many efficient and proven technologies, but these are not widely disseminated. In other words, information on energy-efficient and environmentally sound technologies is not widely known even to stakeholders.
- Support measures should be able to cater for business-, industry- and sector-specific needs.
- Support may be needed in formulating effective regulations in the country context, e.g. to reduce energy subsidies.
- In industry, the capacity of the production team to promote energy efficiency is important.

Conclusions. The consultation workshop benefited from the productive discussions, and participants gave their opinions and views based on their experiences and knowledge. The good mix of different stakeholders, covering government, the private sector and NGOs, ensured that the discussion reflected a cross-sectoral agenda and that it would be useful in addressing national interest. The following points can be summarized from the discussions:

- Indonesia has been actively working towards increasing energy efficiency through the implementation of regulatory as well as voluntary mechanisms since 1982.
- The major focus of the Energy Efficiency Development Plan has been the industrial sector.
- Capacity, technical, financial and social barriers are the key challenges that need to be overcome. These include changing attitudes in businesses and companies to make them understand that EE can bring benefits to their ventures, and obtaining buy-in from executives to help implement an on-going energy management system.

- There are a number of opportunities to help Indonesia achieve its goal of energy efficiency by 2025 as envisaged in the National Energy Policy. These include, but are not limited to,
 - Including other sectors, e.g. SMEs, transport and building sectors.
 - Demonstration and knowledge building about advanced EE technologies.
 - Promotion of EnMS.
 - Development of an energy measurement and verification (M&V) system and promoting a systems approach.
 - Development and delivery of capacity-building programmes for different levels of stakeholders, including government employees, energy management service providers, energy managers in companies and employees of participating financial institutions.
 - Development of a good database system to provide information about new EE technologies and services, sources of equipment and appliances, availability of energy management service providers, etc.

Section A. List of participants

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4	Mr	Dani Sutopo	Senior Manager	Adidas Sourcing Limited
5	Mr	Muhammad Suhud	Clean Energy Policy Analyst	USAID Indonesia Clean Energy Development
6	Ms	Fitria Leli N	Staff	Environmental Sub Division. PT. PLN (National Utility Company)
7	Ms	Amna Apriliani N	Staff	Environmental Sub Division. PT. PLN (National Utility Company)
8	Ms	Sri Bebasari	Chairman	Indonesian Solid Waste Association (INSWA)
9	Ms	Ita Sadono	Communications & Relations	Holcim Indonesia Tbk
10	Ms	Rahimah	Advisor Development Cooperation	Royal Norwegian Embassy
11	Ms	Gita Meidita	Programme Officer/Liaison Officer	HIVOS Foundation
12	Ms	Chrisandini	Sumba Iconic Island Climate Change Adaptation Officer	WWF, Indonesia
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14	Mr	Qatro Romandhi	Section Head of Energy Demand Forecasting	Directorate of Energy Conservation, Ministry of Energy and Mineral Resources
15	Mr	Tiyok Prasetyoadi	Director	Green Building Council, Indonesia
16	Mr	Asep Suwarna	Project Manager	UNDP
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Annex II. SEE4ALL Energy Efficiency Consultation Workshop Philippines

Summary of workshop report

Background. The United Nations Sustainable Energy for All (SE4ALL) initiative establishes three global objectives to be achieved by 2030: to ensure universal access to modern energy services, to double the global rate of improvement in energy efficiency, and to double the share of renewable energy in the global energy mix. Under the SE4ALL initiative, the Asian Institute of Technology (AIT) is assisting the UNEP Risoe Centre in supporting selected Asian countries in developing an Action Plan in Energy Efficiency through a regional Energy Efficiency (EE) Programme.

Organisation of the workshop. As part of this programme, a national Energy Efficiency Consultation Workshop was held in Manila on 24 November 2014 to discuss current and future programme and policy directions, and the possible roles of SE4ALL in energy efficiency in Philippines.

Objectives. The objectives of the workshop were to:

- Review the existing programmes and policy measures
- Understand the barriers and identify measures to address them
- Identify the potential of EE in Philippines
- Identify the support needed for Philippines to progress further with EE.

Discussion topics. The workshop was opened at 9.00 am with an introduction to the participants, followed by a presentation by Dr. Anis Zaman on the background to the project and the objectives of the workshop. The participants were then invited to share their knowledge, experience and opinions around the following major areas:

- The status and effectiveness of energy efficiency programmes and initiatives
- Challenges to implementing energy efficiency measures
- Opportunities to improve energy efficiency further
- Types of support that the Philippines may need in future to make further progress with energy efficiency.

Summary of discussion/consultation. The participants spontaneously joined in the discussion and shared their experiences and views on each of the discussion points mentioned above. A summary of the discussion is given below:

1. Status of EE in the Philippines

The participants discussed the on-going EE programmes and policies in the Philippines and commented on their effectiveness in achieving the desired energy efficiency improvements. A summary of this discussion is given below.

- The government has drawn up an Energy Efficiency and Conservation Roadmap 2012-2030 to drive EE measures in the country. However, to date there are no policies or regulatory instruments enforcing EE in the country. The Energy Efficiency and Conservation Bill 2014 will be the first of its kind once it passes through the parliament in the near future.
- The Department of Energy (DOE) is the leading government agency when it comes to deliv-

ering EE programmes and policies. The government's Energy Management Programme aims to reduce monthly consumption of electricity and transport petroleum products by all government buildings and operations by at least 10% on annual basis through various measures, including lighting and air-conditioning retrofitting. The DOE and the Department of Science and Technology (DOST), in collaboration with a number of government and private organisations, is also implementing a standards and labelling programme for the household and commercial sectors. This programme has already developed and implemented standards for refrigerators and air-conditioners, and is expected to include televisions in near future. In addition, DOE is also involved with other EE programmes that are being delivered in the country by various agencies.

- The United Nations Industrial Development Organisation (UNIDO) supported the Philippines Industrial Energy Efficiency Programme and assists industries in improving energy efficiency through a range of activities, including capacity-building through training on ISO 50001. The GEF-supported Philippines Chiller Energy Efficiency Programme is being implemented by the Department of Environment and Natural Resources with the aim of replacing inefficient CFC-based chillers with new and efficient non-CFC chillers. The High Energy Efficiency Motors (HEM) programme, with the support of EUR 1.9 million from the EU's SWITCH-Asia Programme, is being implemented by a consortium of a number of organisations, including IIEE, ICA and ASSIST. This programme aims to showcase and promote high-efficiency motors and drive systems in the sugar industry, thus demonstrating that investment in EE motors can make a good business case, as often the simple payback period for such investments would be less than a year.
- The International Copper Association (ICA), in collaboration with the Philippine Chamber of Commerce and Industry (PCCI) and the Department of Trade and Industries (DOTI), is delivering an ASEAN Standards Harmonization Initiative for Energy Efficiency (ASEAN SHINE) to harmonize the standards of air-conditioners in ASEAN countries, including the Philippines, and encourage the development of national policy road maps. In addition, the ICA is also working with electricity utilities to improve the energy performances of distribution transformers.
- The Climate Technology Initiative: Private Financing Advisory Network (CTI-PFAN) helps to connect investors with clean energy (including energy efficiency) businesses. In the Philippines, CTI-PFAN have supported sugar mills in accessing the finance required to implement energy efficiency. The Philippines Appliance Industry Association (PAIA), in partnership with the DOE and DOST, is implementing the standards and labelling programme for the residential and commercial sectors.
- There are multiple capacity development programmes being delivered by different organisations. These include:
 - Training programmes for energy management experts run by the Institute of Integrated Electrical Engineers (IIEE). This programme provides knowledge on energy management techniques and the ISO 50001 standard.
 - Training programmes are also being delivered by the Energy Efficiency Practitioners Association of the Philippines (ENPAP) to develop and certify energy managers who

are expected to undertake energy efficiency measures in their organisations.

- The training of electricians to educate them on the use of energy-efficiency products during electrical installation, retrofitting and replacements in all sectors. This programme is being delivered by the Asia Society for Social Improvement and Sustainable Transformation (ASSIST), a regional NGO.

2. Barriers to Energy Efficiency measures

The workshop participants identified some barriers that need to be addressed in order to strengthen energy-efficiency measures in the Philippines further and to achieve the goals of the EE Development Plan. These include:

- **Cultural and attitudinal barriers.** It is very hard to achieve buy-in from top management for energy efficiency investments because they do not perceive EE actions as an investment opportunity but as an item of expenditure only. Experiences from engaging sugar mills in EE measures show that it takes two to three years before the management decides to sign an ESCO contract. This is mostly due to the lack of motivation, which can be also linked to the lack of awareness. The top management needs to be made aware that by implementing EE industry will be able to reduce its costs of per unit of production, which will make it more competitive in the market compared to those that have not implemented EE.
- **Policy and institutional barriers.** While EE has been promoted in the Philippines for a long time, progress in energy efficiency uptake has remained low, predominantly due to the absence of an effective institutional mechanism to support the implementation of existing programmes. For example, the standards and labelling programme is being implemented voluntarily. There is no energy efficiency policy in the Philippines to enforce the implementation of an EE plan or road map. This is seen to be one of the major barriers, as the programmes that are being implemented are voluntarily and on an ad hoc basis. The existence of an enforcement or regulatory framework would have been more effective to achieve a greater outcome.
- **Lack of awareness.** There is a general lack of awareness across all sectors in the Philippines about the needs and benefits of implementing energy efficiency, e.g. financial savings. This creates a lack of motivation for executives and CEOs in implementing energy efficiency, as well as in taking any informed-decisions on EE investments.
- **Technological barriers.** The technological barriers to the adoption of EE in the Philippines are seen to be low. There is sufficient technical expertise in the country, including professionals with previous EE experience in large corporations, who would be able to adopt the new and emerging technologies easily. However, demonstration and pilot projects to showcase advanced EE technologies and their benefits would be useful.
- **Financial barriers.** The financial barriers are not very critical for the Philippines, as industries and companies can afford to make their own investments, and also because the payback period for EE investment is short enough to make a good business case. However, some financial support to end users in the residential sector and to SMEs may be useful to offset the high costs of EE equipment. Large industries have easy access to finance, but the smaller companies (e.g. SMEs) may need some support to make EE investments.

- **Resource and capacity barriers.** While there seems to be sufficient technical capacity among the professionals working in EE, the expertise of technical staff in presenting EE intervention as a business case to top management (e.g. CEO, CFO) is lacking.
- **Other barriers.** There is insufficient infrastructure in the Philippines to support the implementation of EE measures. For example, there is no national testing laboratory to assess the performance of energy products. While DOE, in collaboration with other government and private organisations, is delivering a number of initiatives, the financial and human resources are inadequate. The operational budget for DOE to drive EE programmes is low, and therefore there is a limit to what it can deliver.

3. Opportunities and support in EE in the Philippines

The following provides a summary of EE opportunities in the Philippines and the types of support that would be useful in making further progress with EE initiatives in the country:

- The energy price in the Philippines is very high (electricity USD 0.18/kWh, gasoline USD 1.2/litre, diesel USD 1.0/litre, natural gas USD 1.2/litre)¹ compared to other countries in Asia. This is a great incentive for the implementation of energy efficiency in all sectors.
- The need to extend the standards and labelling initiative to cover more products. All products should have energy performance labelling at the point of sale.
- Most EE programmes and initiatives are being supported by external agencies, which are time-specific. A well-constructed, targeted and on-going support mechanism needs to be established to educate stakeholders from all sectors.
- Financial support. The need for financial support has been identified as 'low to medium', as the energy price in the Philippines is high enough to make EE investment a good business case. In addition, industry and business owners have sufficient resources (or easy access to finance) to invest in EE measures. The following minor types of financial support may be useful:
 - Financial support to the piloting and testing of selected EE initiatives would be helpful. Such pilot projects would be able to convince CEOs and executives and would set the ground work for future upscaling.
 - The introduction of electric vehicles would address the energy consumption and the transport sector (the highest energy consuming sector). The Philippines has existing expertise in developing high energy efficient motors, which would be useful in the manufacturing and assembling of electric vehicles in the country.
- **Policy support.** The immediate introduction of an EE and Conservation Policy is seen to be the right vehicle to catalyse EE initiatives in the Philippines. Policy advocacy support to accelerate the passing of the EE&C Bill 2014 would be useful.
- **Technical support.** It is believed that there is sufficient technical capacity in the country to render EE services to energy consumers. However, some technical assistance to minimize system loss in the electricity distribution network effectively would be useful.
- **Other support.** Most of the assistance from multilateral and bilateral agencies is in the area of human resource capacity-building (the technical and institutional aspects). Support is

needed to develop future infrastructure, e.g. laboratory for testing EE appliances and equipment (quality infrastructure).

▪ **Capacity-building support**

- The capacity, both technical and financial, of ESCOs and energy auditors needs to be further developed so that they are able to present the EE case to executives in way that is both technically sound and financially attractive.
- A knowledge management platform that would provide a good inventory of programmes, initiatives, technologies and services pertaining to EE would be very useful. Such a database would be a one-stop source of information for all stakeholders, including funding agencies, energy consumers and EE service providers. The DOE is in the process of developing a databank to include energy consumption information regarding government facilities and services. This could be a starting point to develop a nationwide platform.
- Support to develop capacity-building programmes for CEOs would be useful. Such programmes should consider the EE campaign through EE ambassador or global role models.
- The training of energy managers, such as the programme being delivered by ENPAP, would need to be extended to cover the staff of smaller companies. Financial support to make this training affordable to SMEs would be useful.
- Support to improve energy efficiency in the building sector is essential. Interventions may include training programmes for the building association and relevant government departments to improve their capacity to develop appropriate building codes.

Conclusions. The future increase in energy demand and the high energy tariff in the Philippines are good drivers of energy efficiency in the country. However, the lack of knowledge about the benefits of EE measures among energy consumers and the absence of an appropriate regulatory framework are significantly hindering progress with EE in the Philippines. These two issues together are responsible for the lack of interest of top management. While multiple programmes and plans are in place, the introduction of a regulatory framework would be helpful in institutionalizing EE initiatives and making them more effective. Assistance with capacity-building and the development of institutional mechanisms will provide the most appropriate and much-needed support for the Philippines to improve the uptake of EE measures.

Section B. List of participants

No.	Name	Organisation
1	Mr. Leonardo Dayon	Alps Maintaineering Services Inc.
2	Mr. Artemio P. Habitan	Department of Energy (DOE)
3	Mr. Charles P. Ladia	House of Representatives
4	Engr. Rolando C. Constantino	Energy Efficiency Practitioners Association of the Philippines, Inc. (ENPAP)
5	Mr. Jose Alejandro	Philippine Chamber of Commerce and Industry (PCCI)
6	Ms. Rhuby R. Conel	Philippine Chamber of Commerce and Industry (PCCI)
7	Dr. Felix A. Velasquez	Philippine Chamber of Commerce and Industry (PCCI)
8	Mr. Sreeni Narayanan	Asia Society for Social Improvement & Sustainable Transformation (ASSIST)
9	Mr. Charles Cole Navarro	Climate Technology Initiative - Private Financing Advisory Network (CTI-PFAN)
10	Engr. Arthur Zabala	International Institute for Energy Conservation
11	Ms. Laurie B. Navarro	Clean Energy Solutions International
12	Mr. Marlon Balobalo	Philippine Appliance Industry Association (PAIA)
13	Engr. Raymond A. Marquez	Cofely GDF SUEZ
14	Engr. Jessie S. Todoc	International Copper Association Southeast Asia (ICASEA)
15	Engr. Arthur A. Lopez	IIEE Foundation
16	Mr Patrick E. Monteno	Department of Science and Technology (DOST)
17	Mr Efren T. Cortez	House of Representative – Committee of Energy
18	Mr Marvin R. Bathan	Institute of Integrated Electrical Engineers (IIEE)
19	Dr Anis Zaman	Asian Institute of Technology

Annex III. SEE4ALL Energy Efficiency Consultation Workshop Thailand

Summary of workshop report

Background. The United Nations Sustainable Energy for All (SE4ALL) initiative establishes three global objectives to be achieved by 2030: to ensure universal access to modern energy services, to double the global rate of improvements in energy efficiency, and to double the share of renewable energy in the global energy mix. Under the SE4ALL initiative, the Asian Institute of Technology (AIT) is assisting the UNEP DTU Partnership in supporting selected Asian countries in developing an Action Plan in Energy Efficiency through a regional Energy Efficiency (EE) Programme.

Organisation of the workshop. As part of this program, a national Energy Efficiency Consultation Workshop was held in Bangkok on 11 November 2014 to discuss current and future programme and policy directions, and the possible roles of SE4ALL in energy efficiency in Thailand.

Discussion topics. The workshop was opened at 9.00 am with introduction to the participants, which was followed by a presentation by Prof. S. Kumar on the background to the project and the objectives of the workshop. The participants were then invited to share their knowledge, experience and opinions around the following major areas:

- Status and effectiveness of energy efficiency programs and initiatives
- Challenges to implementing energy efficiency measures
- Opportunities to improve energy efficiency further
- Types of support that Thailand may need in future to make further progress with energy efficiency
- Possible structure of a coordination agency if SE4ALL support is rendered to Thailand.

Summary of discussion/consultation. The participants joined the discussion spontaneously and provided a wealth of information on each of the discussion points mentioned above. A summary of the discussion is given below:

1. Status of EE in Thailand

The Department of Alternative Energy Development and Efficiency (DEDE) is the key agency driving energy efficiency initiatives in Thailand, and it has been working in this area since the introduction of the Energy Conservation and Promotion Act in 1992. The recent introduction of Thailand's 20-Year Energy Efficiency Development Plan 2010-2030 in 2010 aims to achieve an ambitious 25% reduction in final energy consumption by 2030 compared to the base year of 2010. This translates to a reduction of 38,200 kilotonnes of oil equivalent (ktoe) of final energy demand by 2030 and a reduction of energy intensity from 15.6 ktoe/billion baht in 2010 to 11.7 ktoe/billion baht in 2030. This Plan includes the following initiatives: standards and regulations, technical assistance and capacity-building, financial incentives, creating awareness and energy efficiency networking.

Energy Management for Designated Buildings and Factories, under the ECP Act, has been a major programme under this Plan that encourages and supports high energy building consumers in reducing their energy consumption. The plan also provides financial assistance for capacity-building and energy efficiency-awareness programmes. DEDE also works in partnership with other institutions, e.g. the Thai Chamber of Commerce, the Federation of Thai Industries, etc. to address sectoral needs in improving energy efficiency. The establishment and implementation of

the Revolving Fund has been successful in supporting initial investments in energy efficiency and creating a self-sustained market dynamics by encouraging the involvement of commercial banks in this area. Some banks (e.g. K-Bank) have now included energy efficiency in their financial products list. The ESCO fund was created to allow access to finance by smaller businesses, which would otherwise be unable to obtain funding from the commercial banks. DEDE works with the Revenue Department to facilitate tax incentives for the purchase of EE products, and it also cooperates with the Board of Investment (BOI) to exempt corporate income tax and import duties for EE purposes.

UNIDO, with funding support from GEF, is supporting industries in Thailand to improve energy efficiency at the factory level. These activities include helping with the establishment of an Energy Management System (EMS), providing technical knowledge and training on ISO15001, and helping with system and process optimization. DEDE's EE Development Plan has been the major driver of this programme, as industry is now able to access capital funding under the DEDE Plan. UNIDO also supports SMEs by providing technical support, e.g. training on ISO15001. However, the number of training sessions (about twenty per year) is very low compared to the need and the large opportunities for energy reductions in this sector.

From the regional perspective, a Regional Hub has been launched by the United Nations SE4ALL decade in Manila in collaboration with ESCAP, UNDP and ADB. This Hub will leverage the existing structures of these three agencies' energy programs and integrate the strengths of all three development partners to support the achievement of the SE4ALL goals in the Asia-Pacific region. Reference was made to the recently published Regional EE Policy Recommendation report by the IEA, which may be useful in shaping the SE4ALL regional EE programs in Asia.

Examples of EE measures in the commercial sector include a private initiative that supports energy efficiency in hospital buildings through benchmarking approaches (e.g. energy uses per patient-day). This programme has shown that hospitals are large consumers of air-conditioning energy and that there is therefore a strong need to conserve energy in this sector without compromising the quality of the services provided to patients.

In relation to the effectiveness of the programs, the participants noted that the EE market penetration is increasing. Most consumers are focusing on changing equipment or appliances instead of implementing a system approach, e.g. energy management. The participants also emphasized the need to explore the possibility of a smart grid in the country with the aim of reducing energy demand.

2. Barriers to EE measures

The participants identified barriers that need to be addressed in order to strengthen energy-efficiency measures further in Thailand and to achieve the goals of the EE Development Plan. These include:

- The low energy tariff (the highly subsidized energy sector), which is a major barrier to improvements in energy efficiency, as businesses see no incentives for investing in efficient technologies and services.
- The current attitudes of business owners to energy efficiency need to be changed. They need to be made aware that energy efficiency can not only save money but also help optimize business performance.
- The need to make sure there is a buy-in from executives. This is the first step in engaging

businesses in energy efficiency.

3. Opportunities in EE in Thailand

Discussion was also held to identify the opportunities for energy efficiency in Thailand. In this regard, the participants noted the following:

- There are many large corporates in Thailand that have enough resources to make energy efficiency investments. They also send their employees overseas to learn about advanced technologies. By including energy efficiency in their portfolios, the SE4ALL programme can tap into these resources.
- A systematic approach is needed to increase interested companies' exposure to more advanced technologies.
- While to date more focus has been put on industries (medium to large), SMEs should not be kept out of the scene. Although they consume less energy, the number of SMEs in Thailand is very high. As a sector, they consume a significant amount of energy. Support with the identification of low hanging fruit would be the most appropriate approach for SMEs.
- Given the fact that about six thousand buildings and factories have been designated by law, the opportunity to provide EE support in Thailand is enormous. Appropriate policy developments, e.g. the establishment of an energy consumption index (energy use per square meter of space) and moving towards net zero energy buildings would further strengthen the energy conservation plan and enhance existing opportunities in Thailand.
- DEDE has so far focused on industries and buildings. However, opportunities also exist in other sectors, e.g. the transport sector. Support from SE4ALL in identifying needs and the development of an integrated framework to address energy efficiency in this sector would be very useful.
- While DEDE is helping industries and buildings with EE measures, mostly through technical assistance and financial support, there are other areas that would be useful to look at. These include enhancing knowledge of advanced tools, innovative policy mechanisms, etc. to support further progress of the EE Development Plan.
- Though data collection on energy consumption has and is being undertaken, the data need to be analysed and interpreted for improving (reducing) overall energy consumption.
- There is a lack of in-house capacity, particularly for new employees in energy agencies, who need to be well-trained about EE technologies and services.
- Awareness programmes to educate the wider community about energy efficiency should be developed and delivered.
- A rich and resourceful database needs to be developed on energy efficiency technologies and systems, e.g. efficient lighting systems, advanced industrial technologies, the sources and prices of different EE equipment and measures, etc.
- Tailored capacity-building programmes should be developed nationally for different groups of stakeholders. This may include organising courses, seminars and workshops, in-

creasing the capacity of companies and factories to collect and analyse their energy consumption data, and developing the necessary skills for the Person Responsible for Energy (PRE), etc.

Conclusions. The consultation workshop benefited from very spontaneous and rich discussions, as the participants provided their opinions and views based on their experiences and knowledge of their respective areas of work. The good mix of different stakeholders, covering government, the private sector, regional agencies and the academic community, ensured that the discussion reflected a cross-sectoral agenda and that it would be useful in addressing the national interest. The following points can be summarized from the discussion:

- Thailand has been actively working towards increasing energy efficiency through the implementation of regulatory as well as voluntary mechanisms since the early 1990s
- A major focus of the Energy Efficiency Development Plan has been the industrial and building sectors
- Regional programmes and private-sector initiatives are also available that focus on the SME and commercial sectors
- Institutional and social barriers are the key challenges that need to be overcome. These include changing the attitudes of businesses and companies to make them understand that EE can benefit their ventures and to obtain a buy-in from executives to help implement an on-going energy management system.
- There are ample opportunities for support to help Thailand achieve its goal of energy efficiency by 2030. These include, but are not limited to
 - Expanding the activities of the National Energy Efficiency Development Plan to include other sectors, e.g. the SME, transport and residential sectors
 - Demonstration and knowledge building about advanced EE technologies
 - Development of an efficient measurement and verification (M&V) system
 - Development and delivery of capacity-building programmes for different levels of stakeholders, including government employees, energy management service providers, energy managers in companies and the employees of participating financial institutions.
 - Development of a rich database to provide information about new EE technologies and services, sources of equipment and appliances, the availability of energy management service providers, etc.
- It is important to convey EE messages tailored to the target group, e.g. in engaging with businesses and companies, messages should focus on saving money instead of saving energy or GHG emission reductions.

Section C. List of participants

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Annex IV. SEE4ALL Energy Efficiency Consultation Workshop Vietnam

Summary of Workshop report

Introduction. The United Nations Sustainable Energy for All (SE4ALL) initiative has established three global objectives to be achieved by 2030: to ensure universal access to modern energy services, to double the global rate of improvements in energy efficiency, and to double the share of renewable energy in the global energy mix. Under the SE4ALL energy efficiency initiative, the Asian Institute of Technology (AIT) is assisting the Copenhagen Centre on Energy Efficiency in supporting selected Asian countries in developing an Action Plan in Energy Efficiency through a regional Energy Efficiency (EE) Programme. As part of this programme, an Energy Efficiency Consultation Workshop was held in Hanoi on 27 January 2015 to discuss with relevant stakeholders current and future programme and policy directions, and the possible roles of SE4ALL in promoting energy efficiency in Vietnam.

Objectives. In accordance with the overall objectives of the project, and based on earlier workshops conducted in Thailand, Indonesia and the Philippines, the objectives of the workshop were to:

- review existing programmes and policy measures
- Understand the barriers and identify measures to address them
- Identify the potential of EE in Vietnam
- Identify the support needed for Vietnam to further progress in EE. See Appendix A for the workshop programme.

Summary of discussion/consultation. A summary of the discussion addressing the above objectives is given below:

1. Status of EE in Vietnam

Mr. Lai Duc Toan of the Department of Science and Technology, Energy Directorate, Ministry of Industry and Trade made a presentation on the status of energy consumption, status of energy efficiency, policies and plans in Vietnam (see Appendix C). This was followed by discussion. The highlights of this session were as follows:

- On energy production and generation, total installed capacity in 2013 was 30,688 MW, of which the power from renewable energy (grid) was 1,884MW, accounting for 6.13%. The total energy supply in 2013 was 128.228 billion kWh, and from renewable energy (grid) it was 5.098 billion kWh, representing 3.98%.
- Total energy consumption in 2012 was 49.302 kilotonne of oil equivalent (ktoe), of which total commercial energy consumption in 2012 was 35.216 ktoe. Commercial energy consumption per capita in 2012 was 396,7 kg of oil equivalent (kgOE)/capita, compared with 392,8 kgOE/capita in 2011. Energy consumption was 42.7% from oil, 27.5% from coal, 25.7% from electricity and 4.1% from natural gas. For consumer consumption, the shares were as follows: 45.7% from industry used, 31.7% from transportation and 14.9% from household, the remainder being for agricultural, services, commercial and other purposes.
- In Vietnam, there is a national target programme on energy efficiency called the Vietnam Energy Efficiency Programme (VNEEP), which involves two stages.

Stage 1 (2006 – 2010): Had target savings of –5% of total energy consumption in the whole

country with six groups of activities. The achievement was about 4.8%.

Stage 2 (2011 – 2015): With a target savings of 5-8% of energy consumption with four groups of activities.

- The programme planned to continue building and to carry out activities in 2016 to 2020 in order to promote energy efficiency. According to VNEEP (<http://vneec.gov.vn/>), many national decrees, policies, laws and regulations have been generated on energy savings, and the results have been achieved through awareness promotion. The use of mass media generates increased awareness in energy efficiency in households, industries, the use of solar energy, energy labeling, information dissemination on energy management best practice following the introduction of ISO 50001 standard to support improvements in production processes, and energy audits in enterprises and buildings. In Vietnam, there are about forty Energy Conservation Centers (ECC) that have been created in the provinces, twelve falling under the management of the Department of Industry and Trade (DOIT). These ECCs helped carry out energy-saving policies in the provinces.

- There are three categories of energy-saving programme under the management of three ministries, such as:
 - Energy saving in industry and electricity generation under the management of the Ministry of Industry and Trade
 - Energy saving in building and construction under the management of the Ministry of Construction, and
 - Energy saving in transportation systems and vehicles under the management of the Ministry of Transportation.

The Ministry of Industry and Trade (MOIT) is the overall coordinator of the agencies involved in the programme.

- During the discussion, the participants expressed their opinion that current law with regard to energy conservation is not sufficient to carry out activities with enterprises. Some of the specifics that came up during the discussion were:
 - In general, policies are in place but the issue has been implementation, especially due to a lack of capacity and finance.
 - In the agricultural sector, the pumps for irrigation use very old technology and so have a high potential for energy savings. While some irrigation centers have good management, others have bad management, so that improving management could be good option for energy saving. In food-processing industries, the potential is also high because of the use of old equipment.
 - In the industrial sector in general, the potential for energy saving is very high, especially in remote areas. Training and management and the maintenance of equipment are the key issues for saving energy, since the ability of technicians working in such enterprises is very low. The opportunities for energy savings in small and medium enterprises in industries are high.
 - In the construction (building) sector, the Ministry of Construction has developed building codes and standards for new buildings to follow, and energy savings are one of

the targets. The potential for energy saving is still high in buildings, for both commercial and residential properties however, construction companies want to reduce capital costs while users/occupants target decreases in operating costs. Opportunities are mainly in the management and maintenance of the building.

- MOIT is also promoting the energy savings company (ESCO) concept, although there are none as of now. However, there are energy service providers in the country.
- To support the energy-saving option in enterprises, there are several projects and organizations that provide investment and loan guarantees. One initiative is from the World Bank, which has mobilised USD 200 million in funding. Under another initiative, a UNDP–GEF project on product labelling, with activities carried out in Indonesia, the Philippines and China (regional programme) on energy-efficient products, targeted 30 electricity equipment products. This was started in 2009 and ran until 2014. MOIT was the implementing partner in Vietnam. There was also a UNEP regional programme to phase out incandescent lamps with funding from GEF.
- Some other projects and programmes are being supported by Denmark, UNIDO, UNDP, GEF etc. to carry out energy-saving conservation measures in different sectors such as brick manufacture, ceramics, food-processing, non-fired bricks, etc.

2. Barriers to improving EE in Vietnam

Dr. Quang of the Hanoi University of Science and Technology made a presentation on the barriers and opportunities for promoting energy efficiency in Vietnam (see Appendix D). The major barriers inhibiting the promotion of energy efficiency in Vietnam could be summarized as follows:

- Energy prices are low (the average electricity price is 7 cents/kWh for industry) and the government subsidy does not encourage the implementation of energy efficiency.
- The technology used is low, especially in coal thermal plants, cement factories, brick kilns and boilers.
- Capacity of technical personnel in enterprises is low.
- Lack of training, research, and methodology to disseminate energy saving option.
- Energy management is poor (also due to a lack of measuring equipment), and the running of energy management systems is not good.
- Fuel suppliers cannot meet the demand for quality and quantity of consumers, especially for solid fuel such as coal and biomass.
- Coal used as fuel in Vietnam is anthracite, which is low in quality.
 - Fuel management in enterprises lacks leadership. There are few institutions that can determine fuel quality. For labelling and testing, there are seven centers and two international organisation centers, but with limited management capacity.
 - Lack of local R & D in the country to promote energy efficiency.

3. Opportunities and support needed for EE in Vietnam

Discussing the opportunities for energy savings in Vietnam, the participants agree that the potential for energy saving in Vietnam is very high. The following emerged during the discussions:

- Vietnam produces electricity mostly based on coal-fired thermal power plants. In the future, a number of coal-fired thermal power plants have to be installed. The potential for energy saving is high if good technology is used as well as good fuel management.
- Vietnam has great potential to produce renewable energy from agricultural wastes and reforestation by increasing the production of pellets and briquettes from biomass.
- Opportunity is also high for improving and using cogeneration for both heat and electricity generation in the cement, sugar, pulp and paper etc. industries.
- There is further potential for industrial enterprise in sectors such as bricks and ceramics by replacing or upgrading traditional kilns by high efficiency processes such as continuous kilns, non-fired bricks, and changing fuel from coal to gas.
- Improving energy management in enterprises also presents an opportunity for energy saving.
- Training to expand knowledge and expertise of technicians. Personnel development of ECCs helps promote increased output in research and development, as well as optimizing an enterprise's operations. Business enterprises are a major sector for promoting energy efficiency.

The type of support required through the SE4ALL initiative to promote energy efficiency in Vietnam was discussed based on the barriers and future energy needs of the country. The following areas were considered as needing support:

- Technical support in the following areas for:
 - Implementing energy efficiency opportunities in coal-fired thermal power plants.
 - Implementing cogeneration in the cement and steel industries.
 - Optimization in energy-used systems, such as boilers, kilns, refrigeration, motors etc.
 - Implementing energy management in industry following standards such as ISO50001.
 - Establishing a knowledge center for energy efficiency so that the performance of different energy efficiency options can be calculated and energy efficiency opportunities disseminated.
 - Promoting renewable energy such as solar, wind, biomass and small-scale hydro-power.
- Support for policy development:
 - The energy price should be effective so that it can support the use of energy in remote areas, encourage the implantation of energy efficiency options applying cogeneration as well as the use of renewable energy.
 - The creation of a competitive market for electricity and other fuel sources.
 - Research and improved benchmarks for different industries.
 - Providing requirements for and standards of energy efficiency for some significant energy consumption equipment such as boilers, compressors, motors, etc.
 - Setting the requirements for fuel suppliers that can sustain the quality supplied to the industries.
 - Provide requirements for energy management for use in significant energy-consuming industries (e.g., brick kilns, steel mills, etc.)
- Support for capacity-building:
 - To conduct energy audits with qualified energy management consultants.
 - For energy conservation centres in the different provinces in terms of knowledge of the main energy consuming types of equipment in industry such as boilers, pumps and

fans, refrigeration systems, electrical systems and motors, as well as different methodologies for energy saving in industry.

- Carry out research on different technologies related to energy use.
- Financial support for:
 - Capacity-building
 - Soft loans to carry out energy-efficiency programmes in industry
 - Conducting workshops and exhibitions to connect technical service suppliers with the business sector and vice versa
 - Organising campaigns to increase awareness of energy conservation, global warming, etc.

Conclusions. The consultation workshop benefited from the productive discussions, and the participants gave their opinions and views based on their experiences and knowledge. Many participants have had actual experience in research, conducting energy audits for enterprises and carrying out energy projects in different sectors.

The following points could be summarized from the discussions:

- Vietnam, with a high rate of economic development, is also expected to have a higher rate of energy consumption.
- Vietnam pays great attention to energy efficiency, which is one of the national target programmes (VNEEP).
- Vietnam has high potential for energy saving in industry, building and construction, transportation, and electricity generation.
- Support is needed in Vietnam for capacity-building, finance to carry out energy-saving options, and technologies that can reduce energy use in the different sectors.

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