



# INVESTING IN ENERGY EFFICIENCY

Stimulating Green Economic Growth  
in Cambodia as a COVID-19 Response



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# Abbreviations

<b>ADB</b>	<b>Asian Development Bank</b>
<b>BAU</b>	<b>Business As Usual</b>
<b>CCCA</b>	<b>Cambodia Climate Change Alliance</b>
<b>EE</b>	<b>Energy Efficiency</b>
<b>EMS</b>	<b>Energy Management System</b>
<b>EPC</b>	<b>Energy Performance Contracting</b>
<b>ERRF</b>	<b>Energy Efficiency Revolving Fund</b>
<b>ESCO</b>	<b>Energy Service Company</b>
<b>IEA</b>	<b>International Energy Agency</b>
<b>IFC</b>	<b>International Finance Corporation</b>
<b>LED</b>	<b>Light-emitting Diode</b>
<b>NCDD</b>	<b>National Committee for Sub-National Democratic Development</b>
<b>NCSD</b>	<b>National Council for Sustainable Development</b>
<b>NDC</b>	<b>Nationally Determined Contribution</b>
<b>NEEP</b>	<b>National Energy Efficiency Policy</b>
<b>MEF</b>	<b>Ministry of Economy and Finance</b>
<b>MEPS</b>	<b>Minimum Energy Performance Standards</b>
<b>MISTI</b>	<b>Ministry of Industry, Science, Technology, and Innovation</b>
<b>MME</b>	<b>Ministry of Mines and Energy</b>
<b>MOE</b>	<b>Ministry of Environment</b>
<b>RGC</b>	<b>Royal Government of Cambodia</b>
<b>SME</b>	<b>Small and Medium-sized Enterprises</b>
<b>UNDP</b>	<b>United Nations Development Programme</b>
<b>USD</b>	<b>US Dollar</b>

# Glossary

## Term

## Definition

### **Air Pollution**

Air pollution is the contamination of indoor or outdoor air by a range of gases and solids that modify their natural characteristics. Key pollutants harmful to health include particulate matter (PM2.5 and PM10), carbon monoxide (CO), ozone (O3), black carbon (BC), sulphur dioxide, and nitrogen oxides (NOx).

### **Energy Efficiency (EE)**

Energy efficiency refers to a method of reducing energy consumption by using less energy to attain the same amount of useful output.

### **Energy Efficiency Label**

Energy efficiency labels indicate the energy efficiency level of an appliance or piece of equipment, and make products of the same category comparable regarding energy performance.

### **Energy Efficiency Revolving Fund (EERF)**

An energy efficiency revolving fund (EERF) provides financing and related services to its clients in public or private entities to facilitate their investment in energy efficiency projects. EERFs are designed to be financially sustainable by lending for energy efficiency investment and then recovering the investment costs and associated fees through the derived energy cost savings.

### **Energy Management System (EMS)**

A national energy management system (EMS) aims to establish a structure for implementing plans to improve energy performance, including energy efficiency and effective management, and reporting of energy use in the commercial and industrial sectors.

### **Energy Performance Contracting (EPC)**

An EPC is a mechanism for organizing energy efficiency financing. The EPC involves an Energy Service Company (ESCO), which provides assorted services, such as finances and guaranteed energy savings.

<b>Energy Service Companies (ESCOs)</b>	Energy Service Companies (ESCOs) provide energy services, facilitate access to external capital for EE project implementation, and provide guaranteed savings, usually through Energy Performance Contracting (EPC).
<b>Green Bond</b>	Green bonds are an emerging instrument in which proceeds are designed to be used to fund climate investments such as projects that aim to reduce greenhouse gas (GHG) emissions or are geared towards other sustainability-related purposes.
<b>Guarantees</b>	Guarantees in financing are mechanisms that protect investors from a borrower's failure to repay because of pre-specified events.
<b>Mezzanine Loan</b>	A mezzanine loan is a form of financing that blends debt and equity. Lenders provide subordinated loans (less senior than traditional loans), and they potentially receive equity interests as well. Mezzanine loans typically have high interest rates and flexible repayment terms.
<b>Minimum Energy Performance Standards (MEPS)</b>	MEPS define the minimum energy performance level that an electrical appliance or piece of equipment must achieve before it is imported into the country and sold to the consumer. MEPS work together with EE labels.
<b>On-bill Financing</b>	On-bill financing refers to a loan made to a utility customer - such as a homeowner or a commercial building owner - the proceeds of which would pay for energy efficiency improvements. The utility collects regular monthly loan payments on the utility bill until the loan is repaid.
<b>Passive Cooling</b>	Refers to all urban planning and building design measures that reduce the need for cooling without consuming energy.
<b>Urban Heat Island</b>	An urban heat island is an urban area or metropolitan area that is significantly warmer than its surrounding rural areas due to the high thermal mass of surface materials (buildings, roads, and paved surfaces) and lack of green spaces.

# 1 Introduction

## 1.1 Definitions

Energy efficiency (EE) is a way of managing and restraining energy demand growth in an economy. In simple terms, it means consuming less energy for the same services. Energy efficiency encompasses all changes that result in a reduction in the energy used for a given energy service or level of activity.<sup>1</sup> This reduction in energy consumption is not necessarily associated with technical changes since it can also result from better organization and management or improved economic efficiency in the sector.

In economic terms, energy efficiency includes all measures that decrease the amount of energy used to produce one economic activity unit. This matrix also includes energy intensity and is used to measure the progress in the energy efficiency of an economy. Energy intensity is expressed as the energy used per unit of gross domestic product (GDP) or value added.

According to the International Energy Agency, energy efficiency is the first means of fuelling a sustainable global energy system. It is globally recognized as a critical resource towards global low-carbon economic and social development. Cost-effective energy efficiency improvements can have positive macroeconomic impacts, boosting economic activity and often leading to increased employment. Energy efficiency also reduces the amount of energy required to deliver services, such as mobility, lighting, heating, and cooling. Lowering the cost of energy services frees up resources for households, businesses, and governments.<sup>2</sup>

## 1.2 Energy Efficiency – A Green Recovery Strategy

The COVID-19 pandemic was far more than a health crisis. It affected societies and the way we live, and questioned the status quo norm. Looking at the impact, as governments concerned, disrupted supply chains of agro-food products combined with distribution and logistics problems, deepened inequalities and increased poverty, making it even difficult to achieve Sustainable Development Goals (SDGs).

<sup>1</sup> Definition according to the World Energy Council

<sup>2</sup> Economic Benefits – Multiple Benefits of Energy Efficiency – Analysis – IEA.  
Retrieved from: <https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/economic-benefits-2#abstract>

Many governments have started to consider how to revive their national economies under the new normal. Different sectors of an economy provide a varying degree of opportunities. If the revival of these sectors is combined with energy efficiency investment, robust economic growth can be achieved while also supporting a country's clean energy transition.

Investments in energy efficiency have one of the highest job creation potentials out of all sustainable recovery measures. Even before the COVID-19 crisis, more than 3.3 million people held jobs in the energy efficiency industry in the United States and Europe alone (IEA, 2020). Most of them were employed by small and medium-sized businesses. Well-designed economic recovery programs that promote energy efficiency support existing jobs, create new jobs, and boost economic activity in critical labour-intensive sectors such as construction and manufacturing.

Energy efficiency also delivers longer-term benefits by enhancing competitiveness, improving energy affordability, lowering energy bills, decreasing reliance on energy imports, reducing greenhouse gas emissions, and freeing up funds to spend in other sectors.

## 1.3 Cambodia's Carbon Neutral Future

In 2020, Cambodia submitted its Updated Nationally Determined Contribution (NDC) and committed to a variety of climate change mitigation actions. Thirteen out of 32 mitigation actions listed in the NDC update are in the field of energy efficiency. Promoting and incentivizing energy efficiency in transport, buildings, cement manufacturing, and other industry sectors is key to reducing this emission (NCSD/MOE, 2020).

Cambodia is one of the few developing countries in Asia that has a strategy toward carbon neutrality in place. The Long-Term Strategy for Carbon Neutrality (called LTS4CN) was submitted to UNFCCC in December 2021 and outlines priority mitigation actions to achieve the goal of a carbon-neutral economy by 2050. Key mitigation actions in the energy sector include investments in energy efficiency measures in buildings and industry. In this context, energy efficiency was one of the most cost-effective mitigation actions, with a negative marginal abatement cost of -132 US-Dollar per ton of CO<sub>2</sub> equivalent.

The Ministry of Mines and Energy (MME) has finalized the National Energy Efficiency Policy (2021-2030) which has the vision is “to achieve a more energy efficient economy through the creation of a suitable policy and regulatory environment, removal of barriers, and enhanced investment opportunities on energy efficiency.”<sup>3</sup> This policy will create an enabling environment for energy efficiency in the country and implement piloting and demonstration. It covers four relevant sectors, namely, buildings, industry, transport, and public services.

<sup>3</sup> RGC (2021). National Energy Efficiency Policy (2021-2030). Draft for discussion (February, 2021)

Moreover, the Ministry of Economy and Finance has developed a post-COVID-19 economic recovery plan 2021-2023, which looks at the immediate response and recovery that provides gains to the economy by investing in sustainability that included the promotion of RE as a competitive factor to attract investor and energy efficiency as one of the key areas in the recovery plan. This publication aims to contribute to above mentioned plans and strategies by analysing energy efficiency investment potential as an economic stimulus for recovery and achieving carbon neutrality. The report highlights specific financing mechanisms and policy instruments suitable for fostering Cambodia's energy efficiency in the short, medium, and long term.

## 2 Multiple Benefits of Energy Efficiency

Increased investment in energy efficiency could bring significant benefits to Cambodia's economy, the natural environment, and the whole of society. Figure 1 illustrates the benefits of energy efficiency, which are described in more detail in the following sections.

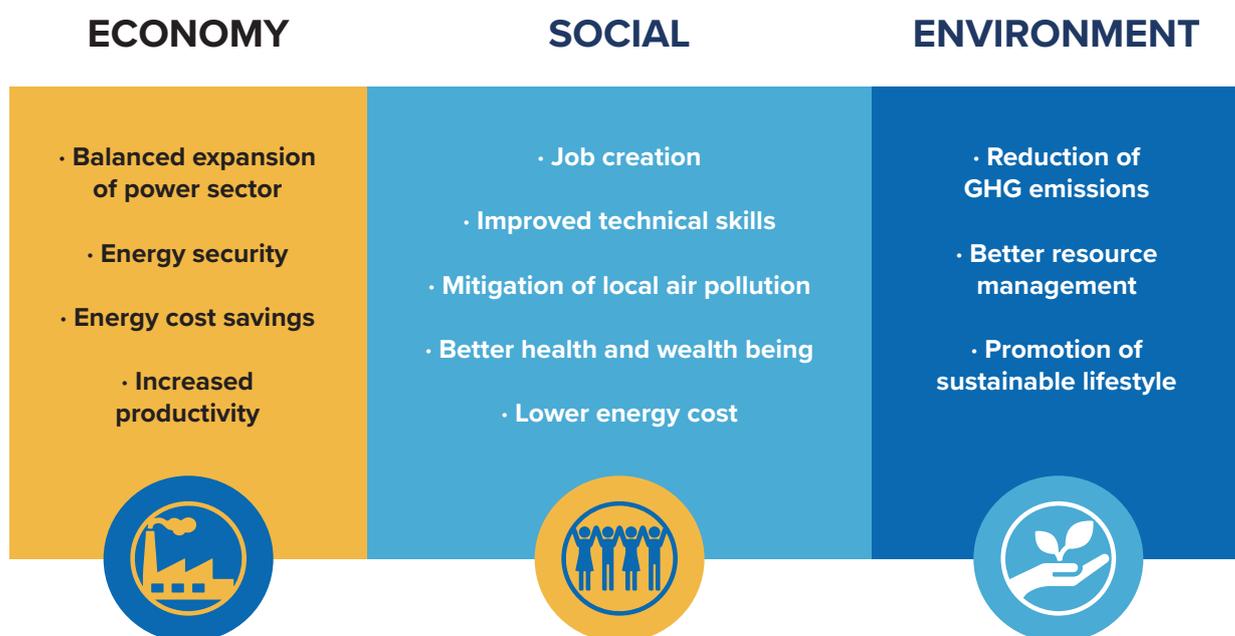


Figure 1: Economic, Social, and Environmental Benefits of Energy Efficiency

### 2.1 Economy

#### Balanced Expansion of Power Sector and Energy Security

Cambodia is not self-sufficient in energy resources and imports 100 percent of the coal and petroleum products used to fulfil its energy needs. The expansion of energy access is a vital requirement for economic development, and energy security is a priority of the

government. The sharply rising energy demand is increasingly met by coal and petroleum products that are imported. The net energy imports had almost doubled from 1.8 Mtoe in 2010 to 3.3 Mtoe in 2018.<sup>4</sup>

Energy efficiency measures and programs will slow down the fast-growing energy demand in the country. Additionally, they have enormous potential to reduce peak demand and, consequently, to decrease investment in power generation, transmission, and distribution systems. This will improve the energy security in the country, and at the same time reduce the risk of power outages like those seen in 2019.

### **Improved Competitiveness and Productivity**

Saving energy in industries and buildings will reduce operational costs and improve companies' productivity and competitiveness. Energy efficiency investments at the company level have a short payback time, and can easily achieve up to 20% of energy-saving (GGGI, 2018).

The firm-level payback time for energy efficiency is short and ranges from as low as four months up to a few years. Simulations from an economic analysis of greening the industrial sector in Cambodia showed an average payback of two to six years across four subsectors. The subsector with the shortest payback time was electronics, followed by garments, food processing, and bricks. Economy-wide payback times for green investments like energy efficiency ranged between 2.5 and 4.4 years. (GGGI, 2018)

### **Lowering Energy Bills**

The Royal Government of Cambodia (RGC) is aiming to make electricity affordable through tariff reduction. Electricity bills can also be reduced by using power more efficiently, for example through efficient appliances and better insulated buildings. An urban middle-class household in Phnom Penh could reduce their annual electricity bill by \$545 USD by using efficient LEED lighting and energy-labelled refrigeration and cooling equipment (UNDP, 2020b). Money saved in electricity costs can be used for other purposes such as education and health.

## **2.2 Social**

### **Job Creation**

Energy efficiency has significant job creation potential. It is estimated that more than 500,000 additional jobs could be created by 2030 if Cambodia follows the Green Industry (GI) scenario, which promotes energy efficiency and other environmental action (GGGI, 2018). Energy efficiency investment will also lead to an increase in knowledge for the new workforce in the EE market.

<sup>4</sup> IEA, 2020: Cambodia Energy Statistics. Retrieved from: <https://www.iea.org/countries/cambodia>

The International Energy Agency (IEA) conducted an economic modelling on green recovery measures in response to the COVID-19 crisis. They concluded that energy efficiency in buildings and industry, together with solar energy, creates the most jobs per million dollars of investment. On average, these three measures create between 10 and 15 jobs for every one million dollars invested (Figure 2).

New jobs in the energy efficiency market are created for energy auditors or managers, for people producing and supplying EE materials and EE technologies, and, finally, for those installing and maintaining such materials and technologies. A substantial employment gain can also be expected in the construction sector.

### Jobs per million USD

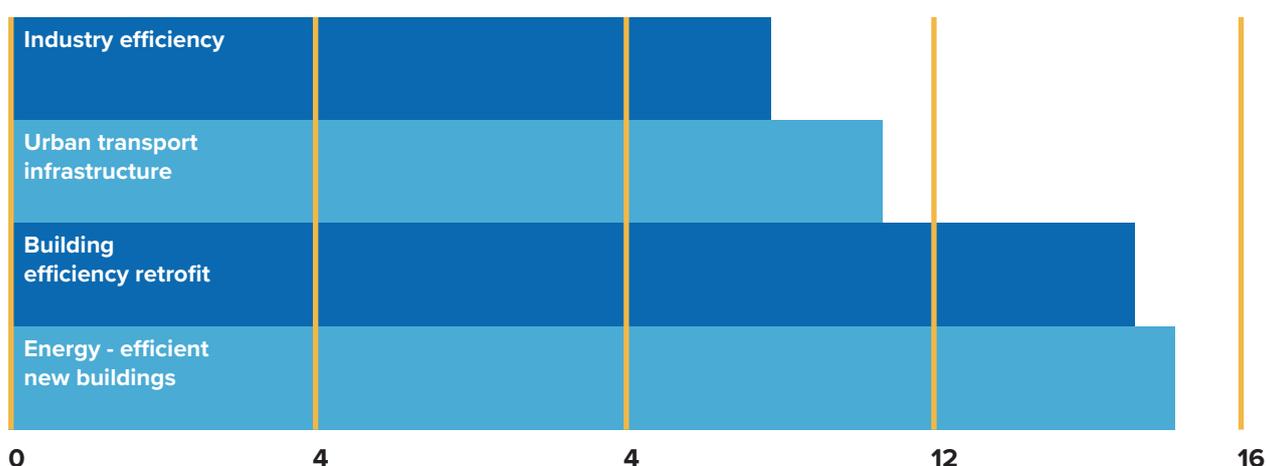


Figure 2: Construction and Manufacturing Jobs Creation Potential for EE Investments <sup>5</sup>

### Health and Well-being

Air pollution threatens the health of people. Estimates in 2018 reveal that 9 out of 10 people globally breathe air that does not meet WHO Air Quality Guidelines. Air pollution in Southeast Asia contributes to 2.4 million premature deaths every year. <sup>6</sup> Saving energy reduces GHG emissions and local air pollution, which results in better health for citizens. Emission standards for combustion vehicles and generators and the promotion of mass transportation and electric vehicles will reduce air pollution in cities.

Heat stress is another internationally recognized health impact linked to climate change. Considering energy-efficient design and passive cooling principles in cities can reduce heat stress exposure and improve people’s well-being. Investments in green infrastructure like parks and vegetation for shading buildings and roads will reduce the urban heat island effect in Cambodia’s cities. Lower outdoor temperatures have a positive rebound effect resulting in less cooling energy for buildings.

<sup>5</sup> IEA (2020) Sustainable Recovery. World Energy Outlook Special Report. Retrieved from: <https://www.iea.org/reports/sustainable-recovery/evaluation-of-possible-recovery-measures>

<sup>6</sup> WHO Website. Retrieved from: <https://www.who.int/southeastasia/health-topics/air-pollution>

## 2.3 Environment

Lower GHG emissions through energy efficiency result in the reduction of local indoor and outdoor air pollution. This decreases the risk of respiratory diseases and improves the health situation of Cambodian people. Similarly, energy-efficient and green design improves the urban environment by reducing heat stress for urban dwellers. The environmental benefits of energy efficiency include reducing GHG emissions, improving resource management, and transitioning towards a more sustainable lifestyle through behavioural change.

Out of 32 climate change mitigation actions identified in the NDC update 2020, 13 actions are linked to energy efficiency. This shows that Cambodia can achieve major emission reductions by promoting energy efficiency in transport, buildings, cement manufacturing, and other industry sectors (Figure 3).

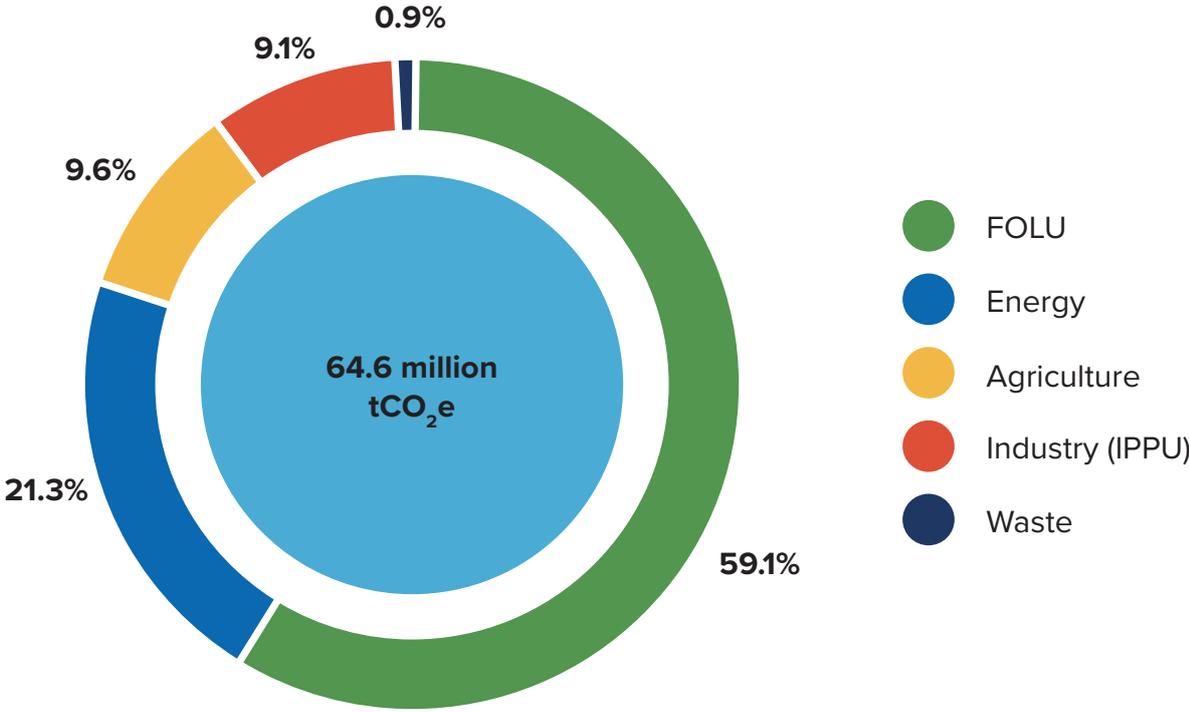


Figure 3: Sectoral Breakdown of Emission Reduction Under NDC Scenario 2030 (NCSD/MOE, 2020)  
[Note: Energy includes electricity, transport, and buildings; FOLU = Forestry and other land use]

The energy sector includes electricity, transport, and buildings and amounts to 38 million tonnes of CO<sub>2</sub> equivalent, the second highest GHG mitigation potential in 2030 (Table 2-1). GHG mitigation potential in industry is further estimated to be 6 million tonnes of CO<sub>2</sub> equivalent. Most mitigation actions related to energy efficiency are in the energy and industrial sector. In conclusion, roughly 30% of GHG emission reductions can be achieved by investing in energy efficiency and renewable energy.

Table 2-1: Emission Savings Under NDC Scenarios in 2030 (NCSD/MOE, 2020)

Sector	GHG Emission Reduction (M tCO <sub>2</sub> e)
FOLU	38.1
Energy	13.7
Agriculture	6.2
Industry (IPPU)	5.9
Waste	0.6
<b>Total</b>	<b>64.6</b>

Similarly, Cambodia's Long-Term Strategy for Carbon Neutrality (LTS4CN) recognizes the environmental benefits of energy efficiency. The GHG emission modelling suggested that energy sector related emissions could be reduced by 74% in 2050 compared to the Business-As-Usual (BAU) scenario. Substantial emissions reductions until 2030 come from energy efficiency and conservation through the implementation of the National Energy Efficiency Policy in buildings, industry, and public services.

Table 2-2: GHG emissions projections and reductions in 2050 under LTS4CN (RGC, 2021)

Sector	BAU scenario (MtCO <sub>2</sub> e)	Emissionis reduction in LTS4CN scenario (MtCO <sub>2</sub> e)	Emissionis balance in LTS4CN scenario (MtCO <sub>2</sub> e)
Agriculture	34.9	-15.6	19.3
Energy	82.7	-54.3	28.2
FOLU	21.2	-71.4	(-50.2)
IPPU	10.7	-9.1	1.6
Waste	6.5	-5.3	1.2
<b>Total</b>	<b>156.0</b>	<b>155.6</b>	<b>0.3</b>

### 3 Investment Opportunities

In response to COVID-19, the RGC is concerned with creating economic stimulus packages that achieve immediate impact in terms of job creation and supporting industry at scale and with speed. Major EE investment opportunities were identified in the industry, building, and public sectors (see Table 3-1). They will be discussed more in detail in the following sections.

Table 3-1: Financial Costs and Benefits of Major Energy Efficiency Actions Considered by the Nationally Determined Contributions (NDCs) of Cambodia (Source: NDC Update, 2020-2030)

NDC Mitigation Action in the Energy Efficiency Field	Financial Costs <sup>7</sup>	Financial Benefits	Co-benefits (Environmental, Social, and Adaptation)	Lead Ministries
<b>Buildings</b>				
Application of energy efficiency labelling & MEPS <sup>8</sup> (lighting, cooling & equipment)	USD 250 million	USD 280 million	Labelling and standard product information of the consumption of energy	MME
Building energy codes and enforcement/certification for new buildings and major renovation	USD 25 million	USD 40 million	Energy efficiency standards, laws and regulations concerning building energy codes are being elaborated and promulgated	MME
Inclusion of performance requirements of Passive Cooling Systems in Building Energy Code of Cambodia	USD 0.8 million	ROI: 44% Payback period: 2.25 years	Improved air quality, more jobs and better economy, better energy security and grid reliability	MLMUPC
Climate-friendly cooling of public sector buildings	USD 67 million	Not available	Reduced GHG emissions – climate-friendly solutions to cooling buildings reduces the reliance on ACs which are a source of GHGs Improved living conditions – as temperatures rise, cooling of buildings is a necessity to avoid heat stress and the subsequent health risks	NCS D
Implementation of National Cooling Action Plan	USD 50 million	USD 1,320 million	Improvement in affordability and access to cooling for the population; improvement in local R&D and manufacturing; enhancement of customer trust and promotion of new & local market players; and generation of jobs and boost in economy	MLMUPC

<sup>7</sup> Financial cost and benefits were submitted by the lead ministries during the process of updating the NDC and are based on secondary studies or the ministry’s estimations.

<sup>8</sup> Minimum Energy Performance Standards for electrical appliances and equipment

Table 3-1: Financial Costs and Benefits of Major Energy Efficiency Actions Considered by the Nationally Determined Contributions (NDCs) of Cambodia (Source: NDC Update, 2020-2030)

NDC Mitigation Action in the Energy Efficiency Field	Financial Costs	Financial Benefits	Co-benefits (Environmental, Social, and Adaptation)	Lead Ministries
<b>Industry</b>				
Promote sustainable energy practices in manufacturing (garment, bricks, food & beverage)	USD 90 million	USD 276 million	Increased productivity and competitiveness, better health & safety for workers, job creation, waste reduction	MISTI
Introduction of efficient electrical industrial motors and transformer	USD 16 million	USD 12 million	Resolve economic viability of investing in the improvement of energy efficiency of the equipment	MME
Improvement of process performance of EE by establishment of energy management in buildings/industries	USD 50 million	USD 60 million	Training of a certain number of energy managers/companies by DTEBP	MME
<b>Public Services</b>				
Implementation of “passive cooling” measures in the cities, public, and commercial buildings	USD 49 million	ROI: 22% Payback period: 4.5 years	Health and well-being of the citizens, energy cost savings to the consumers, improved aesthetics, increased productivity of the population, vegetation acting as carbon sinks	MLMUPC
Efficient off-grid street lightening	USD 10 million	USD 15 million	Improved knowledge of local governance on impact of climate change will lead to mitigating GHG emissions; NCDD will also implement ESS, Gender, and M&E along with climate action	NCDD
Battambang city transitions to a green city	USD 8 million	USD 15 million	Improved knowledge of local governance on impact of climate change will lead to mitigating GHG emissions; NCDD will also implement ESS, Gender, and M&E along with climate action; paradigm shift	NCDD
<b>Cross-Sector</b>				
Public awareness campaigns, through energy efficiency info centres	USD 20 million	USD 32 million	Reducing inefficient appliances/ technologies used; Informing citizens of possibilities to improve EE and of related benefits	MME

## 3.1 Buildings

Buildings and construction sector is one of the central pillars of the Cambodian economy. Stimulus policies targeting buildings have the most significant macroeconomic impacts because the sector has strong potential for activating the local value chain. Currently, the country has no standards and regulations that promote energy efficiency in buildings and incentivize investments in this sector.

Implementing the National Cooling Action Plan will bring the highest financial savings of USD 1,320 million, with a total investment need of USD 50 million. The introduction and broad application of energy efficiency standards and labels in Cambodia can result in financial benefits of USD 280 million by investing USD 250 million. Building energy codes and enforcement for new buildings and significant renovations, combined with voluntary green building certification, requires an investment amount of approximately USD 25 million and can achieve financial benefits of USD 40 million.

### Public Buildings

Cambodia's government can lead by example by considering EE technology in public procurement such as for new buildings, leased buildings, appliances, vehicle fleets, public transport, and infrastructure. Including energy efficiency measures and technologies in public building infrastructure with minimal cost resulting in a long-term saving opportunity by lowering the government's electricity bills. Investment potential for efficient cooling of public buildings is estimated at USD 67 million.

### Commercial and Residential Buildings

A further analysis conducted for the residential and commercial building sector suggests nine policy interventions that have significant financial benefits (see Table 3-2). The growing household appliances stock and cooling demand will contribute to energy demand growth in the coming decade. Of nine policy measures investigated for the residential and commercial building sector, four are related to cooling and refrigeration. However, efficient lighting also brings considerable financial benefits at reasonable investment costs.

Priority should be given to:

- Phase-out incandescent and fluorescent lamps by CFL and LED
- Promote EE air-conditioners (ACs)
- Promote chiller and HVAC systems
- Promote EE refrigerators
- Adopt EE cookstove/biogas
- Promote the use of LPG stoves
- Adopt and promote solar water heaters
- Raise awareness of and build capacity on energy efficiency
- Establish the operation of energy efficiency revolving fund

Table 3-2: Mitigation Action for the Building Sector Suggested in the NDC Update 2020 (UNDP, 2020a)

Mitigation Action	Finance (Million USD / Year)		Co-benefits (Environmental, Social, and Adaptation)
	Costs	Benefits	
Phase-out of Incandescent and Fluorescent Lamps by CFL and LED	8.3	25	Save electricity expenditure and national income and reduce operation costs
Promotion of EE Air-conditioners (ACs)	5.4	16	Address rapid electricity demand and reduce operation costs for end-users and adapt to a warming climate
Promotion of Chiller and HVAC Systems	2.4	7	Address rapid electricity demand and reduce operation costs for end-users
Promotion of EE Refrigerators	11.4	34	Address rapid electricity demand and reduce operation costs for end-users
Adoption of EE Cookstove/Biogas	3.3	10	Save energy and biomass and reduce indoor air pollution
Promote the use of LPG Stoves	8.3	25	Save energy and biomass and reduce indoor air pollution
Adopt and promote Solar Water Heaters	5.4	16	Address rapid electricity demand and reduce operation costs for end-users
Awareness-raising of and capacity building on energy efficiency <sup>9</sup>	2	3.2	Ensure sustainability and enhance the chance of success
<b>Total</b>	<b>34</b>	<b>101</b>	

## 3.2 Industry

Like the building and construction sector, the regulatory framework on industrial energy efficiency is still under development. In the absence of standards and regulations, the industry uses inefficient equipment, and has poor energy management practices resulting in higher energy costs.

Establishing a National Energy Management System (EMS) can help industries reduce their electricity cost and build capacities of the local the local workforce, creating new jobs creation such as for energy managers or auditors.

Energy efficiency improvement or technology replacement in the SME sector might be challenging due to the limited technical capacities and small scale nature of SMEs. Following are few solutions:

- Bulk procurement and direct install programs that involve the government or contracted partners can deliver EE upgrades in hard-to-reach sectors and technologies.
- Through bulk procurement and on-the-ground delivery under one agency's responsibility, it is possible to achieve EE investments at lower cost, scale and speed.

<sup>9</sup> MME estimate for the NDC update

Investment projects that are specific for industries were identified and quantified during the process of updating the NDC, and include:

1. **Energy efficient industrial motors and transformers**, which require an investment of USD 16 million and is expected to result in the financial benefit of USD 21 million for the industries in reduced energy cost.
2. **Promoting energy management and other energy-efficient technologies** in major industries (including garment, brick, food and beverage) with an estimated investment of USD 90 million and will result in saving of USD 276 million until 2030.
3. Improvement of **energy management in buildings/industries** requires an investment of USD 50 million and will result in the financial benefit of USD 60 million (refer to Table 3-1).

### 3.3 Public Infrastructure

Considering energy efficiency in large-scale public infrastructure investment areas can generate more jobs and leverage both public procurement and local value chains. For instance, India's Street Lighting National Program has upgraded around 11 million streetlights with efficient LEDs and generated 13,000 jobs, while reducing greenhouse gas emissions by 5 million tonnes per year.<sup>10</sup>

Following are potential areas for energy efficiency investments in Cambodia's public infrastructure.

- Highly efficient public buildings
- Low-energy consuming affordable housing
- Green city concept for reducing urban heat island effect
- Smart and energy-efficient public street lighting
- Smart grids
- Electric vehicle charging infrastructure
- Public transport infrastructure
- Creation of cycling lanes and pedestrian zones

Smart street lighting upgrades can also deliver multiple infrastructure services, as street light poles can also serve as electric-vehicle charging stations and include 5G telecommunications infrastructure.

<sup>10</sup> Streetlight National Program Dashboard, <http://slnp.eeslindia.org/> (accessed 25 March 2020).

Energy efficiency investment potential related to public infrastructure in Cambodia amounts to over USD 67 million, covering three areas:

1. **Green city concept** for Battambang
2. **Efficient off-grid street lighting**
3. Implementation of “**passive cooling**” measures in the cities <sup>11</sup>

The first and second investment projects show a financial benefit of USD 15 million. The third project has a return on investment of 22% (refer to Table 2-1).

### **3.4 Cross Sector**

Conducting awareness-raising campaigns for both policymakers and those involved in the implementation plays a crucial role in establishing a sustainable energy efficiency market. Making available the information on energy efficiency programs and incentives available is required to inform and educate all key stakeholders.

Raising public awareness through the establishment of EE Info Centres or EE cells. Such centres should be attached to organizations or structures that are visible to the implementers. An EE Info Centre might organize energy awards, energy week, and energy clubs.

An investment of USD 20 million is required to establish and run a network of EE Info Centres. This action would reduce the energy consumption in 2030 by 2% and bring monetary benefits of USD 20 million (refer to Table 2-1).

<sup>11</sup> In this context “Passive Cooling” refers to all measures that decrease the urban heat island effect in cities, such as green space, parks, vegetation in and around buildings, green roofs, as well as the use of building materials of light colors that reflect the sun.

# 4 Energy Efficiency Financing

With the support from the EU and recently from ADB, MME has developed the National Energy Efficiency Policy 2021-2030. This policy will create the regulatory framework for EE in Cambodia. MME is also drafting a sub-decree on EE standards and labelling for electrical appliances and equipment, which will be adopted once the National EE Policy is in place. This policy recognizes the importance of mobilizing funds and states that EE financing shall primarily rely on public sources of finance at the initial stage to create a market for EE products and services.

Access to energy efficiency financing is recognized to be crucial for the effective implementation of energy efficiency policies and regulations. Energy efficiency projects with high return rates remain unimplemented because of increased investment risk, unavailable information on incentive schemes and mechanisms for project developers, lack of awareness on energy efficiency measures, and a limited skilled workforce. (ACE/GIZ, 2019)

Table 4-1 summarizes the major challenges of energy efficiency financing in Cambodia and highlights opportunities to address these challenges. The most relevant financing mechanism will be explained in the following section.

Table 4-1: Challenges and Opportunities for Energy Efficiency Financing in Cambodia (Adapted from ACE/GIZ, 2019)

Challenges	Opportunities
Effective implementation of National Energy Efficiency Policy	<ul style="list-style-type: none"> <li>- Develop EE regulations and activities for long-term investment security</li> <li>- Strengthen the institutional capacity of line ministries through technical assistance</li> </ul>
Lack of financial mechanism and incentives for the development of the EE sector	<ul style="list-style-type: none"> <li>- Introduce financing schemes suitable for lower market maturity, such as budget financing, grants with co-financing, energy efficiency revolving fund, and utility financing</li> <li>- Provide tax rebates for targeted EE technologies and companies that adopt EE projects</li> </ul>
Limited technical capacity of the private sector	<ul style="list-style-type: none"> <li>- Accompany financing schemes with technical assistance component and capacity-building measures for SMEs, building developers, and banks</li> </ul>
Limited awareness of energy and cost-saving opportunities among end-users and companies	<ul style="list-style-type: none"> <li>- Launch financing scheme together with a public awareness campaign</li> </ul>

# 4.1 Potential Financial Instruments for Energy Efficiency

## Overview

There are many financing instruments available to foster investment in energy efficiency. The type of financing scheme is based on the market maturity and size (see Figure 4). While grants, soft loans, dedicated energy efficiency credits lines, and revolving funds fit best in small energy efficiency markets of early maturity, more sophisticated and performance-based financing can be found in more mature markets.

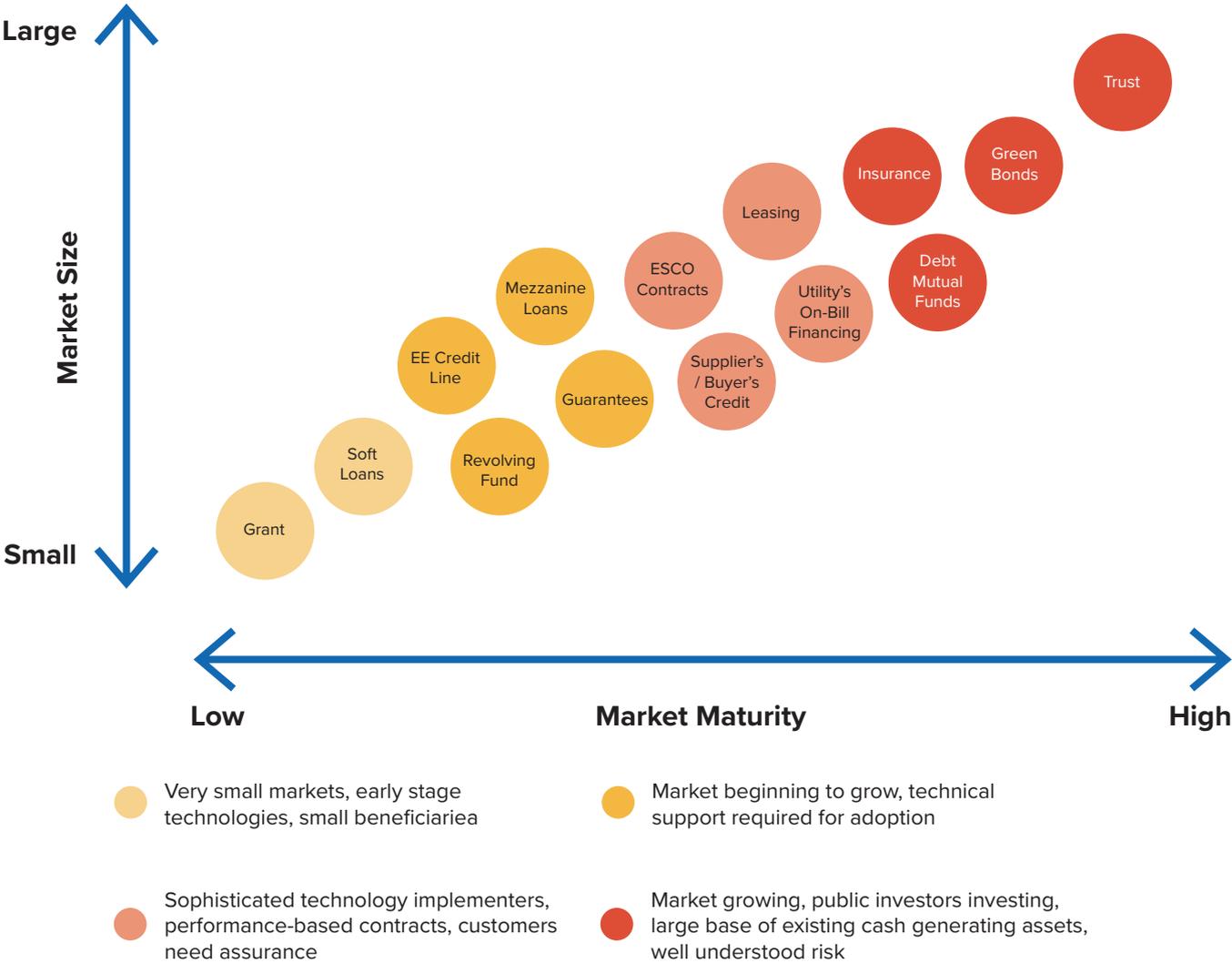


Figure 4: Energy Efficiency Financing Instruments by Market Maturity (Adapted from Wang, Stern, Limaye, Mostert, & Zhang, 2013)

The ASEAN countries provide energy efficiency financing through instruments of early market maturity (Table 4-2). Grants, soft loans, and dedicated energy efficiency credit lines are the most-often applied financing schemes. Singapore and Thailand have established dedicated Energy Efficiency Revolving Funds which have shown satisfactory performance to foster energy efficiency investments. Sometimes such funds are used in combination with public ESCO models to address the lack of technical capacity and aggregate smaller-size projects.

In the following section, financing instruments relevant to Cambodia’s energy efficiency market are explained in more detail. Most of this information was extracted from the report “Mapping of Energy Efficiency Financing in ASEAN” (ACE/GIZ, 2019).

Table 4-2: Energy Efficiency Financing Schemes in the ASEAN Region (Adapted from ACE/GIZ, 2019)

	Grants	Soft Loans	EE Credit Lines	Infrastructure & EE Revolving Funds	Guarantees	ESCO Contracts
Indonesia	✓			✓		✓
Lao PDR	✓					
Malaysia	✓	✓	✓	✓		
Myanmar		✓				
Phillippines	✓					
Singapore	✓	✓	✓	✓		✓
Thailand	✓	✓	✓	✓	✓	✓
Vietnam	✓	✓				

## 4.2 Grants and Other Incentives

Grants are financial awards typically provided to individuals or companies to facilitate or incentivize a determined activity. Grants do not have to be paid back under most conditions, and are often provided by governments, companies, and foundations.

In the energy efficiency sphere, governments often use grants to encourage the adoption of energy-efficient technologies such as insulation and double glazing, among others. Grants are usually directed to a specific sector of the population that would otherwise not be able to adopt these measures. Incentives can also be used to further develop projects and move them towards bankability.

Tax incentives and rebates are similar mechanisms to incentivize investment in energy efficiency. Governments can offer tax deductions on the import duty and sales tax on EE equipment. Like the Qualified Investment Project (QIP) principle, tax reliefs for building and infrastructure developments could be introduced in tourism or other sectors if energy efficiency is considered. Manufacturing, garment, and agro-processing might be other sectors to be targeted.

Rebates are popular market mechanisms to promote the purchase of efficient equipment by households or large energy consumers. These rebates pay down costs of systems and equipment and encourage the use and development of energy efficiency. Most rebate programs offer support for multiple technologies to promote the installation of energy-efficient products or projects, and many are run in partnership with allies like utilities. MME is currently developing the regulatory framework for energy efficiency standards and labelling of appliances and equipment. Once this is in place, rebates can be an attractive mechanism to promote the purchase of energy-efficient appliances.

A study conducted by the Global Green Growth Institute (GGGI) suggests rolling out an incentive scheme for promoting energy efficiency in major manufacturing industry sectors (including garment, brick, food processing, and electronics). The macro-economic modelling concludes that government support of 2% in tax reductions (in case of foregone revenues), or 10% to 15% of the investment in the case of direct incentives, would be a promising intervention option to reduce capital costs and the cost of financing (GGGI, 2018).

## **4.3 Soft Loans and Dedicated EE Credit Lines**

Lending or debt instruments provide borrowers with upfront funding in exchange for repayment of this capital (known as “principal”) along with interest, based on pre-determined timeframes and interest rate terms. Credit lines for energy efficiency measures are extended to end-users at preferential terms in connection with maturity and interest rates. Such credit lines are often provided by national or international development banks and are distributed further to designated markets through regional partner retail banks.

Cambodia has received a soft loan from development banks to develop the power sector. Even though these projects focus on power trade, rural electrification, power transmission, and renewable energy, some energy efficiency elements were included (ACE/GIZ, 2019).

ADB is working closely with MME to assess the EE market and supported the finalisation of National Energy Efficiency Policy (NEEP). In this context, ADB has shown willingness to provide loans to the Royal Government of Cambodia to develop a sustainable energy efficiency market. Once the NEEP is in place, other international development banks and funds might be willing to join.

Such loans could be used to establish dedicated EE credit lines in commercial or public banks for industries and building developers. The recently created SME bank may also play an essential role in providing dedicated EE loans to the SME sector.

Another vehicle for EE loans could be the “Green Financing Institution” developed by Mekong Partners with USAID and the Green Climate Fund (GCF). The Green Financing Institution is envisaged to support and enable Cambodia’s shift towards a greener economy and society, boosting its resilience to the impacts of climate change. The concept is currently under discussion with the National Bank of Cambodia (NBC).

The Cambodian Green Financing Institution’s lending might include equity, debt, convertible or subordinated debt, technical assistance, and other risk management tools. Those eligible for this funding will be firms or projects, either public or private, in the fields of, but not limited to, agriculture, land, water resources, renewable energy, energy efficiency, transportation, and infrastructure.

## **4.4 Energy Efficiency Revolving Fund**

Revolving funds are not new in Cambodia. Nexus established the Clean Energy Revolving Fund (CERF), a pilot debt fund, which enables small and medium agri-businesses to invest in small-scale solar energy solutions by offering affordable finance (REEEP, 2020). The loans are issued following an intensive due diligence process, which Cambodian banks would be unwilling to undertake for small-size loans. The fund managers aim is that Rural Credit Operations (RCO), or other financial institutions, take over the CERF’s portfolio management and continue its expansion. A significant bottleneck of this revolving fund is the current regulations that non-banks cannot manage a loan portfolio with more than USD 250,000 (REEEP, 2020).

An Energy Efficiency Revolving Fund (EERF) provides financing and related services to its clients in public or private entities to facilitate their investment in energy efficiency projects. An EERF is established in energy efficiency markets with low to medium maturity where there are market failures and local banks have perceived energy efficiency as too risky.

EERFs are designed to be financially sustainable by lending for energy efficiency retrofits or, in some cases, investing in projects and then recovering the investment costs and associated fees through the derived energy cost savings. Such funds will help demonstrate the commercial viability of energy efficiency investments and provide a credit history for public agencies and other borrowers. It will pave the way for future commercial financing. (Lukas, 2018).

EERFs may also co-finance projects with commercial banks or even offer guarantees to help bring in commercial financiers. Some EERFs have been designed to finance investments in both energy efficiency and renewable energy (e.g., rooftop solar, solar water heating, and solar cooling).

Table 4-3: The Performance of Thailand's EE Revolving Fund (Irawan & Heikens, 2012)

	Phase 1	Phase 2	Phase 3
Project cost (USD Million)	85.7	94.8	180.5
Revolving Fund Loan (USD Million)	47.7	47.0	94.7
Payback Period (years)	2.4	2.45	2.44
Energy Cost Saving (USD million/year)	35.1	38.7	73.8

The Energy Conservation (ECON) Fund in Thailand is a successful model that has stimulated large energy efficiency investments in energy-intensive sectors while building capacities and confidence within the local banks towards financing energy efficiency. Its highlights include:

- Thailand combined building energy regulations with Energy Efficiency Financing
- Establishment of the Energy Conservation Promotion Fund (ENCON Fund), including an Energy Efficiency Revolving Fund
- Source of ENCON Fund comes mostly from government levies on petroleum products that ranges between 0.07 and 0.25 Thai baht per litre
- The fund is managed outside the government budget system, although the governing body consists of government institutions
- Thailand's EERF is a soft loan:
  - o The fund provides loans to local banks at a zero percent interest rate and with a seven-year final maturity.
  - o In return, banks lend to energy efficiency project owners and developers at a maximum interest rate of four percent.
  - o After recollection funds can be used for further energy efficiency loans.

A fundamental prerequisite for establishing an EERF is demand for financing, namely cost-effective energy-saving investments repaid from the energy savings. According to results from pilot energy efficiency interventions, many energy efficiency measures in Cambodia are highly cost-effective due to the high energy prices. EERF offers various, diverse products for different target groups, as summarized in Table 4-4.

Experience with EERFs around the globe has yielded the following key lessons (Lukas, 2018):

1. The fund should be flexible to adapt to changing market conditions, so the fund does not compete with local lenders. EERFs and commercial bank financing are not mutually exclusive. The EERFs might provide only a portion of the financing, and efforts should be made to coordinate with local banks to streamline applications and approvals and build the capacity of these banks.
2. The financial products need to be designed for the target market, aiming to address the prevailing barriers. When financing or services from other donors become available or as the private sector starts to develop, EERF might shift from providing loans to guarantees as the private sector develops, or shift from the public to residential sector as public financing enters the mainstream.
3. An EERF's governance and management structure must offer sufficient incentives for high performance. It is recommended to establish the fund as an independent organization to ensure the most effective operation. A governing board should be comprised of both public and private sector participants. The institutional setup needs to be simple and lean with a well-incentivized fund manager and competent staff with adequate compensation.
4. The fund should operate based on transparent rules and standardization and aggregation to reduce transaction costs. This is particularly important in small markets like Cambodia. Aggregation can be done in the public sector for EE street lighting or in the industry sector for EE boiler installation/retrofitting, EE motors, or distribution transformers.
5. Access to technical assistance and the development of a project pipeline are crucial to build support for both its day-to-day operations and longer-term sustainability. Substantial time and training are often required to develop the capacity of service and equipment providers.

Energy efficiency revolving funds are widely used in the ASEAN region and have received support from international development banks and other donors. A key advantage of EERFs is that they can help pool funding from governments and different international donors to facilitate coordination. Unlike a typical project team, the staff of such a fund is permanent, allowing the EERF to develop its capabilities over the long term with the aim of achieving the government energy and emission saving targets.

Table 4-4: EERF Financing Products (Adapted from Lukas, 2018)

Product	Description	Suitable for Target Sector		
		Public	Residential	Industrial / Commercial
<b>Debt financing</b>	Soft loans to clients with longer tenor than commercial loans and 100% debt financing.	✓	✓✓	✓✓
<b>Energy service agreements (ESAs)</b>	Beneficiary agrees to pay the current baseline energy bill for the duration of the agreement. EERF invests in the EE measures and recovers investment cost from the energy cost savings.	✓✓	✓	✓
<b>Guarantees</b>	EERF provides commercial banks with partial coverage of the risk involved in extending loans or credit guarantees for EE investments.	✓✓	✓✓	✓✓
<b>Budget captures</b>	Recovering capital through future budget capture is only suitable for public sector.	✓✓		
<b>Forfeiting</b>	Local ESCOs <sup>12</sup> enter into direct energy performance contract with public or private clients. The EERF buys the receival from the ESCO, thereby allowing the ESCO to finance more projects.	✓✓	✓	✓

**Note:** ✓ Suitable ✓✓ Highly suitable

## 4.5 Guarantees

Traditional energy efficiency insurance and guarantee products protect investors from a borrower’s failure to repay because of pre-specified events. Guarantees are effective mechanisms where energy efficiency investments are perceived as high-risk products. Guarantees are so-called de-risking mechanisms suitable for energy efficiency markets at early stages of maturity. A guarantee can be a minimum assurance that protects a portion of the investment through its lifetime, or a back-end guarantee covering the entire investment after a pre-determined timeframe.

Energy savings insurance is a new and innovative insurance product that covers projected energy savings for specifically defined and verifiable energy efficiency measures, as agreed upon in a contract between a SME and technology solution provider. Compensation will be paid to the SME if the promised savings are not realized.

A package of complementary measures is also included in the insurance, including a standardized contract to reduce transaction costs, third-party verification to ensure the quality of the project and the technology provider, as well as credit lines from development banks and grant support to sustain market demand.

<sup>12</sup> Energy Service Company

In the wake of the COVID-19 crisis, the RGB setup a Credit Guarantee Scheme with support from the national financial institutions in the context of the newly established SME Bank. The Credit Guarantee Scheme is supported by the Asian Development Bank (ADB) and the World Bank (WB). The scheme is planned to start with a USD 200 million in funding and is scheduled to take effect at the end of 2020. The Credit Guarantee Scheme will help SMEs attract credit more easily and at a lower cost without collateral.

Energy efficiency investments could be added to this Credit Guarantee Scheme, or a similar mechanism could be set up for dedicated energy efficiency credit lines for SME and real estate actors. It is also possible to access funding through international cooperation agencies and development banks. One commercial bank in Cambodia provided loans for landless farmers, which were made possible through a guarantee provided by the German Development Bank (KfW). A similar financing mechanism could be set up for energy efficiency investments, as EE is a high-priority topic for development banks in the context of green financing.

## **4.6 Energy Performance Contracting and Energy Service Companies**

Energy Service Companies (ESCOs) provide energy services, facilitate access to external capital for energy efficiency project implementation, and provide guarantee savings, usually through Energy Performance Contracting (EPC). EPC allows ESCOs to undertake the implementation of energy efficiency measures on behalf of the end user through an EPC, which often provides a guaranteed level of energy savings to the beneficiary. Furthermore, it allows a sharing of future energy savings between both parties.

There are two distinct types of EPC contracts, “financing Energy Performance Contracts” and “operational Energy Performance Contracts”. The key difference between these contracts lies in the financing arrangement. In operational EPCs, the user is the borrower, and the financing agreement is entered into between the user and the lending institution based on the EPC. In this case, the ESCO’s role is more operational, mitigating technical-related risks and acting as a savings guarantor. In financing EPCs, the project originates from the ESCOs, then ESCOs arrange the third-party financing, implement the efficiency measures, and monitor the project. For large projects, such a centralized role is highly beneficial as the ESCO serves as the main counterpart for the financiers and the beneficiaries.

Public ESCOs are a financing structure that combines the EPC concept with a publicly owned entity set up to fund and own energy efficiency projects implemented in public buildings or infrastructure.

# 4.7 Green Bonds

Corporates or governments often issue bonds when they need to borrow a large amount of money to finance infrastructure projects. Investors can buy the bonds, which are usually traded through brokers under the so-called fixed-income scheme.

Bonds have a maturity date. That means that at some point, the bond issuer must pay back the money to the investors. Unlike stocks, which offer returns based on the profitability of the business from the date the bond was purchased, and allow to receive of returns at a fixed rate.

A green bond is a fixed-income instrument explicitly designed to support specific climate-related or environmental projects. Green bonds typically come with tax incentives to enhance their attractiveness to investors. The benefits of green bonds are highlighted in Figure 5.

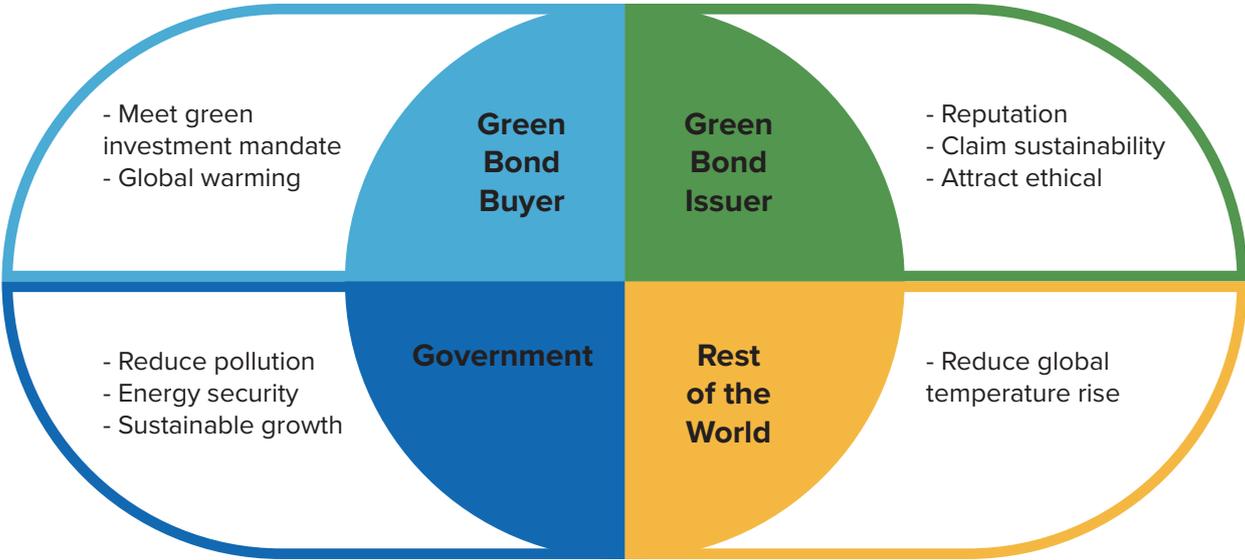


Figure 5: Benefits of Green Bonds (Adopted from Azhgaliyeva, Kapoor, & Liu, 2020)

As a financing instrument, green bonds are increasingly attracting attention by ASEAN governments to finance energy efficiency and renewable energy projects. Five out of ten ASEAN countries have already issued green bonds. Two thirds of the investments are allocated in the building and energy sector (see Figure 6).

Policies subsidizing the cost of green bond issuance are essential for first-time issuers. For example, Malaysia and Singapore disbursed grants to bond issuers to cover the costs of third-party review. (Azhgaliyeva et al., 2020)

Bonds are traded on the national stock exchange. Cambodia has limited experience in issuing and trading bonds. In 2020, there were seven bonds listed on the Cambodia stock exchange, all from corporate companies.<sup>13</sup> Bondholders in Cambodia are entitled to receive a 50 percent discount on withholding tax on bond interest.

In recent years, several initiatives started to address the challenges of the country’s bond market. The bond market offers an attractive proposition to Cambodian corporates. In addition to diversifying their funding sources, the bond market enables issuers to raise more significant amounts of capital with longer maturities and cheaper rates than those available on the loan market.<sup>14</sup>

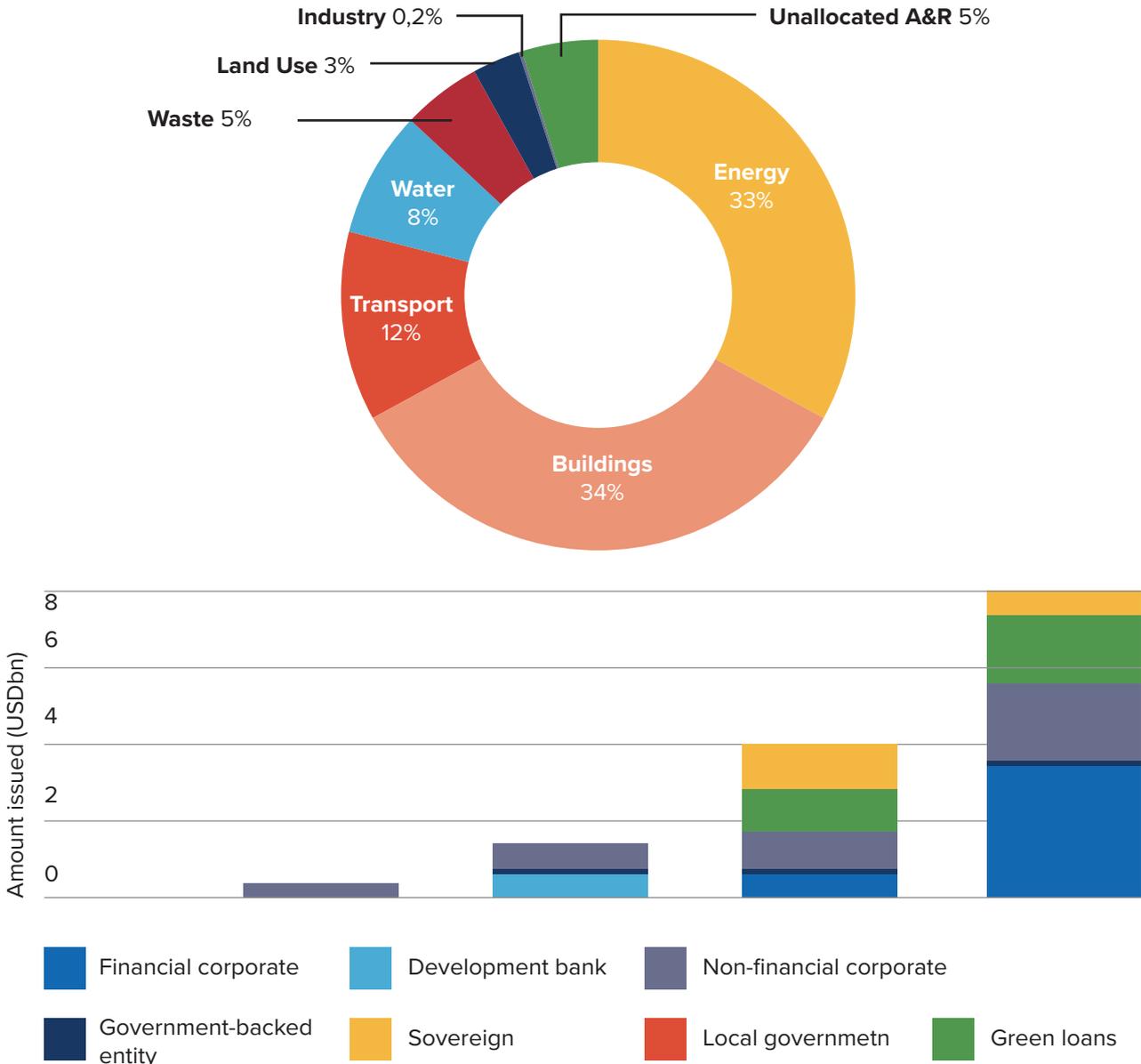


Figure 6: Allocation of Green Bond Investments (left) and Mix of Issuer Type (right) in ASEAN (CBI, 2019)

<sup>13</sup> Investing in bonds a safer alternative. The Phnom Penh Post. 2 August 2020. Retrieved from: <https://www.phnompenhpost.com/banking-securities-business/investing-bonds-safer-alternative>

<sup>14</sup> Cambodian bond market gets a boost from CGIF-backed issuance. The Assett. 5 June 2020. Retrieved from: <https://theasset.com/article/40720/cambodian-bond-market-gets-a-boost-from-cgif-backed-issuance>

Building on success stories, there is potential to progress towards green bonds in Cambodia in the near future (CBI, 2019). The launching of government bonds can also help deepen the domestic capital market and establish a risk-free benchmark for pricing locally issued corporate bonds. The Cambodian government has not yet issued any bonds till date. However, it is expected to diversify its financing instruments once the country climbs up the development ladder. Medium to long-term, the Royal Government of Cambodia might start to issue bonds to be able to finance its investments. Green bonds can play an essential role in scaling up investments in energy efficiency and renewable energy projects.

# 5 Policy Recommendations

In the middle of the current economic crisis, there is an urgent need to develop a comprehensive economic recovery program in response to the COVID-19 crisis. Investments in energy efficiency can play an essential role in ensuring the country's recovery and contribute to Cambodia's low-carbon development path. The following tables suggest policy options that could be rolled out in the short and medium-term.

Table 5-1: Short-term Policy Recommendations

Short-term (1-2 years)	Considerations
Provide incentives to promote EE in manufacturing industries: 2% of tax reductions (in case of foregone revenues) or 10% to 15% of the investment in the case of direct incentives <sup>15</sup>	<ul style="list-style-type: none"> <li>• Link with the Energy Management System (EMS) under preparation by MME</li> <li>• Target priority sectors, e.g., garment, food and beverages, agro-processing, and electronics</li> </ul>
Import tax waiver for EE industrial equipment	<ul style="list-style-type: none"> <li>• A product list of relevant EE equipment is required</li> <li>• Improves the affordability for manufacturing industries and SMEs</li> </ul>
Import tax waiver for EE household appliances	<ul style="list-style-type: none"> <li>• Link with EE Standards and Labels under preparation by MME</li> <li>• Best performing appliances according to EE label (5 stars) could be targeted for the import tax waiver</li> </ul>
Rebate programs for EE appliances	<ul style="list-style-type: none"> <li>• Link to IDPoor welfare program possible</li> <li>• Might be targeted to poorer strata of the population which will result in poverty reduction</li> </ul>
Invest in human resources and capacity building of relevant government staff for efficient EE policy implementation	<ul style="list-style-type: none"> <li>• Involve relevant line ministries: MME, MISTI, and MLMUPC</li> <li>• EE units are required to be established within line ministries</li> </ul>
Green procurement policy	<ul style="list-style-type: none"> <li>• The government can lead by example and promote EE investment by considering EE during the procurement of equipment and construction of new public buildings</li> <li>• Develop procurement templates/guidelines which will ensure equipment and services consider EE</li> </ul>

<sup>15</sup> Based on economic modelling conducted by (GGGI, 2018)

Table 5-2: Medium-term Policy Recommendations

Medium-term (3-5 years)	Considerations
Establish Energy Efficiency Revolving Fund as pooled funding mechanism for the implementation of the National Energy Efficiency Policy (NEEP)	<ul style="list-style-type: none"> <li>• Lean institutional setup</li> <li>• Operate transparently following standardized procedures</li> <li>• Financial products need to be designed for the target market</li> <li>• Flexible enough to adapt to changing market conditions</li> </ul>
Reduction of value-added tax for new green and energy-efficient buildings	<ul style="list-style-type: none"> <li>• Link with green building certification possible</li> <li>• Lowers the price, units are more affordable for the buyers</li> <li>• Balance the additional investment required</li> </ul>
Dedicated EE credit lines for investment in EE industry equipment under the new SME Bank	<ul style="list-style-type: none"> <li>• Link with the introduction of EMS</li> <li>• Capacity building of bankers</li> <li>• A product for relevant EE equipment is required</li> </ul>
Dedicated Credit Guarantee Scheme for EE investments	<ul style="list-style-type: none"> <li>• Link with newly established SME Bank or commercial banks</li> <li>• Build capacity within banking community</li> </ul>
Subsize R&D programs for EE design, technology, and materials for energy savings	<ul style="list-style-type: none"> <li>• Link with energy building code and green building certification</li> <li>• Opportunity to develop local building material and technology market</li> </ul>

A wide variety of financing instruments are available to increase investments in energy efficiency. Experience from ASEAN countries shows success stories that can be adapted to the Cambodian context. While designing financing instruments and related incentive schemes, it is important to bundle potential energy savings in the relevant sector. For specific technology, the financing mechanism should be flexible enough to be adjusted if the market situation changes. Instruments should be accompanied by measures that address the limited technical capacity of involved stakeholders such as building developers, SMEs, and bankers.

## 6 Limitations and Further Studies

This publication offers an overview of potential financing instruments and policy recommendations for fostering energy efficiency investments in Cambodia. It is the first country-specific study of this kind, and further investigation is suggested in the following areas:

- What does an Energy Efficiency (EE) Revolving Fund for Cambodia look like? Who needs to be involved, and which mechanisms are required for its setup?
- How can the Qualified Investment Project (QIP) scheme be used, adapted, or replicated to attract more investment in energy efficiency projects?
- Which types of EE financing incentive schemes can be established under the upcoming New Investment Law?
- What could the specific role of the recently established SME Bank be in promoting energy efficiency?
- How can an EE financing scheme be provided for the residential sector, which is a significant energy consumer in the country?
- Which specific industrial sectors and what kind of EE technologies should the EE credit line prioritize? Who will lead this process?

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# Annex I – Detailed List of EE Actions from NDC Update

Table 0-1: Detailed List of EE Actions Considered by Cambodia’s Updated Nationally Determined Contribution (Adapted from (NCSD/MOE, 2020))

NDC Mitigation Action in the Energy Efficiency Field	Financial Costs	Financial Benefits	Target	Emission Reduction Estimates Until 2030	Co-benefits (Environmental, Social, and Adaptation)	Lead Ministries
<b>Industry</b>						
Promote sustainable energy practices in manufacturing (garment, bricks, food & beverage)	USD 90 million	USD 276 million	24% cumulative emission savings by 2030	5,133 kt CO <sub>2</sub> e	Increased productivity and competitiveness, better health & safety for workers, job creation, waste reduction	MISTI
Introduction of efficient electrical industrial motors and transformer	USD 16 million	USD 21 million	Reduce 2.3% of current electricity consumption in 2030	80 kt CO <sub>2</sub> e	Resolve economic viability of investing in the improvement of energy efficiency of the equipment	MME
Improvement of process performance of EE by establishment of energy management in buildings/ industries	USD 50 million	USD 60 million	- Mandatory energy audits for large electricity consumers - Voluntary scheme for other companies, especially for SMEs to reduce 10% in 2030	100 kt CO <sub>2</sub> e	Training of a certain number of energy managers/companies by DTEBP	MME
<b>Buildings</b>						
Application of energy efficiency labelling & MEPS <sup>16</sup> (lighting, cooling & equipment)	USD 250 million	USD 280 million	Reduce 1.2 TWh (29.7%) of electricity use in 2030	1,000 kt CO <sub>2</sub> e	Labelling and standard product information of the consumption of energy	MME
Building energy codes and enforcement/certification for new buildings and major renovation	USD 25 million	USD 40 million	Reduce 10% of electricity consumption in 2030	N/A	Energy efficiency standards, laws, and regulations concerning building energy codes are being elaborated and promulgated	MME

<sup>16</sup> Minimum Energy Performance Standards for electrical appliances and equipment

Inclusion of performance requirements of Passive Cooling Systems in Building Energy Code of Cambodia	USD 0.8 million	ROI: 44% Payback period: 2.25 years	20% of the newly constructed buildings will comply with Building Energy Code	140.9 kt CO <sub>2</sub> e	Improved air quality, more jobs and better economy, better energy security and grid reliability	MLMUPC
Climate-friendly cooling of public sector buildings	USD 67 million	Not available	Reduce 43,000 tons/year	43 kt CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>Reduced GHG emissions – climate-friendly solutions to cooling buildings reduces the reliance on ACs which are a source of GHGs</li> <li>Improved living conditions – as temperatures rise, cooling of buildings is a necessity to avoid heat stress and the subsequent health risks</li> </ul>	NCSD
Implementation of National Cooling Action Plan	USD 50 million	USD 1,320 million	Enhanced MEPS and F-gas transition for room air conditioners and residential refrigerators targeting the new & existing equipment stock in the country	1,090 kt CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>Improvement in affordability and access to cooling for the population</li> <li>Improvement in local R&amp;D and manufacturing</li> <li>Enhancement of customer trust and promotion of new &amp; local market players</li> <li>Generation of jobs and boost in economy</li> </ul>	MLMUPC
<b>Public Services</b>						
Implementation of “passive cooling” measures in the cities, public and commercial buildings	USD 49 million	ROI: 22% Payback period: 4.5 years	Reducing urban heat island effect in Phnom Penh & Siem Reap	74.5 kt CO <sub>2</sub> e	Health and well-being of the citizens, energy cost savings to the consumers, improved aesthetics, increased productivity of the population, vegetation acting as carbon sinks	MLMUPC
Efficient off-grid street lighting	USD 10 million	USD 15 million	10 Sangkats of Senmonorom municipality, Kep municipality, and Preah Sihanoukville municipality by 2028	N/A	<ul style="list-style-type: none"> <li>a) Improved knowledge of local governance on impact of climate change will lead to mitigation of GHG emissions</li> <li>b) NCDD will also implement ESS, Gender, and M&amp;E along with climate action</li> </ul>	NCDD

Battambang city transitions to a green city	USD 8 million	USD 15 million	5 Sangkats of Battambang municipality integrate green city concept by 2025	N/A	a) Improved knowledge of local governance on impact of climate change will lead to mitigation of GHG emissions b) NCDD will also implement ESS, Gender, M&E along with climate action c) Paradigm shift	NCDD
Cross-sector						
Public awareness campaigns, through energy efficiency info centers	USD 20 million	USD 32 million	Reduce 2% of energy consumption in 2030	25 kt CO <sub>2</sub> e	1. Reducing inefficient appliances/technologies used 2. Informing the citizens of possibilities to improve EE and of related benefits	MME