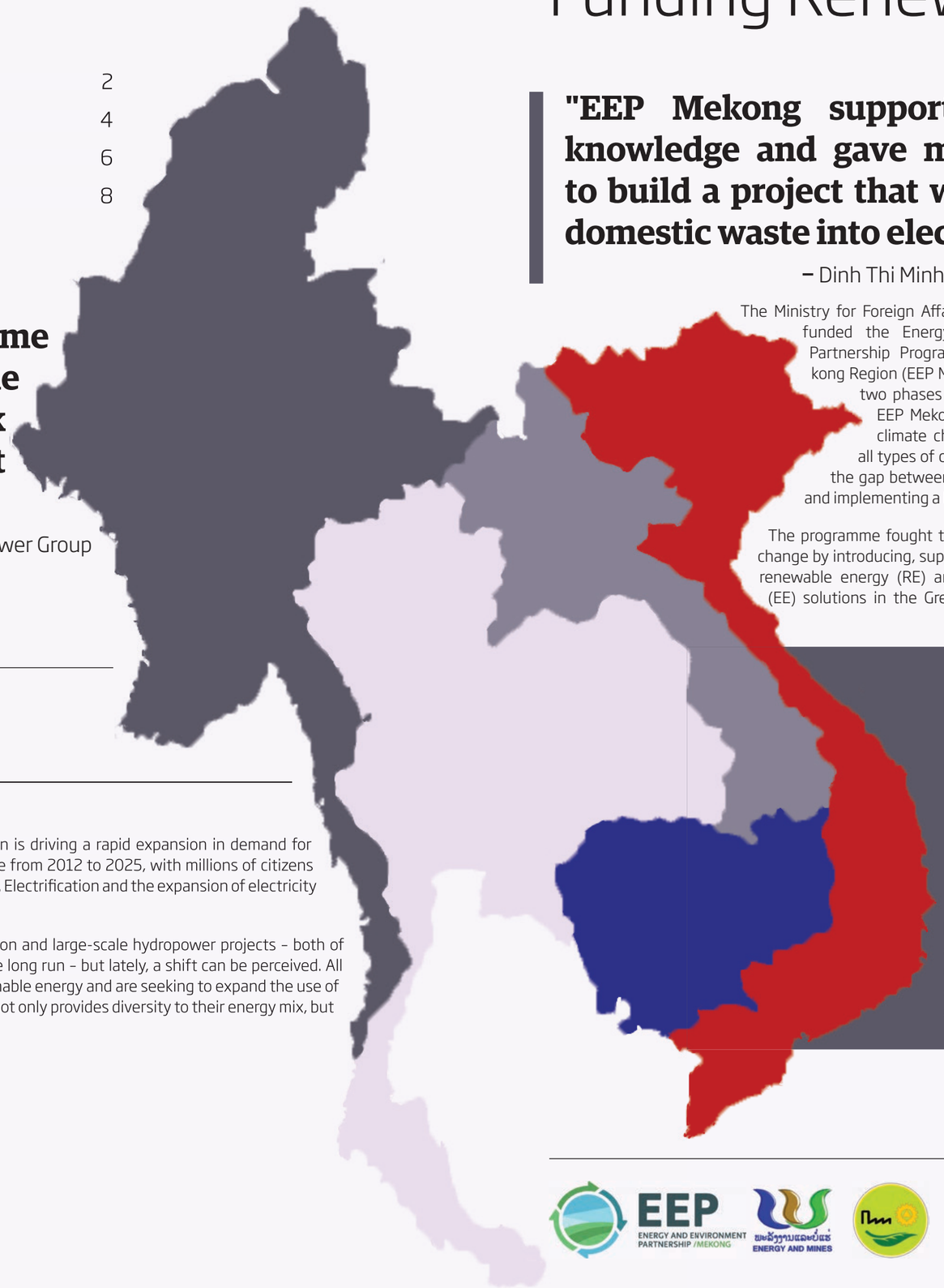
EEP Mekong Programme Results 2014–2019

Catalysing renewable energy and finding pathways to circular economy development

Contents

"The EEP Mekong Programme not only contributed to the success of several landmark projects, but was the catalyst that made them happen."

– Gustaf Godenhielm, the RE Power Group



Introduction

The high rates of economic growth in the Greater Mekong Subregion is driving a rapid expansion in demand for electricity. The region's electricity demand is expected to almost triple from 2012 to 2025, with millions of citizens especially in rural areas lacking access to affordable and reliable energy. Electrification and the expansion of electricity supply have therefore been high on each country's political agenda.

These agendas have mainly focused on fossil fuel-based electrification and large-scale hydropower projects – both of which contribute to environmental damage and climate change in the long run – but lately, a shift can be perceived. All Mekong region countries are waking up to the vast potential of sustainable energy and are seeking to expand the use of renewable energy and energy-efficient solutions. Such an expansion not only provides diversity to their energy mix, but is also a good strategy for coping with climate change.

Funding Renewable Energy

"EEP Mekong supported us with knowledge and gave me the power to build a project that will transform domestic waste into electricity."

– Dinh Thi Minh Thai, Director of MACDI

The Ministry for Foreign Affairs of Finland (MFA) funded the Energy and Environment Partnership Programme with the Mekong Region (EEP Mekong), which ran in two phases from 2009 to 2019. EEP Mekong aimed to combat climate change and promoted all types of clean energy, bridging the gap between a good project idea and implementing a bankable project.

The programme fought the effects of climate change by introducing, supporting, and applying renewable energy (RE) and energy efficiency (EE) solutions in the Greater Mekong Subregion's rural and semi-urban areas, targeting households, small and medium enterprises, and social institutions. The programme took a regional focus and was implemented in Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam.

It was designed as challenge fund to provide early-stage financing to innovative clean energy project developers in the process of building business partnerships. The programme adapted itself to each country's policy and regulatory requirements and supported the building of stakeholders' knowledge and skills in the region's energy sector. NIRAS was contracted to handle both EEP Mekong phases' fund management and technical assistance.

EEP Mekong launched eight calls for proposals (CfPs) and supported 55 waste to energy, biogas, biomass, solar, and hybrid projects across both phases. The projects had a total value of about €29 million and benefited about 250,000 people in total, leveraging private financing valued at about €10 million for climate mitigation in Mekong region countries.

Contributing to Sustainable Development

EEP Mekong funded a wide variety of RE and EE projects that contributed to most of the Sustainable Development Goals (SDGs). The main SDGs contributed to are 7 (affordable and clean energy), 13 (climate action), and 11 (sustainable cities and communities).

EEP ENERGY AND ENVIRONMENT PARTNERSHIP /MEKONG

ENERGY AND MINES

MINISTRY OF ENERGY

Ministry for Foreign Affairs of Finland

EEP Mekong at a Glance

Making an Impact

EEP Mekong focused on contributing to SDGs 7, 11, and 13 in the short and medium term. Over time, the impacts from the provision of renewable energy and the mitigation of climate change will contribute to other SDGs, especially SDG 1, 2, 3, 5, and 8.

Finding Ways to Lower Emissions

EEP Mekong engaged in capacity building around improving energy efficiency within Viet Nam's pulp and paper industry. An external consultant together with the Viet Nam Cleaner Production Centre (VCPC) carried out six energy audits to identify energy saving measures and assess possibilities to reduce greenhouse gas emissions. EEP developed the activity in cooperation with the Pulp & Paper Mill Association of Viet Nam, the Ministry of Industry and Trade of Viet Nam, and the UNDP-Viet Nam Low Emission Capacity Building Programme.

According to the detailed energy audits, which focus on the largest consumers in the papermaking process, it is possible to reduce greenhouse gas emissions both by reducing the amount of steam and electricity used by the production process and by replacing coal used in steam generation with alternative renewable fuels. Due to the large number of paper mills in Viet Nam (approximately 300), there are many opportunities to reduce energy consumption by switching to modern technology.

EEP Mekong Objectives

To deploy sustainable and affordable clean energy solutions while mitigating climate change

To support access to clean energy and thereby improve quality of life in rural and semi-urban areas

To help start-up initiatives and those that are close to commercial maturity reach viability and scale-up

To promote innovation in renewable energy and energy efficiency

To build partnerships between Mekong region countries and Finland (amongst others)

To encourage knowledge exchange and build knowledge and skills in developing sustainable clean energy projects

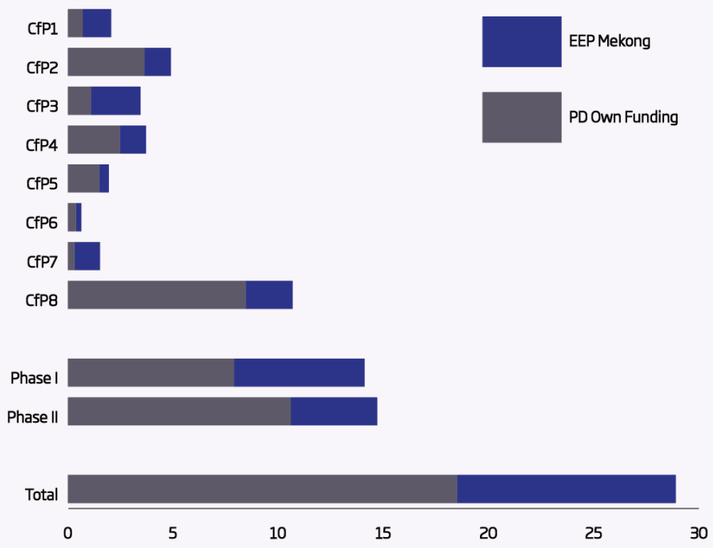
Catalysing Investment

At the start of Phase II, the grant was changed from the usual challenge fund structure to one based on the achievement of previously established results. Phase II also focused on offering grants to larger, bankable projects with high scale-up potential that could demonstrate their ability to raise their own funding.

This had a marked impact on the programme's funding leverage ratios (project value to grant value). Phase I (CfP1–4) achieved a ratio of 2.3, providing €6.2 million in grants to projects valued at €14.1 million. The ratio improved to 3.6 for Phase II (CfP5–8), with €4.1 million being granted to projects valued at €14.8 million.

Phase II's "investment catalysis" effect is noticeable both in terms of the numbers and in the project developers' experiences. The feasibility studies engaged in during CfP7 aimed to stimulate further investments, while several other projects had faced a situation where the EEP Mekong grant was needed to make the project feasible or otherwise attractive to investors and financial institutions.

Project Developers' Own Funding vs EEP Mekong Grants (€ millions)



Building Skills and Knowledge

EEP Mekong aimed to build partnerships by improving the capacity and knowledge transfer of project developers and sectoral agencies. Positive achievements include five study tours to Finland involving 151 stakeholders, five training workshops on waste to energy, an investor workshop, case studies for knowledge dissemination, and the collaboration with Business Finland, EU Viet Nam Climate Diplomacy Fair, Vietwater exhibitions/conferences, and potential funding collaborators such as the Global Green Growth Institute. The capacity building activities all focused on the importance of removing barriers and promoting the development of a more enabling framework for clean energy uptake. Waste to energy (W2E), biogas, and biomass are especially in need of reform.

Recognising the need for project developers to design economically, technically, and socially sustainable RE solutions, EEP Mekong supported project developers in their application process through webinars and one-to-one support. The project developers appreciated the programme's outreach and capacity building activities, which was reflected by the submission of 160 applications during Phase II.

The circular economy is gaining more attention especially in Viet Nam and Thailand, and waste to energy has huge development potential in the region. After the W2E training courses, a simplified comparison of mass incineration and a modern, separate treatment process for dry and wet waste was promoted amongst city and government officials as well as project developers. EEP Mekong promoted engagement with Finnish partners and investigated the implementation of innovative waste to energy technologies.

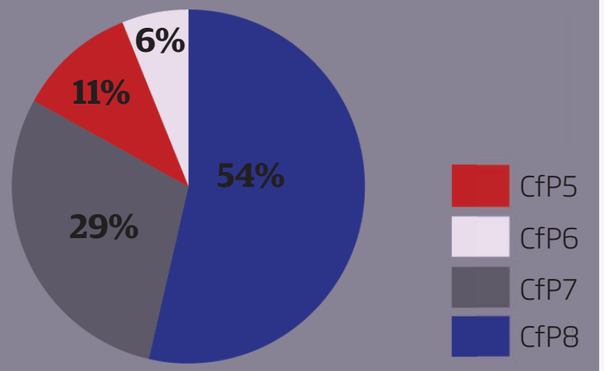
The sustainability of W2E and biogas/biomass depends on ensuring an effective supply chain. EEP Mekong demonstrated that these projects could be replicated and scaled up if their supply chain (e.g. waste from cassava processing) is boosted. The production of biomass pellets is also relevant in that it provides the opportunity for the rural poor to generate an income by engaging in the biomass feedstock supply chain. Overall, solid biomass plays a major role in South East Asia's primary energy mix, accounting for 20% of total demand in 2016.

Phase II Portfolio Overview

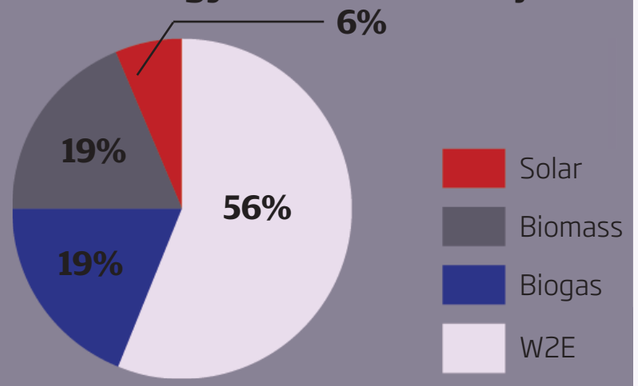
160
applications received

16
projects funded

Funding by Call for Proposal

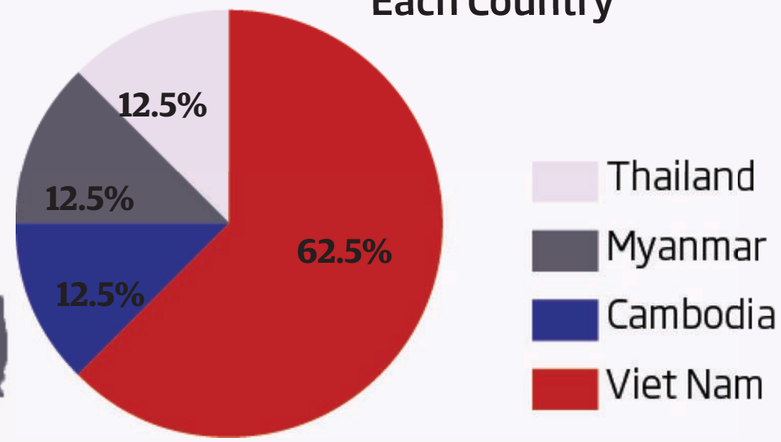


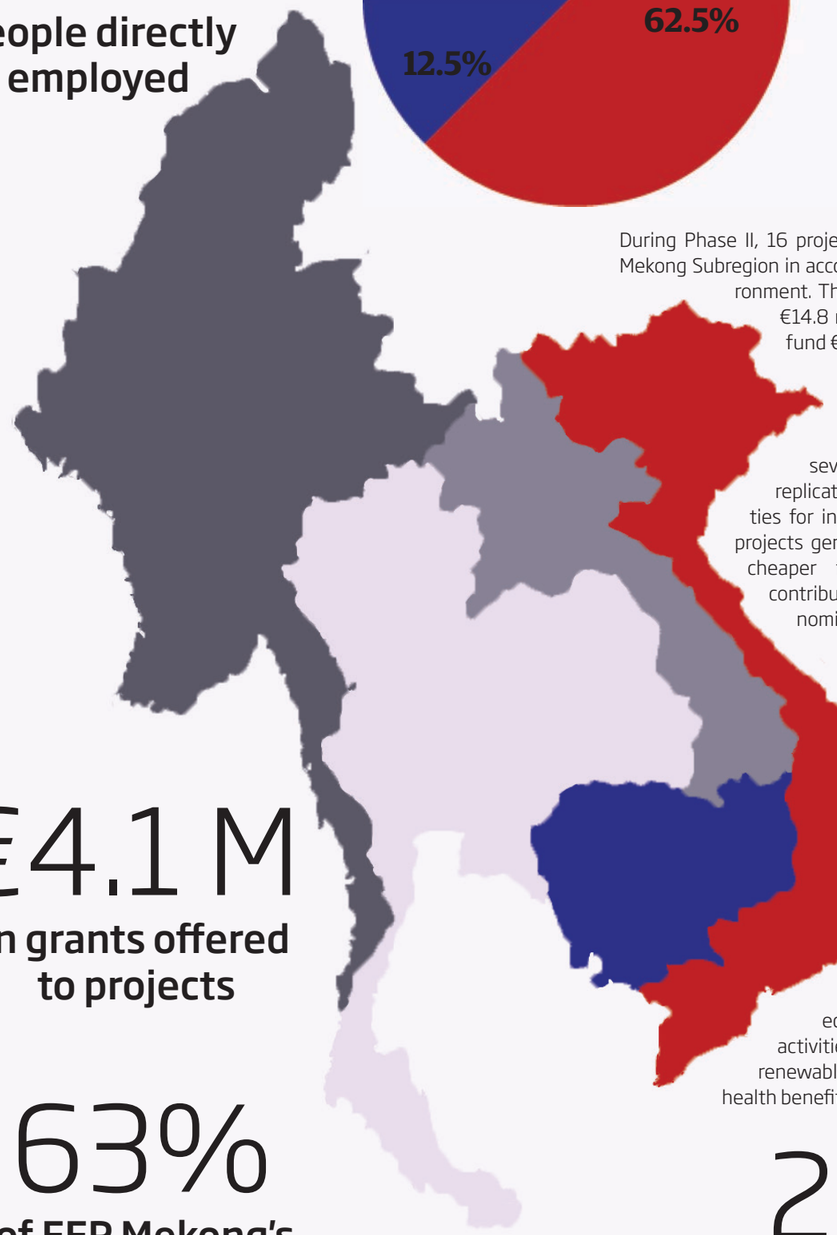
Technology Used in the Projects



162
people directly employed

Projects Funded in Each Country





During Phase II, 16 projects were funded across the Greater Mekong Subregion in accordance to each country's policy environment. The total value of funded projects was €14.8 million, with EEP Mekong agreeing to fund €4.1 million.

The viability of each funded project determined its sustainability. Most of the projects can be scaled up and several project developers have plans to replicate their projects, offering opportunities for investors to get involved. The funded projects generate energy that is about 10–15% cheaper than conventional energy, which contributes to local communities' socio-economic prospects.

In line with EEP Mekong's overall objectives, the funded projects contributed to significant reductions in greenhouse gas emissions. Some of EEP Mekong's supported projects also demonstrated how air pollution from decomposing waste – particularly from agro-industrial production – can be reduced in an economically feasible way.

About 190,000 people benefited directly or indirectly from project activities, for example through access to renewable energy, employment, training, and health benefits from a cleaner environment.

€4.1 M
in grants offered to projects

63%
of EEP Mekong's investment projects are highly scaleable

223
companies benefited from EEP Mekong activities - 40 directly

Some Results...

7 MW
renewable energy generated in the form of biogas and electricity

141,800
tCO_2eq per year greenhouse gas avoided

190,052
beneficiaries

Phase II Projects

Paving the Way for Clean Energy

EEP Mekong supported clean energy business development and project preparation by funding feasibility studies mainly in the areas of waste to energy and biomass utilisation for power generation. The programme received 24 applications during CfP7, a continuous open call that took place over a one-year period. Of those applications, EEP Mekong funded nine projects in Viet Nam and Myanmar. Eight of the approved CfP7 projects had a partner from Finland. The total project value of the bankable feasibility studies was €1.5 million, with EEP Mekong funding €1.2 million.

During CfP7, the programme provided the project developers with support in preparing bankable feasibility studies, cost-benefit calculations, and business plans. This support was provided through one-to-one technical assistance and was especially utilised by project developers in Viet Nam.

The feasibility studies offered a good opportunity for Vietnamese companies to get a more detailed analysis for investment before making a final decision. Usually, very little technical assessment or justification is done in Vietnamese companies before investment decisions are made. Companies mainly rely on individual supplier proposals, so the competitive bidding process is rare both in private and public investments. The feasibility studies gave valuable information to investors, gave consultants/suppliers an improved understanding of local conditions, and offered opportunities for the parties involved in projects to get to know each other better. The concepts around feasibility studies were disseminated in EEP training and workshop sessions. Thus, the understanding of feasibility studies became more widely known than only within the participating companies.

Results from the feasibility studies were used to develop professionally sound business cases and projects to gain interest from potential investors. The Global Green Growth Institute – which is dedicated to supporting and promoting strong, inclusive, and sustainable economic growth in developing countries through their country office in Viet Nam – has shown an interest in co-funding two W2E projects in Viet Nam. Other potential investment sources could come in the form of impact investors such as Finnfund.

EEP Mekong supported the following feasibility studies:

Country	Project	Technology	Objective
Viet Nam	Chau Can Waste Treatment Facility – Biogas Technology Application	W2E	Feasibility study for the application of anaerobic digestion at an existing waste treatment site
Myanmar	10-MW Biomass Power Plant in Taungyi, Shan State	Biomass	Feasibility study for a 10-MW (wood) biomass-based power plant in northern Myanmar (Shan State), including the formulation of a sustainable biomass supply chain
Viet Nam	Vietstar Integrated Solid Waste Treatment Project	W2E	Feasibility study for the application of anaerobic digestion at an existing waste treatment site
Viet Nam	AD Biogas Technology in Sludge to Energy Recovery	W2E	Evaluation of the feasibility of anaerobic digestion in a sewage treatment plant
Viet Nam	Feasibility Study for a Waste Management and Processing Company to Evaluate Biogas Production Potential	W2E	Feasibility study on the application of new technology in the extraction of biogas from municipal solid waste
Viet Nam	Waste to Energy Plant in Hanoi	W2E	Feasibility study to compare different incineration technologies for Vietnamese municipal waste
Viet Nam	Waste to Energy Sludge Treatment Project	W2E	Feasibility study on adding anaerobic digestion to the current sludge composting plant
Viet Nam	Collection of Biogas for Power Generation	Biogas	Power generation from landfill gas
Viet Nam	Municipal Solid Waste Treatment Plant	W2E	Feasibility study on the application of new technology in the extraction of biogas from municipal solid waste

The Sra-Em BioEnergy Plant

- **Country: Cambodia**
- **Sector: Bioenergy**
- **Project developer: IED Invest Cambodia**
- **International partners: IED Invest France**
- **Type of project: Establishment of a biomass gasification power plant**
- **Innovation: The plant's remote location**
- **Project value: €1.93 million**
- **EEP Mekong grant percentage: 23%**

IED Invest Cambodia established a 1 MW-capacity biomass gasification power plant in the Preah Vihear Province, a remote area where few people are connected to the grid. The plant uses waste wood sourced from land clearances of social land concession (SLC) and economic land concession (ELC) projects in the area. IED Invest Cambodia is also establishing plantations of densely grown trees to prevent deforestation and provide employment. The first plantation will produce 28% of the Sra-Em plant's biomass requirement within five years. The plant generates 3 GWh per year, which is fed into the power grid. 700 additional households and businesses in the Sra-Em and Kantuot villages could be connected to the grid thanks to the improved capacity. The project employs 30 people and provides an income to the people who sell biomass to the power plant. By replacing energy generated from diesel, the Sra-Em plant avoids 2,160 tCO_2eq of greenhouse gas emissions.

30 people employed

3 GWh generated p.a.

700 additional households connected

2,160 tCO_2eq GHG avoided

Biodigester Project

- **Country: Cambodia**
- **Sector: Biogas**
- **Project developer: ATEC**
- **Type of project: Introduction and marketing of prefabricated biodigesters**
- **Innovation: The plastic biodigester's design**
- **Project value: €630,000**
- **EEP Mekong grant percentage: 40%**

Pollution from burning firewood leads to an estimated 14,000 deaths per year in Cambodia. Women and children are disproportionally affected as firewood is most commonly used for cooking. This project introduced and marketed prefabricated biodigesters to 13 provinces in Cambodia. The innovative biodigester design allows poor households to use organic waste such as cow manure to generate biogas for cooking and create organic fertilizer as a byproduct. Depending on the payment method, an ATEC biodigester's price is set at $500 to $650 including VAT or $30 per month paid off over two years. Taking into account the savings in cooking fuel and fertilizer (about $23 per month), the net cost of the system is only $7 per month if it is financed, a highly accessible expenditure level. After the biodigester is paid off, the owner will enjoy 23 more years of saving $23 per month. 917 biodigesters were sold during the project's run.

Each year, one biodigester produces:

383 m^3 of biogas

19 t of organic fertilizer

And saves:

3 t of GHG emissions

$260 in household expenses

Thailand's First HCLR-CBG Plant

- **Country: Thailand**
- **Sector: Biogas**
- **Project developer: RE Power Group**
- **International partners: Satel Oy Finland**
- **Project value: €7.08 million**
- **Innovation: Converting biogas to CBG for sale to the public**
- **EEP Mekong grant percentage: 12%**
- **Type of project: Construction of a hybrid covered lagoon reactor (HCLR), compressed biogas (CBG) plant, and CBG filling station**

Agro-industry factories in South East Asia commonly treat their waste water in open ponds. This causes an odour nuisance to people living nearby and leads to the release of dangerous gases such as methane and hydrogen sulphide. These gases are major contributors to environmental problems and climate change. The RE Power Group approached EEP Mekong for a grant to develop Thailand's biggest biogas project to date. The project had the following objectives:

- Efficient waste water treatment in a dual-feedstock HCLR
- Economic utilisation of the produced methane for starch drying or conversion to CBG
- Provision of clean effluent for use in irrigation and as liquid fertilizer
- Building the first industrial-scale CBG plant in Thailand as well as a gas station to sell the CBG to the public as car fuel

152,749
beneficiaries

This project demonstrated that CBG production is an economically viable option that has unparalleled environmental and social impacts. Over 93,000 people in the area benefit from cleaner air and water as a result, while about 60,000 people benefit from access to renewable energy.

The KIT CBG Upgrade

- **Country: Thailand**
- **Sector: Biogas**
- **Project developer: Thai Biogas Energy Company Ltd (TBEC)**
- **International partner: Navdata Oy**
- **Type of project: Upgrading of an existing biogas generation facility to produce CBG for public consumption**
- **Innovation: Converting biogas to CBG for sale to the public**
- **Project value: €1.13 million**
- **EEP Mekong grant percentage: 24%**

The Kitroonguang Biogas Energy Project (KIT) started operating in 2007, making biogas to generate power from tapioca starch waste water. But as the market for biogas energy saturated, it became impossible to acquire power purchase agreements (PPAs) from the government. This made it increasingly difficult for small biogas plants like KIT to remain profitable.

18,000 t
in CO_2 emissions avoided

TBEC therefore upgraded KIT's facilities so it could increase the amount of biogas produced, with the aim of selling the biogas as a fossil fuel replacement. A large portion of the biogas was sold to the host factory as a replacement for fossil fuel oil in its drying processes. The remainder was converted into CBG, one of the cleanest biofuels in existence, and sold to the public as an alternative to fossil fuel-based compressed natural gas (CNG).

After the upgrades were completed, KIT avoids 18,000 tCO_2eq in greenhouse gas emissions per year. The local community also benefited from the creation of 20 new jobs, while about 21,000 people in total benefit from the fact that they can purchase CBG at about 5% cheaper than fossil fuel-based CNG.

150
women employed

1,000 t
GHG emissions avoided

MACDI Wood Waste Pellet Factory

- **Country: Viet Nam**
- **Sector: Biomass**
- **Project developer: MACDI**
- **Type of project: Establishing a factory to produce wood waste pellets**
- **Innovation: Cooperative ownership structure and business model that empowers local women**
- **Project value: €380,000**
- **EEP Mekong grant percentage: 60%**

The Microfinance and Community Development Institute (MACDI) established the project in the Yen Quang Commune of Hao Binh Province. The project offers a renewable alternative to fossil fuels in power and heat generation while creating employment opportunities where 32% of the population lives on or near the poverty line. MACDI did this by setting up a factory that converts wood waste such as saw dust and shavings into pellets for use as combustion fuel. 150 local women were employed as wood waste gatherers and a further ten people were employed in the factory itself. The wood processing factories in the area now sell their wood waste to the factory as an extra source of income when before the waste had been an expense item. After the pellet factory's completion, its ownership was transferred to a cooperative comprising the gatherers, factory employees, and wood waste suppliers. The factory is set to produce about 4,300 tonnes of pellets every year. Wood waste pellets are a clean energy source that can replace fossil fuels in various industrial processes, so the project avoids at least 1,000 tonnes in greenhouse gas emissions every year. It also puts about 4,000 tonnes of wood waste p.a. to positive use, preventing it from polluting the environment.

Engaging, Enriching, and Enabling Women Solar Engineers for Community Solar Electrification in Myanmar

- **Country: Myanmar**
- **Sector: Solar**
- **Project developer: WWF Myanmar**
- **International partners: Barefoot College and the Myanmar Women and Children Development Foundation.**
- **Type of project: Training women solar engineers to install and maintain solar home systems (SHSs) in remote villages in Myanmar.**
- **Innovation: The empowerment of women solar engineers as the main method of ensuring the project's long-term sustainability**
- **Project value: €688,000**
- **EEP Mekong funding percentage: 59%**

21
women trained

Only 1% of people in the Tanintharyi Region have electricity for cooking, and 8% have electric lighting. In the rural area of Kayin State, only 4% of the population have access to any sort of electric power. Most of the power generation developments in these regions are based either on fossil fuels or on large-scale hydropower, putting this very important but fragile environmental habitat at risk. Through this project, 21 local women from 12 villages were trained at the Barefoot College in India to manage the solar electrification of their communities, install solar systems, and maintain them. Rural electronic workshops were founded in each of the 12 villages, with the women running each workshop. The empowerment that these women have gained allows them to have bigger roles in decision-making in their families and communities, and gives them more control over their socio-economic situation. 1,235 households (about 7,400 people) had SHSs installed thanks to this project.

1,265
households connected

EEP

ENERGY AND ENVIRONMENT PARTNERSHIP / MEKONG

EEP Mekong funded by the Ministry for Foreign Affairs of Finland

Ministry for Foreign Affairs of Finland

NIRAS

EEP Mekong technical assistance and fund management was provided by NIRAS International Consulting.

www.niras.com/development-consulting.

Published June 2019

Layout by Misha Gericke

Partner Ministries

ENERGY AND MINES

Ministry of Energy and Mines of Lao PDR

Ministries of Industry and Energy of Myanmar

กระทรวงพลังงาน
MINISTRY OF ENERGY

Ministry of Energy of Thailand

Ministry of Industry and Trade of Viet Nam

MINISTRY OF MINES AND ENERGY

Ministry of Industry, Mines, and Energy of Cambodia