



FULL PROJECT PROPOSAL DOCUMENT

**Energy Savings Siem Reap - Promoting and
Demonstrating Energy Conservation in Siem Reap,
Cambodia**

**Cambodian Climate Change Department (CCCD),
Ministry of Environment of the Kingdom of Cambodia**



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2. Executive Summary¹

Energy Savings Siem Reap aims to promote and demonstrate energy conservation and energy efficiency in the province of Siem Reap. Located in central Cambodia, the City of Siem Reap is the gateway to the ancient city of Angkor, a World Heritage Site at the heart of Khmer civilization. Since the 1990s, tourism in Angkor has developed rapidly, from a few thousand visitors a year to more than a million. The temples of Angkor represent a significant source of revenues for Cambodia, but mass tourism has put additional pressure on society and the environment. Siem Reap's consumption of water and energy has grown rapidly, and has been associated with increased levels of pollution. From 2002 to 2007, the installed capacity of the state electric utility in Siem Reap increased fivefold, yet is unable to cope with demand. Against this background of energy scarcity, little has been done in practice to promote energy efficiency, energy conservation and renewable energy technologies in Siem Reap. To a large extent, the general population remains unaware of basic measures to conserve electricity, including switching to compact fluorescent lamps, and of the links between electricity consumption, greenhouse gas emissions and climate change. The main objective of the project is to raise awareness of energy efficiency and energy conservation in the context of climate change and sustainable development, and to demonstrate the practical feasibility of simple energy conservation measures by installing solar water heaters in selected sites and distributing compact fluorescent lamps (CFLs) to the general population. *Energy Savings Siem Reap* directly responds to Cambodia's priorities in renewable energy and energy efficiency, and contributes to national objectives to reduce poverty, achieve energy security and mitigate greenhouse gas emissions. The project targets households, government buildings (government offices, schools, hospitals), and the commercial and private sectors (hotels/guesthouses, restaurants and commercial centres). The project is coordinated by the Cambodian Climate Change Department of the Ministry of Environment of the Kingdom of Cambodia, with support from the UNEP Risoe Centre, the Department of Energy Technique of the Ministry of Industry, Mines and Energy, the Royal University of Phnom Penh, and the Cambodian Research Centre for Development.

3. General Background

Cambodia's energy sector, despite considerable growth over the last decade, is still struggling to meet the increasing demands of an expanding economy and a growing population. The energy

¹ This summary will be shown in EEP Mekong website

sector is characterised by unreliable and insufficient supply, high electricity tariffs, and low rates of electrification.

Total electricity production in Cambodia amounted to around 1000 GWh in 2008 up from just about 100 GWh in 1991. The country's total supply consists of 350 MW of installed generation capacity. The supply shortage is estimated at around 100 MW. Demand has been increasing fast but would even be faster if electricity rates were lower.

Cambodia's electricity tariffs remain far higher than that of its neighbours and are among the highest in the world. Electricité du Cambodge (EDC), the state-owned electric utility, charges between 9 cents/kWh (its lifeline tariff) and 23 cents/kWh in Phnom Penh and the provincial capitals where it operates. In other areas, Rural Electricity Enterprises (REEs) provide power to rural communities through mini-grids at prices approaching a dollar per kWh. The main reasons underlying these high costs are the dollar-denominated imports of fossil fuels used in power generation, the small size of generation systems which prevents economies of scale, and high technical losses and inefficiencies.

With about 12% of its population having access to electricity, Cambodia's electrification rate is among the lowest in Asia. The Royal Government of Cambodia's objective to increase electricity coverage to 70% of the population by 2030 constitutes a daunting challenge. In a context where electricity is expensive and in short supply, energy efficiency and renewable energy present opportunities for conserving power, realising financial savings, enhancing energy security, as well as contributing to the mitigation of climate change.

Cambodia imports its entire consumption of petroleum products, which has steadily increased since 1999. Diesel and Heavy Fuel Oil (HFO) are the only fuels used to generate electricity in Cambodia. Cambodia's renewable energy sources are abundant but remain largely untapped. Biomass applications have been limited to small-scale projects, with total installed capacity at about 2 MW. The current installed hydropower capacity is of about 14 MW while the country's technical potential for hydropower has been estimated at up to 10,000 MW for the Mekong River, the Mekong tributaries and the coastal provinces. Despite a high level of insolation, Cambodia's use of solar photovoltaic and solar thermal technologies has been limited by high investment costs and low awareness.

The technical potential of renewable energy sources and savings from energy efficiency activities has been estimated to equal 47 million tons CO₂ per year (CRCD/MOE/IGES 2004). A significant proportion of these potential sustainable energy activities may consist of small-scale renewable energy projects and reduction of energy consumption. Based on results from energy audits in Phnom Penh, conducted by MIME, average efficiency improvements of about 30% could be achieved resulting in potential savings of more than 500 GWh for the 2004 base year alone. Energy efficiency activities would include lighting, water heating, air conditioning, generation and distribution, but have been limited so far due to low levels of awareness and lack of technical knowhow.

4. Detailed Background of Project Owners/Developers (Applicant/ Lead Organisation)/Project Management Experience and Expertise

The **Cambodian Climate Change Department (CCCD)**, which is part of the Ministry of Environment (MOE) of the Kingdom of Cambodia, is a public institution with the mandate of carrying out all technical activities related to the implementation of the Climate Change Convention. CCCD acts as the secretariat of the UNFCCC National Focal Point (the Minister of Environment) and of the Designated National Authority under the Kyoto Protocol. CCCD's role is to facilitate and coordinate donor and private sector activities relevant to climate change with other government agencies. Thus, CCCD supports and organises inter-ministerial technical working groups specialised in sectors (energy and forestry), and along climate change themes (GHG inventory, mitigation, vulnerability and adaptation, and UNFCCC implementation). CCCD is also responsible for preparing meetings of the National Climate Change Committee (NCCC), which comprises senior policy-makers. The Committee is an inter-ministerial mechanism with the mandate to prepare, coordinate and monitor the implementation of policies, strategies, legal instruments, plans and programmes of the Royal Government of Cambodia to address climate change. The NCCC is chaired by the Senior Minister, Minister of Environment with the Prime Minister acting as the Honorary Chair. It is composed of Secretaries and Under-Secretaries of State from 19 Ministries and government agencies whose mandates are relevant to climate change adaptation or mitigation activities. Donor funded activities implemented by CCCD have included the preparation of national greenhouse gas inventories and national communications to the UNFCCC, support and assessment of CDM projects against Cambodia's national sustainable development objectives, preparation of the National Adaptation Programme of Action to Climate Change (NAPA), and climate change awareness campaigns.

The **UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC)** was established through an agreement between the Ministry of Foreign Affairs of Denmark and the United Nations Environment Programme (UNEP). URC is part of Denmark's Technical University (DTU), a higher education institution. The centre's main objective is to support developing countries in shifting towards cleaner and more efficient energy systems and climate resilient sustainable development. Through research, policy analysis and capacity building, URC aims to promote and facilitate the incorporation of environmental and climate change aspects into development planning. The centre's activities are divided into three thematic groups: climate strategies and resilient development, clean energy, and carbon finance. URC is an international research institute where more than 75% of academic staff are from developing nations, including from South, Southeast and East Asia. URC is able to call upon human resources with the relevant combination of expertise and field experiences in implementing climate change and development activities in the countries where they are most needed. Current projects in Asia, Africa and Latin America include: promotion of sustainable energy in the context of development, capacity building for the Clean Development Mechanism, and technology needs assessment of climate change mitigation and adaptation technologies.

A key requirement of poverty reduction throughout Cambodia is the development of sustainable and affordable energy supplies for everyone. The **Department of Energy Technique (DET)** of the Ministry of Industry, Mines and Energy (MIME) is the focal point of government efforts to develop renewable energy, energy efficiency and technical standards. DET aims to encourage the efficient use of energy and to minimize the detrimental environmental impacts of energy supply and use. Major activities include information dissemination and implementation of pilot projects with the

objectives of reducing greenhouse gas emissions by using less fuel without sacrificing the quality or quantity of product or service and to promote energy savings. DET has been instrumental in developing electrical power technical standards, mini-grid design outlines, Cambodia's renewable Energy Action Plan (REAP), as well as the establishment of the donor funded Rural Electrification Fund (REF). DET staff have experience in conducting energy audits for the garment industry, power producers, as well as commercial and residential buildings, in addition to providing on the job training to encourage improvements in energy efficiency.

The Department of Environmental Sciences (DES) of the Royal University of Phnom Penh (RUPP) aims to assist in overcoming the environmental problems facing Cambodia by empowering future environmental managers through education, and by encouraging academic staff to conduct studies, consultancies and outreach programs with direct implications for Cambodian environmental management. The Royal University of Phnom Penh is Cambodia's oldest and largest university. It hosts more than 9,000 students, across a diverse range of undergraduate and postgraduate programs. It is unique in Cambodia for offering specialist degrees in fields including the sciences, humanities and social sciences, as well as vocational courses in fields such as information technology, electronics, psychology and tourism. RUPP is the only university in Cambodia with full membership of the ASEAN University Network (AUN). The Department of Environmental Sciences has also run training courses and workshops in environmental conservation for local and provincial government authorities. Department staff have been involved with the Cambodian Climate Change Department, in the preparation of Cambodia's national communications to the UNFCCC and the formulation of national activities for adapting to climate change.

The Cambodian Research Centre for Development (CRCD) is an independent, non-political, non partisan and not for profit research organisation. The activities of CRCD focus on research in the areas of development, with the goal of improving the activities of national and international organisations involved in the development of the Kingdom of Cambodia. CRCD aims to provide to a broad public, knowledge for sustainable development, through academically rigorous research. CRCD's main expertise are: policy analysis and development for natural resources, environment, energy and climate change; preparation of sectoral reviews, master plans, and action plans; project preparation and feasibility studies; environmental and social impact assessment; data analysis, information systems and socio-economic surveys; training, capacity building; and institutional strengthening. The centre has a broad network of post-graduate professionals in various fields of expertise. CRCD staff have participated in a range of research projects in collaboration with other organisations, including: the coordination and promotion of cogeneration technologies for the European Commission, the development and support of greenhouse gas mitigation activities for the Clean Development Mechanism as well as voluntary markets, the assessment and mapping of renewable energy resources (biomass, wind, solar, mini-hydro and micro-hydro) for rural electrification under the EC-ASEAN Energy Facility.

The project will be coordinated by the Cambodian Climate Change Department with technical support from the UNEP Risoe Centre. CCCD will have overall responsibility for field activities implementation, coordination of partner activities, and facilitation with other stakeholders. URC will take the lead on technical issues pertaining to energy conservation, energy efficiency and climate change. The partnership relies on the respective strengths and experiences of the member organizations: lead government agencies responsible for climate change and energy efficiency (CCCD, DET), scientific and technical know-how of academic and research institutions (URC, RUPP), implementation of greenhouse gas mitigation projects in the private sector (CRCD). With the exception of CRCD, a not for profit non governmental organisation officially registered with the Ministry of Interior of the Kingdom of Cambodia, all partners are government institutions (CCCD, DET) or public academic institutions (URC, RUPP). Thus none of the project partners has sales, income or debt, nor is liable for income taxes. The relevant projects in energy efficiency, renewable energy, climate change and sustainable development are presented for each of the partners in the table below.

Partners' relevant projects

Cambodian Climate Change Department

- Climate Change Capacity Strengthening and Awareness Raising Programme for Cambodia Danida)
- Cambodia Climate Change Alliance (UNDP, EC, Sida, Danida)
- Climate Change Awareness Campaign in Cambodia (Oxfam America)
- Enabling Cambodia to Prepare its First National Communication in response to the UNFCCC
- Capacity Development for the Clean Development Mechanism project (UNEP/Riso)
- Formulation of the National Adaptation Programme of Action to Climate Change (NAPA)
- EU – Asia institutional co-operation and multinational dialogues on enabling the meaningful participation of Cambodia, Lao PDR and Vietnam in the Clean Development Mechanism (EU, Hamburg Institute)
- Integrated Capacity Strengthening for the Clean Development Mechanism project (Japanese IGES)
- Enabling Activities for the Preparation of the Kingdom of Cambodia's Second National Communication to the UNFCCC (UNDP/GEF)
- Climate Change Adaptation Initiative (MRC)
- Legal and regulatory aspects of vulnerability to climate change in Asia Pacific (UNEP)
- Technology Needs Assessment for Climate Change (UNEP Risoe)

UNEP Risoe Centre

- Capacity Building for the Clean Development Mechanism (CD4CDM)
- Clean Development Mechanism Bazaar
- Biofuels Assessment on Technical Opportunities for Latin America (Bio Top)
- Capacity Enhancement and Mobilisation for Energy in Africa (CEMA)
- Credit for Solar Energy in Indonesia
- Sustainable Energy Advisory Facility in Latin America and the Caribbean (SEAF LAC)

Department of Energy Technique

- Photovoltaic and micro-hydroelectricity in Kompong Cham Province (with NEDO)
- Photovoltaic and biogas in Kompong Som province (with NEDO)
- Biomass gasification in Kompong Thom Province (with FONDEM)
- Bio-diesel research on non-food biomass (with NEDO)
- Biomass gasification in Kompong Cham province (with DED)
- Installation of solar photovoltaic facilities in health clinics, schools, pagodas, training centre and government offices in rural area throughout Cambodia

Cambodian Research Centre for Development

- COGEN Programme Phase III
- Renewable Energy Options for Rural Electrification in Cambodia (REOREC with EC)
- Assessment of Bioenergy Potential in Cambodia (with EC)
- Sustainable Energy in Cambodia: Status and Assessment of the Potential for Clean Development Mechanism Projects (with IGES)
- Sustainable Development in Angkor: Social, Environmental and Financial Aspects of Conserving Cultural Heritage (with IDRC)

Royal University of Phnom Penh

- Environmental Impact Assessment Training Courses for Professional Managers (with Korean Environmental Institute)
- Environmental Risk Analysis (with University of Florida)
- Wastewater treatment practices in Large Scale Cassava, Palm Oil, and Ethanol Factories
- Scoping Study of Phnom Penh City Development and the environment
- Cambodia & Lao Initiative for Building Human Resources for the Environment (CALIBRE)
- Capacity Building on Waste Economy

5. Project Description

The target location of the project is Siem Reap Province, located in central Cambodia and bordering Tonle Sap Lake. Siem Reap provincial capital is Siem Reap City, which is the gateway to the ancient city of Angkor, a World Heritage Site at the heart of Khmer civilization. Since the 1990s, tourism in Angkor has developed rapidly, from a few thousand visitors a year to more than a million. Siem Reap's population, attracted by economic opportunities, has increased by 300,000 people to reach 0.9 million inhabitants. The temples of Angkor represent a significant source of revenues and foreign currencies for Cambodia, but mass tourism has resulted in the rapid growth of Siem Reap City, put additional pressure on cultural and environmental assets, and increased imbalances in development. Siem Reap's consumption of water and energy has grown rapidly, and has been associated with increased air and water pollution. From 2002 to 2007, the installed capacity of the state electric utility, Electricité du Cambodge (EDC) increased fivefold from 20 MW to 100 MW. Yet, increasing state electricity sales are unable to cope with the latent demand, and have lead the residential and commercial sectors to install privately operated on-site diesel generators. Currently the annual electricity consumption in the city is roughly evenly divided between residential, commercial and government users.

Against this background of energy scarcity, little has been effectively done in practice to promote energy efficiency, energy conservation and renewable energy technologies in Siem Reap. To a large extent, the general population remains unaware of basic measures to conserve electricity, including switching to compact fluorescent lamps, and of the links between electricity consumption, greenhouse gas emissions and climate change. Government buildings, schools and hospitals have similarly not adopted energy conservation and energy efficiency measures. The situation in the commercial sector is more uneven as the internationally operated hotels and commercial centres may generally have adopted better energy efficiency measures than local entrepreneurs. The use of solar water heaters is limited to a handful of entrepreneurial operators. Most guesthouses still rely on water heaters in individual bathrooms. Thus, the direct beneficiaries of project activities consist of the general public, public sector institutions (schools, hospitals, government offices), and the private sector (commercial centres, hotels/guesthouses, restaurants). Households will benefit from the increased awareness of simple and immediately implementable energy conservation measures, as well as the distribution of compact fluorescent lamps against a financial contribution.

The propose project aims to contribute to addressing the immediate problems of energy scarcity in Siem Reap through the promotion of energy efficiency and conservation in the context of development and climate change. The initial conceptual meeting between the five partner organizations took place in November 2009 in Phnom Penh. The meeting was convened and facilitated by the Cambodian Climate Change Department at the Ministry of Environment. The project profile was subsequently developed under the leadership of CCCD, with technical support from the UNEP Risoe Centre and input of the other partners. Preliminary discussions with the Siem Reap provincial departments of MOE and MIME have been initiated to confirm the level of interest among local stakeholders. The full project proposal document was developed in May 2010 upon confirmation from the EEP Steering Committee of eligibility to receive maximum funding in the amount of Euro 300,000. The project partners, including the UNEP Risoe Centre, met in Phnom Penh mid-May 2010 to finalise the details of the proposal. If approved, project activities are expected to start at the beginning of the fourth quarter of 2010. The project duration is two full years.

The project is a direct response to existing local needs in Siem Reap for energy efficiency and electricity savings, and aims to contribute to national development objectives as set out by the Royal Government of Cambodia. Cambodia's highest national development priority is to reduce poverty towards the achievement of Cambodia's Millennium Development Goals (CMDGs), which

include the eight goals of the United Nations MDGs, and a ninth goal to move towards zero impact from landmines and unexploded ordnance (UXO) by 2012. The National Strategic Development Plan (NSDP) 2006-2010 constitutes a broad framework to harmonise development efforts and aid-effectiveness, and incorporates the goals and strategies of the five-year Socio-Economic Development Plans (SEDP), the National Poverty Reduction Strategy (2002) and the CMDGs. The government's Rectangular Strategy (RS) for growth, employment, equity and efficiency constitutes the cornerstone of the NSDP. The Rectangular Strategy has at its core good governance and public sector reform, and focuses on agriculture, infrastructure, human resources, and employment through the private sector. The development of affordable energy supplies to respond to the Kingdom's growing needs is essential to the government's plan to reduce poverty. Cambodia's Power Sector Strategy 1999-2016 encourages the efficient use of energy while minimizing the environmental impacts of energy supply and use. As Cambodia currently imports all the fossil fuels it consumes, the development of renewable energy resources as well as the promotion of energy efficiency will contribute to energy independence and security.

As a developing country party of the United Nations Framework Convention on Climate Change (UNFCCC) and of the Kyoto Protocol, Cambodia is not required to reduce its national emissions of greenhouse gases. However, as a commitment to participate in international efforts to combat climate change, the country has examined its national mitigation potential in its national communications to the Climate Convention, including energy efficiency, through the use of compact fluorescent lamps. In addition, Cambodia has developed a comprehensive and transparent CDM approval process to encourage investments in greenhouse gas mitigation activities that would yield national sustainable development benefits. With currently four registered CDM projects and a broad range of voluntary carbon offset activities, Cambodia is currently in the lead of Least Developed Countries.

Thus the proposed project directly responds to Cambodia's national priorities in renewable energy and energy efficiency, and would contribute to national objectives to reduce poverty, achieve energy security and mitigate greenhouse gas emissions. These objectives fall under the specific mandates of the Ministry of Environment and of the Ministry of Industry, Mines and Energy, the two government institutions partners to the project.

6. General Objective

The main objective of the project is to raise awareness of energy efficiency and energy conservation in the context of climate change and sustainable development, and to demonstrate the practical feasibility of simple energy conservation measures by installing solar water heaters in selected sites and distributing compact fluorescent lamps (CFLs) to the general population. Demonstration and awareness raising in the general population, as well as in the public and private sectors aim to foster a culture of energy savings, where conserving scarce resources becomes second nature in society.

7. Specific Objectives

The specific objectives of the proposed project are:

- To raise awareness of the general public of energy efficiency and climate change issues;
- To build the capacity of government and private sector institutions in implementing energy efficiency measures;
- To develop energy labelling materials for electric appliances sold in Cambodia;
- To install compact fluorescent lamps and solar water heaters for energy savings and demonstration;
- To support the conceptual stages of a carbon offset project for voluntary standards.

Outputs and measurable indicators are discussed in the expected results section.

8. Project Management

The proposed project adopts a pragmatic and flexible approach, with a focus on practical action. Current awareness of energy savings and energy efficiency is low in Cambodia, not only in the general population but also in the public and private sectors. The project will introduce, disseminate and demonstrate the use of simple, affordable and proven technologies (compact fluorescent lamps, solar water heaters) as well as practical energy saving tips. The focus of the project is on end users of energy, consumers of electric appliances, and the general public. There is a broad body of experience from developing and developed countries on energy savers that is already available and can be readily implemented. The project will make use of successful experiences from other countries by translating them and adapting them to the local Cambodian context.

Most of the electric appliances sold in Cambodia are already labelled and rated for energy efficiency following internationally accepted standards. Unfortunately, these labels are in foreign languages and have never been properly explained to local consumers. Similarly, compact fluorescent lamps and solar water heaters are sold locally, but have been mainly used by international firms and organisations. Their benefits have not been properly argued and demonstrated to Cambodian consumers.

The project will use the following approaches to achieve its objectives:

Information and awareness:

- On-site awareness raising workshops will be conducted in selected public and private organisations. These will include introduction to climate change basics and everyday energy saving tips;
- Energy audits geared towards readily implementable measures, the so called “low hanging fruits” or “energy savers”, will be conducted in selected institutions and will provide the basis for their adoption of energy conservation practices;
- An awareness raising campaign including print media, radio and television will be conducted to introduce the general public to energy conservation. Leaflets on energy saving tips will be made

available at the provincial departments of MOE and MIME, distributed on site and made downloadable from the project's website;

- Electric appliances sold in Cambodia will be labelled in Khmer based on internationally accepted standards of the countries of origin (China, European Union, Hong Kong, Japan, Korea, Singapore, Taiwan, Thailand). The use of the labelling programmes, along with their main characteristics, will be explained to the general public as part of the awareness raising campaigns. Thus, the project would favour relabeling in Khmer rather than re-rating the appliances, as Cambodia does not have the resources to extensively test and rate the appliances according to its national standards.

Demonstration and practical action:

- Compact fluorescent lamps will be collected from households against incandescent lamps. Consumers will be asked to pay a symbolic fee of 2000 riels (about 0.50 US cents) per lamp exchanged. A maximum of 3 lamps will be allowed per household. Household contact details will be recorded. The fee may be increased if the uptake by households is successful and CFLs becomes popular with consumers, but until a proven market is firmly established it is proposed that the amount be set at a low initial level;
- Solar water heaters will be installed in a selection of buildings in the public and private sectors. Organisations volunteering as demonstration sites will be asked to pay a contribution of US \$400 dollars towards the cost of equipment and required to make their premises accessible to other potential users;
- Energy consumption will be recorded in a sample of households and institutions.

CCCD and DET are the main government agencies with mandate over climate change and sustainable energy issues, and will thus be able to rely on the support and close cooperation of other government departments within the Ministry of Environment, and the Ministry of Mines, Industry and Energy, as well as with provincial authorities (town hall and district administrations). Both MOE and MIME have permanently staffed provincial offices located in Siem Reap.

All institutions of the partnership have collaborated on a regular basis, working together on the environment and energy issues of the development process in Cambodia. The proposed key senior staff and technical advisors have interacted with each other for several years, which will allow the project to start rapidly with only minimal initial inter-institutional facilitation. In addition, the roles and responsibilities of the project partners are clearly defined (see below), as is the organisation chart provided in the annexes. This will allow partners to contribute to the project in their relevant areas of expertise.

Roles and responsibilities	Lead Partners	Contributing Partners
Coordination of partner activities, facilitation with other stakeholders	Cambodian Climate Change Department	UNEP Risoe Centre
Technical assistance in energy conservation, energy efficiency and climate change	UNEP Risoe Centre	Royal University of Phnom Penh; Cambodian Research Centre for Development.
Awareness raising in energy conservation, energy efficiency and climate change	Cambodian Climate Change Department	All
Demonstration of energy conservation and energy efficiency	Department of Energy Technique	All
Capacity building in energy conservation, energy efficiency and climate change	UNEP Risoe Centre	Royal University of Phnom Penh
Assessment of greenhouse gas mitigation potential	UNEP Risoe Centre Cambodian Research Centre for Development	Cambodian Climate Change Department
Facilitation with public and private stakeholders	Cambodian Research Centre for Development	Cambodian Climate Change Department; Department of Energy Technique; Royal University of Phnom Penh.

9. Project Resources

Key personnel

The senior personnel of the project will be composed of the following staff, whose curriculum vitae are included in the annexes:

Project Coordinator, CCCD/MOE:	Mr. Sum Thy
Climate Change and Carbon Finance Specialist, URC:	Dr. Thanakvaro De Lopez
Energy Efficiency and Renewable Energy Specialist, DET/MIME:	Mr. Heng Bora
Environmental Awareness Raising Specialist, RUPP:	Ms. Va Danny
Stakeholder Consultations and Private Sector Specialist, CRCD:	Dr. Sau Sisovanna

Technologies

The two main technologies promoted in the project consist of compact fluorescent lamps and solar water heaters. Both are commercially viable and reliable although neither has achieved popular success and acceptance in Cambodia.

Unlike incandescent bulbs, compact fluorescent lamps do not use heat to produce light. In a compact fluorescent light bulb, an electric current is driven through a tube containing argon and mercury vapour. This generates ultraviolet light that excites a fluorescent coating (phosphor) on the inside of the tube, which then emits visible light. CFLs use up to 75 percent less electricity than incandescent light bulbs and last up to ten times longer. For instance, a 60 W incandescent bulb can be replaced by a 10-15 W compact fluorescent bulb that produces the same amount of light. The main European and American brands are available in Cambodia. These bulbs are generally manufactured in China and are sold at retail prices averaging US \$2.5 for about 11 W.

Solar water heaters are a simple form of solar thermal application. Solar water heating systems consist of storage tanks and solar collectors. Direct systems circulate water through solar collectors where it is heated by the sun. The heated water is then stored in a tank or used directly. The use of sunlight reduces the amount of electricity required to heat water or altogether avoids the use of high consumption electric water heaters. Commercial and public buildings where hot water demand is high benefit most from the installation of solar water heaters. These include hotels, restaurants, apartment buildings and hospitals. Solar water heaters commercially available in Cambodia range in capacity from 150 litres to 1000 litres.

10. Costs and financing (Budget) ²

A detail budget of the proposed project is provided in the annexes.

11. Five-year Financial Projections of the Project (applicable to commercial projects only)*

The proposed project is not commercial in nature.

² Schedule of Use of Funds, Activities and Expected Results is shown as Annex D

12. Description of Activities

	Activities	Year 1				Year 2			
		Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012	Q3 2012
1	Public consultation workshops								
2	Development of awareness raising materials in Khmer								
3	Development of energy labelling materials in Khmer								
4	Development of website providing information on energy conservation and energy efficiency in Khmer								
5	Awareness raising workshops for public buildings (government agencies, schools hospitals), hotels/guesthouses, restaurants and commercial buildings.								
6	Awareness raising campaign through local media (television, radio, printed press)								
7	Awareness raising campaign in primary and secondary schools								
8	Evaluation of greenhouse gas mitigation potential (determination of baseline methodology, monitoring methodology, and calculation of energy savings)								
9	Installation of solar water heaters and retrofitting of buildings (at least 20)								
10	Installation of compact fluorescent lamps (at least 60,000) against older incandescent lamps								
11	Preparation of Project Idea Note (PIN) for CDM and voluntary carbon standards								
12	Development of analytical materials on lessons learned								

13. Expected Results and Impact Indexes

The proposed project presents economic, social and environmental benefits, as well as multiplier effects. The project directly benefits individual households through the installation of compact fluorescent lamps which will result in energy savings and lower expenditures. As Cambodia has one of the highest electricity cost in the world, for households under the official poverty line of a dollar a day, savings of 2-3 energy efficient lamps are significant. The project will actively seek gender balance by encouraging the participation of women, as they may play a central role in daily decision making in the household in terms of energy expenses and conservation. Awareness raising of children through knowledge and demonstration activities specifically developed for primary and secondary schools aim to ensure that current and future generations become more sensitive to climate change and energy issues. A broad range of public (government offices, schools, hospitals) and private (hotels, guesthouses, restaurants, markets) organisations will similarly benefit from the energy savings promoted by the project, as well as from increased knowledge of energy efficiency and climate change issues. In addition, the target organisations will gain institutional capacity to sustain the energy efficiency measures put in place. From an environmental perspective, the proposed activities will contribute to the mitigation of greenhouse gases and climate change, decreased fossil fuel combustion and improved local air quality. The project has significant multiplier potential as it aims to overcome the existing barriers in terms of knowledge and information, and to demonstrate in a practical manner the benefits of energy efficiency. The installation of solar water heaters will act as demonstration sites that other interested entrepreneurs may visit and further replicate. Thus, the project will constitute a model for scaling up and replication.

Expected results	Indicators (units)
<ul style="list-style-type: none"> ▪ Information on energy conservation and energy efficiency available in Khmer and disseminated 	<ul style="list-style-type: none"> ▪ Number of radio spots run ▪ Number of leaflets, brochures, posters and print materials distributed ▪ Energy savers website developed (with tips on saving energy and money)
<ul style="list-style-type: none"> ▪ Awareness raising of energy efficiency and energy conservation increased 	<ul style="list-style-type: none"> ▪ Number of awareness raising workshops ▪ Number of participants in awareness raising workshops ▪ Number of television spots run ▪ Number of newspaper advertisements and features published
<ul style="list-style-type: none"> ▪ Energy efficiency of electric appliances labelled in Khmer 	<ul style="list-style-type: none"> ▪ Number of electric appliances labelled (types and models) ▪ Number of electric appliances labelled (units)
<ul style="list-style-type: none"> ▪ Greenhouse gas emissions reduced 	<ul style="list-style-type: none"> ▪ Amount of greenhouse gas emission reductions (CO₂ eq) ▪ Project Idea Note for CDM and voluntary carbon standards developed ▪ Number of solar water heaters installed and number of buildings retrofitted (at least 20) ▪ Number of compact fluorescent lamps distributed (at least 60,000)
<ul style="list-style-type: none"> ▪ Electricity consumption for equivalent output level decreased 	<ul style="list-style-type: none"> ▪ Amount of electricity saved (KWh, US \$)
<ul style="list-style-type: none"> ▪ Project lessons analysed and disseminated 	<ul style="list-style-type: none"> ▪ Analytical paper on lessons learned published

14. Risk Analysis:

The legal and political risks of the project are minimal, as the planned activities have been developed by government institutions in partnership with academic and non government organisations. The lead ministries responsible for climate change and energy issues in Cambodia are both involved in the partnership. The management succession risk is similarly considered small as the partner organisations are either large well established institutions, or can rely on a broad network of collaborators. Thus key personnel could be replaced with relative ease, although a transition period would be required.

The main technologies to be used (compact fluorescent lamps, solar water heaters) are proven, functioning and commercially available locally. The project will not compromise quality for poorly manufactured units from other countries. The models sold in Cambodia include reliable brands by multinational firms. However, these products have to date not been commercially successful due to poor consumer acceptance and low levels of awareness about their benefits. The project faces the difficult task of educating Cambodian consumers to the usefulness of these technologies and explaining the broader benefits of adopting energy saving habits. The probability of social acceptance will be enhanced by a comprehensive awareness raising campaign in Khmer through appropriate communication channels, the dissemination of self-explanatory energy savings materials, as well as the demonstration of the reliability and usability of these technologies. By proving that money can be saved at the household level, in government offices and private facilities, the project uses a financial argument that the general public may understand. Although households and institutions will be requested to contribute financially towards the cost of equipment, these amounts will initially be set at low levels until public interest in adopting energy saving habits are firmly established.

Compact fluorescent lamps are up to six times more efficient than their incandescent equivalents. Switching to CFLs results in lower electricity consumption and therefore mitigates greenhouse gas emissions. However, compact fluorescent lamps contain mercury, which is a regulated toxin. CFLs do not emit mercury when unbroken or during normal use. Cambodian pollution standards with regards to toxicity concentrations in the environment are in line or stricter than internationally accepted standards, including those set by the World Health Organisation (WHO). In countries with appropriate recycling facilities, the glass, phosphor powder and mercury vapour are collected for reuse. However, in the absence of such facilities in Cambodia, the spent CFLs will be collected at the provincial departments of environment and energy, and disposed of as household hazardous waste, following an existing programme for used household batteries.

15. Monitoring and Evaluation Scheme

The project implementation team will conduct continuous monitoring of the impacts and successes of the planned activities. Project management will keep track of resource use, implementation of activities and delivery of results. The uptake or level of interest by the target stakeholders and beneficiaries will be a key measure for the success of the project. The project implementation team will produce bi-annual progress reports and a final report applying the monitoring indicators for results achieved. Progress in the implementation of the project will be communicated periodically to the EEP Regional Coordination Unit, as well as to the senior management of all partner organisations involved. As *Energy Savings Siem Reap* is a government lead project, progress will

also need to be presented to the National Climate Change Committee, which is Cambodia's high level inter-ministerial body overseeing climate change activities carried out in the country.

16. Management Plan

The sustainability of the action is closely linked to the continued involvement of the Ministry of Environment, and the Ministry of Industry, Mines and Energy, beyond the funding period. Awareness raising materials designed in Khmer will provide the necessary basis for future environmental education activities. Energy saving tips and explanation for labelling of electric appliances will remain available to the general public through the official websites of the ministries.

The project will also contribute to establishing a technical foundation for the financing of compact fluorescent lamps and solar water heaters with revenues from greenhouse gas emission reductions achieved. As it stands, the size of the project is unlikely to justify administrative registration costs under the Clean Development Mechanism. However, the replication of the project to the capital city and other parts of Cambodia would be eligible both under the Clean Development Mechanism and voluntary carbon standards as part of broader Programme of Activities (POAs). Programmatic CDM is suitable for such replicable projects with low and physically spread emission profiles. Once a POA has been registered, small activities that are similar to *Energy Savings Siem Reap* can be added in turn.

17. Documentation and Dissemination Plan

The success of the project depends on its ability to gain public recognition and acceptance. Thus, the awareness raising campaign will aim to ensure that the project maintains a high profile and that beyond project completion energy savings habits continue to be practised in the general population. EEP contribution will be duly acknowledged through the display of its logo on all printed materials disseminated to promote energy conservation, as well as in informative advertisements in the media. Lessons learned from the project will be the subject of a joint research article lead by URC.

18. Conclusions

Energy Savings Siem Reap aims to promote and demonstrate energy conservation and energy efficiency in the province of Siem Reap. To a large extent, Cambodia's population remains unaware of basic measures to conserve electricity, including switching to compact fluorescent lamps, and of the links between electricity consumption and climate change. The main objectives of the project are to raise awareness of energy efficiency and energy conservation in the context of climate change, and to demonstrate that simple measures can be implemented successfully and do make a difference.

Energy Savings Siem Reap directly responds to Cambodia's priorities in renewable energy and energy efficiency, and contributes to national objectives to reduce poverty, achieve energy security and mitigate greenhouse gas emissions. The project targets households, government buildings (government offices, schools, hospitals), and the commercial and private sectors (hotels/guesthouses, restaurants and commercial centres). *Energy Savings Siem Reap* adopts a pragmatic and flexible approach, with a focus on practical action with end users and consumers. The project is country-driven and lead by the Royal Government of Cambodia in partnership with academic institutions and non-government organisations.

Energy Savings Siem Reap recognises that individuals and organisations, as responsible citizens, have an essential role to play in conserving energy and mitigating greenhouse gases. The project aims to lay the foundations for behaviour change and to foster a culture of energy frugality.

 09/06/2010

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