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Enhancing Capacity for Low Emission Development Strategies in Cambodia Pre-Scoping Desk Study

October 29, 2012

This report was produced for review by the United States Agency for International Development (USAID). It was prepared by the Low Emissions Asian Development (LEAD) program.

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Contract No. AID-486-C-11-00002

October 29, 2012

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
I. INTRODUCTION: APPROACH AND BACKGROUND	2
1.1 Background on Low Emission Development Strategies (LEDS)	3
1.2 Objective and Approach to the Assessment	4
1.3 Structure of the Report	5
2. POLICIES, STRATEGIES, AND INSTITUTIONAL STRUCTURES RELATED TO LEDS	6
2.1 National Government Planning	6
2.2 LEDS-Related Strategies	11
2.3 Limitations and Barriers	16
3. RELEVANT CURRENT AND PAST PROGRAMS	18
3.1 LEDS-related Government Programs	18
3.2 USG LEDS-Related Activities	25
3.3 Gaps and Areas for Collaboration	27
4. ANALYTICALLY-BASED MACROECONOMIC DECISION MAKING	30
4.1 Macroeconomic Decision Making Capacity of the RGC	30
4.2 Involvement of Universities and Institutes	33
4.3 Gaps and Recommendations	34
5. NATIONAL GREENHOUSE GAS INVENTORY	35
5.1 Draft result of the SNC mitigation analyses	35
5.2 Greenhouse Gas Emissions from Agriculture, Forestry, and Other Land Use	35
5.3 Identification and Screening of GHG Mitigation Options	37
5.4 Mitigation Scenarios	37
5.5 Greenhouse Gas Inventory for the Energy and Transport Sector	38
5.6 Gaps and Areas for Collaboration	40
6. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: FORESTRY AND OTHER LAND USE	42
6.1 Current Forestry Sector Activities	42
6.2 Development Goals and Priorities	43
6.3 Key GHG Emissions Drivers and Trends	47
6.4 Sectoral Structure and Institutional Capacities	48
6.6 Gaps and Areas for Collaboration	52
7. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: AGRICULTURE	54
7.1 Current Agricultural Sector Activities	54
7.2 Development Goals and Priorities	54
7.3 Key GHG Emissions Drivers and Trends	55
7.4 Sectoral Structure and Institutional Capacities	56
7.5 Key Policies and Implementation Plans	56
7.6 Existing and Planned Donor Support	58
7.7 Gaps and Areas for Collaboration	58
8. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: ENERGY USE AND POWER GENERATION	60
8.1 Current Energy Sector Activities	60
8.2 Development Goals and Priorities	61

8.3	Key GHG Emissions Drivers and Trends	61
8.4	Potential for Renewable Energy	62
8.5	Energy Sector Structure and Institutional Capacities	65
8.6	Key Policies and Implementation Plans	66
8.7	Existing and Planned Donor Support.....	66
8.8	Gaps and Areas for Collaboration	66
9.	SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT:	
	TRANSPORTATION	68
9.1	Development Goals and Priorities	68
9.2	Key GHG Emissions Drivers and Trends.....	68
9.3	Key Policies and Implementation Plans	69
9.4	Gaps and Areas for Collaboration	70
10.	SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT:	
	INDUSTRY AND WASTE	71
10.1	Development Goals and Priorities	71
10.2	Key GHG Emissions Drivers and Trends.....	71
10.3	Sectoral Structure and Institutional Capacities	72
10.4	Key Policies and Implementation Plans	72
10.5	Gaps and Areas for Collaboration	73
11.	CONCLUSIONS	74

ACRONYMS

ADB	Asian Development Bank
AFOLU	Agriculture, Forestry, and Other Land Use
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
AusAID	Australian Agency for International Development
BAU	Business As Usual
BCI	Biodiversity Conservation Corridor Initiative
CARD	Council on Agriculture and Rural Development
CARDI	Cambodia Agriculture Research and Development Institute
CAVAC	Cambodia Agricultural Value Chain Project
CCCA	Cambodia Climate Change Alliance
CCCSP	Cambodia Climate Change Strategic Plan 2013-2023
CCD	Climate Change Department
CCEAP	Climate Change Enabling Activity Project
CC-SEA	Climate Change-Strategic Environmental Assessment
CCTT	Climate Change Technical Team
CDC	Council for the Development of Cambodia
CDM	Clean Development Mechanism
CEDAC	Centre d'Etude et de Développement Agricole Cambodgien (Cambodian Centre for Study and Development in Agriculture)
CEP-BCI	Core Environment Program
CGGRM	Cambodia Green Growth Road Map
CHP	Combined Heat and Power
CMDG	Cambodian Millennium Development Goals
CNMC	Cambodian National Mekong Committee
CNPA	Cambodian National Petroleum Authority
CoM	Council of Ministers
CRS	Cambodian Rectangular Strategy
CSOs	Civil Society Organizations
CTA	National Programme Coordinator
DANIDA	Danish International Development Agency
DFID	UK Aid from the Department for International Development
DIMES	Departments of Industry, Mines and Energy (provincial level)
DNA	Designated National Authority
EAC	Electricity Authority of Cambodia
EC	European Commission
EC-LEDS	Enhancing Capacity for Low Emission Development Strategies
EDC	Electricité du Cambodge (national electricity utility)
EIC	Economic Institute of Cambodia
ELC	Economic Land Concession
ESMAP	Energy Sector Management Assistance Program (World Bank)

FA	Forestry Administration (part of MAFF)
FAO	Food and Agricultural Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FiA	Fishery Administration (part of MAFF)
GCC	Global Climate Change
GCM	General Circulation Model
GDANCP	General Department of Administration for Nature Conservation and Protection
GDCC	Government-Donor Coordination Committee
GDI	General Department of Industry
GDoP	General Directorate of Planning
GDP	Gross Domestic Product
GEF	Global Environment Facility
GERES	Groupe Energies Renouvelables, Environnement et Solidarités
GGMP	Green Growth Master Plan
GGR	Green Growth Roadmap
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation)
GMS	Greater Mekong Subregion
HARVEST	Helping Address Rural Vulnerabilities and Ecosystem Stability (USAID program)
HDI	Human Development Index
HH	Households
IED	Innovation Energie Développement
IMGGWG	Inter-Ministerial Green Growth Working Group
INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate Change
ITC	Institute of Technology of Cambodia
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
KOICA	Korea International Cooperation Agency
KP	Kyoto Protocol
LDC	Least Developed Country
LEAD	Low Emissions Asian Development
LEDS	Low Emission Development Strategies
LPG	Liquefied Petroleum Gas
LUCF	Land Use Change and Forestry
LULUCF	Land Use, Land Use Change and Forestry
MAFF	Ministry of Agriculture, Forestry and Fisheries
MDG	Millennium Development Goal
MEF	Ministry of Economy and Finance
MEYS	Ministry of Education, Youth, and Sports
MFI	Microfinance Institution

MIME	Ministry of Industry, Mines and Energy
MLMUPC	Ministry of Land Management, Urban Planning, and Construction
MoC	Ministry of Commerce
MoE	Ministry of Environment
MoFAIC	Ministry of Foreign Affairs and International Cooperation
Mol	Ministry of Interior
MoIn	Ministry of Information
MoP	Ministry of Planning
MoWRAM	Ministry of Water Resources and Meteorology
MPWT	Ministry of Public Works and Transport
MRD	Ministry of Rural Development
MRV	Measurement, Reporting and Verification
MSME	Micro, Small, and Medium Enterprise Program
MV	Medium Voltage
NAMAs	Nationally Appropriate Mitigation Actions
NAPA	National Adaptation Programme of Action
NBP	National Biodigester Programme
NBPO	National Biodigester Programme Office
NCCC	National Climate Change Committee
NCCN	National Climate Change Network
NCDM	National Committee for Disaster Management
NFP	National Forestry Programme
NGO	Nongovernmental Organization
NIES	National Institute for Environmental Studies
NIS	National Institute of Statistics
NP-SNDD	Sub-national Democratic Development
NSDP	National Strategic Development Plan
NSDR	National Strategy for Disaster Reduction
NTFP	Non-Timber Forest Product
OPIC	Overseas Private Investment Corporation
PA	Protected Areas
PBPO	Provincial Biodigester Programme Offices
POAs	Programme of Activities
PPCR	Pilot Program on Climate Resilience
PRSP	Poverty Reduction Strategy Papers
PSB	Programme Support Board
PVC	Polyvinyl Chloride
RDMA	(USAID) Regional Development Mission for Asia
RE	Renewable Energy
REDD+	Reducing Emissions from Deforestation and forest Degradation plus the conservation, sustainable management, and enhancement of forest carbon stocks
REE	Rural Electricity Enterprise
REF	Rural Electrification Fund

REPA	Renewable Energy Promotion and Awareness
RETP	Rural Electrification and Transmission Project
RGC	Royal Government of Cambodia
RHA	Rice husk ash
RHBG	Rice husk burning gasifiers
RLs/REL	Reference Levels or Reference Emissions Levels
R-PP	REDD+ Readiness Preparation Proposal
SAW	Strategy for Agriculture and Water
SBCA	Seima Biodiversity Conservation Area
SEDP	Socio-Economic Development Plan
SIDA	Swedish International Development Cooperation Agency
SLCs	Social land concessions
SMEs	Small and Medium Enterprises
SNA	Sub-national administration
SNC	Second National Communication (report on the status of climate change)
SNV	Netherlands Development Organization
SREP	Sustainable Rural Electrification Plans for Cambodia
SRI	System of Rice Intensification
TAP	Technical Advisory Panel
TJ	Terajoule
TWG F&E	Technical Working Group on Forestry and Environment
TWG Lands	Technical Working Group on Lands
TWGAg	Technical Working Group on Agriculture
TWGF	Technical Working Group on Fisheries
TWGs	Technical Working Groups
TWG E&CC	Technical Working Group on Environment and Climate Change
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USG	United States Government
USTDA	United States Trade and Development Agency
V&A	Vulnerability and Adaptation
VERs	Verified Emission Reductions
WB	World Bank
WCS	Wildlife Conservation Society

EXECUTIVE SUMMARY

Cambodia has seen high economic growth over recent years and must balance unrestrained high emissions growth with the realities of climate change and related issues. This desk study identifies opportunities for the United States Government (USG) to better integrate and improve its support to the Royal Government of Cambodia (RGC) in enhancing its internal capacity to develop and implement low emission development strategies (LEDS), primarily through the US Government’s Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) initiative. This report is intended to serve as initial input to the USG EC-LEDS scoping mission to Cambodia.

Across the Cambodian economy, all sectors are ripe for engagement in enhancing the capacity for LEDS development. At a strategic level, several national strategies and plans have been developed, including the Rectangular Strategy, Millennium Development Goals (MDGs), and National Strategic Development Plan, which include actions on climate change. A specific climate change strategy is being developed by the National Climate Change Committee (NCCC), which is coordinated by the Cambodian Climate Change Department (CCD) as part of the Ministry of Environment (MoE). Directly related to LEDS is the recent Green Growth Roadmap (GGR) developed with the participation of 17 ministries and chaired by the Prime Minister.

Related to LEDS activities, the first organizational frameworks are in place; committees and stakeholder participation have been organized. An initial general approach to supporting policies and frameworks for EC-LEDS can be provided at the national level for overall strategy development resulting in sector-specific strategies. As an excellent starting point for EC-LEDS, support to further develop, refine, and implement the GGR and other strategies and plans may be a first priority area of collaboration as well as synthesizing the large number of committees and Technical Working Groups (TWG) to more efficiently build capacity for implementing LEDS.

Further, the NCCC has developed other activities that could be supported, such as the Climate Change Trust Fund, which could benefit from additional funding for mitigation support, including Programme of Activities (POAs), Nationally Appropriate Mitigation Actions (NAMAs), and activities to promote Reducing Emissions from Deforestation and Forest Degradation plus the conservation, sustainable management, and enhancement of forest carbon stocks readiness (REDD+). The risk is that low emission development strategies will be implemented and supported but concurrently, competing economic growth strategies may prevent meaningful results. For example, nature conservation organizations have supported preservation and official ratification of national parks and wildlife sanctuaries. At the same time, the RGC has approved economic land concessions (ELC) inside these parks to support economic growth.

For detailed planning of LEDS, modeling and economic analyses are necessary to formulate effective implementation programs. Analytical tools for decision making are known but data are limited, making these tools inefficient for RGC. A portfolio of actions is often formulated but without incorporating funding mechanisms or, funding is fragmented by the larger portfolio of donors. Although several strategies are relevant to LEDS, especially the GGR, they will have limited impact on actual emission figures because implementation strategies are not well formulated, financing plans are nonexistent, or financing is not identified. Capacity building of government officials must be coupled with sustainable training programs, as highly qualified staff may leave for better paid jobs with donors, nongovernmental organizations (NGOs) or the private sector, and strategies developed may have minimal implementation and impact.

I. INTRODUCTION: APPROACH AND BACKGROUND

Cambodia, located in Southeast Asia, borders Vietnam to the east, Lao People's Democratic Republic to the north, and Thailand to the west (Figure 1). It has a land area of 181,035 km². The country's population grew from 9 million in the 1960s to 14.1 million in 2011. Cambodia is one of the poorest countries in Southeast Asia with a Human Development Index (HDI) of 0.494, ranking it 126th of 169 countries for which HDI is reported. GDP in 2011 was US\$ 14.204 billion; GDP per capita was US\$ 900 and real GDP growth for 2011 was 6.1 percent. Agriculture makes up 31 percent of the economy, industry 22 percent, and services 40 percent.¹



Figure 1: Map of Cambodia

Approximately 80 percent of Cambodians live in rural areas with limited access to clean and affordable water and energy. Thirty-four percent of the rural population lives below the national poverty line of less than 2,367 riels (\$0.60) per day. Table 1 provides a snapshot of the regional context, comparing Cambodia to neighboring countries in Southeast Asia.

¹ Global Finance – Cambodia Country Report. Available online at <http://www.gfmag.com/gdp-data-country-reports/306-cambodia-gdp-country-report.html#axzz23R6KwGVQ>.

Table 1: Regional snapshot comparing Cambodia to its neighboring countries on key variables

Country	Land Area ¹ (‘000 km ²)	Population ¹ (million)	Population Density ¹ (people/km ²)	GNI ³ per capita (US\$)	HDI Ranking ² (out of 169 countries)	National Electrification Rate
Cambodia	181.0	14.1 (5)	82	\$650	126	24%
Vietnam	310.1	87.3	278	\$1,010	115	95%
Lao PDR	230.8	6.3	27	\$880	124	70%
Thailand	510.9	67.8	132	\$3,760	92	99%

Sources: (1) World Development Indicators Database, 2009 unless otherwise indicated

(2) Human Development Index, UNDP 2010, <http://hdr.undp.org/en/statistics>

(3) GNI is Gross National Income

Cambodia is a Least Developed Country (LDC) that receives a large amount of donor funding to support economic development and poverty reduction. The real Gross Domestic Product (GDP) annual growth rate from 2004 to 2007 averaged 11.15 percent but over the period 2001-2012 it has averaged 7.74 percent per annum.² Cambodia is experiencing intense and rapid development in urban areas, especially in the capital Phnom Penh, with new buildings, shops, and cars that are transforming Phnom Penh and other major towns to modern urban cities.

This is in stark contrast with rural areas where development is limited. Families in rural areas are generally poor but sustain a reasonable living standard as long as they are not victims of disease, land disputes, or economic land concessions that take away their source of subsistence income. In Cambodia, families work to increase and secure the support of their families through education and to achieve higher living standards. Energy demand is higher in urban areas with larger houses, air conditioners, televisions, and cars.

Concurrently, a growing population increases the need for agricultural land, reducing that available for national parks and forests. With these main drivers of the economy, green growth and low emission strategies are not part of everyday discourse for the average Cambodian but are mainly discussed within development agencies, nongovernmental organizations (NGOs), and relevant ministries and government entities. Although the RGC is interested in these programs, it often depends on donor support to implement development strategies and frameworks.

1.1 BACKGROUND ON LOW EMISSION DEVELOPMENT STRATEGIES (LEDS)

Developing countries are among the most vulnerable to climate change. As a cross-cutting stressor on human and natural systems, climate change is an additional challenge for development priorities by exacerbating existing economic, social, and governance stresses. However, it may also offer opportunities for countries to stimulate employment and attract greater investment and financial flows through access to carbon markets and other climate-related financing mechanisms. Addressing challenges and leveraging the opportunities associated with climate change and development may facilitate countries' bypassing less efficient industrial technologies as they move toward cleaner production with lower emissions,

² Global Finance – Cambodia Country Report. Available online at <http://www.gfmag.com/gdp-data-country-reports/306-cambodia-gdp-country-report.html#axzz22ANjD07k>.

on development pathways that are resilient to climatic variability and changes in environmental, economic, and social systems.

One of the outcomes of international negotiations on climate change is agreement that low emission development strategies are needed to achieve sustainable economic and social development. These LEDS provide strategic frameworks that articulate concrete actions, policies, programs, and implementation plans to advance economic growth and improve environmental management. LEDS are country-driven processes that help meet development objectives and lay a foundation for achieving long-term, measurable greenhouse gas (GHG) emission reductions as compared to a business as usual (BAU) development pathway.

The United States Government is fulfilling its international commitments for “fast start” financing to address the challenges of climate change by helping countries build analytically rigorous LEDS, among other fast start activities. The USG’s EC-LEDS program supports developing countries’ efforts to pursue long-term, transformative development and accelerate sustainable, climate-resilient economic growth while slowing the growth of GHG emissions. EC-LEDS is country-driven and tailored to each country’s unique capacity and technical, analytical, and policy needs. The intent is to build capacities in partner countries, provide targeted technical assistance, and build a shared global knowledge base on LEDS.

Cambodia is a prospective EC-LEDS partner country and participates in the Low Emissions Asian Development (LEAD) program of USAID’s Regional Development Mission for Asia (RDMA). LEAD, in coordination with USAID bilateral Missions and other USG agencies, helps Asian governments, businesses, and institutions develop frameworks for sustained low-carbon development across all economic sectors through capacity building in LEDS development and implementation, GHG inventories, and carbon market development.

I.2 OBJECTIVE AND APPROACH TO THE ASSESSMENT

This assessment will identify, summarize, and analyze the priority technical, institutional, and capacity needs and gaps related to LEDS development and implementation in Cambodia. This report will inform and guide the EC-LEDS Scoping Team in its evaluation of the key LEDS related needs and gaps with the greatest potential impact and outcome for EC-LEDS. The team’s findings and recommendations will provide the basis for further U.S. engagement with and support for the development and implementation of LEDS by the RGC.

The objective of the pre-scoping desk study is three-fold:

- To analyze the current status of efforts and assess the current capacity of the RGC and donors in developing and implementing LEDS
- To identify opportunities for the USG to better integrate and improve its support to the RGC in enhancing its internal capacity to develop and implement LEDS
- To summarize findings from the desk study into a report for internal use by USG agencies which may conduct more detailed in-country assessments and consultations as part of formulating a joint US-RGC program of support to further mutual goals

The Pre-Scoping Desk Study Team included five experts who evaluated existing programs, policies, activities, and documents from the RGC, donors, and institutions for LEDS potential. They carried out this desk study based on an extensive literature review and without any formal or informal contact with Cambodian government officials. Written source material included official documents such as national development and climate change strategies, Poverty

Reduction Strategy Papers (PRSP), other reports, and academic articles. The results are described in the following chapters.

I.3 STRUCTURE OF THE REPORT

This Pre-Scoping Desk Study is structured to present the findings by five LEDS components (organize the LEDS process; assess current situation; analyze options; prioritize actions; and implement and monitor) for LEDS-related documents, relevant policies, programs, and strategies; and technical evaluation of the quality, capacities and potential for LEDS, and suggestions for collaboration. The Chapters that follow are:

- Chapter 2: Policies, Strategies, and Institutional Structures Related to LEDS
- Chapter 3: Relevant Current and Past Programs
- Chapter 4: Analytically-Based Macroeconomic Decision Making
- Chapter 5: National Greenhouse Gas Inventory
- Chapter 6: Sector-Specific Observations and Needs Assessment: Forestry and Other Land Use
- Chapter 7: Sector-Specific Observations and Needs Assessment: Agriculture
- Chapter 8: Sector-Specific Observations and Needs Assessment: Energy Use and Power Generation
- Chapter 9: Sector-Specific Observations and Needs Assessment: Transportation
- Chapter 10: Sector-Specific Observations and Needs Assessment: Industry and Waste
- Chapter 11: Conclusions

The Pre-Scoping Desk Study also includes the following extensive annexes

- Annex 1: Symbols and Units
- Annex 2: Resources
- Annex 3: Recommended Agencies and Contacts
- Annex 4: Policies and Strategies Related to LEDS
- Annex 5: RGC Structures for Climate Change and LEDS
- Annex 6: Current and Past Programs Related to LEDS
- Annex 7: Diagrams of Institutional Mechanisms Related to LEDS
- Annex 8: Important Documents Related to LEDS
- Annex 9: Overview of LEDS-Related Programs and Activities

2. POLICIES, STRATEGIES, AND INSTITUTIONAL STRUCTURES RELATED TO LEDS

2.1 NATIONAL GOVERNMENT PLANNING

LEDS and its institutional structures are not definitively visible in the national strategy and economic agenda of RGC, but many strategies and nascent institutional structures have been developed to facilitate green growth and to address climate change issues. These climate change related documents are the basis for EC-LEDS to engage with RGC and provide support through identifying gaps in strategy development and planning, supporting implementation, and strengthening policies through technical assistance and capacity development. Cambodia's Initial National Communication (INC) is an important starting point for LEDS since it reports on the country's GHG inventory in 1994. The desk study team considers the Second National Communication (SNC) to be more relevant for EC-LEDS since the SNC contains information about Cambodia's efforts to reduce emissions as well as more recent data on GHG emissions. Additionally, this desk study evaluates key documents which have not been officially released but are discussed in public forums and available unofficially. Including these documents in an assessment of the current status is crucial for providing the scoping team with appropriate context for meetings with RGC.

The desk study team evaluated each document listed in Table 2 against the five LEDS components and three sub-areas. This evaluation identified the strengths and/or weakness of each document as approximations of relative quality of coverage in each document of the items required for developing and implementing LEDS. The documents are discussed in more detail later in this report.

Rectangular Strategy. To coordinate and streamline development, the RGC adopted the “Cambodian Rectangular Strategy” (CRS) in 2004 to focus economic growth and to guide implementation of the National Strategic Development Plans. Built on prior planning documents and the MDGs, the CRS aims to promote economic growth, job creation, equity and social justice, and enhanced efficiency of the public sector. It also aims to create an integrated enabling environment of good governance, administrative and sector reform, peace and political stability, partnership/integration, and financial reform. The CRS continues to be an important economic policy document for the fourth legislature (2009-2013).

National Strategic Development Plan (NSDP). Conforming to the Rectangular Strategy, the NSDP was developed to guide the implementation of national and sectoral development strategies and plans, targeting poverty reduction as its most important issue. The NSDP highlights the need for stable and accountable public institutions as vital elements of good governance for robust economic and social progress. Furthermore, the NSDP calls for improved enforcement of existing laws and for the development of additional legislation to ensure RGC can appropriately address environmental issues and natural resources management in forestry, fisheries, and land. The NSDP lists general targets for each major sector, and proposes specific actions to expand and improve transport, energy, and water infrastructure to meet increased demand for better access to services, especially in the rural areas.

Table 2: Evaluation of Key RGC Documents related to LEDS and other Strategic Development

Evaluation of Key RGC Documents related to LEDS and other Strategic Development Planning in Cambodia	Planning									
	<i>Rectangular Strategy (2004) and Phase II (2008)</i>	<i>Green Growth Roadmap (2009)</i>	<i>National Strategic Development Plan 2009-2013 (2010)</i>	<i>Second National Communication (July 2010 draft - not for citation)</i>	<i>National Forest Programme 2029 (2010)</i>	<i>National REDD+ Roadmap 2010-</i>	<i>National Program for Sub-national Democratic Development (2010)</i>	<i>Strategy and Action Plan for Rural Electrification (2011)</i>	<i>Cambodia Climate Change Strategic Plan (under development)</i>	
1. LEDS Organizational Framework										
a. Institutional Structure	In Place	Proposed	In Place	In Place	In Place	Proposed	In Place	In Place	In Place	In Place
b. Workplan for (LEDS) Development	In Place	Reasonable	In Place	In Place	In Place	Draft	In Place	In Place	In Place	Draft
c. Stakeholder Involvement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
2. Assessment of the Current Situation										
a. Summary of Development Goals	Reasonable	Reasonable	Reasonable	Clear	Reasonable	Draft	Reasonable	Clear	Clear	Draft
b. Economic and Environmental Data	Reasonable	Limited	Reasonable	Limited	Reasonable	Limited	Not in Place	Reasonable	Reasonable	Limited
c. GHG Inventory	Limited	Not in Place	Limited	Reasonable	Limited	Limited	Not in Place	Limited	Limited	Based on SNC
3. Analytical Tools for Decision Making										
a. Business as Usual (BAU) scenario	Limited	Limited	Limited	Reasonable	Limited	Limited	N/A	Limited	Limited	Reasonable
b. Low Emission Path	Limited	Reasonable	Limited	Reasonable	Limited	Reasonable	N/A	Limited	Limited	Reasonable
c. Assessment of Mitigation Options	Limited	Reasonable	Limited	Reasonable	Limited	Limited	N/A	Limited	Limited	Based on SNC
4. Portfolio of Actions										
a. Portfolio of Actions to Achieve Goals	Limited	Limited	Limited	Limited	In Place	Draft	Reasonable	In Place	In Place	Draft
b. Prioritized Near Term Actions	Limited	Reasonable	Limited	Not in Place	In Place	Draft	Reasonable	Limited	Limited	Draft
c. Financial Plan	Limited	Not in Place	Limited	Not in Place	In Place	Limited	Limited	In Place	In Place	?
5. Implementation and Monitoring										
a. Financing Structured	Limited	Not in Place	Limited	Limited	Not in Place	To Be Drafted	Not in Place	Not in Place	Not in Place	To Be Drafted
b. Measurable Implementation Progress	Limited	Not in Place	Limited	Not in Place	Not in Place	To Be Drafted	Not in Place	Not in Place	Not in Place	To Be Drafted
c. Monitoring System in Place	Reasonable	Not in Place	Reasonable	Not in Place	Not in Place	To Be Drafted	Not in Place	Not in Place	Not in Place	To Be Drafted
Relevance to LEDS	Limited	High	Moderate	High	Moderate	High	Limited	High	High	High

Planning

RELEVANT LEDS STRUCTURES AND CAPACITY

INTER-MINISTERIAL STRUCTURES

While the Rectangular Strategy and the National Strategic Development Plan outline RGC's vision for Cambodia, several national structures, laws, and policies lay out institutional mechanisms related to climate change. The most important and relevant entities are listed in Table 3.

Table 3: List of Inter-Ministerial Structures

Inter-ministerial Structures
Ministry of Environment
National Climate Change Committee
Climate Change Technical Team
Cambodia Climate Change Alliance
Climate Change Department (MoE)
National Committee on Green Growth
Technical Working Groups
Government-Donor Coordination Committee
REDD+ Task Force
National Climate Change Network

MINISTRY OF ENVIRONMENT

Recognizing its broad mandate for environmental protection and natural resources management, the MoE is the designated RGC focal point to the United Nations Framework Convention on Climate Change (UNFCCC) and plays a lead role in coordination, planning, and implementation of climate change related activities across the RGC.

Overall coordination of RGC activities on climate change rests with the MoE as chair of the inter-ministerial National Climate Change Committee (NCCC). The structure for these institutional arrangements is shown in Figure 2.

NATIONAL CLIMATE CHANGE COMMITTEE

The NCCC, set up in 2006, is responsible for preparing, coordinating, and monitoring the implementation of policies, strategies, legal instruments, plans, and programs of the RGC to address climate change and contribute to the protection of the environment and natural resources (Sub-decree on the establishment of the National Climate Change Committee, 2006).³

³ Please see Annex 5 for additional information on NCCC Structure for list of 20 ministries represented and: <http://beta.camclimate.org.kh/index.php/nccc-organigram.html>

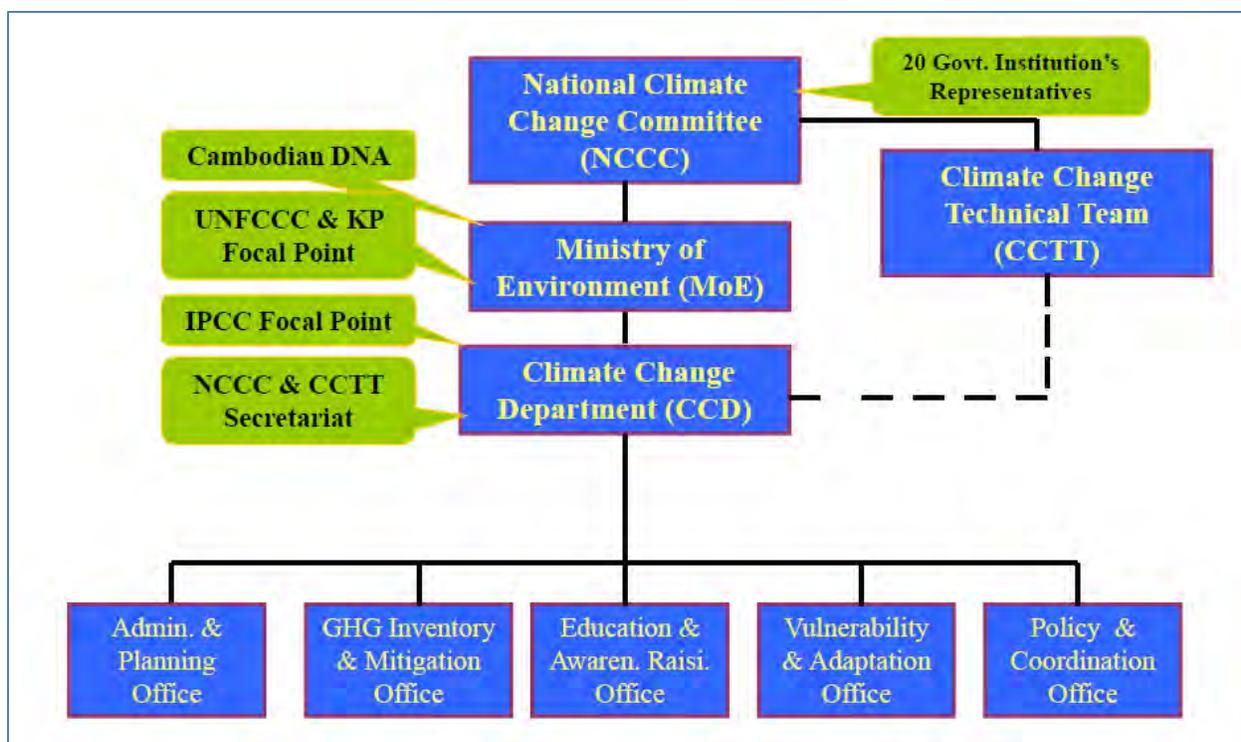


Figure 2: Management Structure of Climate Change in Cambodia

Source: Policy and Strategy on Climate Change in Cambodia Presentation by Mr. CHEA Chan Thou, Deputy Director of Climate Change Department, MoE

CLIMATE CHANGE TECHNICAL TEAM

The Climate Change Technical Team (CCTT) was launched in 2011 as a connection between the NCCC and the CCD. The CCTT is intended to provide technical expertise on climate change issues. The CCTT follows the NCCC format of representatives from 20 ministries but currently does not seem to have an official mandate or work plan and has limited capacity. Lack of funding and technical capacity remain the major challenges facing the NCCC in coordinating effective policy responses with sector line agencies such as Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Water Resources and Meteorology (MoWRAM), Ministry of Industry, Mines and Energy (MIME), and others. Moreover, the NCCC Chairman has limited power to influence the policy decisions of the line agencies.

CAMBODIA CLIMATE CHANGE ALLIANCE

Another high-level coordinating mechanism is the Cambodia Climate Change Alliance (CCCA), a multi-donor initiative with the objective to promote institutional strengthening through capacity development and to operate a grants facility to help vulnerable communities and others cope with climate change impacts and disasters.⁴ The CCCA Trust Fund of US\$ 8.9 million is anchored within NCCC to provide a unified funding platform accessible by other relevant government agencies, NGOs, and civil society. This funding is primarily for capacity building and adaptation activities.⁵

⁴ Cambodia Climate Change Alliance: Purpose of Project. Available online at <http://www.un.org.kh/undp/what-we-do/projects/cambodia-climate-change-alliance>. Please see Annex 5 for additional information.

⁵ UNDP Cambodia Climate Change Alliance website: <http://www.un.org.kh/undp/what-we-do/projects/cambodia-climate-change-alliance>

CLIMATE CHANGE DEPARTMENT

The CCD serves as the UNFCCC national focal point as well as the Designated National Authority (DNA) for the Clean Development Mechanism (CDM). The CCD has the offices of: GHG Inventory and GHG Mitigation, Vulnerability and Adaptation (V&A), and UNFCCC Implementation, with the responsibility to undertake all technical activities related to implementation of UNFCCC and other climate change related tasks assigned by the MoE.

The CCD also coordinates development of the Cambodia Climate Change Strategic Plan 2013-2023 (CCCSP) which is a good step towards direct engagement of other technical departments through mainstreaming climate change in their respective sector plans. However much work remains to be done, especially in establishing appropriate capacity and institutional structure in relevant ministries, namely MIME, MAFF, MoWRAM, Ministry of Public Works and Transport (MPWT), Ministry of Planning (MoP), and National Institute of Statistics (NIS), to ensure concerted policy response to climate change. Additionally the offices have limited resources to effectively manage the climate change program and rely on external expertise and funding.⁶

NATIONAL COMMITTEE ON GREEN GROWTH

Among the LEDS-related strategic planning documents for Cambodia is the Green Growth Roadmap (GGR), which outlines the RGC's aspirations for low-carbon growth and thereby functions as a LEDS. The GGR was developed by an Inter-Ministerial Green Growth Working Group (IMGGWG) of 17 ministries lead by MoE, and depicts the road to sustainable development of the economy, including the sustainable use of its natural resources. Its starting point is the expected increase in climate variability and the need for the economy to adapt.

Formation of a National Committee on Green Growth is under consideration by IMGGWG, and a preliminary structure has been proposed. This new body would have the responsibility to coordinate and collaborate with government entities, NGOs, and civil society to formulate green growth policies, strategies, action plans, and legal instruments consistent with national sustainable development policies. There is a concern of possible overlap with existing mechanisms within the same agency, such as NCCC, and other inter-ministerial committees such as REDD+ with similar structure and membership.

TECHNICAL WORKING GROUPS

Nineteen technical working groups (TWGs) were set up for specific themes at different levels, often on a project basis. There is no dedicated TWG for climate change, and many of the TWGs are not yet functional. Those that have been established include TWGs on Forestry and Environment, Fisheries, Energy, and Agriculture.⁷ A Government-Donor Coordination Committee (GDCC) was established to coordinate TWGs and to review progress on a quarterly basis. Development partner cooperation on climate change is achieved through a monthly informal meeting chaired by UNDP with ad-hoc meetings with the NCCC.⁸

REDD+ TASK FORCE

A formal institutional structure for REDD+⁹ was recently developed, facilitated by a number of REDD+ activities and pilot projects. Formal REDD+ management arrangements are complicated by forest management falling under several government entities' jurisdiction, namely Forestry Administration (FA), Fishery Administration (FiA), and General Department of Administration for Nature Conservation and Protection (GDANCP).

⁶ Please see Annex 5 for additional information on CCD.

⁷ Cambodia List of Technical Working Groups: http://www.cdc-crdp.gov.kh/cdc/gdcc/eighth_review.htm#annex1

⁸ Government-Donor Coordination Committee website: <http://www.cdc-crdp.gov.kh/cdc/gdcc/default.htm>

⁹ Please see Annex 5 for additional information.

The Cambodia REDD+ Readiness Plan (referred to as the REDD+ Roadmap) is an important milestone in defining directions and rules of engagement. Following initial stakeholder consultations in late 2009 and early 2010, an interim inter-ministerial REDD+ Taskforce was created with a mandate to develop the Cambodia REDD+ Readiness Plan Proposal. The Taskforce was primarily composed of technical officials and chaired by the FA and members seconded from the CCD and National Parks Department of GDANCP / MoE and the Ministry of Land Management, Urban Planning and Construction (MLMUPC).

STAKEHOLDER ENGAGEMENT

The National Climate Change Network (NCCN) was established in 2009 by a group of Civil Society Organizations (CSOs) working for environmental protection and natural resource management to reduce the severity of climate change impacts by encouraging coordination and communication among stakeholders, especially NGOs.¹⁰

2.2 LEDS-RELATED STRATEGIES

Strategies and implementation plans relevant to LEDS have been developed by a number of RGC ministries, including MoE, MAFF, MIME, and MPWT. The desk study team evaluated the most LEDS-relevant plans (see Table 2). Here, each is described briefly, particularly its relevance to LEDS.

2.2.1 INITIAL NATIONAL COMMUNICATION TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (BASE YEAR 1994)

The INC was produced in 2002 by MoE as part of the Global Environment Facility (GEF) sponsored Cambodia's Climate Change Enabling Activity Project, the first and only to date officially released study on climate change undertaken in Cambodia. This INC provides information on the national circumstances and national GHG inventory for 1994. It also describes Cambodia's capability to respond to the impacts of climate change and measures that have been or need to be taken to mitigate climate change in the country.

The GHG inventory indicated that in 1994, Cambodia removed 64.85 Mt CO₂e and emitted 59.71 Mt CO₂e therefore acting as a net carbon sink with removal of 5.14 Mt CO₂e (Figure 3). Carbon dioxide made up 74 percent of emissions, while methane was 18 percent and nitrous oxide contributed eight percent of the total. The main source of CO₂ emissions was the Land Use Change and Forestry (LUCF) sector, at 97 percent, followed by agriculture at 18 percent, and the energy sector (three percent); the industry sector contribution to total CO₂ emissions was insignificant (INC, 2002). Projections of GHG emissions and removals by sectors in the INC indicated that Cambodia would become a net emitter of greenhouse gases by 2000 when the total projected emissions of 73.36 Mt CO₂e would exceed total projected removals (67.12 Mt CO₂e) by an estimated 6.24 Mt CO₂e. This would be nearly a full reversal of the 1994 inventory results. The 2010 draft SNC, described next, uses a base year of 2000 but lacks sufficiently verified GHG inventory detail to determine if the projections were accurate.

¹⁰ Please see Annex 5 for additional information.

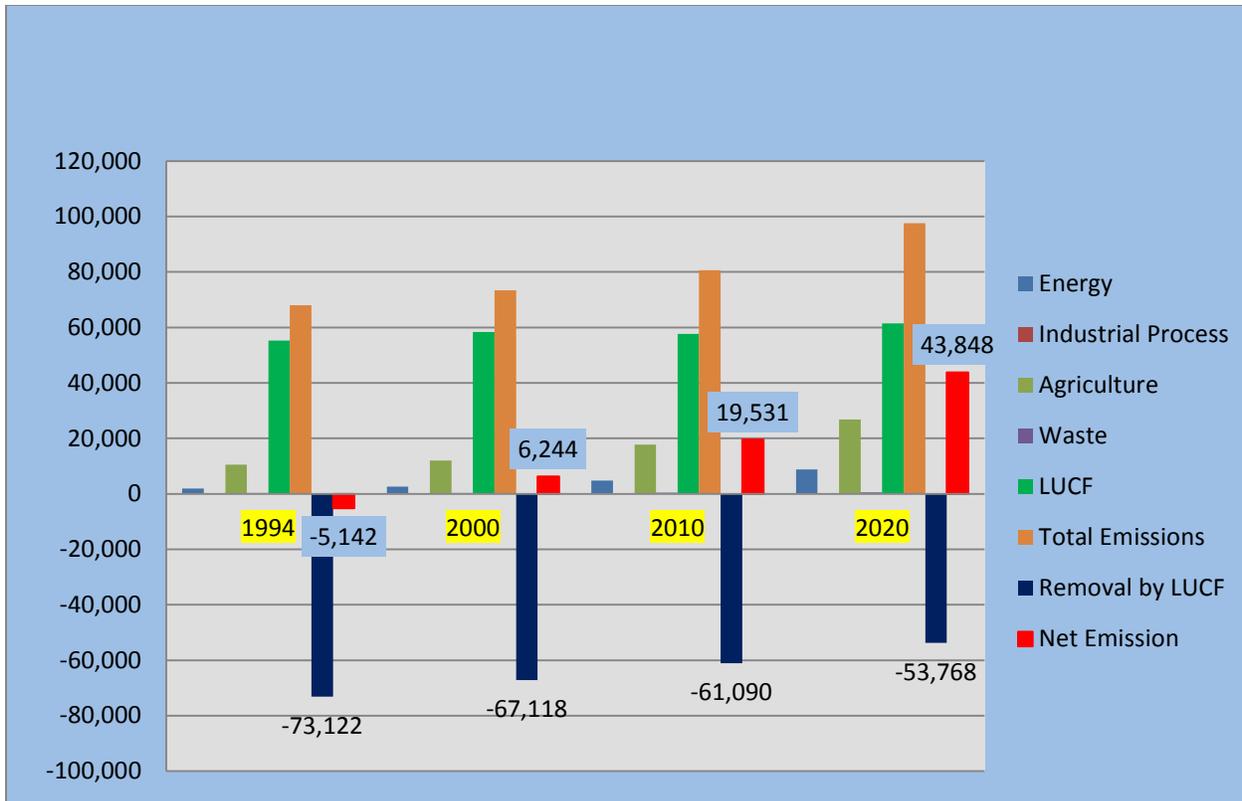


Figure 3: Projection of GHG Emissions and Removals by Sector (Gg)¹¹

Source: Initial National Communication, 2002

2.2.2 SECOND NATIONAL COMMUNICATION TO THE UNFCCC (DRAFT), (BASE YEAR 2000)

The MoE drafted the Second National Communication to improve knowledge and capability to meet its obligations in implementing the UNFCCC. The draft SNC provides an overview of the socioeconomic conditions and achievement, an overview of GHG inventory by economic sectors in 2000, review and update of climate projections until 2050, a V&A assessment, and an analysis and identification of adaptation and mitigation options for agriculture, forestry, water resources, health, and coastal zone sectors (see Annex 9).

Potential mitigation options described include energy efficiency measures, solar power, rice husk gasification with combined heat and power, electric vehicles, efficient cookstoves, and ceramic water filters. The baseline emissions for the energy sector in 2000 were 2.63 Mt CO₂e and expected to reach 25.55 Mt CO₂e by 2050. The mitigation options in the energy sector are projected to result in reductions of 17 percent compared to the baseline, or 3.88 Mt CO₂e reductions by 2050.¹²

There is currently no national process or system of collecting, managing, updating, analyzing, and archiving data at the institutional level for GHG inventories in Cambodia (the work is conducted by external consultants on a project basis), compounded by a general lack of current

¹¹ The UNFCCC prefers reporting in gigagrams (Gg), while USG reporting tends to use megatons (Mt = million metric tons). One Mt = 1,000 Gg. GHG figures will be reported in million tons throughout this report except when tables and figures are sourced from other documents.

¹² SNC – Chapter 5: Energy Mitigation

or reliable data in the forest, agriculture, energy, transport, and waste sectors.¹³ The draft 2000 inventory, therefore, made extensive use of IPCC default emission factors, and in some cases default activity data.¹⁴ This increases the uncertainty of the findings, which are also internally inconsistent within the draft SNC itself. For example, the SNC is inconsistent on background information such as rice production data. Rice production is a significant contributor of methane emissions so reliable activity data on production is needed for determining emissions. The SNC states that rice is harvested on 2.5 million ha and is 90 percent of total crop area (page 15 SNC). Later in the same document, the SNC states that rice is harvested on 83 percent of the total crop area (which is 3.22 million ha – indicating that rice is harvested on 2.67 million ha) (page 55). These challenges are some of the reasons that the draft produced in 2010 has yet to be submitted to the UNFCCC Secretariat (the draft is still undergoing review).

2.2.3 CAMBODIA CLIMATE CHANGE STRATEGIC PLAN (UNDER DEVELOPMENT)

The Cambodia Climate Change Strategic Plan 2013-2023 (CCCSP) is still under development, coordinated by the MoE's CCD with technical and financial support of the CCA. The CCCSP is intended to serve as an entry point for climate change policy development and integration and as a funding mechanism. It also is expected to provide guidance for developing sectoral action plans, awareness raising campaigns, investment promotion, capacity building, public-private partnerships, green growth planning, and other strategic guidance. CCCSP development is based on guidelines¹⁵ from the Council of Ministers (CoM), such as a planning process comprised of sectoral and document review (climate change observation, projections, impacts, institutional capacity), consultation (stakeholders, sector and site visits) and formulation of principles and thematic programs (adaptation, mitigation, coordination, and other cross-cutting strategies), which is expected to be complete by the end of 2012.

A number of sectoral strategies addressing both mitigation (energy production, transportation, industrial processes, waste management, and land use change and forestry) and adaptation (agriculture, water resources, public health, forestry, fisheries, and public infrastructure) and the cross-sectors (meteorology, disaster risk reduction, coastal zone, research and development, education and public awareness raising, gender, and protected areas) will be integrated in the CCCSP. These sectoral strategies have contained specific elements concerning LEDS, particularly in the mitigation section.¹⁶

2.2.4 CAMBODIA GREEN GROWTH ROAD MAP

The GGR was prepared in 2009 by the MoE with financial and technical support from the Korea International Cooperation Agency (KOICA) and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). In order to address economic, social, and environmental pressures, the GGR proposes a set of interventions to improve access to goods and services such as: clean water and sanitation; renewable energy; information and knowledge; better mobility; finance and investments; food security; and sustainable land use.

The GGR short-term plan includes improving the enabling environment by creating a National Ministerial Green Growth Council (NMGGC), conducting public awareness and consultation processes, and various sectoral initiatives. The GGR does not provide details on how these

¹³ For overview of problems with Cambodia's GHG Inventory, see slide 12, Cambodia: Current Status of GHG Inventory and SNC (2011). Presentation by Uy Kamal, Head of GHG Inventory and Mitigation Office. Available at ics-net.org/meetings_locarnet/2011/01/pdf/P1_3_Uy.pdf

¹⁴ The lack of current or reliable data limits an in-depth analysis of emissions profiles. For Cambodia, the most significant sectors are agriculture, industry, energy and transportation, as well as land use (discussed in detail later in this report).

¹⁵ See Presentation by Sum Thy, Director of Climate Change Department, Ministry of Environment : http://www.camclimate.org.kh/download.php?file=3_Towards%20CCCSP_Sum%20Thy_English.pdf

¹⁶ Please see Annex 9 for additional information

would be implemented, or assessment of their feasibility and practicality. Medium-term interventions focus on sustainable rural development in agriculture, energy, forestry and water, waste management, and transportation. Long-term interventions are more thematic than specific, including unspecified fiscal initiatives, ecological agriculture, infrastructure and trade improvement, sustainable energy, education, health improvement, and decentralization and deconcentration¹⁷.

In short, the GGR aims to provide a comprehensive plan for mainstreaming green growth concepts and ideas into national and sectoral development plans building on and being supportive to NSDP, MDGs, and other government reforms. A Green Growth Master Plan (GGMP) is now being formulated to provide detailed activities corresponding to the seven areas identified in GGR. Though many interventions are still general and much remains to be done to implement green growth interventions, specific LEDS activities leading to reduction of resource consumption/savings and low carbon emissions can be devised and implemented, while nonstructural measures such as legal, technological, and financial/fiscal incentives can be initiated as an enabling environment for LEDS to take root.

The GGR, however, provides little actionable detail on how the RGC intends to achieve its green growth goals. Sectoral integration is also insufficiently detailed to provide sound analysis of feasibility. Furthermore, little mention is made of existing sectoral strategies. It would be helpful, for example, to intertwine the National Forestry Program (NFP) with the GGR as a way to integrate sectoral planning into national economy-wide climate change responses, and to reinforce cross-sectoral implementation.

2.2.5 REDD+ ROADMAP

The Cambodia REDD+ Roadmap was prepared by the FA, containing six sections: a) management of national REDD+ readiness; b) consultation, stakeholder engagement, and awareness raising plan; c) development and selection of REDD strategies; d) implementation framework (including benefit-sharing and safeguards); e) development of the Reference Levels; and f) development of the monitoring system for national measurement, reporting and verification (MRV).

A formal institutional structure for REDD+ is now in place and good progress has been made through implementation of a number of REDD+ activities and pilot projects. One of the challenges is that forest management falls under the jurisdiction of several government entities, namely FA, FiA, and the GDANCP. A national focal point for REDD+ was designated under the FA, which takes the lead in getting these projects running, undertaking the preparation of a REDD+ Roadmap, active participation in the UNFCCC negotiations, and development of potential inter-ministerial mechanisms in the form of a task force and technical working groups. A number of important REDD+ initiatives carried out by the FA are:

- Establishment of REDD+ pilot involving 13 community forests covering an area of more than 66,000ha in Oddor Meanchey province, which would offset about eight million tons of CO₂e over a period of 30 years.
- A REDD+ pilot covering 187,698 ha of the Seima Biodiversity Conservation Area (SBCA) in Monduliri province, developed with the Wildlife Conservation Society (WCS), and covering one of the most important areas for biodiversity conservation in Cambodia. The Monduliri forests are also home to the indigenous Bunong minority, and the SBCA pilot will be an important demonstration of benefit-sharing from REDD+ to local people.

¹⁷ Deconcentration is the delegation of tasks from national to a local or sub-national level.

- An interim inter-ministerial REDD+ Task Force created in January 2010, with a mandate to develop the Cambodia REDD+ Readiness Preparation Proposal (R-PP) for the World Bank led Forest Carbon Partnership Facility (FCPF). The Task Force is composed of technical officials and chaired by the FA with the GDANCP of the MoE as the Deputy Chair (the agency is responsible for management of protected areas and development of climate change policies and strategies), and members seconded from the CCD National Parks Department of GDANCP/MoE and the MLMUPC, the FiA of MAFF, the Ministry of Economy and Finance (MEF), the Ministry of Interior (MoI), the Ministry of Rural Development (MRD) and MIME. The REDD+ Taskforce’s initial mandate was for an interim period with the expectation that it would be replaced by more permanent National REDD+ management arrangements at the end of the readiness planning process.
- The management arrangements for REDD+ Readiness were prepared by the interim Task Force as part of the REDD+ Roadmap, which comprises the Cambodia REDD+ Taskforce, the Task Force Secretariat, several technical teams drawn from the individual line agency members, a REDD+ Advisory Group consisting of technical experts and lead development partners, and a REDD+ Consultation Group formed of representatives from civil society, indigenous peoples, NGOs, and the private sector.

Actions that could facilitate the uptake and success of REDD+ in Cambodia include: strengthen protection and management of all forests and the implementation of deforestation reduction strategies; development of markets for legal and sustainable forest products; integration of forests in land use planning; and clearly defined land tenure and carbon ownership rights.

2.2.6. NATIONAL PROGRAM FOR SUB-NATIONAL DEMOCRATIC DEVELOPMENT

The World Bank, United Nations Development Program (UNDP), and other donors have supported the RGC to increase capacities and decision-making at provincial, community, district, and village levels. This resulted in the National Program for Sub-national Democratic Development (NP-SNDD) 2010-2019. The NP-SNDD’s objective is to promote good governance in the public sector through decentralization and deconcentration with transparency, accountability, and democratic participation. It recognizes the impact of climate change in Cambodia that will require effective government leadership at all levels. Line ministries are represented at provincial, community, and district levels and often organize national meetings inviting representatives from the provinces. NP-SNDD provides key entry points required to create a national “adaptation system” that will support society in the long-term, iterative process of adjusting as the climate changes.¹⁸

2.2.7. NATIONAL FOREST PROGRAMME 2010-2029

The NFP was prepared in 2010 by the FA to give a long-term perspective (20 years) with the overall objective to provide optimum contribution to equitable macroeconomic growth and poverty alleviation, particularly in rural areas through conservation and sustainable forest management and with active participation of all stakeholders. Based on a number of challenges related to a wide range of forest management issues (deforestation, conflicts, unsustainable forest management, law enforcement, climate change, knowledge and capacity) the NFP has identified nine strategic objectives (see Annex 4) with the most relevant to LEDS, being objectives two (to adapt to climate change and mitigate its effects on forest based livelihoods), three (to promote macro land-use planning that allows for holistic planning across sectors, jurisdictions and local government borders), and four (to promote forest governance and law enforcement at all levels). Of particular interest is objective two concerning climate change

¹⁸ Please see Annex 4 for additional information.

adaptation and mitigation, where the NFP specifically targets international mechanisms, notably REDD+ and CDM, as a means to address climate change in the forest sector, since forests are both a source of carbon emissions and a sink through sequestration.

2.2.8. NATIONAL POLICY ON RURAL ELECTRIFICATION FOR RENEWABLE ENERGY (2006)

The National Policy on Rural Electrification for Renewable Energy is officially approved by the CoM and provides for general support by the government for renewable energy projects for rural electrification, and does not include renewables for other areas such as improved cook stoves, or biogas for household cooking. It was produced and approved in order to provide a policy framework for the World Bank-GEF Rural Electrification and Transmission Project (RETP) that included the installation of 12,000 solar home systems and subsidy of US\$45 for 50,000 additional household connections by rural electricity enterprises (REE).¹⁹

2.2.9 STRATEGY AND ACTION PLAN FOR DEVELOPMENT OF RURAL ELECTRIFICATION IN THE KINGDOM OF CAMBODIA

The RGC has approved the Strategy and Plan for Development of Rural Electrification, which was formulated to ensure all villages have access to electricity by the year 2020 and at least 70 percent of all households have access to grid-quality electricity by the year 2030 (see Annex 4). The strategy does not include a feed-in-tariff policy for renewable energy. As part of the RETP, MIME developed a renewable energy plan for the 30 percent of households who remain off-grid with solar as the main option, though a financing component was not included in the plan.

2.3 LIMITATIONS AND BARRIERS

Climate change remains a challenge for many RGC agencies. MoE faces difficulties and constraints with the most prevalent being the lack of reliable time series and disaggregated economic data from other ministries for accurate estimation of GHG emissions and reductions.

Limited capacity for GHG mitigation analysis and identification of cost-effective options is found not only in many government institutions such as MoE, MIME, MAFF, and MoWRAM, but also in the private sector. Technology and knowledge transfer is time-consuming and costly. A lot of effort has been made to promote awareness but much work remains to be done for uptake and national consensus on a low emission development path.

Coordination is improving through the establishment of national committees, working groups, and networks, though those committees still have limited power to influence sector policy-making and sometimes significantly overlap in objectives. Inter-ministerial mechanisms on REDD+ and GGR are being considered but may take some time before becoming functional and may cause confusion with existing structures. In addition, political commitment, weak governance, poverty, and limited funding hinder effective implementation of many policies and strategies, including LEDS.

MoE has limited powers to influence strategies formulated by MIME for energy and industry or MAFF regarding agriculture and forestry. Even though line ministries are part of climate change committees, strategies formulated by line ministries do not necessarily align with national climate change strategies. At the same time, strategies formulated by the Climate Change Committee under MoE often lack details regarding sector specific technical challenges. The Green Growth Strategy, for example, is very general and inconsistent with strategies developed by line ministries.

¹⁹ Please see Annex 4 for additional information

CAPACITIES AND CAPACITY BUILDING OF MINISTRIES

In general, the capacities of line ministries are very limited as highly-skilled Cambodians are attracted to employment with international donors or NGOs rather than lower-paying government positions. Donor organizations, NGOs, and bilateral organizations provide capacity building to the government; however, once trained staff returns to their ministry there are no funds available to utilize the knowledge and skills acquired. Most commonly, a donor is interested in supporting a certain sector and invests in strategy development for the designated department of a ministry and, once the strategy is approved, provides funds for implementation. For example, the development of the National Forest Programme was funded by DANIDA, which also had funds available for implementation. After 2012, DANIDA will end this support to FA and implementation of much of the NFP is likely to end unless another donor takes over implementation support. EC-LEDS can support capacity building of RGC ministries and technical staff through a sustainable program over a period of years that includes regional training exchanges and US based training programs. For example, RGC experts may have courses or workshops in developing technology appropriate Feed-in-Tariffs to promote scaling of renewable energy.

3. RELEVANT CURRENT AND PAST PROGRAMS

3.1 LEDS-RELATED GOVERNMENT PROGRAMS

Most current and past government programs related to LEDS have been donor-driven, and often stop when donor funding ends. UNDP, Danish International Development Agency (DANIDA), Swedish International Development Cooperation Agency (SIDA), and the European Commission (EC) established the Trust Fund of the Cambodian Climate Change Alliance to provide an ongoing internal RGC mechanism for support. These are four of the main donors of LEDS related government programs.

Other international donor agencies and NGOs supporting RGC programs include the Australian Agency for International Development (AusAID), Japan International Cooperation Agency (JICA), World Bank, Asian Development Bank (ADB), United Nations Industrial Development Organization (UNIDO), and Netherlands Development Organization (SNV). Many international NGOs operating in Cambodia have recently integrated climate change into their mainstream activities or developed special climate change related programs (see Table 4 for snapshot and Annex 6 for additional information).

Table 4: Relevant Current and Past Programs

Project Title	Ministry (lead), department	Donor(s), involved agencies	Description/ Objectives	Relation to LEDS	Areas for Collaboration
Rural Electrification and Transmission Project (RETP) Dissemination of 12,000 Solar Home Systems	MIME	World Bank-GEF Rural Electrification Fund (REF) (implementation), Sunlabob Laos (installation), IED/CCDE (implementation)	As part of the larger RETP project, 12,000 solar home systems have been installed in rural areas that are not yet electrified. The households receive a subsidy of \$150 per system and pay the remaining cost over a four-year period with a monthly fee. The REF is using the collected fees for a program called “power to the poor” to enable poor families to pay grid connection cost over a two-year period. Dates: Completed in Feb 2012 Budget: \$3 million	The project of the WB is good but small. Solar energy would be a suitable option for the 30 percent of households that are excluded from the existing rural energy strategy. MIME already developed a program to provide these 30 percent with solar energy.	Rent-to-own model is very effective and should be scaled.
National Biogas Programme (NBP)	MAFF (Department of Animal Health and Production)	SNV, GIZ Carbon Credits, HIVOS, FMO, ACLEDA, PRASAC (local microfinance institution), Amret (loans and bank finance)	The NBP is a joint venture intervention of MAFF and the SNV, which was established in 2006 to provide alternative sustainable energy sources through dissemination of affordable biogas technologies and development of commercial and market-oriented biogas sector in selected provinces of Cambodia, namely Kampong Cham, Kandal, Svay Rieng, Takeo, Kampong Speu, Kampong Chhnang and Kampot (MAFF& SNV, 2008). Already 14,000 digesters have been built. Dates: 2006 - Ongoing	Climate Change Mitigation The setup of the NBP could be used as an excellent example for other sectors and technologies.	Could be part of larger National Program on Renewable Energy; develop national programs for other sectors based on the NBP model. This could be for many of the proposed mitigation options in the draft mitigation reports
Sustainable Forestry Project	FA, MAFF	UNDP-GEF	Trial Sustainable Forestry at provinces around Aural Mountain. Includes both support to community forestry and energy and forestry related technologies.	Reduced emissions through protection of forest and through reduced emissions from efficient cook stoves	Trial could be extended if successful.
Greater Mekong Sub-region Biodiversity Conservation Corridor Project	MoE & FA, MAFF	ADB	Biodiversity conservation in corridor in Northeastern Cambodia for eight years Dates: 2011- 2018 (8 Years) Budget: \$19 million	Indirectly: forest conservation	
Renovation to Invasive Species Management	MoE	GEF-UNEP	To establish invasive species demonstration site and identify high risk of invasive species in Cambodia	Indirectly: forest conservation	

Project Title	Ministry (lead), department	Donor(s), involved agencies	Description/ Objectives	Relation to LEDS	Areas for Collaboration
in Production and Protection forest in Southeast Asia			Dates: 2011 - 2013 Budget: \$298,626		
Revising National Biodiversity Strategy Action Plan	MoE	GEF-UNEP	Revising National Biodiversity Strategy Action Plan 1) Effective national management of the REDD+ Readiness process and stakeholder engagement in accordance with the consultation principles. 2) Development of the National REDD+ Strategy and Implementation Framework 3) Design of Cambodia's Reference Level for REDD+ 4) Monitoring system designed for REDD+ with capacity for implementation Dates: 2011 - 2012 Budget: \$300,000	Indirectly: forest conservation	
Cambodian Climate Change Alliance Trust Fund	MoE	UNDP, SIDA, DANIDA and EC	A CCCA Trust Fund worth US\$ 8.9 Million is earmarked and additional funding is available to sustain the CCCA beyond three years. A TAP was set up to provide technical support and expertise to PSB and NCCC.	Main focus on climate change adaptation.	Potential to include fund to also cover mitigation efforts.
Implementation of National Forestry Program	FA, MAFF	DANIDA	The Forestry Program is a widely supported strategy and if implemented contribute to sustainable management of all forests in Cambodia.	Directly, without implementation of the forestry program deforestation will impact existing forests and accumulate to deforestation.	Although DANIDA has supported the development of the strategy it will withdraw support by the end of 2012. It would be very important to find additional donors to support implementation.

Other relevant projects of Development Agencies and NGOs

Donor Agency/ NGO	Government Agency	Description/Objectives	Relation to LEDS	Areas for Collaboration
UNDP	FA and MoE	Cambodia's REDD+ Roadmap, has been accepted by the World Bank with changes pending. It will be re-submitted for the next Policy Board meeting in August 2012. World Bank no longer has a presence in Cambodia, however the FCPF money is expected to flow through multiple implementing partners, most likely UNDP. UNDP focusing on policy support to national government,	Directly related to LEDS	Active participation proposed in REDD Road map development and implementation
UNIDO	MIME, Industry Department	Cleaner Production Program has received GEF funding to implement energy efficiency measures in the garment and rubber industry and brick works.	Climate change mitigation measures in Industry	Scaling of pilot projects.
FAO		Cambodia's REDD+ Roadmap. Inception workshop held in November 2011. FAO focused on providing technical MRV and remote sensing support.	Low emission development path for forestry sector.	
JICA		Providing Technical Assistance to FA. Work Plan directly linked to the UN-REDD/FCPF process Focus on MRV and capacity building on remote sensing.		MRV capacity development
DANIDA		Co-chair of TWG on Forests and Environment but it will withdraw from Cambodia at end of 2012.	Reduced deforestation	Continue support to TWG F&E
IUCN	Cambodia's resilience to climate change	This four-year project will build the capacity of people and the ecosystems on which they depend to cope with impacts of climate change in eight provinces along the coastline between Bangkok and HCMC. In Cambodia, the project will work in Koh Kong and Kampot Provinces. Dates: 2011 - 2015	Reduced deforestation	Capacity development for economic development tools and social impact analysis
GERES-Cambodia	MIME, Department of Energy	Introduction of efficient cook stoves (about 30 local	Climate Change mitigation through	Support and establish a

Donor Agency/ NGO	Government Agency	Description/Objectives	Relation to LEDS	Areas for Collaboration
		entrepreneurs have been trained by GERES to produce efficient cook stoves with over 1 million disseminated). GERES received support from the EU, World Bank. At present UNDP and AUSAID through the ADB are supporting GERES with additional funding	efficient cooking stoves	National Program for Efficient Cook Stoves
Pico Sol	MIME, Department of Energy	Developed a solar road map for Cambodia Implements a solar school project in Cooperation with The Netherlands Developed a solar lantern business model and identified over 50 local entrepreneurs	Climate Change mitigation through support of the solar sector.	Support and setup of a National Program for Solar Home Systems
IED, CCDE (consultancy agency)	MIME, Department of Energy	Implements the 12,000 solar home systems for the World Bank (collection of rental fees). In cooperation with Total, initiated the first Solar/Diesel hybrid electricity generation for a Rural Electrification Enterprise (REE). With UNIDO funding started a local special purpose company for rural electrification to sell electricity to a REE for much reduced price compared to generate electricity with diesel.	Renewable energy technologies including biomass gasification and solar energy to reduce GHG.	Support private sector participation for Renewable Energy options Include solar and biomass gasification.
EEP	MoE	The Energy and Environment Partnership Programme With the Mekong Region (EEP Mekong) (2009-2012) is funded by the Ministry for Foreign Affairs of Finland and the Nordic Development Fund. It aims at supporting wider provision and use of renewable energy and combating climate change. This provides funding for projects, studies, capacity development and information-sharing. EEP is a demand-driven program and promotes public-private partnerships.	Has limited impact on reduction of climate change.	As mainly financed by donor funding limited potential to scale up.

Non-Energy NGOs

Name	Ministry	Description/Objectives	Relation to LEDS	Areas for Collaboration
World Wildlife Fund (WWF)	MoE, FA	WWF does not have an existing REDD+ project in Cambodia, however various staff have a good understanding of REDD concepts and are engaged in national level policy discussions and coordination mechanisms with NGOs. WWF is working to reduce deforestation in the 222,100 ha Phnom Prich Wildlife Sanctuary (governed by the MoE) and the 372,971 ha Mondulkiri Protected Forest (governed by FA) for over 10 years. Existing work is based on law enforcement, community work and research to better understand the ecology of the area.	Reduced deforestation	Improved mapping and GIS capacity development
Wildlife Conservation Society (WCS)	MoE, FA	In the final stages of developing a REDD+ pilot project covering 187,698 ha of the Seima Biodiversity Conservation Area in Mondulkiri province. Communities are engaged as they see threats to their forests from ELC so they are very supportive of REDD+ concept even if there are limited direct financial benefits.	Reduced deforestation	
Wildlife Alliance	MoE, FA	Enforcement-based model in Southern Cardamom plateau. Attempting to develop a VCS project; lacks REDD+ in-house capacity and struggling with leakage issues.	Reduced deforestation	Develop capacity on REDD+ through training workshops and land use models
PACT-Cambodia	MoE, FA	Establishment of the region's first REDD+ pilot project in Oddar Meanchey province. Developed in collaboration with the Clinton Climate Initiative, Community Forestry International, Terra Global Capital. Despite expectations to generate an estimated 8 million tons of CO ₂ offset credits over the 30 year project life for sale on the voluntary carbon market, PACT is struggling to	Reduced deforestation	Work with FA to facilitate buy-in;

Name	Ministry	Description/Objectives	Relation to LEDS	Areas for Collaboration
		commercialize the project and lacks genuine support and buy-in from FA.		
Conservation International	FA	Recently completed feasibility study for a 600,000 ha project area in Prey Long –area across four provinces. Working with support from technical team from Conservation International Japan, Australia and others.	Reduced deforestation	
The Center for People and Forests	FA	Community forestry projects – program currently under revision.	Reduced deforestation	
Fauna and Flora International (FFI)	FA	Community Carbon Pools program in protected areas in the Central Cardamom Mountains. Goal is NOT to have REDD credits, but try to help empower local communities and governments so that they actually participate in REDD projects.	Reduced deforestation	

3.2 USG LEDS-RELATED ACTIVITIES

In addition to the RGC activities described above, a wide range of USG agencies have activities that support Cambodia on one or more components of LEDS. With a few notable exceptions described below, most of the USG activities are not explicitly linked to LEDS, yet they are aligned with elements of developing and implementing LEDS. The USAID Mission in Cambodia has a \$69 million annual budget with programs in health, education, governance, anti-trafficking, rule of law, human rights, and economic growth.²⁰ Much of the portfolio is dedicated to fighting malaria and HIV, halting human trafficking, and improving rule of law and social justice, among other objectives. There also is a substantial program of support to small business and microenterprise development. USAID/Cambodia supports all three U.S. Presidential Initiatives: Feed the Future, Global Climate Change, and Global Health.

The current program most relevant to LEDS is the Helping Address Rural Vulnerabilities and Ecosystem STability Program (HARVEST; 2010-2015) designed to improve food security through enhanced agricultural development and rational management of natural resources in Cambodia. HARVEST includes activities that may contribute to LEDS through elements such as assessing the current situation, analyzing options, and prioritizing actions. HARVEST is designed to increase food availability and access by bolstering productivity of agriculture, fisheries, and forestry; support the adoption of climate change adaptation techniques; strengthen value chains; and create private sector-led rural employment. The long-term goal of HARVEST is “sustainable increases in incomes and food security with higher nutritional standards for rural Cambodian families.”²¹ A program component addresses mitigation and adaptation aspects of the response to climate change, focusing on degradation of forests from agricultural expansion and identifying – with local communities – ways to slow or reverse the decline in forest carbon stocks, specifically concentrated on support for sustainable watershed management and climate change adaptation in four provinces around Tonle Sap.

USAID/Cambodia’s Micro, Small, and Medium Enterprise Program (MSME) supports non-timber forest product value chains and ecotourism in critical biodiversity areas of Cambodia. The MSME project “focuses on three components: (i) value chain development in support of livelihoods, (ii) community-based biodiversity conservation in Koh Kong, Oddar Meanchey, Stueng Treng, Preach Vihear, and Banteay Meanchey provinces, and (iii) public-private dialogue” (Ashwell & Kesaro 2011). Efforts to improve community management of areas with high biodiversity cover four forest landscapes: Prey Lang, Beng Per Wildlife Sanctuary, the Cardamom Mountains, and Oddar Meanchey community forests. Small enterprise value chains include honey, resins, and ecotourism. MSME works with 31 community-based organizations in community forests and community protected areas covering 120,000 hectares to facilitate boundary demarcation and non-timber forest management. Relationship to LEDS components are indirect, and include identifying and **analyzing options** for potential activities that may support reductions in forest degradation.²²

USAID/Cambodia also has an open procurement ongoing at the time of this draft report for a four-year, \$20 million Supporting Forests and Biodiversity project. This project “will strengthen capacities of Cambodians at the local, sub-national and national level to produce meaningful and sustainable reductions in GHG emissions from the forestry-land use sector, participate in and benefit from the emerging international REDD+ frameworks, and conserve biodiversity.” Links to LEDS are indirect, relating to potential options to reduce threats to forests and

²⁰ USAID budget for FY 2010 was \$69 million. See History of USAID in Cambodia: <http://cambodia.usaid.gov/history>

²¹ USAID Cambodia HARVEST website: <http://www.cambodiaharvest.org/about.aspx>.

²² For more details, see Cambodia MSME website: <http://www.cambodiamsme.org>

associated biodiversity, as well as direct to the extent that support is provided to articulating sub-national reference emissions levels, a component of BAU.

- The USAID RDMA program on Lowering Emissions in Asia’s Forests (LEAF) is a five-year regional effort which was started in early 2011 to promote regional collaboration on forest management. LEAF’s regional approach is to strengthen the technical capacity of Cambodia, Laos, Thailand, and Vietnam, as well as other countries, to manage their forests better through: sharing effective approaches to common challenges; replicating and scaling up innovations in other Asian countries; developing regional models, methodologies and standards; and addressing trans-boundary issues and causes of deforestation. LEADS components include analysis of reference levels (BAU scenario) and prioritizing actions.
- USAID’s regional Low Emissions Asian Development (LEAD) program helps Asian governments, businesses, and institutions develop frameworks for sustained low-carbon development across all economic sectors. This five-year program is designed to build capacity in LEADS development and implementation, GHG inventories, and carbon market development in up to 11 countries: Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Papua New Guinea, Philippines, Thailand, and Vietnam. LEADS components include: building capacity for GHG inventory methodologies, preparation, and reporting; demonstrations of emissions calculation software and methodologies, activity data collection systems; analysis of GHG market development and engage in regional knowledge sharing. LEAD intersects with almost all LEADS components.
- The United States Trade and Development Agency (USTDA) is funding a \$361,000 training program and reverse trade mission, called the Cambodia Oil and Gas Resource Management project. Its purpose is “to strengthen the capacity of the Cambodian National Petroleum Authority to work with the private sector in exploring and developing natural resources.”
- The Export-Import Bank of the United States (Ex-Im Bank) provides short-term and medium-term financing for purchases of U.S. exports by private-sector buyers in Cambodia, following an interagency process to review the country risks. Support is limited to transactions with a commercial bank functioning as a guarantor.
- The Overseas Private Investment Corporation (OPIC) has developed a political risk insurance product to cover private sector investment in forestry projects, including REDD projects, as well as afforestation and reforestation. In 2011, OPIC entered its first contract for this type of coverage, providing political risk insurance to Terra Global Capital, an investor in the Oddar Meanchey REDD project that aims to sell offset credits in the international carbon markets generated by protecting forests in that province.
- The U.S. Environmental Protection Agency (USEPA) does not currently have an active bilateral program with Cambodia, but does have ongoing or completed projects related to air quality, arsenic removal and containment, mercury, methane, and other pollutants. Much of the engagement is through multilateral fora such as Association of Southeast Asian Nations (ASEAN), Asia-Pacific Economic Cooperation (APEC), and others.
- Most closely relevant to this study is the Southeast Asia component of the UNFCCC-USAID-EPA Regional Capacity Building for Sustainable National Greenhouse Gas Inventory Management Systems in Southeast Asia project, which includes Cambodia. Through this effort, the UNFCCC and USEPA’s goal is assisting Cambodia in producing an improved national GHG inventory for agriculture and land-use and establish a

sustainable national GHG inventory system. EPA assists the UNFCCC in implementing this approach through hands-on-assistance and training to partner countries, in addition to tools (e.g. ALU National GHG Inventory Software and the “Developing a National GHG Inventory System Template workbook”) working alongside inventory experts. Cambodia is a partner country in Phase II of this regional project. An initial planning meeting to kick-off activities was organized with CCD in July 2011 to initiate planning technical assistance support for Cambodia. In follow up in-depth meetings, CCD flagged staffing constraints and limited department funding as continued challenges to implementing activities. The department does not have staff dedicated to coordinating and managing the GHG inventory development process so that it can be a valuable input to other programs.

- The U.S. Department of Agriculture (USDA), through its Foreign Agriculture Service has worked with Cambodia and neighboring countries on avian influenza control, and has an ongoing Food for Peace program that monetizes agricultural commodities.
- The U.S. Forest Service (USDA/FS) is less active in Cambodia compared to other countries in the region (e.g., Indonesia) except through their collaboration with LEAF across the Lower Mekong. Given the importance of forest conversion – the single-largest source of GHG emissions before factoring in sequestration – they likely will be a key partner for future USG engagement with RGC.

3.3 GAPS AND AREAS FOR COLLABORATION

The previous chapter outlined RGC goals and institutional structures supporting LEDS development and implementation, while this chapter highlighted programs that are ongoing or recently concluded that address climate change and related issues. Later chapters will cover specific sectoral gaps and opportunities for collaboration that may be of interest to the EC-LEDS Scoping Mission, so this section focuses on the gaps and potential opportunities for collaboration as they relate to overall national economic planning and implementation of economy-wide LEDS-related strategies and structures such as the GGR and NCCC.

One of the major gaps is the integration of green growth and climate change into RGC processes such as the NSDP 2009, while another relates to allocation of resources sufficient to implement programs. One potential opportunity is to support the RGC to develop ways to finance all of the new plans, policies, and strategies including a process for engaging with the private sector, both local and regional. Another is to support clear processes for conducting MRV for all implemented programs. For example, the Draft Climate Change Mitigation Analyses (SNC) both for the energy and non-energy sectors have been developed and have resulted in a list of mitigation options that do not have identified funding support for implementation. Lately, the RGC has issued a memorandum on economic land concessions and this could be an interesting area to support planning activities that could result in real structural contributions to thousands of families without land titles. Additionally, the NSDP 2009 directs the MoE to increase technical capacity to conduct Environmental Impact Assessments, develop strategies to efficiently control environmental pollution, and collect data and establish guidelines for managing wetlands. It also directs the MPWT to promote development of urban transportation (including commuter light rail) with the aim to reduce carbon dioxide emissions.

Other programs have good intentions such as the World Bank RETP Solar Home System, UNDP sustainable forestry program, and others. These programs require very large amounts of funding to implement nationally, reach measurable results or contribute to climate change mitigation. Without government policies and implementation of these policies with guidelines, subsidies, and fines they will have limited effect.

OPPORTUNITIES FOR COLLABORATION

Many interesting national strategies were presented in Chapter 2 but as can be seen from the evaluation on the five LEDS activities, the programs have limited funding for implementation. In this Chapter, we have presented several implementation programs and many projects, however, with limited impact at the national level. The RGC could be supported to guide the current programs towards contributions to the GGR and at the same time improve its quality with examples of successful projects. The list of programs related to LEDS is rather extensive and it would not be easy to select specific programs to support. The National Biodigester Program could be taken as a good model on how to develop a sub-national program for a certain technology as part of the GGR.

In order to achieve scale, the LEDS Scoping Team and USAID Mission may look into areas that are both economically attractive for households and industries and at the same time result in reduced emissions. This would minimize the funding required and result in the uptake of the technology without continued financial support. For example, the introduction of biomass gasification was copied by many private entrepreneurs and now about five gasifier producers manufacture locally. Also, the improved cook stove was introduced and now, without any additional support, about 30 producers are making efficient stoves. These programs are ready to scale up and guidelines and standards could be developed.

Gap	Opportunity
Programs are often fragmented with limited relation to LEDS.	The GGR offers a good framework; however, it has limited funding for implementation. EC-LEDS could work with existing programs to integrate low emissions strategies into national, sub-national and sectoral strategies and plans.
Donors and NGOs do not all have the capability to calculate reductions in climate change to accepted standards for verification.	EC-LEDS may provide technical assistance to CCD to develop a database with projects and support NGOs or others to calculate the emission savings and potentially if large amounts of CO ₂ are reduced, develop VER or CDM schemes (this does not require the USG to take active part in CDM trading). CCD staff are excellent administrators and would benefit from technical support. EC-LEDS can enhance in-country capacity building on GHG inventories development and tracking; and support MRV efforts. Potential NGOs: GERES, WENETCAM, DAT and NEXUS.
National Development Strategies such as the Rectangular Strategy and NSDP often mention climate change; however, the detail is often too general to be useful.	Support RGC with technical assistance in the formulation of national development strategies: to specify, detail, and integrate LEDS components with implementation strategies. Ensure that formulated actions are realistic and funds are allocated for implementation.
Strategies developed at ministry level do not comply with strategies developed on national level such as the GGR.	Enhance national planning capacity and provide support to line ministries to integrate LEDS components into ministerial strategy development.
Typically, representatives from ministries are requested to participate in the formulation of, for instance, the GGR; however, these representatives only provide advice and do not integrate the strategies in ministerial planning documents. Currently, 9 line ministries have received financial and technical support from CCCA to develop their sectoral climate change plans.	

One specific program that is well-positioned to support overall coordination and integration of LEDS into economic planning is the USAID/RDMA LEAD program mentioned above. Working in collaboration with several USG agencies such as NREL, USFS, and EPA, LEAD has as part of its mandate to provide training and technical assistance to EC-LEDS activities in the region. The

five LEDS components are: (1) LEDS Organizational Framework, (2) Assessment of the Current Situation, (3) Analytical Tools for Decision-Making, (4) Portfolio of Actions, and (5) Implementation and Monitoring. Each component has sub-components (as identified below). Specific topics identified in LEAD draft work plans for FY 2012/FY 2013 are the following options which may be of interest to Cambodia:

1. Policy analyses, frameworks, architecture, and coordinating structure(s) for development and implementation of LEDS – to support components 1(a) LEDS institutional structure, 1(c) Stakeholder engagement on LEDS, 2(a) Summary of development goals
2. Economic and emissions modeling, analyses, and assessments – to support LEDS components 2(b) Economic and environmental data, 3(a) BAU emissions path, 3(b) low emissions path, and 3(c) Assessment of low emissions options
3. Financing green growth and LEDS – to support LEDS components 4(c) Financing plan and 5(a) Financing secured

4. ANALYTICALLY-BASED MACROECONOMIC DECISION MAKING

4.1 MACROECONOMIC DECISION MAKING CAPACITY OF THE RGC

The RGC has made substantial progress in building institutional capacity for knowledge and analytical-based planning and decision making using mathematical models, methods, and tools specifically designed for analysis of sub-national, sectoral, and national policy and strategies. For example, MIME is using Geospatial Social Image Mapping (GEOSIM) software in planning its rural electrification strategy. The capacity and skills to employ these approaches varies from agency to agency. Several RGC ministries and universities continue to upgrade their skills by adopting new tools and practical decision-making frameworks with improved data inputs and research capacity. Lacking appropriate federal funding, many universities have accommodated research programs for international funders. For example, the Royal University of Phnom Penh (RUPP) has conducted projects to enhance capacity building for transportation analysis²³.

Key RGC ministries involved in climate change planning and decision-making on LEDS related activities include: MoP, MEF, MoE, MAFF, MoWRAM, MIME, MLMUPC, MPWT, and Ministry of Rural Development (MRD). The MoP plays a lead role in national development planning and monitoring of macro-economic progress and achievements, including major government strategies and goals such as the Rectangular Strategy and Cambodia MDGs. The MoP consists of a General Directorate of Planning (GDoP) and the NIS. The GDoP's responsibilities include: formulation of concepts, strategies, plans, and programs for short, medium, and long-term socioeconomic development by coordinating with other sector planning; analysis and forecast of the overall situation of macroeconomic growth; and regular advice on targets for economic development.

The NIS is responsible for collection, management and analysis of statistical data supporting national planning and decision making. Those data include: economic statistics (Consumer Price Index, National Account); demographic statistics (General Population Census, Country Investment Program); and social statistics (Cambodia Socioeconomic Survey, Cambodia Demography and Health Survey). A number of survey reports produced under the support of United Nations Population Fund (UNFPA) include: Population Census; Statistical Year Book 2008; Cambodia Demography and Health 2010; Poverty Profile 2004; and other policy review reports. The coverage and quality of economic, environment, and socio-demographic statistics, including national accounts (GDP by sector) has gradually improved over recent years with the support of ADB, International Monetary Fund (IMF), UNDP, UNFPA, and JICA. The MoP has developed a set of monitoring indicators for measuring success of the National Policies and Strategies such as MDG, NSDP, and PRS.

Cambodia has enjoyed steady GDP growth for the last decade as a result of good macroeconomic performance and implementation of fiscal and administrative reforms. The

²³ Source: Scoping Study: Research Capacities of Cambodia's Universities. Available online at <http://www.cdri.org.kh/webdata/download/sr/sr5ae.pdf>

economy is narrowly based and driven by four main sectors: garment, tourism, construction, and agriculture. The garment and tourism sectors are vulnerable to external risks such as global economic downturns. Agriculture, which shares 30 percent of the GDP and accounts for more than 60 percent of the total employment, has not reached its full potential because of limited irrigation infrastructure and farming skills, and climate change risks.

Key factors driving energy demand are the growth in population and GDP. Cambodia has high population growth rates and consequently the demand for products and services such as food, water, and energy is likely to increase. The UN forecasts that the population of Cambodia will almost double in 2050 compared to 2000, increasing from 12.8 million to 23.8 million in 2050.

ELECTRICITY DEMAND ANALYSIS FOR RURAL ELECTRIFICATION

To meet growing demand for electricity, in 2010 MIME prepared the Sustainable Rural Electrification Plan (SREP) with financial support of the French Embassy through the technical support of Innovation Energie Développement (IED) Company. The ambitious development goal of the SREP is that “by 2020 all villages will have access to electricity in different forms” (see diagram below). In other words, by 2020, 80 percent of villages will be connected to national grids and by 2030, 95 percent of villages will have access to national grids. MIME is using GEOSIM’s package of analysis tools (spatial analysis, demand analysis, network and distribution analysis) to guide SREP implementation, which will be transferred to the MIME for further planning purpose.

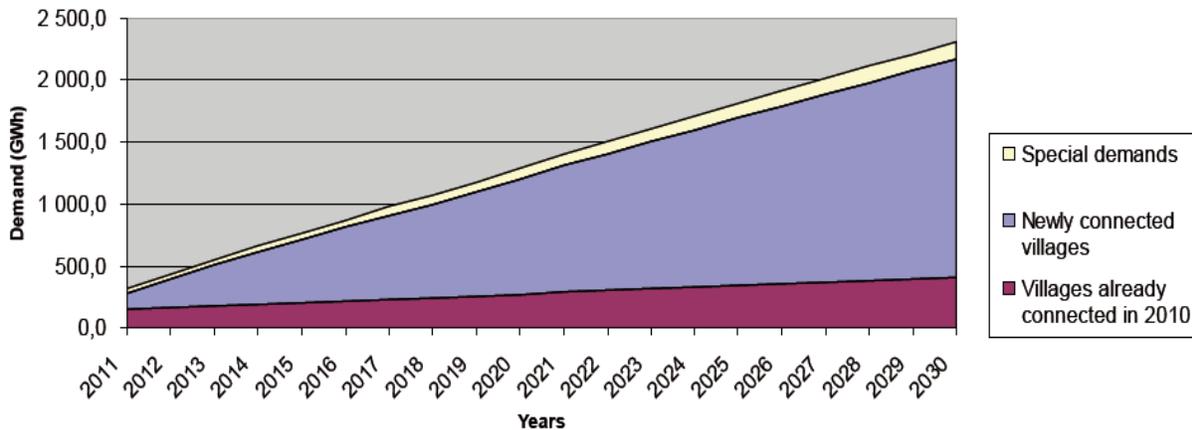


Figure 4: Electricity Demand for Rural Areas

Source: Ministry of Industry, Mines, and Energy, 2011

SREP activities include a least-cost comparison of a range of renewable energy options (biomass, mini hydro, wind, and solar power) to assess potential sources for connection with national grids. Three development scenarios are discussed for the expansion of the national grid potential investment (with differing rates of expansion).

Table 5: Infrastructure and Investment Requirements for SREP

Phase	Number of villages to be electrified	Number of households (HH) to be electrified x 1000	Length of Medium Voltage (MV) line (km)	Amount to be invested on MV network (MUS\$) ²⁴	Amount to be invested on Distribution (MUS\$)	Total investment cost (MUS\$)	Investment cost per village (US\$)	Investment per HH (US\$)
2011-2015	4,431	570	7,171	143.4	183.5	327	73,776	575
2016-2020	4,054	539	5,910	118.2	158.7	277	68,303	514
2021-2030	2,087	729	4,164	83.3	203.5	287	137,422	393
2011-2030	10,572	1,838	17,246	344.9	545.8	891	84,250	485

Source: Ministry of Industry, Mines and Energy, 2011

GHG EMISSIONS AND MITIGATION ANALYSIS IN ENERGY AND TRANSPORT SECTORS

GHG emissions and mitigation analysis was conducted to assess the potential mitigation options and emission abatement in the energy sector as part of the SNC report.²⁵ The Long-range Energy Alternatives Planning (LEAP) system was used to estimate CO₂ emissions projection (Business as Usual). CCD experts and counterpart representatives from different ministries selected various mitigation options described in more detail in Section 5. The feasibility indicators to screen the mitigation options were based on UNFCCC documentation (UNFCCC 2004) and assessed the mitigation options against nine feasibility indicators (social acceptability; technical feasibility; environmental acceptability; contribution to economy; political acceptability; maturity in Cambodia; ease of implementation; appropriateness of the user; and affordability). The baseline scenario indicate that the transport sector will grow very rapidly resulting in the largest share in total emissions of the four sectors (see Table 6) of 11,376 Gg in 2050. Without major Government intervention however, mitigation options are limited.

Table 6: Emission in Gg of CO₂e by sector for 2000-2050

	Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Energy Industries		385	1,008	1,453	1,212	1,931	2,849	3,539	4,430	5,567	7,023	8,888
Manufacturing Industries		320	508	689	828	923	1,024	1,144	1,270	1,414	1,578	1,766
Transport		709	1,249	2,000	2,465	3,040	3,751	4,631	5,720	7,069	8,742	10,816
Other Sectors		1,229	1,304	1,392	1,482	1,658	1,977	2,285	2,623	3,025	3,505	4,079
Total		2,643	4,070	5,533	5,987	7,551	9,601	11,599	14,043	17,075	20,848	25,549

Source: MoE, GHG Emissions Analysis for the Energy and Transport Sector, 2010

²⁴ Million United States Dollars (MUS\$)²⁵ GHG emissions and mitigation analysis are discussed in detail in Section 5 of this report.

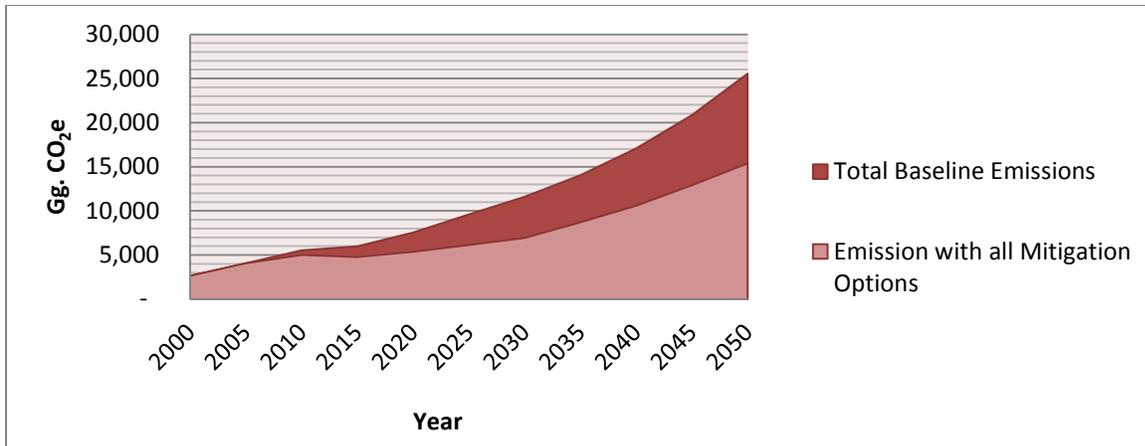


Figure 5: Total Baseline Emissions and Total Potential Saving all Mitigation Options in Gg Co2e

4.1.1 ECONOMIC AND ENERGY MODELING

Good experience and knowledge is gained in the use of different models, methods, and tools for climate change adaptation planning, preparation of Cambodia's National Communication under UNFCCC, and GHG inventory/projection and mitigation analysis by relevant sector ministries.

- GIS software such as ARCINFO, ArcView and ArcMap were introduced two decades ago and continue to be very useful tools for environment and natural resources planning, including climate change.
- The MoE has adopted MAGICC-SCENGEN (Model for the Assessment of Greenhouse gas Induced Climate Change – A Regional Climate SCEnario GENerator) and a regional climate model (PRECIS), with a number of General Circulation Models for modeling climate change impacts and scenarios, although they are not well suited for Cambodian climate conditions.
- GHG inventory has made extensive use of IPCC default emission factors, and in some cases, default activity data as noted in the SNC. Reference approach and key source category approaches are used to estimate GHG emissions.
- A combination of IPCC Technical Guidelines, National Adaptation Programme of Action (NAPA) Guidelines, and multi-criteria analysis and simple scoring techniques are used to identify priority adaptation projects in Cambodia's NAPA.
- A sustainable development matrix is used as a tool to assess the contribution of CDM projects in the following four aspects of sustainable development: economic, social, environmental, and technology transfer.
- The LEAP 2000 Model is used to estimate GHG emissions from the energy sector, but a lack of activity data precludes better estimation of emissions. GHG emission and mitigation analysis has been conducted to assess the potential mitigation options and emission abatement in energy sector as part of the draft SNC report.

4.2 INVOLVEMENT OF UNIVERSITIES AND INSTITUTES

Involvement of RGC universities or institutes is limited to non-LEDS research and consultations. A few universities and institutes that can potentially support LEDS activities include the Royal University of Phnom Penh, the Technical Institute of Cambodia, and the Royal University of

Agriculture. The Cambodia Development Research Institute has a good reputation in conducting socioeconomic surveys and research supporting development decision making. The Economic Institute of Cambodia possesses macroeconomic modeling capacity, using several models such as a Computable General Equilibrium Model and Demographic Model to produce independent economic forecasts for the short, medium, and long term.

4.3 GAPS AND RECOMMENDATIONS

The lack of data is a problem for both adaptation and mitigation efforts and cost-benefit analyses are required to make appropriate recommendations. Data gaps are a major obstacle for using quantitative decision-making tools such as cost-benefit analysis to guide decisions on selection of best adaptation options. The baseline emissions calculations for the mitigation analyses had to work with limited and incomplete data sources. For example, there are no reliable data on primary energy imports. The energy analysis is based on estimation of the demand side but could not be verified with primary energy data, except for the electricity sector.

Even if better data were available, the technical capacity of ministries to undertake analyses using analytical tools is limited. Consultants are often hired with donor funding to provide training of the tools but also undertake the actual analysis. For example, the GEOSIM model and LEAP have been introduced by donors and annual trainings have been provided for LEAP by the ASEAN Center for Energy, but MIME has not completed independent LEAP analyses.

Generally, qualified staff leaves government once training is complete and move on to international development agencies, donors, and NGOs. Some agencies and organizations pay salary supplements to try to create incentive to remain in government positions, with mixed results as this only lasts as long as donors finance these positions.

OPPORTUNITIES FOR COLLABORATION

EC-LEDS can assist in developing curricula for universities and training workshops for agencies to develop sustained analytical capacity for complex analyses and modeling. The quality of the curricula of universities is improving and better skilled students are looking for jobs that fit their knowledge base and technical expertise. Elevating the quality of data, the complexity of its use in the RGC planning process may attract new technical graduates. Additionally, EC-LEDS may assist the development/refinement of current RGC macroeconomic models and tools to more Cambodian appropriate models through research and development by universities, institutes, and others. Promoting the regular publication and reporting of specific sector data by various ministries and government entities will encourage increased capacity in complex modeling and analysis and limit the use of default activity data for emissions inventory assessments. For example, the Electricity Authority of Cambodia produces excellent annual reports for the sector with all data available. A similar authority could be set up for transport, household energy, industrial energy applications, forestry, and other sectors.

5. NATIONAL GREENHOUSE GAS INVENTORY

Cambodia is a non-Annex I developing country (and is a UN designated Least Developed Country) and has no obligation to reduce emissions, but must report on the steps it is taking or envisages undertaking to implement the UNFCCC. The INC has been submitted and the SNC report has been drafted. The following sections are based on the INC and draft SNC. *As the SNC has not yet been officially approved the text should be taken as indicative although the technical reports of the Energy and Non-Energy sectors have been presented in open meetings and discussed with involved ministries and stakeholders.*

Section 2 provides an assessment of the overarching situation in Cambodia and presents the institutional arrangements for addressing climate change. With support from UNDP and GEF implementing agencies, the CCD under MoE has worked to collect and analyze emissions data.

5.1 DRAFT RESULT OF THE SNC MITIGATION ANALYSES

The CCD has, with financial support from UNDP, undertaken the technical climate change mitigation analyses for the energy, transport, and non-energy sectors. Both analyses have developed baseline scenarios for estimated emissions until 2050. The emissions in 2000 were still negative and by 2050 it is expected that Cambodia will be a net emitter of GHG. The non-energy sector will have slightly more emissions compared to the energy sector, of which transport has the largest increase and share in emissions.

Table 7: CO₂e Emissions for all sectors in 2000 and estimates for 2050 (in Gigagrams)

Energy and Transport Sector	2000	2050
A1 Energy Industries	385	8,888
A2 Manufacturing Industries	320	1,766
A3 Transport	709	10,816
A4 Other Sectors	1,1229	4,079
Sub Total	2,643	25,549
Non Energy Sectors	2000	2050
Enteric Fermentation	4,872	10,018
Rice Cultivation	14,365	22,625
Agricultural Soils	2,362	6,305
LUCF uptake	-50,465	-41,940
LUCF emission	20,044	37,103
Subtotal	-8,822	34,112
Total	-6,179	59,661

Source: MoE, Draft SNC Mitigation Analyses

5.2 GREENHOUSE GAS EMISSIONS FROM AGRICULTURE, FORESTRY, AND OTHER LAND USE

GHG emissions from agriculture, forestry, and other land use (AFOLU) comprise the vast majority reported in Cambodia's Initial National Communication (INC; MoE 2002) and the latest

estimates from other sources (e.g., Kamal 2011, Ashwell et al. 2011, EPA 2011, and LEAF 2012). The National Green Growth Roadmap (GGR; RGC 2009) cites deforestation as Cambodia’s “most serious” environmental threat, which may be the world’s third highest for the period 2000-2005 (Ashwell and Kesaro 2011).

The land use change and forestry (LUCF) component of overall CO₂ emissions reported by RGC in its INC was 5.35 Mt CO₂e (79 percent of the national total, based on 1994 data), and agriculture contributed another one million tons CO₂e (18 percent), for a combined 97 percent of all emissions. These were offset by 7.3 Mt CO₂e sequestered into growing forests, leaving the country as a net sink by almost one million Mt CO₂e. The INC does, however, caveat that data availability and quality are not reliable, and that some of the assumptions may not be correct (Ashwell et al. 2011). Rapid increases in land conversion in the late 1990s and the 2000s altered Cambodia’s status as a net sink although an official, definitive assessment of Cambodia’s GHG inventory remains pending since a draft second national communication was circulated in 2010. Data quality has not improved appreciably in terms of official forestry statistics, but independent assessments using remote sensing have given a clearer portrayal of the LUCF emissions due to land conversion.

The National Strategic Development Plan Update 2009-2013 (NSDP 2009) states that forest cover in 2008 stands at 58 percent of total land area, or 10.8 million of the country’s 18.2 million ha. The LEAF REDD+ Atlas (LEAF 2012) provides a breakdown of forest cover at a provincial level. Seven provinces are reported to have greater than 75 percent forest cover, in the northeast of the country and the two western-most provinces. Preah Vehear (north-central) has the highest at 92 percent. Another seven provinces have less than 25 percent forest cover; they are all in the southern plains except Banteay Mean Cheay, which is along the Thai border northwest of Tonle Sap. Prey Veng has the lowest rate at 2 percent (9,000 ha).

Cambodia lost an average of 0.5 percent of its forest cover annually between 2002 and 2006 (FAO 2005, UN-REDD 2011), verified by Landsat-calibration analysis of provincial forest data (LEAF 2012). Provinces along the Thai border in the northwest have some of the highest deforestation rates (up to 4.4 percent in Pailin), perhaps due to a logging ban in Thailand and a porous border. Battambang is estimated to be losing more than 15,700 ha of forest per year (2.8 percent). Three provinces along the northern border (Stung Treng, Preah Vih, and Otdar Mean Chey) have the lowest deforestation rates at 0.1 percent per year. The last of these three is the site of a USAID-sponsored REDD+ demonstration site, raising questions about the ability of the project (for which OPIC has provided political risk insurance) to generate sufficient additionality to be financially viable.

The non-energy sector comprises the sector agriculture (including emissions from livestock through enteric fermentation and manure management), rice cultivation, agricultural soils and savanna, and residue burning) and the LUCF sector. Table 7 shows the emission categories by source. The agriculture sector excludes the subsector agricultural burning and savanna burning, as the emissions are insignificant (<1 percent of total) relative to the total emissions. Under the BAU scenario, emissions are forecast to increase from negative 8.82 Mt CO₂e in 2000 to 34.11 Mt CO₂e in 2050. Within the agricultural sector, the emission from livestock (enteric fermentation and manure management) are projected to double (4.87 to 10.02 Mt CO₂e.); the emission from rice cultivation will increase from (14.37 to 22.63 Mt CO₂e.); and the agricultural soils emission will almost triple (2.36 to 6.31 Mt CO₂e.). The LUCF sector remains a net sink; however, the total sink capacity decreases from negative 30.42 to negative 4.84 Mt CO₂e.

5.3 IDENTIFICATION AND SCREENING OF GHG MITIGATION OPTIONS

In total, 46 GHG mitigation options were identified in the non-energy mitigation analyses, with 14 in the sector livestock, 12 in the subsector rice cultivation, nine in the subsector agricultural soils, and 11 in the LUCF sector. For the identification of the most suitable options to reduce GHG emission while contributing to sustainable development, a screening matrix was adopted from the UNFCCC (2006). The purpose of the matrix is to provide a qualitative indication of the attractiveness of each option based on a number of indicators by ranking the options based on the impact of the options on the environment, economy, development objectives, the MDGs, and their technical feasibility. The outcome of the screening matrix is not decisive, as other factors are taken into account in determining the overall attractiveness of an option, such as the relative GHG abatement cost, the mitigation potential, and government plans.

Table 8: Most Attractive GHG Mitigation Options

#	Sector	GHG mitigation option
4 A,B	Livestock	Small-scale and large-scale biogas and composting Aquaculture Fodder production
4C	Rice cultivation	Drainage in rainy season Switch to sulfur fertilizer Compost/bio-slurry
4D	Agricultural soils	Organic input agriculture and bio-slurry Crop management
5	LUCF	Agroforestry Reforestation REDD+

5.4 MITIGATION SCENARIOS

Two mitigation scenarios have been developed to benchmark the impact of options against the baseline, the economic potential, and the technical potential.

SCENARIO 1: THE ECONOMIC POTENTIAL

This scenario assumes that in the future carbon finance can be obtained for curbing the GHG emission sources and sinks in the agriculture and forestry sector. This scenario assumes that the options become economically viable with the help of carbon finance based on a conservative return of \$10/tCO₂e abated. The scenario includes the no-regret potential (the options with a negative or zero incremental GHG abatement cost). Table 8 shows the impact of the most attractive options against the baseline. For each option a certain implementation rate is assumed; a higher or lower ambition level will shift the impact on the baseline to the left or right.

A scenario for both sectors could not be established as many options are interdependent on each other, for example, the use of bio-slurry for rice cultivation will decrease the potential for using it on agricultural soils resulting from the limited availability of bio-slurry.

SCENARIO 2: THE TECHNICAL POTENTIAL

According to the UNFCCC, the technical potential is the mitigation potential that can be achieved by implementing technologies that are already known to be technically feasible. This scenario is more ambitious than the economic potential scenario and is only achievable with subsidies or policies that promote the adoption of the technologies/options.

Table 9 shows the impact of the scenarios on the total emissions.

Table 9: Aggregated GHG Emission Mitigation for Each Scenario by Sub-Sector

Sector	BAU 2050 (Mt CO ₂ e.)	Economic potential 2050		Technical potential 2050	
		(Mt CO ₂ e.)	% abatement	(Mt CO ₂ e.)	% abatement
Livestock	10.018	7.628	-24%	5.862	-41%
Rice cultivation	23.833	NA	NA	20.873	-12%
Agricultural soils	6.305	5.994	-5%	5.786	-8%
LUCF	-4.836	-15.962	-230%	-20.545	-325%

The LUCF sector has the highest potential to augment sink capacity, which amounts to an increase of 230 percent and 325 percent in the economic scenario and the technical potential scenario respectively. In the agricultural sector, the livestock sub-sector has the highest potential to reduce emissions, followed by the rice cultivation sector. The agricultural soil sector can only reduce emission by a small percentage. Although it is not possible to combine the GHG mitigation of all the sectors, as some options are interdependent on each other, it can, however, be concluded that in 2050 even under the technical potential scenario, the non-energy sector will become a net emitter.

5.5 GREENHOUSE GAS INVENTORY FOR THE ENERGY AND TRANSPORT SECTOR

This section is based on the draft technical report on greenhouse gas mitigation in the Energy and Transport sector that is part of the enabling activities for the preparation of the Kingdom of Cambodia's Second National Communication to the UNFCCC. The draft report has been formulated by the CCD in cooperation with counterparts from several ministries including, MIME, MAFF, MoWRM, and MPWT and a Climate Change Mitigation Advisor with financial support from the GEF and the UNDP.

MITIGATION ANALYSIS

The Energy and Transport Mitigation analysis is underpinned by a baseline emissions projection scenario for the period 2000 to 2050. In formulating this projection, emissions between 2000 and 2009 are based on existing energy consumption data per sector, and emissions beyond 2009 are based on forecasts.

The following sectors were analyzed:

- 1A1, the Energy Industries Sector covering all electricity generation activities related to distribution and consumption
- 1A2, the Manufacturing Industry Sector, which includes energy demand analyses of the main larger industries and Small and Medium Enterprises (SMEs)
- 1A3, the Transport Sector, which incorporates fuel consumption estimates for motorbikes, cars, trucks, trains boats, and planes
- 1A4, the "Other" Sectors, which covers energy consumption estimates by the Commercial Sector, such as hotels and office buildings; the Residential Sector with both energy for cooking and lighting in urban and rural areas; and the energy consumption of the Agricultural Sector.

The Baseline Emissions Scenario shows an increase in total emissions from 2.64 Mt CO₂e in 2000 to 25.55 Mt CO₂e in 2050. These energy and transport emissions are equal to 0.2 tCO₂e per capita in 2000 to 1.3 tCO₂e in 2050. The transport sector will have the largest share in 2050 followed by the Energy Industry (all emissions related to electricity generation) with 8.89 Mt CO₂e.

Potential mitigation options were formulated based on previously successful project and pilot projects, feasibility studies, literature reviews and recommendations from Government counterparts and other experts. In total, 38 proposed mitigation options were screened using feasibility indicators based on UNFCCC documentation (UNFCCC 2004). The nine feasibility indicators are: (1) social acceptability, (2) technical feasibility, (3) environmental acceptability, (4) contribution to economy, (5) political acceptability, (6) maturity of the technology in Cambodia, (7) ease of implementation, (8) appropriateness of the user, and (9) affordability. Connecting rural electricity enterprises with the national grid was the most feasible option (highest score) while increasing public transportation in cities scored the lowest.

A team of experts from various ministries identified a number of options and potential was determined based on estimated savings and savings achieved in pilot projects or estimations from the MIME-UNIDO cleaner production project in Cambodia. The 11 mitigation options suggested for the energy industries (electricity) sector have the potential to save 3.83 Mt CO₂e by 2050. Energy efficiency results in the highest savings of 1.6 Mt CO₂e by 2050, followed by energy efficient buildings and solar power electricity generation. Other mitigation options include the connection of the industries and commercial sectors and other buildings that utilize diesel to generate their own electricity with the national grid, solar home systems (SHS), Pico and Mini, Micro Hydro, electricity generation with rice husks and methane recovery from large hydro dams.

Manufacturing industries currently consume large amounts of diesel, and certain industries such as the garment industry and brick works also use large amounts of fuel wood. Small-scale industries, such as noodle factories and palm sugar and rice wine producers, also consume substantial amounts of wood, which contributes to the pressures on Cambodia's forest resources. The mitigation options proposed for the manufacturing sector include energy efficiency, which has the potential to reduce emissions by about 20 percent, and technology change that can reduce emissions by between 40 percent – 70 percent. Examples of technologies with the potential of high-end emission reductions include rice husk gasification with combined heat and power generation (CHP) or cogeneration using other sustainable biomass sources. The total potential savings in emissions for the manufacturing sector are estimated at 1.28 Mt CO₂e by 2050. The largest share in these savings can be achieved in the main four industries – including garments, brick works, rubber factories, and rice mills – with 1.14 Mt CO₂e by 2050.

The savings of the other mitigation options proposed are not included due to a lack of data on their potential. However, substantial savings (up to 50 percent) can be generated by all small-scale industries using post-combustion efficient cook stoves, while efficient charcoal production can achieve 20 percent savings and, together with sustainable wood plantations, could reduce emissions by 100 percent. Other potential options include: methane recovery from organic wastes from, for example, beer factories, cassava processing, and livestock rearing; landfill gas recovery; recovery methane from the sewer stream in Phnom Penh; and the use of rice husk briquettes by small businesses instead of charcoal. Feasibility studies are required to estimate the potential savings of these mitigation technologies. Biofuel could be produced as an alternative to fossil fuels but such initiatives require careful consideration of the potential side effects, such as increases in food prices. Government policies should be developed for future

biofuel development which, inter alia, should limit the total land area that can be utilized for biofuel production to prevent competition with food crops. At present, ethanol is produced from cassava in Cambodia and exported. Currently there is no government policy to encourage or mandate the use of ethanol in Cambodia.

The transport sector is set to grow rapidly and is forecast to have the largest share in total emissions of the four sectors in 2050 at 10.82 Mt CO₂e. The proposed mitigation options only result in a 19 percent savings (4.78 Mt CO₂e). The main mitigation options include fuel switching, electric and hybrid vehicles, and motor vehicle inspection to optimize diesel engines. Other mitigation options, such as a Transport Master Plan and better roads, might improve the flow of traffic but are not expected to result in substantial emission savings. To achieve higher emission savings from the transport sector, unpopular policies are likely to be required, such as higher taxes on cars, as introduced in Vietnam, or only permitting the use of electric vehicles in the city. Trucks are responsible for the highest emissions and stringent limitations on such transport will negatively affect the economy. Biodiesel may be an option but has its own potential side effects.

Mitigation options for the other sectors include the promotion of technologies that increase energy efficiency or replace the use of fuel wood or charcoal, such as efficient cook stoves, biodigesters, and ceramic water filters, the latter reducing the need for wood to boil water. Solar lanterns could replace the kerosene lighting and wind water pumping could reduce the need for diesel pumping. The total savings from these mitigation options amount to 0.23 Mt CO₂e in 2050. These savings are low compared to the total CO₂ savings realized by biodigesters and cook stoves through Verified Emission Reductions (VERs) schemes as they do not include emissions from biogenic CO₂. If biogenic CO₂ is included, the emissions from efficient cook stoves, biodigester, and ceramic water filters increases to 2.51 Mt CO₂e per year in 2050.

FINANCIAL ANALYSIS

A financial analysis of the mitigation options was undertaken, where data were available. The net and gross abatement costs were calculated for 19 options. The net abatement cost includes the relation between profit or loss, discount rate, and potential carbon saving. The options are shown to be economically feasible with the exception of solar home systems, which are too expensive to compete with the cost of traditional battery charging.

5.6 GAPS AND AREAS FOR COLLABORATION

The Climate Change Department has limited capacity to undertake the National Communications required as part of the UNFCCC; without donor support to increase capacity and undertake the research and report formulation, these reports would not have been produced. International consultants supported expert teams with representatives from relevant ministries to undertake the analyses. Long-term training for data analysis will allow the CCD to gain competence and eventually undertake analyses without limited international consultants.

Gap	Area for collaboration
<p>Limited capacity to detail baseline emission calculation for National Communications. The SNC has developed reasonable baseline emission calculations but for implementation further analyses is required. The SNC mitigation analyses group had limited time and capacity to undertake complex analyses. However, the results form an interesting list of options that are sufficient to start implementing.</p>	<p>The SNC has developed a list of mitigation options that need baseline studies and cost/benefit analyses. It would be recommended to focus on several mitigation options and develop concrete detailed National Implementation Programs (based on Climate Change Action Plan). Mitigation analyses are conducted on a project basis with support of consultants – EC-LEDS can enhance local capacity for GHG inventory development and maintenance through workshops and training on data gathering, modeling, and analysis.</p>
<p>Some tools have been used to formulate the SNC; however, they were undertaken by foreign consultants. Energy consultants have tried to involve the Institute of Technology of Cambodia (ITC); however, the capacity of ITC and other universities need to be further improved to enable them to contribute to baseline calculations.</p>	<p>Work with ITC and the Royal University of Phnom Penh to develop climate change modeling skills focused on energy with LEAP, agriculture and forestry. Detailed weather modeling tools might be too complex but basic knowledge could be included in the support to universities.</p>
<p>Comprehensive, quantitative assessment of the drivers of deforestation and forest degradation has not been completed. Such an assessment was recommended in both the UN-REDD Country Programme and the FCPF Readiness Preparation Proposal. Of particular interest will be relatively high-resolution analysis based on primary field data rather than extrapolation of one or two small studies in non-representative areas (e.g., Oddar Meanchey) using low-rigor methodologies.</p>	<p>KfW and GIZ are preparing – in conjunction / support of the UN-REDD Country Programme – a comprehensive quantitative analysis of the drivers of deforestation and forest degradation. The latter of these is perhaps the more challenging from a methodological perspective. USAID, through its LEAF program, could collaborate with GIZ or others to support a more rigorous, objective analysis of drivers in order to target programs toward reducing those drivers. LEAF is developing a methodology for assessing forest degradation that may be field tested in Cambodia as per this collaborative effort.</p>

For the USAID/RDMA LEAD program, three of the seven major contract tasks relate to strengthening GHG inventories and subsidiary parts of estimating and projecting emissions. These include the following, for which training and technical assistance may be available for support to Cambodia:

1. **National GHG Inventory Capacity Building and Development**, including collaboration with the UNFCCC-USEPA GHG Capacity Building project in Southeast Asia; expansion of support for tools and workbooks to other sectors; and demonstration and replication²⁶ of GHG inventory templates through the Asia LEDS Training Facility at AIT in Thailand
2. **GHG Accounting Protocols and Tools Development, Capacity Building, Pilot Demonstrations, and Replication**, including training of private GHG accounting professionals, training of regulators and other government staff at sub-national levels, and demonstration and replication of GHG accounting protocols and tools (including, among others, the wetlands protocol developed by scientists from the US Forest Service and Center for International Forestry Research)
3. **Emissions Factor Identification and Development**, including development of new emissions factors for specific industry subsectors, and demonstration of emissions factors at subnational and enterprise levels, Emission factors to be assessed will be selected based on key category analysis and literature review, with support from other regional research teams.

²⁶ “Replication” is the term used in the LEAD contract and thus in the work plan.

6. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: FORESTRY AND OTHER LAND USE

6.1 CURRENT FORESTRY SECTOR ACTIVITIES

According to MAFF and as stated in the National Strategic Development Plan Update 2009-2013 (NSDP 2009), the Cambodian government is focusing on conservation of forests and sustainable forest management. Under the plan, forest coverage would attain 60 percent of total land area in 2015 through increased protected areas and the encouragement of private sector and local communities to participate in conservation efforts and tree planting. Although the official forest cover is 59 percent, the reality might be lower, as after 2006 no official figures have been presented. The official figure by the FA indicates the size of land *managed* by FA and not the status and quality of the forest. Some forest statistics estimate that only 3 percent of primary forest remains.²⁷ Several threats impact existing forest, including land clearing for agriculture, both by rural farmers and for land concessions, and illegal mining. Several NGOs and development agencies have requested the RGC to update official figures and recognize that although large stretches of land are officially classified as forested, in reality they are very degraded or converted into agricultural land.

NSDP 2009 directed the establishment of the forest biodiversity resource and wildlife protection area in 29 places covering a land area of 4.45 million hectares, which equals more than 25 percent of the total land mass through tree planting by government agencies, private companies, and individual households. RGC planned to reduce household fuel wood consumption from 85.5 percent of total households in 2005 to 61 percent in 2010 (NSDP, 2006). An aim of the Cambodian MDGs (2003) was to increase forest cover to 60 percent of total land from 2005 to 2015 and to reduce the number of inhabitants dependent on fuel wood as their primary energy source from 92 percent to around 52 percent by 2015. In RGC's Rectangular Strategy for Growth, Employment, Equity and Efficiency Phase II (2008), Side 4 of Rectangle 1 refers to forest reform and planned for sustainable forestry management and the promotion of protected forests through establishing protected and biodiversity conservation areas, reforestation, crackdown on illegal encroachments, and occupation of forest land by private individuals. The policy also encouraged the private sector to establish commercial forest plantations in degraded forest land and to improve local livelihoods by using forest resources sustainably.

²⁷ <http://rainforests.mongabay.com/20cambodia.htm>

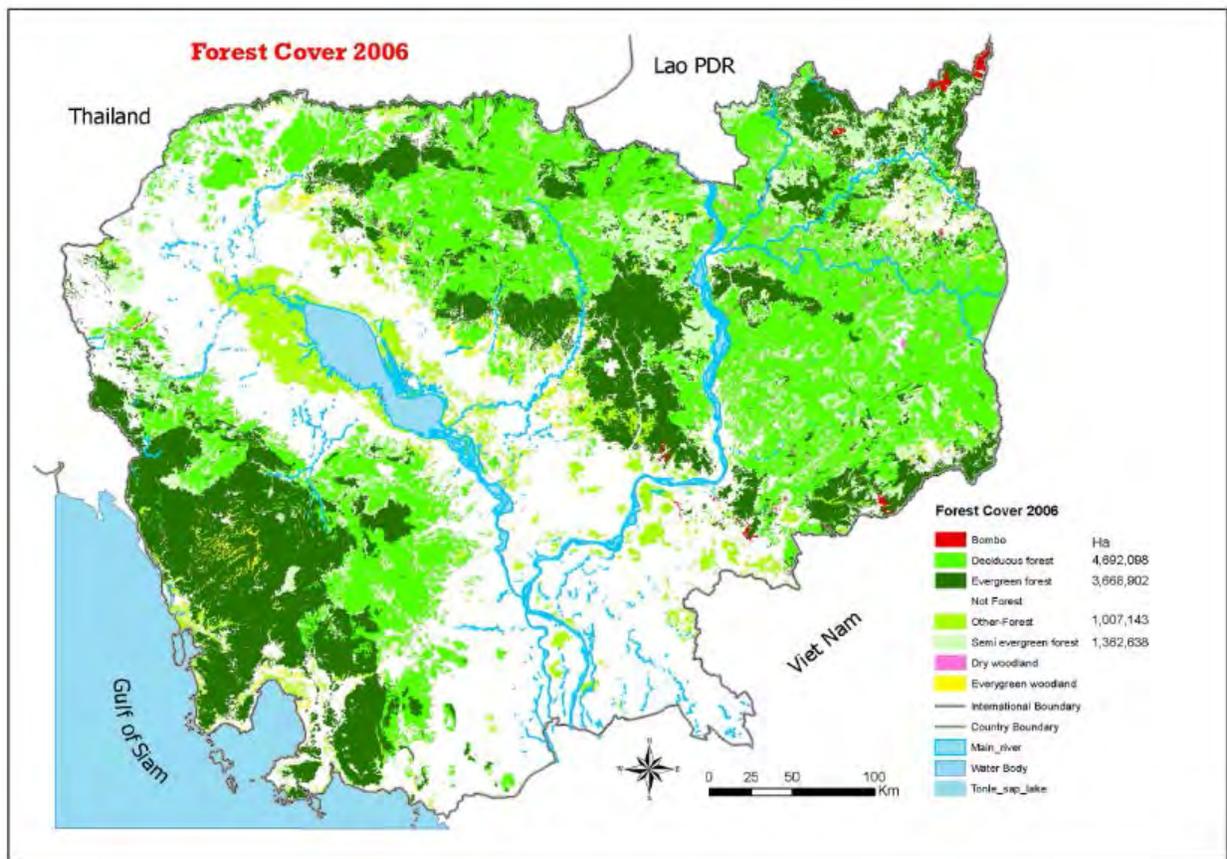


Figure 6: Forest Cover 2006

Source: Forestry Administration

6.2 DEVELOPMENT GOALS AND PRIORITIES

Cambodia’s development goals in the forest sector are outlined in the same broad economic planning documents cited in earlier sections of this report, as well as some specific to the sector. These include the following, which are then described briefly as they relate to the stated **national goal** of maintaining (or returning to) **60 percent forest cover** by 2015:

1. Rectangular Survey (RGC 2004)
2. Agriculture Sector Strategic Development Plan (ASSDP; MAFF 2005)
3. National Strategic Development Plan Update 2009-2013 (NSDP 2009)
4. National Green Growth Roadmap (NGGR; RGC 2009)
5. National Forest Programme 2010-2029 (NFP; RGC 2010)
6. National REDD+ Roadmap (MAFF 2010 and Lao 2012)
7. Cambodia Readiness Preparation Proposal (R-PP; FCPF 2011)
8. Cambodia UN REDD National Programme (UN-REDD 2011)

The Rectangular Survey lists forestry reform as one of four priorities under Rectangle 1: Enhancement of Agricultural Sector. Those reforms are organized into three pillars:

1. Sustainable forest management policy
2. Protected Area System to protect biodiversity and endangered species
3. Community Forestry as a sound, transparent and locally managed program

A series of sub-decrees listed in the NSDP 2009 provide protection of forested protected areas, conservation of biodiversity, and sustainable management of the nation's forest resources. In addition to forest sector reforms, land reform efforts are planned to address property rights and secure tenure, as well as fisheries reforms that promote sustainable management of flooded forests along the southwestern coast, the Tonle Sap Lake shorelines, and riverine ecosystems. The well-articulated statements of intended priorities for the Fourth Legislature – covering strict enforcement of the Forestry Law, expanded community forestry, management efficiency, and ecotourism development – are juxtaposed with a “naming names” report by the advocacy group Global Witness (2007) on senators and senior government officials allegedly involved in the illegal timber trade.

The GGR articulates a clear goal – also noted in other strategic planning documents – “to maintain 60 percent forest cover by 2015” using CDM Afforestation/Reforestation and REDD+ projects to achieve this goal. Ashwell and Kesaro (2011) cite this goal as “laudable” while noting it may be “unrealistic” to expect achievement to rely on native forest cover. The Green Growth Roadmap includes reforestation as one of the ways to achieve the goal. It explicitly mentions REDD as a source of funding and proposes the creation of country capacities and readiness in order to sustain Cambodia's participation in REDD. It further proposes the creation of a national system of payments for environmental services, and an internal emissions trading system for industrial emitters. Another interesting aspect of the Green Growth Strategy is that the waste management, transport, energy, and other sectoral discussions all describe linkages back to forests and their management. The decentralized governance section highlights community forest management.

Among the 40 projects proposed in the GGR for short- (ST; 2-5 years), medium- (MT; 5-10 years) or long-term (LT; 10-20 years) implementation, the following are directly related to AFOLU:

1. Develop a scheme for innovative investments to ensure sustainable natural resource management [ST, MT, LT; Ministry of Planning with ministries of Economy and Finance, and Commerce]
2. Develop eco-village for sustainable economic growth and environmental sustainability [MT, LT; Ministry of Environment with 13 other ministries (including MAFF)]
3. Development and implementation of sustainability of forests management [MT, LT; Ministry of Agriculture, Fisheries, and Forestry with 13 other ministries and agencies]
4. Participatory sustainable land use management and enhancing the effective land use planning for indigenous people [MT, LT; Ministry of Land Management, Urban Planning and Construction with three other ministries (including MAFF)]
5. Community-based tourism development for improving economic development and increasing job opportunity [MT, LT; Ministry of Tourism with local authorities and NGOs]

6. Reducing emissions from deforestation and forest degradation (REDD) [MT, LT; MoE and MAFF with private sector and NGOs]
7. Development of national strategy plan to ensure sustainable natural resource management in protected areas [MT, LT; Ministry of Interior with local authorities]
8. Implement afforestation and reforestation for CDM project to ensure forest cover to mitigate climate change [ST, MT, LT; MoE, Climate Change Department and MAFF, Forestry Administration with local authorities, NGOs, academia, and private sector]

The Technical Working Group on Forestry and Environment (TWG F&E) initiated the development of the National Forestry Programme (NFP) in order to support the Cambodian government's goals of poverty reduction, sustainable forest management, and forest conservation. The purpose of the NFP is to establish a workable social and political framework for efficient management, conservation, and sustainable development of Cambodia's forests, which will increase public and private interests and commitment to sector activities (NFP 2009). TWG F&E members include civil society, NGOs, international organizations, development partners, and governmental agencies, organized to support the NFP development process. They work together to develop an NFP that can respond to demands of local, national, and international requirements through providing a strategic, transparent framework to plan, use, manage, protect, and regenerate forest resources for the benefit of all Cambodians.

Danida, UK Aid from the Department for International Development (DFID), and New Zealand Agency for International Development (NZ Aid) supported the RGC to develop the NFP, which elaborates nine strategic objectives organized into six program areas. The two objectives most relevant for LEDS are: "maximize sustainable forest contribution to poverty alleviation, enhanced livelihoods, and equitable economic growth" and "macro land-use planning that allows for holistic planning across sectors, jurisdictions, and local government borders." The NFP program areas are:

1. Forest demarcation, classification, and registration – harmonized with other legal frameworks as a way to reduce or prevent land conflicts; includes a function-based forest classification system
2. Conservation and development of forest resources and biodiversity – to improve management models, add value to forest products, alleviate poverty, and safeguard environmental services
3. Forest law enforcement and governance – a set of five sub-programs to institute legal reforms, improve enforcement (including forest crime reporting), and manage forest-related conflicts
4. Community forestry program – comprising production forests and commune conservation areas
5. Capacity and research development – focusing on internal human resources, extension services and public awareness, and research capacity
6. Sustainable forest financing (including REDD+) – implementation of NFP through budgetary allocations, forest sector revenue generation, private sector and donor funds, and Payments for Environmental Services (PES) schemes

The National REDD+ Roadmap and the UN-REDD National Programme documents are highly parallel, with the latter describing many of the details for implementing the former. Lao (2012)²⁸ also provides an update as of February 2012 on implementation progress so far. The activities outlined in both the Roadmap and the UN-REDD program document are complemented (in some cases paralleled) by those in the Readiness Preparation Proposal (R-PP) reviewed by the Forest Carbon Partnership Facility in March 2011. To date, no grant agreement has been signed between RGC and FCPF.²⁹

The REDD+ Roadmap is organized into six sections, described below with corresponding components of the UN-REDD Country Programme and the FCPF draft R-PP identified.

Table 10: Corresponding arrangement of REDD+ Readiness activities in the National REDD+ Roadmap, UN-REDD Country Programme, and Forest Carbon Partnership Facility (FCPF) draft Readiness Preparation Proposal (R-PP)

REDD+ Roadmap	UN-REDD Country Programme	FCPF draft R-PP
Part 1: Management of REDD+ Readiness	Component 1: REDD+ readiness management arrangements and stakeholder consultation	Component 1: Organize and Consult: National readiness management arrangements Information sharing and early dialogue with key stakeholder groups Consultation and participation process
Part 2: Consultation and stakeholder participation		
Part 3: Develop national strategy on REDD	Component 2: National capacity building towards development of REDD+ strategy and implementation framework	Component 2: Prepare the REDD+ Strategy: Assessment of land use, forest law, policy and governance REDD+ strategy options
Part 4: Develop national REDD+ implementation framework (including benefit-sharing and safeguards)		REDD+ implementation framework Social and environmental impacts during readiness preparation and REDD+ implementation
	Component 3: Subnational REDD+ capacity-building and demonstration [corresponds to subnational actions under Parts 2-6 of the Roadmap]	
Part 5: Reference levels	Component 4: Support to development of the monitoring system	Component 3: Develop a reference level
Part 6: Create forest monitoring systems, including reporting and verifying		Component 4: Develop a monitoring system Emissions and removals Multiple benefits, other impacts, and governance
		Component 5: Schedule and budget
		Component 6: Design a program monitoring and evaluation framework

²⁸ Cambodia REDD+ Readiness Status/Overview of Roadmap – Presentation from February 2012. Available online at: [http://www.undp.org.my/files/editor_files/files/PDF_presentations/Microsoft_PowerPoint-3_Cambodia_REDD+ Roadmap_Mr.Sethapal_Lao_Legislation_and_Law_Enforcement_Dept_Cambodia.pdf](http://www.undp.org.my/files/editor_files/files/PDF_presentations/Microsoft_PowerPoint-3_Cambodia_REDD+Roadmap_Mr.Sethapal_Lao_Legislation_and_Law_Enforcement_Dept_Cambodia.pdf)

²⁹ http://www.forestcarbonpartnership.org/fcp/sites/forestcarbonpartnership.org/files/Documents/PDF/June2012/FCPF%20Readiness%20Progress%20PC12_June%2029%202012.pdf

Progress toward implementing these various plans and strategies has been slow (Ashwell and Kesaro 2011) for a range of reasons. Among these are institutional barriers (e.g., MAFF has responsibility for the permanent forest estate and MoE is responsible for forested protected areas, yet the latter has very little power or field personnel), capacity constraints – including human, financial, knowledge, and technology capacity, uneven application of land use policies, poor integration of planning at all levels of governance (Ashwell et al. 2011), and uncertain political will to halt illegal logging by elites (Global Witness 2007).

In response to the Sub-decree No188 on Forestry Administration Promotion Equivalence of the General Department dated November 2008, the FA adjusted its structure of organization to establish a new office responsible for REDD.

6.3 KEY GHG EMISSIONS DRIVERS AND TRENDS

GHG emissions from forest land conversion (i.e., deforestation) and forest degradation have been generally described as falling into five categories (RGC 2010, MAFF 2010, FCPF 2011, UN-REDD 2011, and Ashwell & Kesaro 2011):

1. Agriculture – including smallholder encroachment and agro-industrial expansion
2. Governance – including issues related to policies, planning, regulations, and law enforcement
3. Economics – including forest resource valuation, opportunity costs of alternatives, and trade
4. Population – including both the number of people and in-migration or settlement dynamics
5. Infrastructure – especially roads that open new areas of accessibility, and industrial concessions

A complete formal assessment of the drivers of deforestation in Cambodia has not been conducted. Indeed, the REDD+ Roadmap (MAFF 2010), NFP (RGC 2010), FCPF R-PP (2011), and UN-REDD Country Programme all include as one of the gaps the lack of a **quantitative assessment** of drivers of deforestation and forest degradation. The latter two of these programmatic documents list conducting such an assessment as one of the priority actions for REDD+ Readiness.

From a desk review of the above-cited RGC documents, a case study from the Center for Clean Air Policy (Ashwell et al. 2011), a USAID-commissioned assessment (Ashwell & Kesaro 2011), the LEAF REDD+ Atlas (2012), and the analysts' experiences, **key drivers** from among the approximately two dozen listed in the reviewed documents are the following (subject to confirmation from rigorous quantitative analysis):

1. Illegal logging and awarding of land concessions³⁰ in contravention of a moratorium
2. In-migration of settlers into formerly well-forested areas, aided by road construction and exacerbated by a high inflation rate that increases rural poverty
3. Weak governance across levels and scales – from local to provincial to national – ranging from unclear tenure to contradictory policies to low technical capacity among responsible agencies

³⁰ Especially problematic are economic land concessions awarded extra-legally for agri-businesses such as rubber plantations in protected areas despite a moratorium. See <http://www.phnompenhpost.com/index.php/2012062557006/National-news/hun-sen-grants-elcs.html>

Some reports cite rural energy poverty and the use of wood fuel as a significant driver of degradation in Cambodia’s forest (e.g., Ashwell et al 2011) while the FCPF R-PP and UN-REDD Country Programme documents list the role as “unclear.” The R-PP suggests that understanding the role of rural energy and wood fuel use in forest degradation be one of the top priorities for further research on drivers. Further research could be conducted on trends of deforestation, including logging, land concessions, agriculture and need for firewood and charcoal.

6.4 SECTORAL STRUCTURE AND INSTITUTIONAL CAPACITIES

Management and regulatory jurisdictional authority over land and forest resources in Cambodia falls under the responsibility of several different government agencies, each with their legislated responsibilities. Some of the relevant laws include the 1993 Royal Decree on Creation and Determination of Nature Reserves, Environmental Protection and Natural Resources Management Law of 1996, Land Law of 2001, Forestry Law of 2002, Fisheries Law of 2006, Protected Areas Law of 2008, the 2009 Sub-decree #83 on Registration of Land of Indigenous Communities, and others. The primary means for implementing this mandate is the National Forest Programme 2010-2029 (NFP; RGC 2010).

The FA is organized into a central headquarters and sub-national units. The headquarters has 13 offices covering standard disaggregation of duties (e.g., extension, industry, community forestry, wildlife, etc.), with the Administration and International Cooperation Office holding the functions (among others): (a) to coordinate international cooperation and public communication affairs, and (b) to control, monitor, and evaluate all the documents and memorandums of international organizations and NGOs concerned with FA affairs. This office, therefore, is the coordinator for donor activities and external support to REDD+. Four subnational divisions called Inspectorates each cover several provinces, with 15 cantonments and 55 divisions below that. Figure 7 shows these subdivisions of FA and their boundaries.³¹ Each subnational jurisdiction coordinates with provincial governments and district officials in carrying out their duties.

While the Gulf Inspectorate covers the coastal mangrove areas, and the North and South Tonle Sap Inspectorates have the freshwater flooded forests within their area of jurisdiction, these forested wetlands are the responsibility of the Fisheries Administration under the Fisheries Law of 2006. FiA’s regulatory authority applies to flooded forests and mangroves outside the boundaries of protected areas.

³¹ Government of Cambodia – Forestry Administration. Function and Structure: <http://forestry.gov.kh/AboutFA/MandateEng.html>

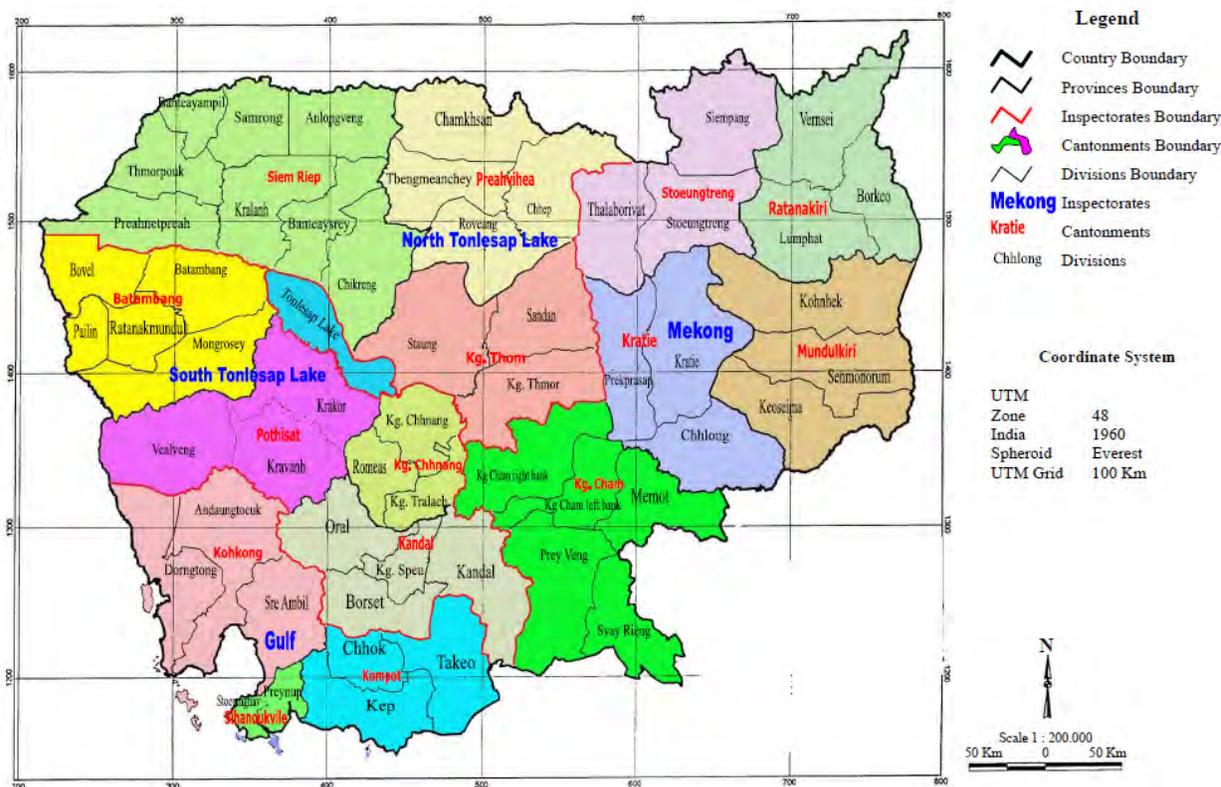


Figure 7: Subnational jurisdictions of Forestry Administration in Cambodia, composed of four Inspectorates, 15 Cantonments, and 55 Divisions

Protected areas come under the jurisdiction of the MoE and are regulated under the Protected Areas (PA) Law of 2008. The PA Law provides for eight categories of protected areas, arranged by management objectives. These generally follow the International Union for Conservation of Nature (IUCN) classification system for PAs. The PA Law lists a total of 31 protected areas within the national system, most having been established by Royal Decree in 1993. The current system (see map) includes the following components:

Table II: Summary of protected areas in Cambodia as annexed

Category of protected area	Number of protected areas	Total area of protected areas
National Parks	7	742,250
Wildlife Sanctuaries	10	1,891,271
Protected Landscapes	3	97,000
Multiple-Use Areas	3	403,950
Biosphere Reserve [Tonle Sap]	1	n/a
Ramsar site [Steng Trung]	1	14,600
Heritage Site	2	n/a
Marine Park	2	n/a

Because the primary purpose of the PAs is to conserve biological diversity, their consideration as part of developing and implementing LEDES is limited primarily to carbon storage provided by forested landscapes within these protected areas. Of particular note in this regard are Botum

Sakor, Phnom Bokor, Kiriom, Phnom Kulen, and Virachey national parks; Kulen Promtep, Beng Per, Samlaut, Phnom Samkos, Phnom Aural, Lomphat, Phnom Prich, Phnom Nam Lyr, and Snoul wildlife sanctuaries; and Cardamom Mountains Protected Forest (managed by FA).

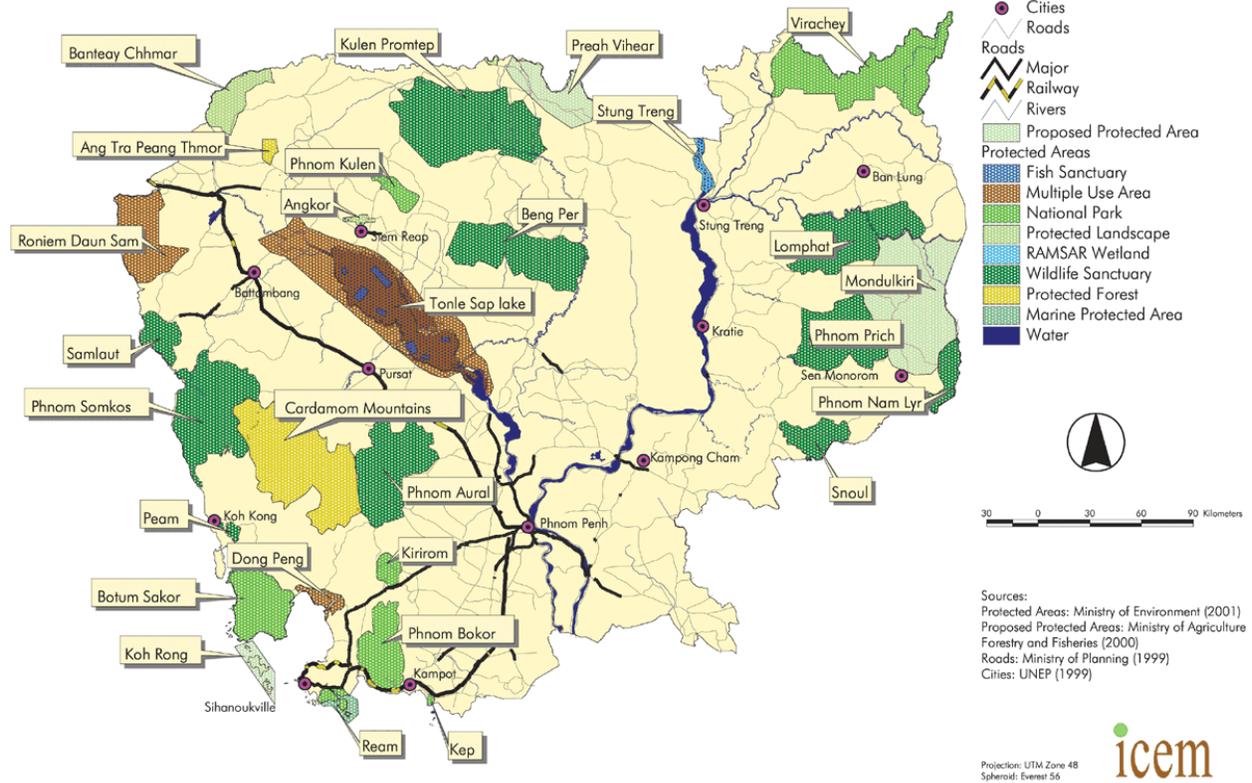


Figure 8: Protected areas system of Cambodia as of December 31, 2002

Additional areas i.e., Prey Lang protected forest are not shown; more recent map unavailable graphically

CAPACITY ASSESSMENT

Coordination through and across Government will be critical to the success of REDD+. The capacity of several institutions will also have to be increased if strategies for REDD+ are to be effectively implemented. Each of the official RGC documents (e.g., REDD+ Roadmap, NFP, UN-REDD Country Programme, FCPF R-PP) as well as independent analysts' reports (e.g., Ashwell & Kesaro 2011) cites generally weak capacity within each of these institutions. Building the strength of FA – particularly to implement its mandate – is a core objective of both the UN-REDD and FCPF programs. No reports could be found during the desk study that documented a systematic, comprehensive skills assessment or similar detailed analysis of training needs; rather, the kinds of technical, financial, scientific, and institutional challenges faced by the majority of developing countries have been listed as well for Cambodia. In the absence of any specific information to the contrary, and noting again that no interviews were conducted as part of this study, the team adopts the conservative assessment that nearly all skills sets required to develop and implement strategies for low emission, high sequestration, climate-resilient economic growth could be improved.

The NGO sector in Cambodia is extensive, often has skilled personnel, and has established mechanisms for coordination on forestry, community forestry, REDD+ and climate change. Both national and international NGOs have the capacity to provide technical support to Government agencies in the implementation of REDD+ Readiness activities, such as awareness raising and REDD+ strategy development. There are several organizations with experience of REDD+ processes internationally and the implementation of pilot REDD+ projects within Cambodia, as well as organizations with considerable experience in community forestry, community-based forest livelihoods, indigenous rights, and land. The knowledge and skills of these organizations will be important to the development of National REDD+ strategies.

Civil society and indigenous groups: Cambodia has a substantial rural population, including 20 different indigenous peoples groups. These communities rely heavily on subsistence agriculture as well as the gathering of non-timber forest products (NTFPs). Although the legal framework on land and forestland tenure and ownership rights is relatively clear, implementation of this framework in rural or forest areas has been limited and local people are vulnerable to relocation for economic development or incursion resulting from migration to forest frontier regions. Given that Cambodia's population is increasing at one of the highest rates in Asia, coupled with rapid economic growth over the past decade, these conflicts are likely to become more prevalent, particularly in remote forest areas where many indigenous groups are found. Development and implementation of a National REDD+ Strategy thus presents a potential opportunity because it should encourage scaling-up of efforts to demarcate and register land boundaries and establish forestland co-management arrangements (such as Community Forestry), in order to determine local beneficiaries responsible for achieving REDD+. However, development and implementation of a National Strategy for REDD+ also presents potential risks if it leads to alienation of forestland resources, and exclusion of the voice and participation of forest-dependent communities. The historical, cultural, and political context of Cambodia has resulted in a weak level of civil society organization at the national level with limited engagement in policy debate and formulation. Organizations that have grown from a grassroots issue base have often struggled to maintain links with their constituents as they have grown. A number of different organizations and networks exist that have the capacity to manage processes of consultation and participation; however, support to these organizations must also be managed carefully to allow them to maintain and develop structures of downward accountability.

Cambodia has several established policy research institutions, such as the Cambodia Development Resource Institute and the Center for Advanced Study. Major universities include the Royal University of Phnom Penh, which already has well-regarded Master's courses on environmental conservation and provides teaching on PES, the Royal University of Agriculture (Chamkar Dong), and Prek Leap National School of Agriculture, all in Phnom Penh. Universities could play a key role in implementation of REDD+ through courses on REDD+ and necessary skills such as forest inventories.

Development partners have provided vital support to the development of Cambodia's forest, environment, land, and climate change sectors. Several partners have already committed to provide further support to policy dialogue and Roadmap implementation. Development partner experience will play an important role in linking national and international process. It is important that communication between partners' and Government is also clearly maintained to ensure that efforts towards REDD+ are coordinated with other initiatives.

All of Cambodia's neighbors are currently investigating the potential for national mechanisms for REDD+. Coordination amongst these countries will provide important lessons. The Roadmap planning process was an important achievement for the RGC, demonstrating inter-ministerial cooperation and effective consultation and engagement with local stakeholders. This

achievement was due to strong national leadership by the FA of MAFF and the GDNCP of MoE. The Roadmap was used as the basis of a funding request to the UN REDD Global Program for \$3.0 million, which was approved by the UN REDD Policy Board on November 5, 2010. In addition, UNDP, FAO, JICA, and the Government of Japan have committed funding for Roadmap activities.

6.6 GAPS AND AREAS FOR COLLABORATION

Given the relatively non-specific nature of the UN-REDD country program, the FCPF R-PP, and the NFP in terms of describing precisely what aspects of REDD+ Readiness they will support and where, it is difficult – without any interviews (i.e., based solely on documents reviewed on the UN-REDD website)³² – to pinpoint areas for potential collaboration between USG agencies and the RGC and its other implementing partners. Thorough analysis of the referenced documents showed that they had very similar, yet imprecise descriptions of REDD+ Readiness activities planned to be undertaken. For example, while support to establishing reference levels is listed in both documents, they do not specify the methodology to be used, the extent of analysis (national or sub-national), whether all forest types would be included, and whether there would be efforts to develop and apply emissions factors other than IPCC default values. Likewise, there was insufficient detail on efforts to improve activity data. Based on these, the desk study team concluded that interviews with government officials could be used to understand with greater clarity the exact nature of ongoing efforts, plans underway, and remaining gaps. This section, therefore, will more generally describe what it planned under these three key programs, as initial guidance for the Scoping Mission in terms of questions to ask and details to be fleshed out as part of the scoping.

For REDD+ Readiness in Cambodia, the key activities include:

1. Understanding how to integrate REDD+ into Community Forestry, Community Fisheries, Community Protected Areas & Indigenous Communal Land titles, including implementation within larger forest management units (e.g. Protected Areas or Protection Forests or Forestry Concessions) that contain smaller community-managed or owned forest areas
2. Legal analysis and development, e.g. including development of regulations under the 2008 Protected Area law; analyzing how to link projects to subnational and national implementation
3. Establishing national-level guidelines for REDD+ demonstration projects developed by the Technical Team on REDD+ Projects and informed by the lessons learned from existing REDD+ activities
4. Analyzing links with other Government policy processes and laws, including the NCDD and land-use planning, investigating conservation concessions as an implementation modality for REDD+.

The REDD+ Taskforce will establish separate Technical Teams in order to develop technical recommendations on particular key issues. The Technical Teams would be composed of technical officers from different line agencies responsible for the issue under discussion as well as other stakeholders as identified, including civil society and indigenous people's representatives. Nongovernment members could be drawn from organizations represented in the Consultation Group. The membership and terms of reference for each Technical Team will

³² UN-REDD website for Cambodia has not been updated since November 2011 (verified on October 21, 2012). See: http://www.un-redd.org/Key_results_achievements_Cambodia/tabid/106626/Default.aspx. Scoping team should verify progress with Keo Omaliss, National REDD+ Focal Point for Cambodia.

be decided by the REDD+ Taskforce. Currently, at least four Technical Teams are planned, and more may be required through the Readiness process:

- REDD+ Projects Technical Team: Composed of FA, GDANCP, FiA, and other line agencies as appropriate, and development partner and civil society representatives. Responsible for developing guidelines for REDD+ pilot projects to ensure that projects are undertaken in a way that allows them to be nested into the national REDD+ system.
- REDD+ Benefit-sharing and Revenue-distribution Technical Team: Composed of FA, GDANCP, MEF, other line agencies as appropriate, and development partner and civil society representatives. Responsible for considering how to manage REDD+ revenues in Cambodia and guidelines for local benefit-sharing arrangements.
- MRV/REL Technical Team: Composed of FA, GDANCP, FiA, MLMUPC, and other line agencies, development partners, and civil society as appropriate. Responsible for implementation of Component 3, development of Cambodia’s REL(s), and establishment of the MRV system for forest carbon.
- Consultation and Safeguards Technical Team: Composed of FA, GDANCP and other line agencies, development partners, and civil society as appropriate. Responsible for developing the consultation plan, the strategic environmental and social assessment framework, and the Monitoring System for Multiple Benefits, Other Impacts, and Governance.

7. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: AGRICULTURE

7.1 CURRENT AGRICULTURAL SECTOR ACTIVITIES

Developing the agricultural sector is a high priority for RGC. The MAFF and the Council on Agriculture and Rural Development (CARD) are focused on increasing agricultural productivity and deploying sustainable agricultural practices while improving the standard of living for people working in the sector. The agricultural sector is the single largest employer in Cambodia and contributes approximately 30 percent of GDP.³³ Rice is the dominant staple crop on cultivated land and Cambodia is self-sufficient. The main cash crops are cassava, rubber, cashew nuts, and some palm oil. An estimated 280,000 km² of land is used for agriculture with additional efforts concentrated on fisheries in the Mekong River and in Tonle Sap Great Lake (considered to be one of the most productive fresh water fisheries in the world).³⁴ Cambodia has made significant gains in the agriculture sector since 1995: agricultural productivity of rice has almost doubled; commercial fish production has grown from 122,000 tons to 3.5 million tons; and, the cattle population has increased from 2.7 million to 3.5 million animals. Multiple enhancements, such as improved rural roads and increased access to credit for the agriculture sector, have helped improve rural living standards. The percentage of Cambodians living below the poverty line fell from 47 percent to approximately 30 percent (as of 2007). The National Strategic Development Plan Update 2009-2013 (NSDP 2009) is determined to further spread these benefits and calls on MAFF and other relevant agencies to continue to improve agricultural productivity and rural livelihoods.

7.2 DEVELOPMENT GOALS AND PRIORITIES

Development of the agriculture sector is a significant goal for the RGC, as this sector is the single largest source of primary employment for Cambodians.³⁵ An average annual GDP growth rate of almost four percent is targeted for the sector in the 2009 – 2013 period of the NSDP, with livestock and poultry the fastest-growing subsector at 4.9 percent, followed by crops at 4.2 percent. These would be offset by relatively slow growth in fisheries and forestry. Several key economic planning documents describe how the RGC intends to achieve these targets in agricultural sector development:

1. The Rectangular Strategy lists “enhancement of agriculture sector” as its first rectangle, specifically “improving productivity and diversifying” the sector.
2. Enhancing productivity and improving water resources management are highlighted in the Strategy for Agriculture and Water that supports implementation of the NSDP 2009.

³³ Cambodia’s Agricultural Strategy: Future Development Options for the Rice Sector. Available online at <http://www.cdri.org.kh/webdata/download/sr/agriStrategy9e.pdf>

³⁴ ADB: Sector Assistance Program Evaluation for the Agriculture and Rural Development Sector in Cambodia. Available online at <http://www.adb.org/sites/default/files/SAP-CAM-2009-32.pdf>

³⁵ Cambodia Human Development Report 2011. Available online at http://hdr.undp.org/en/reports/national/asiathepacific/cambodia/Cambodia_2011_NHDR.pdf

- Sustainable agriculture also figures prominently in the GGR as a means to increase economic development, create jobs to reduce poverty, and minimize GHG emissions.

The agriculture sector in Cambodia is primarily focused on rice (80 percent), plus some maize, cassava, and soybean production. Rice production was estimated to be 6 million tons in 2010 and reach 7.5 million tons by 2020. Rice is also a staple crop for Cambodians, so enhancing production has been integral to Cambodian development strategies.³⁶

7.3 KEY GHG EMISSIONS DRIVERS AND TRENDS

Emissions from the agricultural sector can be categorized as direct and indirect emissions. Soil management practices and livestock are responsible for direct emissions. The agriculture sector is an end-user of electricity and transportation fuels, which accounts for indirect emissions. While indirect emissions are primarily carbon dioxide (CO₂), agricultural processes are responsible for a variety of non-CO₂ direct emissions such as methane and nitrous oxide.

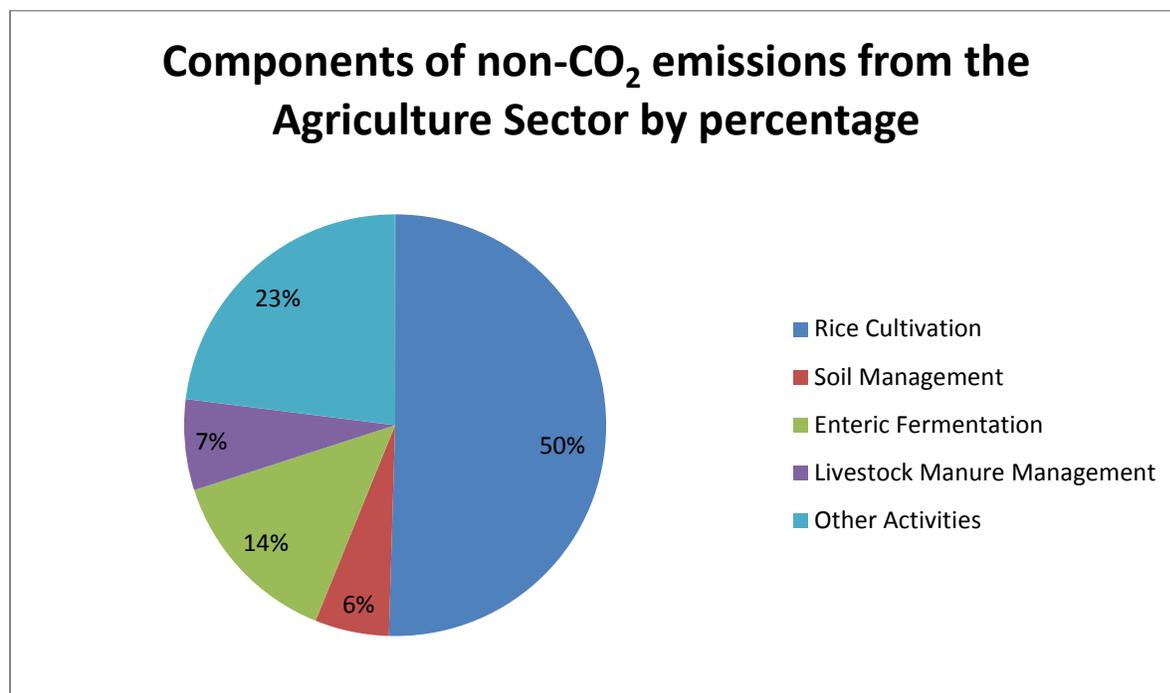


Figure 9: Emissions from Agriculture in Cambodia

Source: US Environmental Protection Agency

In 2010, Cambodia’s total non-CO₂ emissions from the agricultural sector were estimated to be 31.7 million tons CO₂ equivalent (MtCO₂e). Of total non-CO₂ emissions, rice cultivation was responsible for emissions of 16 MtCO₂e of methane (in 2010). An additional 1.8 MtCO₂e were from nitrous oxide (N₂O) from agricultural soils.

Another significant contributor to non-CO₂ emissions from the agricultural sector is known as enteric fermentation. Enteric fermentation is the digestive process in ruminant animals (such as cows, goats, and sheep) that produces methane (CH₄). In 2010, CH₄ emissions from enteric fermentation in Cambodia are estimated to be 4.4 MtCO₂e. Livestock manure management

³⁶ Cambodia’s Agricultural Strategy: Future Development Options for the Rice Sector. Available online at <http://www.cdri.org.kh/webdata/download/sr/agriStrategy9e.pdf>

accounts for an additional 0.6 MtCO₂e of CH₄ and 1.6 MtCO₂e of N₂O. Other agricultural sector activities, such as burning agricultural/crop residues, irrigation and tillage methods, and general soil management, were responsible for emissions of 3.8 MtCO₂e of CH₄ and 3.5 MtCO₂e of N₂O in 2010.³⁷

7.4 SECTORAL STRUCTURE AND INSTITUTIONAL CAPACITIES

MAFF is the primary organization responsible for the agricultural sector. MAFF oversees the activities of several agencies and public institutions related to the sector, including federal-level departments for agriculture, forestry, and fisheries, as well as relevant provincial-level organizations. MAFF also has authority over the Royal University of Agriculture, the Cambodia Agriculture Research and Development Institute (CARDI), Cambodia Rubber Research Institute and multiple agricultural colleges (such as Prek Leap and Kampong Cham).³⁸

Other important entities include the Council for Agriculture and Rural Development (CARD) and the Cambodian Centre for Study and Development in Agriculture (CEDAC). CARD is a high-level agency that advises RGC on multiple issues and cooperates with MAFF in its activities. CARD focus areas include improving agricultural productivity to increase crops for export and to coordinate the involvement and activities of international donors, NGOs, and the private sector in the agricultural sector.³⁹ CEDAC is a nongovernmental organization focused on increasing sustainable agriculture in Cambodia by enhancing capacity building, organizing farmer training and improving access to information for the agricultural community.⁴⁰ Significant international efforts in Cambodia's agricultural sector include UNDP, SNV and GERES.

UNDP (with SIDA and AusAid) supports the Cambodia Community Based Adaptation Program (CCBAP).⁴¹ CCBAP aims to develop local capacity to respond to climate change. Cambodia's agricultural sector is heavily dependent on adequate water supply and CCBAP is working to reduce vulnerability to reduced availability of water. SNV works to increase productivity in the rice sector through enhanced cultivation practices. SNV also supports diversification of farming systems and improved market access as a means to strengthen the agricultural sector and increase resilience to climate hazards. GERES is working to reduce deforestation and increase crop diversification.

7.5 KEY POLICIES AND IMPLEMENTATION PLANS

Cambodia integrates mitigation and adaptation into its agricultural policies and development goals. Specifically, the Strategy for Agriculture and Water 2006-2010 (SAW)⁴² calls for increased research and investment in high yield and high quality rice including varieties that are more resistant to adverse weather incidents and climate change. SAW also discusses the importance of appropriate crop diversification and water use to both reduce vulnerability to climate events and enhance food security. SAW also calls for increased capacity building to support efficient resource use for agriculture. The NSDP 2009 highlights the role of agriculture in Cambodia's success and focuses on four areas for action: (1) Improving agricultural productivity and diversification, (2) Land reform and clearing of mines, (3) Fisheries reform, and (4) Forestry reform. NSDP 2009 details specific actions and responsible agencies to work on

³⁷ Emissions data from US Environmental Protection Agency 2011. Global Anthropogenic Non-CO₂ Greenhouse Gas Emissions.

³⁸ Cambodia Ministry of Agriculture, Fisheries and Forestry organization: <http://www.maff.gov.kh/en/aboutmaff/organization.html>

³⁹ Cambodia Council for Agriculture and Rural Development website: http://www.card.gov.kh/Home_EN.html

⁴⁰ Centre for Study and Development in Agriculture website: <http://www.cedac.org.kh/home.asp>

⁴¹ Cambodia Community Based Adaptation Program website: <http://www.un.org.kh/undp/what-we-do/projects/cambodia-community-based-adaptation-programme-2>

⁴² RGC: Strategy for Agriculture and Water 2006-2010. Available online at: http://www.card.gov.kh/tl_files/documents/card/policy/English/National_Strategy_Agriculture_Water_2006-2010.pdf

each of these issues. To improve agricultural productivity and diversification, NSDP 2009 directs MAFF to continue updating the Agriculture Sector Strategy, specifically to:

- Strengthen research and development of improved agricultural practices and crop technologies; enhance technical capacity at all levels of the agricultural sector and promote organizations for farmers and other agricultural workers to strengthen the agricultural management system; deploy appropriate communication and education programs
- Evaluate and reform the legal and institutional framework to provide better services to the agricultural sector, and integrate agricultural sector needs in larger packages of reforms

For land reform and mine clearing, NSDP 2009's aim is to improve management of state-owned unused land and implement transparency in land management practices, as well as to continue progress on clearing land mines. For reforming fisheries, NSDP 2009 directs MAFF to establish fish market mechanisms that promote productivity and improve international competitiveness. For forestry reform, NSDP 2009 calls on forest administrators to continue efforts on forest conservation and to increase cooperation with international initiatives aimed at forest conservation. For the general agricultural sector, NSDP 2009 directs MAFF to meet overall productivity goals shown in Table 12.

Key Indicators	Unit	2008 Actual	2009 Estimated	2010 Projected	2011 Projected	2012 Projected	2013 Projected
Land under crops (cash and industrial crops)	000 Ha	596	645	774	930	1000	1000
Paddy: cultivated area	million Ha	2.61	2.63	2.65	2.65	2.65	2.65
Yield per hectare	tons	2.74	2.77	2.80	2.83	2.87	3.00
Rice Production	million tons	7.17	7.28	7.42	7.50	7.60	7.95
Irrigated land area	000 Ha	1.120	1.145	1.170	1.195	1.220	1.245
Reduction of animal morbidity and mortality rates	%	6.0	5.5	5.0	4.5	4.0	3.5
Production of cattle and buffaloes	Million heads	4.20	4.29	4.32	4.38	4.44	4.50
Cultivated area of rubber	000 Ha	111.4	128.4	143.4	158.4	173.4	188.4
Yield per hectare	tons	0.95	1.10	1.10	1.15	1.20	1.30
Dried rubber production	000 tons	26.6	38.5	49.5	63.3	78.0	97.5
Fishing Lots	Sq. Kms	415	415	415	415	415	415
-Released to Fishery Community	%	56.4	56.4	56.4	56.4	56.4	56.4
Fish: Catch (from all sources)	tons	471	515	617	668	726	788
Forest cover -- % of land area	%	59.00	57.59	57.99	58.39	58.79	59.19
Reforested (cumulative total from 1985)	000 Ha	10.81	18.92	73	73	73	73
Fuel Wood Dependency -- % of households	% of households	73	67	61	59	56	54
Forest Boundary Demarcation	km	321	228	413	500	500	500
Forestry Community	No.	124	210	300	350	400	450

Table 12: Key Indicators for Agriculture, Fisheries and Forestry

Source: Cambodia National Strategic Development Plan Update 2009-2013.

7.6 EXISTING AND PLANNED DONOR SUPPORT

International organizations providing support to Cambodia include the World Bank, ADB, the United Nations Food and Agricultural Organization (FAO), and JICA. These international organizations have agriculture-specific projects in Cambodia and have integrated assistance into other programs (such as the improvement of the rural road network to also improve the agricultural sector and flow of goods). Specifically, the World Bank is working to improve access to finance for agribusiness by establishing a risk-sharing mechanism and by providing technical assistance to increase reliability of credit flows. Also, the Bank is working to overcome barriers to commercial lending and also addressing improvements to the legal and institutional framework for agricultural sector financing.⁴³ ADB is working to improve the rice production sector through efforts that include the commercialization of practices, assistance for reform of agricultural land management practices, and enhance paddy production through efficient water use.⁴⁴ ADB is working to increase capacity building efforts in the agricultural sector.⁴⁵ JICA provides support for improved land management and standardized use of fertilizers.⁴⁶ FAO provides technical assistance for capacity building in the agricultural sector.⁴⁷

7.7 GAPS AND AREAS FOR COLLABORATION

The amount of information available on lowering emissions in the agriculture sector is very sparse. The vast majority of reports and strategy documents relate to adaptation in the agriculture sector, as well as general development plans. Many of those include planned activities – such as expansion of irrigation or intensification of productivity through wider use of fertilizers – that could have negative implications in the levels of agricultural emissions. The desk study team recommends targeted questions to officials in MAFF about these activities, and the extent to which they had considered the emissions aspects as part of their decision making.

Cambodia would benefit from increased international support and EC-LEDS assistance to further develop the agricultural sector. Possible activities include integration with regional programs, such as conducting cross visits with the USAID project in Bangladesh (IFDC implementing partner) on use of pelletized fertilizer to increase yields, lower waterway nitrification, and lower nitrous oxide emissions. EC-LEDS may also work to strengthen capacity to implement land use planning and land allocation/administration at subnational levels not only to rationalize estate crops such as rubber, but also to reduce emissions from deforestation in parts of Cambodia where land conversion to plantation crops is an important driver.

Additionally, USAID can expand its assistance to RGC with conducting opportunity cost analyses of different land allocation options to support more evidence-based decisions about where economic land concessions (ELCs) and social land concessions (SLCs) are located/ permitted. USAID can also collaborate with the International Rice Research Institute to conduct on-farm research to determine practices to best improve water management of rice paddies to increase productivity while lowering methane emissions. (USAID could also collaborate with CARD since improving agricultural productivity is a national objective.)

⁴³ World Bank: Cambodia Agribusiness Access to Finance Project. Available online at <http://www.worldbank.org/projects/P121809/cambodia-agribusiness-access-finance-project?lang=en>

⁴⁴ ADB: Climate Resilient Rice Commercialization Sector Development Program website: <http://www.adb.org/projects/44321-012/details>

⁴⁵ ADB: Piloting the Post-Harvest Technology and Skills Bridging Program for Rural Poor website: <http://www.adb.org/projects/42164-012/details>

⁴⁶ JICA: Capacity Building for the Quality Standard Control of Agricultural Materials website: <http://www.jica.go.jp/project/english/cambodia/006/index.html>

⁴⁷ FAO Cambodia website: <http://www.fao.org/isfp/country-information/cambodia/en/>

Finally, USAID could work to assess the potential for shifting commercial livestock operations to more intensive management practices that reduce methane emissions by improving manure management while also supporting wider use of biogas digesters to provide cleaner energy options for farms (i.e., reduce the use of diesel generators). CEDAC is keen to find additional climate finance to support farmers with a system of rice intensification (SRI) and organic agriculture. SRI is a technique that requires less water to stay in the field resulting in less anaerobic fermentation and reduced production of methane. Studies in Indonesia and the Philippines have shown up to 50 percent reductions in methane emissions.⁴⁸ USAID can support CEDAC's efforts to increase SRI in Cambodia with additional studies to determine full impact of SRI and assist RGC with the development of CDM projects.

⁴⁸ See (1) Anas Iswandi and Norman Uphoff. Prospects of the System of Rice Intensification in Asia (2009). Available online at <http://repository.ipb.ac.id/handle/123456789/28312> and (2) International Food Policy Research Institute: Reducing Methane Emissions from Irrigated Rice. Available online at http://www.ifpri.org/sites/default/files/publications/focus16_03.pdf

8. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: ENERGY USE AND POWER GENERATION

8.1 CURRENT ENERGY SECTOR ACTIVITIES

The Draft Mitigation Analyses for the Energy and Transport Sector, Ministry of Energy 2010 states Cambodia’s total energy demand increased from 121,000 TJ in 2000 to 163,000 TJ in 2010 and is projected to increase to 260,000 TJ by 2030. Biomass is still the main primary source of energy. Wood and charcoal accounted for 58.4 percent of total energy demand in 2010, down from 78 percent in 2000. It must be noted that the decrease in the energy demand of wood is a result of a switch to charcoal and does not take into account that wood is used to produce charcoal. Therefore, allowing for this, and assuming that 6 kg of wood produce 1 kg of charcoal and that charcoal has only 1.75 times the energy value of wood, the actual share of wood for total energy use in 2010 is about 69 percent.

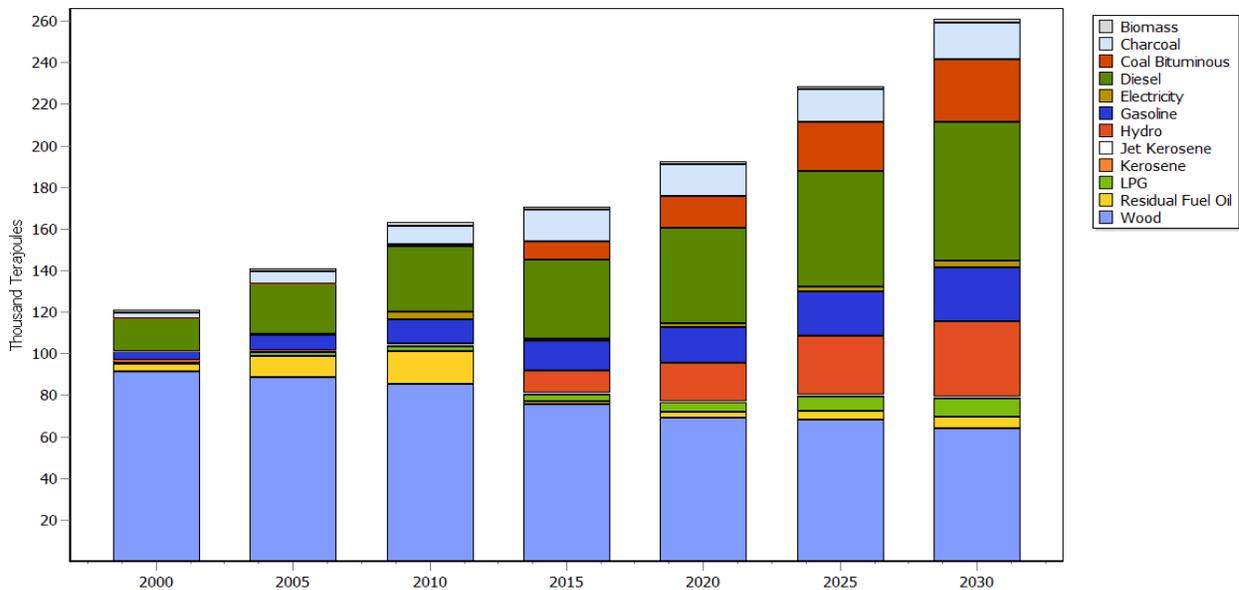


Figure 10: Energy Demand in Cambodia 2000-2030

Source: Draft Energy Mitigation Analyses (2010)

While Cambodia is one of the poorest countries in the world, its electricity tariffs are among the highest in the world, reaching as high as US\$1.25/kWh in rural areas compared to approximately US\$0.19/kWh in Phnom Penh, or even US\$0.06-0.10/kWh in Thailand or US\$0.03-0.10/kWh in Lao PDR and Vietnam. Currently, only six percent of Cambodia’s rural population has access to grid-based electricity, mostly from village micro-grids that are often powered by inefficient diesel generators; and 80 percent use kerosene lamps or florescent lights powered by car batteries, costing an equivalent of US\$2.00-3.50/kWh.

Another significant issue in Cambodia’s energy sector is related to domestic household energy. Eighty-three percent of the total population and 94 percent of the rural population depend on

biomass fuels, including firewood and charcoal, as their main cooking fuel. This places a heavy burden on Cambodia's natural resources and if managed unsustainably, can have significant environmental and socioeconomic implications for the country. Also, the cost of fuel for cooking is a major drain on family income. The rural poor spend approximately 10 percent of their consumption expenditure on energy needs, with cooking energy needs representing 70 percent of total energy spending.

8.2 DEVELOPMENT GOALS AND PRIORITIES

Energy security is a fundamental development issue for RGC and the country is committed to providing reliable and affordable electricity to its citizens. Both the Rectangular Strategy and the National Strategic Development Plan Update 2009-2013 (NSDP 2009) prioritize energy as a development objective. The Rectangular Strategy highlights the importance of efficient and sustainable energy production, the need for adequate power structure infrastructure, and renewable energy production. NSDP 2009 supports further development of all types of renewable energy and calls for increased energy efficiency.

8.3 KEY GHG EMISSIONS DRIVERS AND TRENDS

Cambodia has considerable hydropower reserves, limited coal supplies, and offshore oil and gas reserves. To meet energy needs, Cambodia is a net importer of fossil fuels such as gasoline, diesel, heavy oil, fuel oil, and kerosene. These fuels are used for transportation (primary) and electricity generation (secondary). Electricity supplied to urban areas is mostly imported from neighboring countries (Thailand, Vietnam, and Laos). In rural areas, fossil fuels are directly used for energy needs (diesel for generators and kerosene for lighting).

The mitigation analyses for the energy and transport sector projected the CO₂ emissions for several scenarios. Results of the baseline scenario show an increase in total CO₂ emissions from 2.64 Mt CO₂e in 2000 to 25.55 Mt CO₂e in 2050. These emissions are equal to 0.2 tCO₂ per capita in 2000 to 1.3 tCO₂ in 2050. The transport sector will have the largest share of 10.82 Mt CO₂e in 2050 followed by the energy industries (all emissions related to electricity generation) with 8.89 Mt CO₂e.

Table 13: Emissions in Gg CO₂e by sector 2000-2050

	Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
A1 Energy Industries (GgCO ₂ eq.)		385	1,008	1,453	1,212	1,931	2,849	3,539	4,430	5,567	7,023	8,888
A2 Manufacturing Industries (GgCO ₂ eq.)		320	508	689	828	923	1,024	1,144	1,270	1,414	1,578	1,766
A3 Transport (GgCO ₂ eq.)		709	1,249	2,000	2,465	3,040	3,751	4,631	5,720	7,069	8,742	10,816
A4 Other Sectors (GgCO ₂ eq.)		1,229	1,304	1,392	1,482	1,658	1,977	2,285	2,623	3,025	3,505	4,079
Total (GgCO₂ eq.)		2,643	4,070	5,533	5,987	7,551	9,601	11,599	14,043	17,075	20,848	25,549
Detailed emissions per sector												
A1 Energy Industries												
	Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
National Utility EDC (GgCO ₂ eq.)		339	884	1,250	953	1,623	2,524	3,211	4,093	5,214	6,648	8,481
REEs (GgCO ₂ eq.)		35	42	52	63	77	93	113	138	168	204	248
Battery Charging Stations (GgCO ₂ eq.)		11	82	151	196	232	232	215	199	185	171	159
Total (GgCO₂ eq.)		385	1,008	1,453	1,212	1,931	2,849	3,539	4,430	5,567	7,023	8,888
A2 Manufacturing Industries												
	Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Rice Milling (GgCO ₂ eq.)		94	151	201	221	244	270	298	329	363	401	443
Brick Works (GgCO ₂ eq.)		-	5	9	11	13	16	19	23	27	33	40
Garment Industries (GgCO ₂ eq.)		117	115	113	113	113	113	113	113	113	113	113
Rubber Factories (GgCO ₂ eq.)		18	14	11	11	11	11	11	11	11	11	11
Cement Factories (GgCO ₂ eq.)		3	4	6	7	9	11	13	16	19	23	28
Other Industries (GgCO ₂ eq.)		87	218	349	465	533	604	691	779	881	998	1,132
Total (GgCO₂ eq.)		320	508	689	828	923	1,024	1,144	1,270	1,414	1,578	1,766
A3 Transport												
	Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Road (GgCO ₂ eq.)		700	1,238	1,986	2,448	3,020	3,726	4,601	5,683	7,025	8,688	10,750
Train (GgCO ₂ eq.)		9	11	14	17	20	25	30	36	44	54	66
Total (GgCO₂ eq.)		709	1,249	2,000	2,465	3,040	3,751	4,631	5,720	7,069	8,742	10,816
Other Sectors												
	Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Commercial Institutional (GgCO ₂ eq.)		68	106	142	173	210	256	311	379	461	560	682
Residential Sector (GgCO ₂ eq.)		948	940	936	928	983	1,156	1,287	1,408	1,547	1,706	1,890
Agriculture (GgCO ₂ eq.)		212	258	314	382	465	565	688	837	1,018	1,239	1,507
Total (GgCO₂ eq.)		1,229	1,304	1,392	1,482	1,658	1,977	2,285	2,623	3,025	3,505	4,079

Source: MoE 2010, Draft Greenhouse Gas Mitigation Analyses for the Energy and Transport Sector.

Within the energy sector, high-impact subcategories include electricity generation, residential energy consumption, and the industrial sector. Electricity generation depends on fossil fuels. Residential energy is supplied by electricity through the grid in urban areas (primarily Phnom Penh) and through a mix of solar, kerosene, battery power, and biofuels in rural areas.

For the energy sector, the largest driver of GHG emissions is the significant use of fossil fuels for power generation. Diesel/ heavy fuel oil accounts for approximately 80 percent of fuel for power generation.⁴⁹ Cambodia's electrification rate is extremely low – only about 17 percent of the country's population has access to electricity. In rural areas where an estimated 83 percent of the population lives, the electrification rate is even lower (under approximately 13 percent).

8.4 POTENTIAL FOR RENEWABLE ENERGY

8.4.1 SOLAR

The current capacity of solar power in Cambodia is extremely limited. Specifically, current capacity of solar energy is approximately 3000 kilowatt peak (kWp) but there is significant potential for increasing capacity. Many NGOs, such as Pico Sol, are working to expand solar

⁴⁹ Ministry of Industry, Mines and Energy: Cambodian Power Development Plans. Available online at http://cambodia.usembassy.gov/media2/pdf/cambodian_power_development_plans.pdf

energy in Cambodia.⁵⁰ According to Pico Sol, solar energy could be used to provide reliable lighting and energy needs for 2.3 million rural households in Cambodia.⁵¹ Although there are approximately 20 solar companies established in Cambodia, most are in urban areas. There are over 13,000 villages in Cambodia. Many of which are in remote rural areas, and it is difficult and expensive to reach these villages, carry out promotional activities, install solar systems, and provide service to households that are often below the poverty line. As a result, there are limited opportunities in rural areas where solar can be highly beneficial.

8.4.2 BIOMASS

Fuel wood is still the most important energy source in terms of total energy demand (Table 14). Fossil fuels are becoming increasingly more important; however, fuel wood will be the main source of energy for cooking, especially in rural areas for centuries to come. The supply of fuel wood also becomes an important issue as forests are disappearing as a result of deforestation and forest land conversion for agriculture. The estimated rural energy demand for cooking and lighting in Cambodia for 2010 was about 84,000 TJ of which 88 percent came from firewood and charcoal and less than three percent from electricity. Table 14 shows the importance of fuel wood in rural energy. Most of the emphasis of rural energy policy and strategy development by donors and government is on electricity however this only represents an important but very small percentage of the rural energy demand.

Table 14: Estimated rural energy demand for cooking and lighting in Cambodia (TJ)

Type of Fuel	2010		2015	2020	2030
Total Electricity	2,155	2.5%	2,790	3,476	5,095
Total Charcoal	6,796	8.0%	12,323	12,156	13,112
Total Firewood	67,920	80.3%	54,742	49,749	35,522
Total LPG	2,313	2.7%	3,135	4,671	8,964
Total Kerosene	1,166	1.4%	843	673	717
Total Candle	144	0.2%	148	164	203
Total Animal Dung	4,117	4.9%	3,030	1,821	1,068
Total	84,610.50	100%	77,009	72,707	64,679.50

Source: UNDP/MIME/GERES 2006: Residential Energy Demand in Rural Areas

Biomass gasification. Beside using biomass for cooking, it is also used for gasification to generate power and electricity. There are over 200 biomass gasification systems operational in Cambodia. Most of them are powering rice mills, or to drive generators to power isolated electrification grids and drive pumps in ice plants. About one-third of the gasifiers are imported by SME-Cambodia from India from the Ankur company; the others are locally manufactured. There are about eight manufacturers of gasifiers, three of which produce similar quality gasifiers as the imported Ankur gasifiers and about half as expensive.

The price of electricity by REEs depends largely on the price of diesel. Large, efficient generators can produce 3 kWh per liter of diesel; however, older generators produce less. With average network distribution losses of 15 to 25 percent, the price of electricity in smaller REEs (below 500 households) is about US\$ 0.90 per kWh. This is five times as expensive in Phnom Penh. This motivated many REEs to try biomass gasification. The news from the first system in

⁵⁰ Pico Sol website: <http://cambodia.picosol.nl/en/about-pico-sol-cambodia>

⁵¹ Pico Sol: The Solar Roadmap for Cambodia. Available online at <http://picosol.nl/files/solar-roadmap-cambodia-summary.pdf>

Anlong Tamey in 2006 spread quickly around the country and many people tried to build gasifiers themselves due to the cost of the imported Ankur gasifiers but many did not succeed or only realized marginal savings.

8.4.3 HYDROPOWER

In Cambodia, hydropower production is under 20 MW but the potential for development is estimated to be 10,000 MW.⁵² Currently, technical potential of hydropower resources in terms of installed capacity is estimated at 5,000 – 8,600 MW. An estimated 50 percent of the hydropower potential is located in the Mekong River Basin, 40 percent on tributaries of the Mekong River, and the remaining 10 percent in the southwestern coastal areas. At present, only two projects are operating, with an installed capacity of 13 MW, while four projects are being developed. Previous studies have identified 42 potential hydropower projects, with a total installed capacity of 1,825 MW, capable of generating around 9,000 GWh/year of electricity (see Table 15).

Table 15: Hydro Energy in GWh per year

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hydro in GWh/year											
Kirirom I	40	40	40	40	40	40	40	40	40	40	40
Kirirom II			78.55	78.55	78.55	78.55	78.55	78.55	78.55	78.55	78.55
Kamchay			498	498	498	498	498	498	498	498	498
Stung Atay				573	573	573	573	573	573	573	573
Stunt Tatay					858	858	858	858	858	858	858
Lower St Russey Chrum				1020	1020	1020	1020	1020	1020	1020	1020
Lower SeSan II						1953	1953	1953	1953	1953	1953
Lower SeSan I						485	485	485	485	485	485
Stung Cheay Areng							617	617	617	617	617
Total Hydro	40	40	616.55	2209.55	3067.55	5505.55	6122.55	6122.55	6122.55	6122.55	6122.55
Total Hydro (80%)	32	32	493.24	1767.64	2454.04	4404.44	4898.04	4898.04	4898.04	4898.04	4898.04

Source: Based on data from MIME-Hydro department

8.4.4 WIND

Status and Potential for CDM Projects estimates that wind energy resource potential in Cambodia is approximately 1,380 MW or 3,665 GWh/year. Pilot projects have been deployed with international support. Wind energy assessments are primarily conducted in the southern part of the Tonle Sap lake, the mountainous districts in southwest Cambodia, and in coastal areas such as Sihanoukville, Kampot, Kep, and Koh Kong, which have an annual average wind speed of at least five meters per second (m/s).

8.4.5 BIOFUELS

In Cambodia, two species (jatropha and cassava) are estimated to have the greatest potential as biofuel sources. The two species are native to Cambodia and are abundant in the country. International entities such as JICA are working on developing such biofuels in Cambodia. Jatropha has been planted by private companies on several thousands of hectares. The yields have been disappointing and are labor intensive. Growing jatropha requires frequent work, and the harvest is very low during the first years. The harvesting of the seeds also requires training as the resin affects clothing. There are several diseases that can totally destroy jatropha plantations and it does not tolerate flooding.

Cassava has been planted by an increasing number of farmers resulting in high yields and profits. Yields over the years decrease as a result of depleted soils, and are destroyed by lack of

⁵² Institute of Technology of Cambodia: Presentation on Renewable Energy. Available online at http://www.reepro.info/fileadmin/files/REEPRO/Cambodia/2009_Renewable_Energy_Development_for_Austria_Conference.pdf

rain. Cassava is a product with potential to replace fossil fuels but it can result in competition with food crops that result in increased food prices affecting mainly the poor. There are no biofuel strategies in Cambodia. This could be one area for collaboration. As suggested in the draft energy mitigation analyses, Cambodia could allocate a maximum number of hectares for biofuels.

8.4.6 RESIDENTIAL ENERGY

In Cambodia, hundreds of privately-owned REEs supply electricity to consumers in rural areas (90 percent are off-grid suppliers). REEs offer services such as battery recharging, solar power for water purification, and renewable and non-renewable energy for lighting and cooking needs⁵³. Since Cambodia's electricity sector is fragmented and consists of numerous energy providers, there are significant losses in distribution and transmission. The cost of electricity is much higher in Cambodia than in most other countries and significantly higher than neighboring countries.⁵⁴ The fragmented nature of the electricity system also means that electricity supply is relatively unreliable. Renewable energy is not well integrated into the energy sector and there remains considerable scope for expanding use of renewable sources. There are a few demonstration projects underway but renewable energy in Cambodia is generally in the research and development stages.⁵⁵

8.4.7 BIODIGESTERS

Biodigesters have been deployed in Cambodia under the National Biodigester Program.⁵⁶ NBP is a collaboration between the MAFF and SNV. NBP is committed to increasing the number of household biodigesters in rural provinces with a focus on sustainability and reliability. NBP is also working to provide technical and educational assistance to expand the program and deploy biodigester technology on a wide scale in the country. There are now over 15,000 biodigesters installed and the potential is estimated at 250,000 or 25 percent of the rural population. NBP has acquired carbon finance to pay a subsidy of \$150 per biodigester. The program has financing until the end of 2012 and NBP is looking for new donors. If NBP can sustain the carbon finance, the program will be sustainable by 2020 and would not require additional funding. Monitoring studies have shown that living standards increase, especially for women and children, and kitchens and farm yards of families with biodigesters are more hygienic as a result of the dung that is fermented inside the digester reducing incidences of disease⁵⁷.

8.5 ENERGY SECTOR STRUCTURE AND INSTITUTIONAL CAPACITIES

The Cambodian energy sector is managed by the MIME. Independent Power Producers account for most power generation. MIME coordinates policies and objectives for all relevant agencies for energy and power generation. Key agencies include:

1. *The Cambodian National Petroleum Authority* (CNPA) manages petroleum resources and coordinates international oil and gas off-shore exploration for Cambodia.

⁵³ World Bank Presentation: Rural Electrification Fund Cambodia. Available online at <http://siteresources.worldbank.org/INTENERGY2/Resources/presentation10.pdf>

⁵⁴ Phnom Penh Post: Government to cut Power Subsidies. July 6, 2012. Available online at <http://www.phnompenhpost.com/index.php/2012070657247/Business/govt-to-cut-power-subsidies.html>

⁵⁵ The Current Status of Renewable Energy, Energy Efficiency Development in Cambodia – MIME Presentation. Available online at http://www.eepmekong.org/downloads/regional_forum/Presentations/2_Country_reports/2_Presentation_Cambodia.pdf

⁵⁶ National Biodigester Program website: <http://www.nbp.org.kh/>

⁵⁷ 2011/2012 National Biodigester Monitoring Study

2. *Électricité du Cambodge (EDC)* is the state-owned utility responsible for generation, transmission, and distribution of electricity for the entire country.⁵⁸ EDC is owned by MIME and the Ministry of Economy and Finance.
3. *The Electricity Authority of Cambodia (EAC)* is an independent agency responsible for regulating and monitoring the electric power sector in Cambodia.⁵⁹

8.6 KEY POLICIES AND IMPLEMENTATION PLANS

NSDP 2009 outlines specific tasks to be undertaken by MIME to improve the energy and power generation sector. NSDP 2009 identifies high priority areas for RGC action, specifically:

- Increase electricity capacity and reduce tariffs
- Develop appropriate energy management policy and create the legal and institutional framework to implement the policy
- Implement appropriate capacity building and institutional reform for EAC and EDC
- Promote renewable energy and energy efficiency to meet national energy demand
- Increase available electricity supply by commissioning multiple hydropower plants
- Expand electricity transmission network by commissioning multiple transmission lines

Additionally, the Rectangular Strategy directs the RGC to attract private sector investment for development of energy infrastructure (generation, transmission, and distribution). The Electricity Law outlines the responsibilities for EAC and for electricity generation and transmission.⁶⁰

8.7 EXISTING AND PLANNED DONOR SUPPORT

International donors have previously provided significant assistance for improving Cambodia's energy sector and power generation infrastructure. The World Bank, JICA, and the German Agency for International Cooperation (GIZ) have supported multiple projects aimed at increasing transmission reliability and promoting renewable energy development. Currently, ADB supports efforts to increase connectivity to the national transmission grid for the Siem Reap region and allow for improved electricity imports from Thailand.⁶¹ ADB is also assisting with a power transmission and distribution project for the port city of Sihanoukville with improved imports of electricity from Vietnam.⁶² International stakeholders also provide support through the Renewable Energy Promotion and Awareness (REPA) Program, an endeavor under the RGC's Rural Electrification Fund.⁶³ Additionally, Cambodia receives support from the Netherlands government for the national biogas program.⁶⁴

8.8 GAPS AND AREAS FOR COLLABORATION

The attitude of the RGC towards renewable energy is positive but with limited investments in implementation.

Gaps	Opportunities fo Collaboration
Renewable Energy is of interest to RGC but it has no funding	Policies and incentives may be developed to support detailed

⁵⁸ *Électricité du Cambodge* website: <http://www.edc.com.kh/about.html>

⁵⁹ Electricity Authority of Cambodia website: <http://www.eac.gov.kh/>

⁶⁰ Electricity Law of Cambodia: <http://www.eac.gov.kh/pdf/regulations/laws/electricity%20law-en.pdf>

⁶¹ ADB: CPTL Power Transmission Project. Available online at <http://www2.adb.org/projects/project.asp?id=40914>.

⁶² ADB: Second Power Transmission and Distribution Project. Available online at <http://pid.adb.org/pid/LoanView.htm?projNo=37041&seqNo=01&typeCd=3>.

⁶³ Renewable Energy Promotion and Awareness Program website: <http://www.repacambodia.net/>

⁶⁴ Cambodian Biogas Program – SNV: <http://www.snvworld.org/en/regions/world/news/cambodian-biogas-programme-celebrates-milestone-15000th-biogas-program>

to undertake implementation. Current renewable energy policy covers electrification but there are no policies targeting other renewable energy sources such as wind, biomass, biofuel or solar energy.	renewable energy programs such as feed-in-tariffs. EC-LEDS can provide support/training for the development of appropriate incentives.
Limited support for the recently approved Strategy and Plan for Development of Rural Electrification. The Strategy clearly identifies the contribution of renewable energy electricity generation such as solar and biomass but only for isolated grids and off-grid areas.	Support implementation arrangements of the Renewable Energy aspects of the Strategy. Develop feed-in tariff structure to support decentralized renewable energy generation including different costing mechanisms; include systems that enable private individuals, companies, insitutions and larger factories to be connected to the grid; enable net-metering.
Renewable energy strategy is only focused on electricity.	Support the development and implementation of a Renewable Energy Strategy with specific focus on off-grid options such as cookstoves, and biomass.
No energy efficiency in industry.	Cooperate with the EU in the energy efficiency policy development program. At present, the EU is supporting MIME to develop an energy efficiency policy for Industry. It would be beneficial to provide complementary activities since an implementation plan will be needed after the policy is in place.
There is limited cooperation between MIME and MoE regarding potential for renewable energy projects.	Initiate cooperation between MIME and MoE to develop and implement renewable energy policy. It could be an integrated part of the GGR and tuned with the SNC mitigation activities.
MIME has developed a renewable energy strategy as part of the RETP however support for implementation has not yet been identified.	Focus on the rural and remote 30 percent of households that are not part of the approved government strategy.
Universities have limited capacity in renewable energy. The Institute of Technology of Cambodia has developed some renewable energy subjects but technical capacity is limited.	Support ITC or University of Cambodia to further develop curricula for renewable energy.

9. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: TRANSPORTATION

9.1 DEVELOPMENT GOALS AND PRIORITIES

The expansion and improvement of the transportation sector is an integral component of Cambodia's development priorities. Cambodia needs an efficient rural road network since approximately 80 percent of the population lives in rural areas. An enhanced rural network is also needed to improve services for the agricultural sector (a significant economic driver). For urban transportation, Phnom Penh has experienced an annual growth rate of approximately eight percent and lacks adequate infrastructure. RGC has collaborated with multiple international donors to develop and implement projects needed for transportation and will continue to seek international support for these efforts.

9.2 KEY GHG EMISSIONS DRIVERS AND TRENDS

In 2000, the transportation end-use sector accounted for 780 Gg of CO₂e or approximately 22 percent of CO₂ emissions from fossil fuel combustion.⁶⁵ For the transportation sector, the largest driver of greenhouse gas emissions is the significant increase in the number of road vehicles. In 2007, there were approximately 1 million total road vehicles (including 273,243 cars, 4,067 buses and 37,098 trucks). The estimated annual growth rate for all vehicle types is 5.1 percent.⁶⁶ Cambodia has a large used-car market and emissions laws are not finalized or implemented.

Table 16: Emissions in Gg CO₂ equivalents for the Transport Sector

Year	2,000	2,005	2,010	2,015	2,020	2,025	2,030	2,035	2,040	2,045	2,050
Road (GgCO ₂ eq.)	700	1,238	1,986	2,448	3,020	3,726	4,601	5,683	7,025	8,688	10,750
Train (GgCO ₂ eq.)	9	11	14	17	20	25	30	36	44	54	66
Total (GgCO ₂ eq.)	709	1,249	2,000	2,465	3,040	3,751	4,631	5,720	7,069	8,742	10,816

Source: MOE 2011, Draft Energy and Transport Mitigation Analyses

⁶⁵ Presentation: Current Status of GHG Inventory and SNC. Available online at http://lcs-net.org/meetings/2011/01/pdf/P1_3_Uy.pdf

⁶⁶ ADB: Cambodia Transport Sector Assessment, Strategy, and Road Map. Available online at <http://www.adb.org/sites/default/files/cam-transport-assessment.pdf>

The category “Road” has the most emissions and Figure 11 shows that trucks will hold the largest share in emissions by 2050 within this category. Although there are more motorbikes than all other vehicles, their emissions are relatively small and result in low emissions from transportation overall.

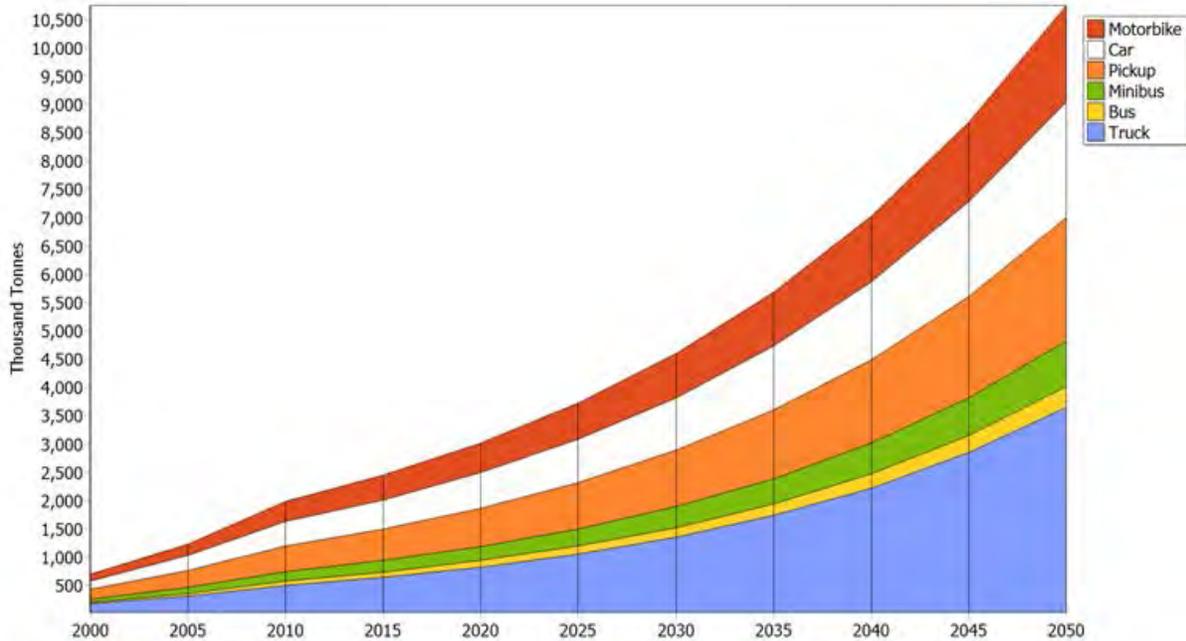


Figure 11: Emissions in GgCO₂ equivalents for vehicles

SECTORAL STRUCTURE AND INSTITUTIONAL CAPACITIES

The Cambodian transportation sector is primarily managed by high-level government ministries. The MPWT is responsible for national and provincial road networks and the railway system. There is no national transportation policy, so MPWT provides general guidance and coordinates policies and objectives for transportation subsectors.⁶⁷ The State Secretariat of Civil Aviation manages air travel issues. The MRD is responsible for managing rural roads. RGC intends to involve sub-national and municipal councils in the process under the National Program for Sub-National Democratic Development 2010-2019 (designed to deploy RGC’s decentralization strategies). Additionally, international donors are significantly involved in transportation sector design and development.

9.3 KEY POLICIES AND IMPLEMENTATION PLANS

The National Strategic Development Plan Update 2009 (NSDP 2009) calls for the establishment of adequate transportation infrastructure in rural areas to improve market access for those communities. Objectives for rural transportation development and reform are woven into the strategic plans for MPWT and MRD. For urban transportation objectives, NSDP 2009 directs MPWT to promote development of urban transportation (including commuter light rail) with the aim of reducing CO₂ emissions. For general transportation infrastructure in Cambodia, both NSDP 2009 and the Rectangular Strategy (Phase II) prioritize the development of an efficient

⁶⁷ Ministry of Public Works and Transport: General Transport Policies. Available online at <http://www.mpwt.gov.kh/transportpolicygeneral.html>

multimodal network to improve domestic transport and provide international connectivity for trade.

9.4 GAPS AND AREAS FOR COLLABORATION

Transport is expected to grow rapidly over the coming decades resulting in increased GHG emissions. Although emissions per person are still low in 2050, congestions and pollution will increase significantly. RGC policies indicate that international collaboration is critical to further expansion and improvement of Cambodia’s transportation sector. USAID can help identify specific areas for RGC action such as increasing use of renewable energy for transportation, deploying energy efficient technologies and using cleaner fossil fuels for existing vehicle fleet, and developing and implementing a comprehensive master plan for both urban and rural road networks. Since RGC has already received considerable support in the development of its transportation sector, it is essential to examine gaps and weaknesses of other involved organizations. A considerable barrier has been the lack of adequate legal and institutional framework for implementing best practices. USAID can work with RGC to improve the framework and enhance oversight needed to deploy low emission strategies and technologies.

Gap	Area for Collaboration
There is no national road planning strategy.	Support development of a national road low emission planning strategy that includes capacity building and detailed analysis for LEDS. Detail and further develop transport mitigation activities with the MPWT. These could include special roads for motorbikes and <i>tuk tuk</i> in the city (as has been implemented in Ho Chi Minh City, Vietnam).
Import duty on electric scooters.	EC-LEDS can provide support/training for the development of appropriate incentives for encouraging the use of low emissions transport.

10. SECTOR-SPECIFIC OBSERVATIONS AND NEEDS ASSESSMENT: INDUSTRY AND WASTE

10.1 DEVELOPMENT GOALS AND PRIORITIES

The protection and sustained growth of a strong industrial sector is a high priority for Cambodia, and is integral to RGC's poverty reduction and economic development goals. RGC's long-term objectives are to increase competitiveness on an international level and become further integrated into regional markets. The industrial sector is a significant driver of the Cambodian economy and accounts for approximately 30 percent of Cambodia's gross domestic product. Garment/textile manufacturing is the predominant component of the industrial sector, followed by construction and mining.

The National Strategic Development Plan Update 2009 (NSDP 2009) identifies specific strategies to improve the industrial sector, including: an efficient transportation network, affordable and reliable electricity, improved access to needed natural resources, adequate capacity building for labor force, and the development of the appropriate legal framework to foster growth.

10.2 KEY GHG EMISSIONS DRIVERS AND TRENDS

In 2000, the industrial sector accounted for 333 Gg of CO₂e or approximately 12 percent of CO₂ emissions from fossil fuel combustion.⁶⁸ The Cambodian industrial sector relies on extremely inefficient technology and industrial processes are also inefficient with high energy consumption per unit of output. Specifically, the rubber refining sector consumes approximately twice the amount of energy when compared to international levels. High energy intensity is also a concern for the garment sector and the rice processing sector. The Cambodian industrial sector lacks the institutional capacity and framework to switch to improved technology, use biofuels, and implement energy efficient practices.⁶⁹ Industry and waste were two of the sectors covered in the RGC's National GHG Inventory (included in the First National Communication to the UNFCCC). There is considerable potential for deploying energy efficient technologies at both large- and small-scale industries. The draft Energy and Transport Mitigation Analyses calculated the total potential savings with the garment industry, brick works, and rubber industry as the most likely sectors to save energy. Also, biomass gasification can reduce significant amounts of diesel for all types of industry, but are especially suitable for rice mills as they have their own supply. They would only require 25 percent of the rice husks for their own energy requirements and use the 75 percent to generate electricity for the grid or other industries that demand electricity. Biomass gasification is an economically interesting option for all industries that use diesel to generate electricity. The cost of generating 1 kWh with diesel is about \$0.45 and with a gasifier it would be around \$0.10 per kWh. Small-scale industries can also benefit from improved technologies such as those that require heat. However, gasifiers can also use wood

⁶⁸ GEF Project Document for Cambodia: Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector. Available online at <http://www.thegef.org/gef/node/4081>

⁶⁹ GEF Project Document for Cambodia: Reducing GHG Emissions through Improved EE in the Industrial Sector.

and a number of rural electricity enterprises and ice plants are using wood – which contributes to deforestation.

Groupe Energies Renouvelables, Environnement et Solidarités (GERES) Cambodia has developed a special post-combustion stove technology. At present, GERES Cambodia is working with rural farmers that produce palm sugar to use this stove. Potentially, other small-scale industries such as rice noodle making and rice wine production could benefit from this very efficient stove.

10.3 SECTORAL STRUCTURE AND INSTITUTIONAL CAPACITIES

The MIME is the main authority for the industrial sector. A central MIME agency is the General Department of Industry (GDI). Nine departments under GDI are responsible for specific aspects of the industrial sector, including:⁷⁰ developing and implementing government policy and regulation; research, development, and deployment of technology; promotion and management of small and medium businesses; and testing/analysis of product quality and safe industrial practices.⁷¹

SNV is one of the NGOs involved in Cambodia's Industry and Waste sectors. SNV is working to expand standardized efficient rice husk gasification technology as a means to convert waste (rice husk) to energy.⁷²

10.4 KEY POLICIES AND IMPLEMENTATION PLANS

NSDP 2009 calls for efforts to facilitate trade and for increased regional collaboration with organizations such as ASEAN and the Greater Mekong Sub-region framework. NSDP 2009 highlights the importance of integrating industrial sector growth strategies within overall national objectives such as developing adequate transportation infrastructure and enhancing the private sector (specifically, establishing Special Economic Zones).

MIME's GDI oversees the Industry and SME Development Strategic Framework for 2010-2015 to provide guidance to the industrial sector to adapt to changes in the global economy and to promote diversification of sectors. GDI is also responsible for implementing strategies identified in the Rectangular Strategy Phase II (such as improving efficiency and increasing competitiveness).⁷³ NSDP 2009 directs the MoE to prepare laws to efficiently manage waste and chemicals.

In Phnom Penh, waste management falls under the jurisdiction of the Phnom Penh Municipality. Currently, solid waste generation in Phnom Penh is estimated at 1,500t/day, of which about 70 percent is organic matter. Residential areas account for approximately 89.5 percent of solid waste while market sources are responsible for 7.1 percent of waste generated. Of the total waste generated, 84.4 percent is actually collected and of this, 93 percent is disposed at the landfill. Only 0.3 percent of the waste is recycled and 0.1 percent is treated through incineration. Since waste contains a high proportion of organic matter, there is potential for developing landfill gas recovery to generate electricity and including composting in GHG mitigation strategies. Current efforts to mitigate waste include an LFG Power Generation Project implemented by Ecocam Corporation and a Dongkor landfill with an area of 8.42 ha (10.2m deep) that was

⁷⁰ Ministry of Industry, Mines and Energy: Organizational Chart. Available online at <http://www.gdi.mime.gov.kh/en/government/about-us.html>

⁷¹ Ministry of Industry, Mines and Energy: Organizational Chart. Available online at <http://www.gdi.mime.gov.kh/en/government/about-us.html>

⁷² SNV: Waste to Energy for the Rice Milling Sector website: <http://www.snvworld.org/node/1795>

⁷³ General Department of Industry: Corporate Strategic Framework for 2010-2015. Available online at <http://www.gdi.mime.gov.kh/en/government/download-documents/policy-and-strategy/182-gdi-corporate-strategy-2015-eng.html>

constructed in 2009 to replace the old landfill “Stoeng Mean Chey” to increase the capacity to absorb increasing waste generation.

Table 17: Projected Waste Generation and Treatment (t/day)

Waste Generation and Treatment	2010	2015	2020
Total	1272.4	1781.4	2241.0
Landfill	1189.7	1621.1	1927.3
Incineration	1.3	17.8	44.8
Recycling	3.8	89.1	268.9
Others (improper disposal)	77.6	53.4	0.0

10.5 GAPS AND AREAS FOR COLLABORATION

There is considerable scope for collaborating with RGC on deploying low emission strategies in the industrial sector. USAID can support efforts to raise awareness about energy efficiency technologies and practices. USAID can work to identify sector-specific improvements for the manufacturing sector (such as deploying more efficient cook stoves for production of rice wine and noodle-making). USAID can assist with the development of the appropriate legal and institutional framework needed to invest in energy efficient technologies. There is also a need for assistance with increasing technical capacity to ensure sustainability of efforts (such as appropriate training to use newer technology and best practices for energy efficient production).

Gap	Option for collaboration
Electricity supply does not meet demand and as a result industry uses diesel generators for electricity generation	Develop an industrial LEDS energy supply and demand program that include options for gasification, solar, feed-in-tariff, reasonable prices for small-scale electricity producers. Provide loans for connections cost and develop a high quality grid with centralized backup for black outs.
There is at present no support, guidance or any regulation for gasification.	MIME could be supported to set up a low emission/energy efficiency department to support and regulate industrial energy generation.

II. CONCLUSIONS

Low emission development strategies are not well known and understood concepts in RGC planning or strategy development. However climate change-related issues and sustainable development, including social, economic, and environmental issues, are part of most coordinating strategies, including the Rectangular Strategy, the Cambodian MDGs, and National Strategic Development Plan. These documents, though, are very general and limited regarding specific action to meet climate change goals. The Green Growth Roadmap provides a bit more specificity regarding linkages between climate change and development issues but is also rather vague – and a bit naïve – in terms of how the stated aspirations will be achieved. It provides a list of 40 different projects, with no indication of how they would be financed, and no analysis of their feasibility as projects or how well the projects would address priority needs related to green growth. The GGR does provide an excellent point of departure for conversations between the USG and RGC on ways that EC-LEDS support may be used to strengthen implementation, including how to achieve targets on emissions or growth targets per sector.

The RGC has formed most of the necessary government bodies or other institutional frameworks to carry out reporting and other requirements under the UNFCCC, including the formulation of policies and strategies to address climate change. The draft Second National Communication has been circulating for more than two years as a draft, perhaps due to the inconsistencies in the GHG inventory (based on 2000 data). The 2010 draft of the SNC does include a detailed listing of climate change mitigation activities, even if these are not always technically or financially viable (e.g. biofuels from cassava).

A Climate Change Trust Fund has been established with the support of four major donors (UNDP, DANIDA, SIDA, and EU). The Fund was initially set up only for climate change adaptation and resilience activities; if additional funding becomes available, it may also be used to finance NAMAs or other mitigation activities. However, as Cambodia has very low emissions per capita, the RGC and its Trust Fund focus primarily on adaptation to climate change impacts.

Implementation of any climate change related programs in Cambodia is often dependent upon the amount of funding available by donor organizations. Although draft mitigation analyses have been undertaken, only limited achievements have been realized. There are successful projects such as improved cook stoves, biodigesters, and solar home systems but they have been pilots that would need to be scaled up to reach a larger population. There are some programs that support increased efficiency in industry but these also remain at the pilot stage. Only biomass gasification has been scaled and several local gasifier producers have been established with over 200 gasifiers operational, used mainly by rice mills, rural electricity enterprises, and ice factories.

Renewable energy investments have been limited and fragmented. Coordinated efforts from the government and donors with funding for data collection, research, feasibility studies, pilot projects, and finance to undertake scaling of successful pilots should be a high priority to start reducing GHG emissions and at the same time allow thriving green growth.

REDD+ readiness preparation has led to the creation of several agencies, committees, and working groups, as well as a few pilot REDD+ projects have been launched. However, these pilots have been sighted in areas with lower deforestation pressures, thereby reducing the additionality potential to generate REDD+ credits (e.g., Oddar Meanchey province, or Seima Biodiversity Conservation Area in Monduliri province, both have annual deforestation rates of

0.1 percent) compared to other provinces with much higher annual losses both in area (e.g., Battambang >15,700 ha/yr or 2.8 percent of forest cover) or as a proportion of forest cover (e.g., Pailin at 4.4 percent).

Even though Cambodia participates in both the UN-REDD and World Bank FCPF programs for REDD+ readiness, nearly all documents reviewed for this desk study highlighted the very low levels of understanding among government officials at national and subnational levels on fundamental concepts related to land-based emissions. USAID/Cambodia has an ongoing procurement for its four-year, \$20 million Supporting Forests and Biodiversity program that is meant to partially address this gap and EC-LEDS may facilitate workshops and seminars on fundamental concepts including integration of LEDES into existing national plans and strategies.

Meanwhile, economic land concessions and the need for additional agricultural lands are resulting in continued deforestation at a relatively high rate. Currently, 97 percent of GHG emissions are from land use change and forestry. The RGC has a target of 60 percent forest cover (slightly higher than the current estimate of 55-58 percent), and its GHG inventories report the sector as a net carbon sink due to sequestration.

Agriculture is less than one-fifth of total emissions, but is expected to grow in the coming years. For example, intensification of agriculture with increased input of fertilizers may result in higher nitrous oxide emissions, while more widespread use of irrigation contrasts with RGC goals to reduce methane emissions from rice farming.

To attain the highest potential savings strong government policy is required to promote a green growth agenda. Initially, economic growth might be slightly lower. This path of green growth can also put Cambodia ahead of neighboring countries still largely dependent on fossil fuels. To achieve the potential emission reductions private sector investment, financial support from carbon financing (either Verified Emission Reductions from the voluntary carbon markets or Certified Emission Reductions from CDM projects), donor support and government regulations are required.

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