Study on cooperative MRV as a foundation for a potential regional carbon market within ASEAN

Lao PDR Country Report

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IGES
Regional Collaboration Centre – Bangkok
Promoting Action Against Climate Change

National Environment Agency
Safeguard · Nurture · Cherish

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Abbreviations

ADB	Asian Development Bank
AFOLU	Agriculture, Forestry and Land Use
ASEAN	Association of Southeast Asian Nations
BAU	Business as usual
BUR	Biennial Update Report
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
DCC	Department of Climate Change
GDP	Gross domestic product
GHG	Greenhouse gases
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
JCM	Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
LULUCF	Land Use, Land-Use Change and Forestry
MONRE	Ministry of Natural Resources and Environment
MRV	Monitoring, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Action
NC	National Communication
NDC	Nationally Determined Contribution
QA/QC	Quality assurance / Quality control
REDD	Reduced Emissions from Deforestation and Degradation
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
VCS	Verified Carbon Standard

Executive Summary

The latest officially available data on GHG emissions from Lao PDR is from year 2000, and has been reported in its Second National Communication (NC). In that year, Lao PDR's net greenhouse gas (GHG) emissions totaled 50.8 $MtCO_2e$, with the Land Use, Land Use Change and Forestry (LULUCF) sector accounting for approximately 83 percent of the total. This was followed by the agriculture (15%) and energy sectors (2%).

Lao PDR submitted its Intended Nationally Determined Contribution (INDC) in September 2015. Mitigation targets in the INDC were proposed as an aggregation of different policies, strategies and programmes without the explicit mention of an economy-wide GHG emissions reduction target. However, Lao PDR will commence work on updating its NDC in 2019.

Carbon pricing is currently not an issue under consideration by the national government of Lao PDR. Nevertheless, there is some experience in the country on market-based mechanisms and results-based payments through projects registered under the Clean Development Mechanism (CDM), Gold Standard, and VCS standard.

Inventory preparation in Lao PDR for the First and Second NCs were done in an unstructured and on an ad-hoc basis with assistance from external consultants. Presently, there is no clear Measurement, Reporting and Verification (MRV) framework that outlines the steps to guide national GHG inventory preparation. Data for the 2000 GHG inventory was obtained from national statistics published by the Ministry of Planning and Investment, and the Statistics Office. These datasets, however, are too general and aggregated, and therefore insufficient to calculate GHG emissions according to the various sub-sectors defined by the IPCC. In order to address the identified data gaps, data sources other than official statistics were consulted, such as information made available from different ministries and online resources. These methods are being adopted in the preparation of the inventories for 2010 and 2014, which will be part of the Third NC and First Biennial Annual Report, respectively.

Lao PDR recognizes this capacity gap and is currently pursuing efforts to develop a domestic MRV system which can assist the country to prepare national GHG inventories and tracking progress in the implementation of targets set in the NDC. The United Nations Environment Programme (UNEP) is currently seeking support from the Global Environment Facility (GEF) for a project that will increase the institutional capacity of different stakeholders on activities that are aligned with the establishment of a national MRV system.

Although no MRV frameworks have been defined at the sectoral or policy levels, several MRV blueprints have been identified for the renewable energy, transport, and forestry sectors. These blueprints have been developed as part of Nationally Appropriate Mitigation Action (NAMA) programmes and REDD+ activities, and could serve as jumping-off points for the establishment of an MRV framework in a bottom-up manner. This report discusses these blueprints in greater detail.

At the facility level, no MRV requirements exist or are planned. However, MRV at the project level has been carried out for active CDM projects, albeit for a different purpose. Nonetheless, Lao PDR's National Policy on Energy Efficiency and Conservation from 2016 provides potential entry points for facility-level MRV. This policy proposes indicative targets on energy efficiency and conservation, such as a 10 percent reduction in final energy intensity by 2030 vis-à-vis a business-as-usual scenario. Achieving this target would require a systematic approach to monitoring energy consumption and collected activity data could provide the foundation for the development of a more comprehensive MRV framework for both energy use and GHG emissions.

Lao PDR is currently in the initial stages of MRV development and faces several challenges, including limited awareness across national ministries and the lack of technical stakeholder capacity. A key obstacle that would need to be overcome is the lack of an institutional framework that can enable data to be collected in a consistent, reliable and frequent manner. To this end, current experiences and learnings from the CDM, NAMAs and REDD+ could be harnessed and have the potential to inform the development of a national MRV framework.

1. National Climate Change Context

The Lao People's Democratic Republic (Lao PDR) is the only landlocked country of ASEAN, bordering Cambodia, China, Myanmar, Thailand, and Vietnam. It has a total surface area of 236,800 km2, with a mix of mountainous and low-lying regions. Of this land area, approximately 17 million hectares are protected or conserved forests, 1.8 million hectares are production forests, and the remaining area is used for agriculture and other land use[1].

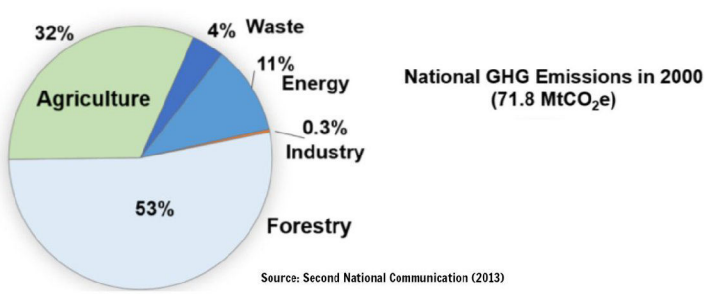
Lao PDR has a population of approximately 6.6 million inhabitants[2]. Over the 10-year period from 2007 to 2016 its population grew at approximately 2 percent annually, with the exception of 2015 when it shrank by 4.7 percent. The country is the least densely populated country among the ten ASEAN Member States, with 28 inhabitants per km2. In 2016, Lao PDR's Gross Domestic Product (GDP) at current prices totalled 129,279 billion Lao Kip (approximately 15.6 billion USD)[3]. The services sector accounts for the largest share of the economy (44.9%), followed by industry (37.5%) and agriculture (17.6%). Nevertheless, the majority of the work-force in the country is employed in the agriculture sector. In the 2010-2016 period, Lao PDR's GDP grew at an annual average rate of 7.6 percent, which compares with 5.1 percent in the whole of ASEAN. In fact, Lao PDR has recorded the highest GDP growth rate among ASEAN countries during the period under consideration. On a per capita basis, Lao PDR's GDP was 2,402 USD/capita at current prices in 2016, the seventh highest among ASEAN Member States.

The latest officially published greenhouse gas (GHG) emissions figures for Lao PDR are from the year 2000. These are recorded in the national GHG inventory chapter of its Second National Communication (NC), which was submitted to the UNFCCC in 2013. In this year, Lao PDR recorded net emissions of **50.8 MtCO2e**. This represents a significant change in the national emissions profile vis-à-vis previously reported figures, calculated for 1990 and presented in the First NC. In this year, Lao PDR was a net sink, reporting net removals of 104.56 MtCO2e[4]. The shift observed along this 10-year timeframe can be largely ascribed to the rapid socio-economic development of the country. In addition, the high uncertainty of the 1990 emission estimates due to the lack of country-specific emission factors and the li-mitations of the availability/reliability of statistical data must be noted.

Table 1, on the following page, presents the breakdown of GHG emissions for 2000 and Fig. 1, below, displays the contribution per sector for that year. It may be observed that the largest share of GHG emissions in Lao PDR is due to the Land Use, Land Use Change and Forestry (LULUCF) sector, which contributed to 83 percent of total emissions. This is followed by agriculture (15%) and energy (2%), while emissions from the IPPU and waste sectors were negligible. The relatively low contribution of the energy sector to national GHG emissions may be noted, as demand for electricity is mostly met by hydropower generation. It should also be noted, that Lao PDR exports an estimated two-thirds of its hydropower[5] to neighboring countries, in particular to Thailand and China. This is why Lao PDR is often referred to as the "battery of South-East Asia".

The national GHG inventory is expected to be updated with emissions data from 2010 when the Third NC is submitted in 2019. Based on initial analysis of the inventory data for 2010, there are no major changes in the sectorial breakdown vis-à-vis the year 2000, although the contribution of the energy sector is expected to increase marginally[6]. Additionally, Lao PDR will initiate work on the preparation of its first Biennial Update Report (BUR) in 2019, and inventory data will be updated for 2014.

Figure 1 - Share of emissions in Lao PDR, 2000



1 Second National Communication Lao People's Democratic Republic, 2013.
2 Figures as of mid- 2016. Source: ASEAN Statistical Yearbook 2016/2017.
3 Ibid. Exchange rate used as of 30 June 2016.
4 First National Communication Lao People's Democratic Republic, 2000.
5 International Hydropower Association, 2018.
6 Information based on stakeholder consultations conducted in Lao PDR on 15 and 16 October 2018 (please see Section 4). Increase in energy sector emissions is due to the commissioning of a 1,868 MW coal-fired power plant in year 2016. Approx. 80% of the power generated by this facility is exported to Thailand.

Table 1: GHG emissions by source in Lao PDR, 2000, expressed in MtC02e

Greenhouse Gas Source and Sink Categories	C02 emissions	C02 removals	CH4 emissions	N20 emissions	Total (MtC02e)
Energy	**1.004**	**-**	**0.015**	**0.021**	**1.040**
Fuel combustion	1.004	-	0.013	0.021	1.038
Fugitive emissions	-	-	0.002	-	0.002
Industrial Processes & Product Use	**0.048**	**-**	**-**	**-**	**0.048**
Mineral production	0.047	-	-	-	0.047
Metals	0.001	-	-	-	0.001
Agriculture	**-**	**-**	**5.280**	**2.327**	**7.607**
Enteric fermentation	-	-	2.109	-	2.109
Manure management	-	-	0.273	-	0.273
Rice cultivation	-	-	2.890	-	2.890
Agricultural soil	-	-	-	2.324	2.324
Burning of savannah	-	-	0.001	-	0.001
Burning of agricultural residues	-	-	0.007	0.003	0.010
LULUCF	**42.759**	**-2.047**	**1.097**	**0.108**	**41.917**
Change in forestry & wetlands	7.674	-	-	-	7.674
Forest & grassland conversion	35.085	-	1.097	0.108	36.290
Abandoned land	-	-2.047	-	-	-2.047
Waste	**-**	**-**	**0.051**	**0.081**	**0.132**
Solid waste disposal	-	-	0.023	-	0.023
Wastewater handling	-	-	0.028	0.081	0.109
Total (excluding LULUCF)	**1.052**	**-**	**5.346**	**2.321**	**8.827**
Total (Net) (including LULUCF)	**43.811**	**-2.047**	**6.442**	**2.537**	**50.743**

Source: Second National Communication (2013)

Lao PDR ratified the Paris Agreement on September 7, 2016, while its Intended Nationally Determined Contribution (INDC)[7] was submitted to the UNFCCC on September 30, 2015. The GHG emission reduction targets proposed in the INDC were based on policies, strategies and programmes that had been previously approved by the national government. In this context, the INDC does not put forth an economy-wide GHG emission reductions target, but it is rather an aggregation of different policies, strategies and programmes, as outlined in Table 2, on the following page.

7 Intended Nationally Determined Contribution, Lao People's Democratic Republic, 2015.

Table 2: Climate change mitigation strategies and programmes of Lao PDR, as per the Intended Nationally Determined Contribution

Name of Strategy/ Programme	Objectives	Estimated GHG emission reductions
Forest Strategy to the Year 2020	>> To increase forest cover to 70% of land area by 2020.	>> 60,000 to 69,000 ktCO2e (once the target is achieved)
Renewable Energy Development Strategy	>> To increase the share of renewable energy to 30% of energy consumption by 2025. This applies to projects lower than 15 MW of installed capacity. >> For the transport sector, to increase the share of biofuels to meet 10% of the demand for transport fuels by 2025.	>> 1,468,000 ktCO2e (by 2025)
Rural Electrification Programme	>> To make electricity available to 90% of households in rural areas by 2020.	>> 63 ktCO2e/year (once target is achieved in 2020)
Transport focused NAMA	>> To develop a road network which will reduce the distance travelled by vehicles. >> To increase the use of public transport compared to business-as-usual (BAU) scenario.	>> 33 ktCO2e/year for the road network objective >> 158 ktCO2e/year for the public transport development
Expansion of the use of large scale hydroelectricity	>> To build large hydropower plants (>15MW) hydropower plants to provide clean electricity to neighbouring countries. >> The estimated total installed capacity will be 5,500 MW by 2020, with 20,000MW of additional hydroelectric capacity planned for construction after 2020.	>> 16,284 ktCO2e/year for the 2020-2030 period
Climate change action plans	>> To establish national capacities to monitor and evaluate policy implementation.	>> Not determined

It has been reported that some of the emissions reduction goals identified in the NDC have already been achieved (e.g. the goals of the rural electrification programme)[8]. However, there is no mechanism in place to track progress on the implementation of the NDC, either on mitigation, adaptation or finance. Policy-wise, the only major update on climate change issues since the NDC was submitted is the drafting of a decree on climate change, which is currently under preparation and will contain provisions on mitigation, adaptation and disaster risk reduction. Lao PDR's Ministry of Natural Resources and Environment (MONRE), will start working on an update to the NDC in 2019[9].

2. Analysis of National MRV Systems

2.1 Carbon pricing status and outlook

Lao PDR ranks as a Least Developed Country (LDC) and is one of the lowest CO2 emitting countries in the world on a per capita basis[10]. In light of this, carbon pricing is currently not an issue under consideration by the national government, and is in fact a very novel topic to the different ministries[11].

There is, however, some experience in the country on market based mechanisms and results-based payments associated with the reduction of GHG emissions for third Parties. For example, as of October 2018, Lao PDR had 23 CDM projects registered by the CDM Executive Board. Most of these projects consist of hydropower plants, and out of these seven had been issued CERs (see table 4, section 2.4, for further details). Activities have also been carried out under the Gold Standard and the VCS standard, the latter with project activities in the forestry and agriculture sectors[12]. Furthermore, four projects were under development under the JCM: one of them has already been registered (an energy efficient data center), and three were in the development pipeline (on REDD+, solar power and the upgrade of electricity transformers).

8 Based on information provided by MONRE on meetings in Lao PDR on October 15, 2018.
9 Based on stakeholder consultations held in Lao PDR on October 15 and 16, 2018.
10 World Bank 2018, CO2 emissions (metric tons per capita).
11 Assessment based on the consultations held in Lao PDR on October 15 and 16, 2018.
12 As of October 2018, two projects had been registered under the VCS: i) a rubber based agro-forestry system for sustainable development and poverty reduction in the Bolikhamsay Province, and ii) a REDD project in the Xe Pian National Protected Area. These projects are available here and here.

2.2 National GHG inventory and MRV processes

Lao PDR has formally submitted GHG inventories for the years 1990 and 2000 in the First and Second National Communications (NCs), respectively, to the UNFCCC. The preparation of these inventories was made in an unstructured and ad-hoc basis and for the specific purposes of reporting emissions as part of NC submissions. Therefore, there is not an MRV framework specifically associated with inventory preparation.

The Department of Climate Change (DCC) in the Ministry of Natural Resources and Environment (MONRE) has the mandate to coordinate the development of NCs for Lao PDR. In this context, a Technical Working Group on Climate Change (TWGCC) was established in 2013 to provide technical advice to DCC on climate change issues, which include the preparation and submission of NCs. This working group is composed of representatives from eight ministries.

The GHG inventory for 1990, submitted as part of the First NC, was compiled with the technical support of the Tata Energy Research Institute of India, and heavily relied on external consultants. For the Second NC, the inventory for 2000 preparation mostly relied on national experts. However, few institutional arrangements are currently in place for the preparation of national GHG inventories. For the 2010 inventory, which is expected to be submitted to the UNFCCC in 2019 as part of the Third NC, preparation is coordinated by the DCC with the support of a national consultant.

Emissions for the 2000 GHG inventory were calculated by multiplying activity data with emission factor defaults (tier 1) based on the 1996 revised IPPC Guidelines[13]. The same procedures have been adopted for the preparation of the 2010 GHG inventory. Tier 2 and tier 3 emission factors have not yet been developed for Lao PDR.

Regarding activity data, the main source of information are national statistics published by the Ministry of Planning and Investment (MPI) and the Statistics Office. These data sets, however, are too general and aggregated, and additional data is required for most IPCC sub-sectors to calculate GHG emissions. Due to this, DCC and the national consultant carry out consultations with different ministries, which are the main "data owners" for different economic sectors, in order to explain the processes associated with the inventory preparation and obtain more specific data. For example, in the preparation of the national GHG inventory for 2000, a reference approach was used for the estimation of energy sector emissions, which was based on Lao PDR's energy balance. In addition, the national consultant also collects data from other sources so as to address identified data gaps, such as directly contacting industrial facilities or searching for information available through online sources where certain activity data can be found[14].

Nonetheless, some sector/sub-sectoral activity data is highly uncertain. For example, statistical data on solid waste generated in Lao PDR is not usually collected, except for in some major urban centers such as the capital city, Vientiane. In view of this, activity data for this sub-sector has been determined by proxy based on a national average solid waste generation rate per capita (for the latest year such data is available) and a population growth rate. This can result in a considerable under/over estimation of GHG emissions from this sub-sector.

No formal QA/QC procedures exist in the preparation of the national GHG inventory. However, an informal process is followed internally within DCC whereby data and calculations are cross-checked by different individuals of the team.

Lao PDR recognizes the importance of developing a domestic MRV system, not only for the purposes of preparing national GHG inventories, but also for tracking progress in the implementation of targets of the NDC. In this connection, a number of capacity building initiatives have been proposed or are in the process

13 Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

14 For instance, data on the annual lignite consumption and characteristics of the feedstock of the only operational coal-fired power plant in Lao PDR is available from the facility's website, and can therefore be used for estimating emissions.

of being implemented. Among these, a project proposal was developed by the United Nations Environment Program-me to seek funding from the Global Environment Facility (GEF). The overarching goal of this project is to strengthen institutional capacities in Lao PDR to support compliance with the Enhanced Transparency Framework under Article 13 of the Paris Agreement[15]. This project includes the conduct of several activities aligned with the establishment of a national MRV system, in particular:

- A detailed assessment of the institutional arrangements and capacities for the collection, analysis and reporting of data related to GHG emissions;
- The establishment of a national GHG database management system to enable the collection of activity data from line ministries in a harmonized manner;
- The development and update of country-specific emission factors for the Energy and AFOLU sectors;
- The preparation of sector-specific spreadsheets, toolkits and guidelines to facilitate data collection and reporting;
- The development of a specific academic curriculum at the National University of Laos on GHG inventories and MRV.

This project concept was approved by the GEF in June 2018, while approval for implementation was still pending as of November 2018. It should be noted as well that some activities similar to those proposed under this project are already being carried out by the Global Green Growth Institute (GGGI) in the scope of a separate initiative. The GGGI led activities are funded by the Green Technology Center of the Republic of Korea, and were initiated in June 2018 with conclusion planned for the end of 2019. As part of this project, GGGI will be mapping the institutional arrangements for MRV of the national GHG inventory and undertake a gap analysis. In addition, spreadsheets and other support tools will be developed by an international consultant to facilitate data collection and the estimation of national GHG emissions.

2.3 Sectoral and policy-level MRV

Lao PDR does not currently have any sectoral or policy level MRV frameworks in place. However, the basis for the establishment of such frameworks exists or has been proposed as part of a number of sectoral initiatives and programmes that have been developed for Lao PDR. MRV blueprints have been identified for the following sectors: i) renewable energy, ii) transport, and iii) REDD+. These are briefly described in this section.

a) Renewable Energy Sector

In 2015, a Nationally Appropriate Mitigation Action (NAMA) programme was developed with the support of UNDP for Lao PDR's renewable energy sector[16]. The aim of this NAMA is to support the targets set by the na-tional government of providing access to electricity to more than 90% of households in Lao PDR by 2020. Through the implementation of the NAMA, GHG emission reductions are achieved in rural communities by replacing fossil fuels (e.g. diesel used to run generators) with renewable sources of energy. The NAMA focu-ses on a specific type of intervention: the establishment of mini-grids. In the first part of the programme, 8 mini-grids were planned for implementation, which would provide electricity access to around 6,000 people and result in GHG emission reductions of 13,000-14,000 tCO2e.

The NAMA proposes two baselines: a GHG emission baseline and a sustainable development baseline, the latter of which to take into account the "co-benefits" associated with the access to cleaner forms of energy by rural communities. An MRV framework to assess progress in the achievement of emission reductions and sustainable development benefits is proposed as part of the NAMA. Table 3 on the following page summarizes the MRV procedures for the GHG emissions reduction component of this NAMA.

15 Global Environment Facility, 2018.
16 NAMA For the Renewable Energy Sector of Lao PDR, UNDP, 2015.

Table 3: MRV framework of NAMA for the Renewable Energy Sector of Lao PDR

MRV for Renewable Energy NAMA	
Measurement / Monitoring	>> Calculation of emission reductions based on a simplified version of the UNFCCC approved methodology AMS-III.BL: "Integrated methodology for electrification of communities"; >> Two types of consumers distinguished: • Type 1: consumers not connected to the national grid with an annual electricity consumption below 500 kWh/year; • Type 2: consumers not connected to the national grid with an annual electricity consumption above 500 kWh/year; >> Emission factors are differentiated for the two types of consumers ;[17] >> Electricity generated in the mini-grids monitored through a calibrated meter; >> Type 2 consumers with a consumption over 1,000 kWh/year need to have an electricity meter; >> The share of electricity consumed for each household needs to be at least 75% of the total; >> Readings of electricity meter(s) to be recorded on a data sheet at least on a bi-weekly basis; >> Recording in a centralized register of the consumers and electricity consumed by the consumer included under the programme.
Reporting	>> Reporting is the responsibility of NAMA Executing Entities. These are private companies which voluntarily participate in the NAMA and operate the mini-grids; >> These Executing Agencies shall produce reports to the NAMA Coordinating Authority (whose role is fulfilled by the Ministry of Energy and Mines) on the GHG emission reductions resulting from implementing the NAMA; >> These reports are expected to include, inter alia, a description of the GHG emission reduction calculation method, the measurement method of the parameters monitored, characteristics of the measurement instrument, measurement records and identification of the uncertainty associated with the GHG emission estimation.
Verification	>> Verification process proposed to be conducted by third party accredited auditors, along the lines of the CDM, every one or two years; >> Tasks to be performed by the third party auditor include desk review of documents, site visits/interviews of key stakeholders and drafting of verification report.

As of November 2018, this NAMA was still seeking funding for implementation. However, it was reported that one of the eight mini-grids foreseen under the programme was under implementation with the financial support of the European Union[18].

b) Transport Sector

The transport sector is under the purview of the Ministry of Public Works and Transport, and a number of initiatives that have been developed for this sector hold the potential of directly or indirectly resulting in the reduction of GHG emissions. While MRV is a novel concept to this ministry, some of these initiatives could serve as foundational elements for the establishment of a sector focused MRV framework for transport.

Among these, Lao PDR's NDC refers to a transport NAMA proposal which was developed with the double-fold objective of improving the national road network and to increase the use of public transport in relation to a BAU scenario (see Table 2). This NAMA was developed in 2010 as part of a feasibility study funded by JICA[19], and it lays out possible options for an MRV system in the transport sector:

- **Measuring & monitoring**: based on the ASIF (activity, structure, intensity, fuel) method, whereby emissions from the transport sector are calculated in a bottom-up manner as a product of transport activity (e.g. in person-km travelled), modal share, fuel intensity (e.g. litre of fuel per person-km travelled), and carbon content of fuel or an emission factor. As part of the NAMA, several parameters would need to be monitored, with data collected from different sources such as national statistics, traffic surveys or number of registered vehicles.
- **Reporting:** in the form of a monitoring report.
- **Verification**: CDM procedures suggested for adoption, such as the conduct of validation and verification steps by a third party auditor both *ex-ante* and *ex-post*.

17 The NAMA project document does not provide details on how the EF for the two consumer types was determined.
18 Source: meeting on October 16, 2018 with Mr. Seumkham Thoummavongsa, Deputy Director General of the Institute of Renewable Energy Promotion, Ministry of Energy and Mines, Lao PDR.
19 Feasibility Study on NAMAs in the Transport Sector of Lao PDR, 2010.

As of November 2018, no plans existed to further develop this NAMA proposal[20]. Other initiatives that could be considered as a springboard for the development of a transport-sector MRV framework include a Green Freight Project carried out in the context of the Greater Mekong Subregion initiative of the Asian Development Bank (ADB)[21] and a GEF-proposal on Sustainable Urban Transport for Vientiane[22], also led by the ADB. While details on the MRV blueprint of the first project are not publicly available, an MRV system has not been considered as part of the second, although the monitoring framework proposed could potentially be extended to incorporate a GHG emission reduction component.

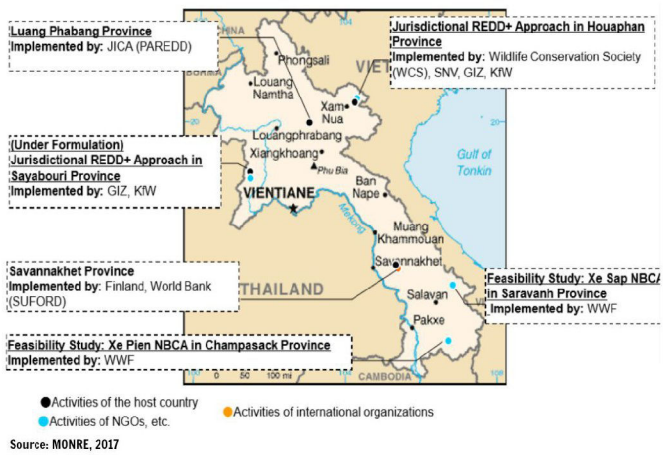
In addition to the above, fuels in the transport sector are subject to excise taxes. These taxes are, on the one hand, a revenue generation mechanism for the government, on the other a means of pricing the negative externalities associated with traffic congestion and the import of fuels. Excise taxes apply to all liquid fuels (petrol, diesel, jet fuel, lubricant, hydraulic oil, grease and brake oil)[23] except for compressed natural gas, which is exempted from such levies in years 2018 and 2019. As of October 2018, the structure of these levies was under revision, as taxes levied on diesel consumption were lower than petrol, whereas the government's plan was to reverse their focus (i.e. higher taxes for diesel, lower taxes for petrol). Data on liquid fuel consumption is monitored by the Min-istry of Industry and Commerce, while fuel taxation is under the purview of the Ministry of Finance.

b) REDD+

The forestry sector is, by and large, the largest contributor to GHG emissions in Lao PDR, accounting for an estimated 83% of the national total, as shown in Fig.1. Therefore, this is a priority sector for the achievement of GHG emission reductions. This has led to the development of several initiatives on REDD+ with support from both bilateral and multilateral programmes. A snapshot of these initiatives is provided in Fig. 2.

The main reference for the establishment of an MRV framework for REDD+ in Lao PDR is "Lao PDR's Forest Reference Emission Level and Forest Reference Level for REDD+ Results Payment under the UNFCCC"[24]. This document was developed in alignment with international REDD+ requirements and submitted to the UNFCCC in January 2018. It has however since been revised in order to incorporate a set of recommended changes to the GHG accounting methodology. Nonetheless, the national MRV system for REDD+ is expected to be consistent with the framework laid out in this document[25].

Figure 2 - REDD+ Demonstration projects in Lao PDR [26]



In a nutshell, the calculation of the Forest Reference Emission Level and Forest Reference Level (FREL/FRL) was based on average annual historical emissions and removals over 2005-2015 in Lao PDR. For this purpose, activity data and emission/removal factors were determined. Activity data was based on forest type maps, which have been prepared every 5-years, the first in 2005. Emission and removal factors were determined based on a combination of national datasets, IPCC default factors and some supplementary data from Vietnam's REDD+ programme.

In addition, Lao PDR is in the process of developing its National Forest Monitoring System, which will include a database and a web-based portal. This system is expected to be linked with a national REDD+ registry to be developed in the future, and which will contribute to the integrity, transparency, and consistency of emissions/removals reported, including the avoidance of double-counting risks[27]. This will also be the stepping stone for the harmonization of REDD+ data reported in the national GHG inventory, tracking progress in the implementation

20 This was confirmed in a meeting held with the Ministry of Public Works and Transport on October 16, 2018.
21 Green Freight in the Greater Mekong Subregion, ADB, 2015.
22 Vientiane Sustainable Urban Transport Project, GEF, 2016.
23 Laos Tax Booklet 2016, VDB Loi Co. Ltd.
24 Lao PDR FREL Submission, 2018
25 Information conveyed during meetings with the REDD+ Office, Department of Forestry, Ministry of Agriculture and Forestry, on October 15, 2018.
26 Presentation delivered by Mr. Bounthee Saythongvanh, Deputy Director of Division, Department of Climate Change, MONRE, on a workshop jointly organized by UNFCCC and Singapore's National Environment Authority, on 16-17 October 2018 in Singapore, in the context of CI-ACA Phase I.
27 These risks exist in the scope of REDD+ initiatives in Lao PDR, as showcased by the registration of two REDD+ projects under the VCS standard.

of the NDC, and the establishment of a domestic carbon market (for REDD+ and/or other emission reduction unites), in case the government decides so in the future[28].

2.4 MRV at facility level

No requirements exist or are planned for the MRV of GHG emissions at the facility level, in Lao PDR. Nonetheless, MRV at the project level has been carried out for active CDM projects, even though their purpose is to claim emission reductions rather than reporting GHG emissions as part of regulation or out of voluntary initiative. Table 4 below identifies these projects, indicating the registration date, CDM methodology applied, and volume of CERs issued.

Table 4: CDM projects in Lao PDR with CER issuance

Project Name	Registration Date	CDM Methodology	CERs Issued
Energy Efficiency Improvement Project At A Beer Brewery In Lao PDR	7 April 2007	**AMS-II.D.** – Energy efficiency and fuel switching measures for industrial facilities; **AMS-I.C.** - Thermal energy for the user	**2,168 CERs** (for the 07/04/2007 to 31/03/2008 period)
Xekaman 3 Hydropower Project, Lao PDR	21 December 2011	**ACM0002** – Consolidated baseline methodology for grid-connected electricity generation from renewable sources	**828,779 CERs** (for the 30/04/2013 to 31/05/2016 period)
Nam Lik 1-2 Hydropower Project	4 May 2012	**ACM0002** – Consolidated baseline methodology for grid-connected electricity generation from renewable sources	**138,899 CERs** (for the 04/05/2012 to 30/09/2012 period) and **51,947 CERs** (for the 01/10/2012 to 28/02/2014 period)
TBEC LIG Biogas Project	16 November 2012	**ACM0014** – Mitigation of greenhouse gas emissions from treatment of industrial wastewater	**40,246 CERs** (for the 16/11/2012 to 12/12/2014 period)
Xenamnoy 1 Hydropower Project	21 February 2014	**AMS I.D**. – Grid connected renewable electricity generation	**43,740 CERs** (for the 01/03/2014 to 28/02/2015 period) and **92,319 CERs** (for the 01/03/2015 to 28/02/2017 period)
Nam Long Hydropower Project	30 September 2014	**AMS I.D**. – Grid connected renewable electricity generation	**74,146 CERs** (for the 01/10/2014 to 31/10/2017 period)
Xenamnoy - 6 Hydropower Project	23 July 2015	**AMS I.D**. – Grid connected renewable electricity generation	**24,088 CERs** (for the 28/07/2015 to 28/02/2017 period)

A possible avenue for the introduction of MRV at the facility level is laid out by Lao PDR's National Policy on Energy Efficiency and Conservation of 2016[29]. This policy document was developed with the assistance of the ADB, and it is considered by the Ministry of Energy and Mines as a guiding framework for further measures. Follow-up plans to this policy include, for instance, the issuance of a Prime Minister's Decree on energy efficiency and conservation and the development of minimum energy performance standards.

The policy also proposes indicative targets on energy efficiency and conservation, such as a reduction in 10% of final energy intensity by 2030 compared with a business-as-usual (BAU) scenario. Such targets are, however, non-binding and only "indicative", as for instance a BAU trajectory has not been developed and there is not a framework in place to track progress in implementation. On the other hand, the policy sets forth possible entry points for the development of MRV procedures at the facility level – which could be made fit to track both the consumption of energy and GHG emissions – as well as the introduction of carbon pricing instruments and the potential for emissions trading.

28 Forest Carbon Partnership Facility (FCPF), 2018, "Readiness Package Self-Assessment Report: Readiness for Reducing Emissions from Deforestation and Degradation (REDD+)"

29 This policy document was not found online in English language. However, a printout version of the policy was handed over to the authors during the fact finding mission of October 15 and 16, 2018.

These entry points include the following:

- The responsibility bestowed to the Ministry of Energy and Mines to monitor and verify the implementation of the policy (Chapter 4, p.12);
- The promotion of energy efficiency and conservation as a means to access "international carbon financing exchanges through the mechanism ratified by the Government of Lao PDR" (Chapter 1 (3b), p. 6);
- The improvement of energy management systems in factories (Chapter 2 (2a), p.7);
- Promotion of energy services to small and medium industries to gradually reduce energy cost subsidies and, in the long-term, aim for "international carbon credit exchanges" (Chapter 2 (2a), p.7);
- Introduction of a reward & punishment system for fostering energy efficiency in industries, as well as "appropriate incentives" to encourage investments in energy efficient equipment, machines and production systems (Chapter 2 (2a), p.7);
- The adoption of fuel standards and the promotion of energy efficiency vehicles through "appropriate incentives" (Chapter 2 (2d), p.8).

3. Concluding Remarks and Future Outlook

Lao PDR does not have a framework in place for the Monitoring, Reporting and Verification of GHG emissions, either at the facility, sectoral or national GHG inventory level. The country is at an initial stage of MRV development, and the set-up of such framework faces a number of challenges, including limited awareness across national ministries, the lack of technical capacities of stakeholders, and the low priority assigned to this subject.

One of the major challenges in the context of Lao PDR is the lack of an institutional framework that can support the collection of data in a consistent, reliable, and periodic manner. This has an impact on the availability of the activity data required for calculating national GHG emissions, as well as in the development of country-specific emissions factors.

On the other hand, some sectoral policies, strategies and programmes could be an opportunity for the establishment of an MRV framework in a bottom-up manner. For instance, the national energy efficiency and conservation policy of 2016 could serve as the basis for the collection of GHG emission data at the facility level and as testing ground for the introduction of monitoring and reporting guidelines or procedures. Additionally, MRV frameworks proposed as part of NAMA programmes developed in Lao PDR, especially the Renewable Energy NAMA, could serve as a blueprint for the development of Tier 2 emission factors. Institutional coordination will, however, be crucial to the success of any such initiatives, particularly to ensure alignment with the processes associated with the preparation of national GHG inventories.

Lao PDR could also capitalize on experiences acquired through participation in market-based mechanisms, such as the CDM, especially in the context of future developments under Articles 6.2 and 6.4 of the Paris Agreement. The potential for harnessing these experiences is also based on the fact that Lao PDR borders three countries that have plans to introduce carbon pricing instruments (China, Thailand and Vietnam), which could help mobilize the potential for carbon units generated from clean power sources in Lao PDR, particularly from hydropower. In this connection, the harmonization of MRV in the electricity sector with other countries of the region could be of particular interest to Lao PDR, whereas an initial area of focus could be the development of MRV guidelines or procedures for large-scale facilities.

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