Initiative for Climate Action Transparency – ICAT Project in Lesotho

Assessing selected methodologies for assessing GHG emission impacts of policies and actions-energy sector focus, and

Harmonize methodologies for assessing greenhouse gas impacts of policies and actions in the energy sector.

ICAT Initiative for Climate Action Transparency

Initiative for Climate Action Transparency – ICAT

Deliverable #3:

Harmonizing methodologies for assessing GHG impacts of policies and actions in the energy sector.

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List of Acronyms

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business-As-Usual
BOS	Bureau of Statistics
BTR	Biennial Transparency Report
BURs	Biennial Update Reports
CC M&E	Climate change Monitoring and Evaluation
CCPIS	Climate Change Policy Implementation Strategy
CDM	Clean Development Mechanism
CO_2	Carbon dioxide
COP	Conference of Parties
DRTS	Department of Road Transport and Safety
EMP	Electrification Master Plan
ETF	Enhanced Transparency Framework
GACMO	Greenhouse Gas Abatement Cost Model
GEF	Global Environment Facility
GHG	Greenhouse Gases
GoL	Government of Lesotho
GST	Global Stock Take
ICAT	Initiative for Climate Action Transparency
INDC	Intended National Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
JICA	Japan International Cooperation Agency
KPA	Key Priority Areas
LDCs	Least Developed Countries
LMS	Lesotho Meteorological Services
M&E	Monitoring and Evaluation
MAC	Marginal Abatement Cost
MEF	Ministry of Environment and Forestry
MRV	Monitoring Reporting and Verification
MW	Megawatt
NAMAs	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NC	National communications
NCCC	National Climate Change Committee
NCCP	National Climate Change Policy
NDCs	Nationally Determined Contributions
NEP	National Energy Policy
NIR	National GHG Inventory Report

NSDP	National Strategic Development Plan
PA	Paris Agreement
QA/QC	Quality Assurance/Quality Control
RISDP	Regional Indicative Strategic Development Plan
RSL	Revenue Services Lesotho
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
t	Tonne
tCO_2e	Tonne of carbon dioxide equivalent
TNA	Technology Needs Assessment
TNC	Third National Communication
UNDP	United Nations Development Programme
UNEP-CCC	United Nations Environment Programme – Copenhagen Climate Centre
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services
VER	Voluntary Emission Reductions

Executive Summary

Harmonizing methodologies for assessing GHG impacts of policies and actions in the energy sector: In the energy sector, it is crucial to have consistent and harmonized methodologies for assessing the greenhouse gas (GHG) impacts of policies and actions. This is important for ensuring that accurate and comparable data are used to inform decision-making and to track progress towards emissions reduction goals.

Harmonizing methodologies involves establishing common standards and guidelines for measuring and reporting GHG emissions. This can help to improve the accuracy and reliability of emissions data, as well as facilitate the comparison of emissions reduction efforts across different regions and sectors.

By harmonizing methodologies, policymakers and stakeholders can ensure that they are using consistent and reliable data to evaluate the effectiveness of energy policies and actions. This can help to identify best practices and areas for improvement, and to support the development of more effective and targeted emissions reduction strategies.

Overall, harmonizing methodologies for assessing GHG impacts in the energy sector is essential for promoting transparency, accountability, and informed decision-making, and for driving progress towards a low-carbon and sustainable energy future.

1. Introduction

1.1. Background

The United Nations Framework Convention on Climate Change (UNFCCC) aims to combat climate change by stabilizing greenhouse gas (GHG) concentrations in the atmosphere at a safe level through various agreements and legal instruments that the Parties may adopt. Reporting requirements to achieve this objective include national communications and biennial update reports (BURs) for developing countries with additional flexibility given to LDCs. Parties are required to provide reliable, transparent and comprehensive information on GHG emissions, climate action and support. The arrangements for national reporting for the UNFCCC and its Kyoto Protocol have evolved into a comprehensive measurement, reporting and verification (MRV) framework. Measures to significantly enhance transparency of action and support under the convention were adopted as part of the Bali Action Plan at COP 13 and elaborated in decisions adopted at subsequent Conferences of the Parties (COPs). The Paris Climate Agreement, adopted at the twenty-first session of the COP to the UNFCCC and entering into force on 4th November 2016 aims to strengthen the global response to climate change by keeping global temperature rise well below 2° Celsius above pre-industrial levels and pursuing efforts to limit the temperature increase even further, to 1.5° Celsius. Additionally, the agreement aims to strengthen countries' ability to address the impacts of climate change (UNFCCC, 2020).

Article 13 of the Paris Agreement established an Enhanced Transparency Framework (ETF) for action and support in order to build mutual trust and confidence among the Parties and to promote the effective implementation of the Paris Agreement. The ETF is designed with built-in flexibility, which takes into account Parties' different capacities and builds upon the collective experience of transparency under the Convention. Its implementation is pursued in a facilitative, non-intrusive, non-punitive manner that is respectful of national sovereignty and is designed to avoid placing an undue burden on the Parties. The purpose of the ETF for transparency of action is to:

- Provide a clear understanding of climate change actions in light of the objective to limit global warming to well below 2°C and to pursue efforts to limit warming to 1.5°C; and
- Provide clarity and track progress towards achieving Parties' NDCs (Article 4) and Parties' adaptation actions (Article 7) to inform the Global Stock Take (GST) (Article 14) (Maso and Canu, 2019)

Lesotho's topography and location influence its temperate climate, characterized by alpine characteristics. This increases the country's vulnerability to climate variability and long-term climate change (LMS, 2013) Lesotho is already experiencing negative impacts

from climate change, including an increased frequency of extreme events such as droughts, increased rates of soil erosion and desertification, and decreased soil fertility(UNDP, 2015). In the projected future climate, the country is likely to become generally hotter and drier. Similarly, Lesotho will also continue to experience extreme events such as droughts, floods and other climate-related disasters, as well as continued fluctuations in rainfall and rising temperatures. This will likely result in adverse environmental impacts such as soil erosion, deforestation, recurrent droughts, desertification, land degradation, and the loss of biodiversity including wildlife. Key sectors such as agriculture and livestock, healthcare, water resources, and tourism are increasingly vulnerable.

This report on the harmonization of methodologies for assessing the greenhouse gas impacts of policies and measures in the energy sector in Lesotho is part of the ICAT Lesotho project on Monitoring, Reporting and Verification (MRV) in the energy sector under the Initiative for Climate Action Transparency (ICAT). The report was prepared under the direct guidance and supervision of the Lesotho Meteorological Services of the Ministry of Environment and Forestry, Ministry of Energy, and UNEP-CCC.

1.2. Objective of the Initiative for Climate Action Transparency (ICAT)

The Initiative for Climate Action Transparency (ICAT) aims to strengthen capacities in developing countries to assess the impacts of their climate policies and actions and to support greater transparency, effectiveness, ambition and trust in climate policies worldwide.

The Initiative works with countries to build capacities on understanding and applying tools and approaches to MRV greenhouse gas (GHG) emissions reductions and adaptation action. It also aims to strengthen existing institutional arrangements and processes for MRV of policies and actions.

The Paris Agreement marks a historic turning point in global climate action, committing all countries to limit global temperature rise, adapt to changes already occurring, and regularly increase efforts over time. Countries also agreed on a process to prepare successive nationally determined contributions (NDCs) that raise ambition towards achieving the objectives of the Agreement. Mutual trust and confidence in the effective implementation of NDCs builds on enhanced transparency to support accelerated climate action. Article 13 of the Paris Agreement highlights the critical need for improved transparency to monitor the progress and assess the impacts of all climate actions in order to regularly increase efforts over time. ICAT seeks to address this need.

ICAT is designed to finance activities at the country, regional and global levels to drive immediate and long-term impacts that will result in sustained improvements to the administrative, legislative and institutional transparency infrastructure within countries. ICAT aims to facilitate effective decision-making and policy design, rooted in credible data. It provides tools to collect more robust and consistent data on emissions, mitigation and adaptation efforts, capacity building and support. Therefore, better availability and quality of data will allow for assessment of the impact and effectiveness of domestic climate policies and set in motion an upward spiral of ambition and implementation. In addition to providing the guidance and tools for policy evaluation, the Initiative will create a space for countries to share their experiences and lessons learned.

Combining broadly applicable methodologies and tools with in-country capacity building, ICAT is uniquely positioned to use on-the-ground experiences to refine tools and guidance. With better information and data, ICAT enables countries to select the most efficient, cost-effective policies to achieve their sustainable development priorities and fulfil their reporting requirements.

By working with countries' existing reporting commitments, ICAT also promotes harmonization with other transparency efforts and in-country strategies to help maximize the impact of country efforts. Objective of the ICAT project in Lesotho is to fill the gaps of MRV and institutional needs for reporting of NDCs by developing an affective national MRV system through enhancing existing institutional set up for the energy NDC.

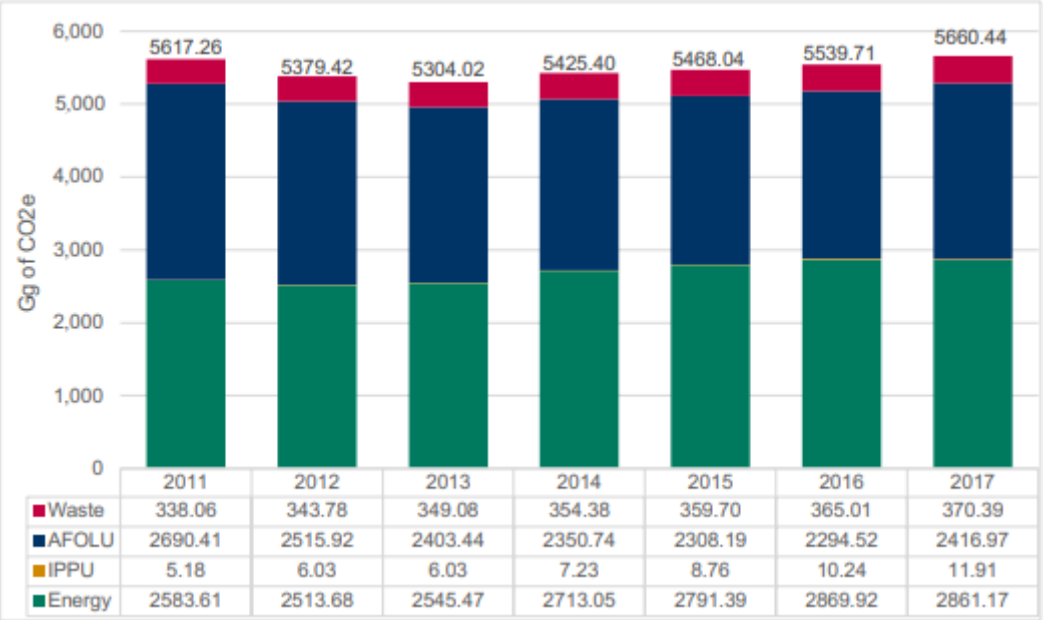
The objective of ICAT is to provide policymakers around the world with tools and support to assess the impacts of their climate policies and actions, to further transparent and ambitious climate action and mobilize investment. This is achieved through two components: ICAT series of guidance and country support to build capacity. ICAT sought to support Lesotho' efforts to establish a domestic MRV system for tracking of progress with NDC implementation in the energy and transport sectors in line with the requirements of the enhanced transparency framework of the Paris Agreement.

1.3. National GHG Emissions Status and Trends of the Sectors

Figure 1 presents the results of the 4th GHG inventory, showing the GHG emissions for each year between 2011 and 2017. The Figure shows that Lesotho's emissions were at 5

617.26 Gg CO_2e in 2011, then declined slightly between 2011 and 2013 to 5 304.02 Gg CO_2e in 2013 before increasing again over the next four years to 5 660.44 Gg CO_2e in 2017.

The AFOLU sector was the largest contributor to the national GHG emissions in 2011 at 2 690.41 Gg CO_2e (47.9%), trailed closely by the Energy sector at 2 583.61 Gg CO_2e (46%). By 2017 the Energy sector, with transportation subsumed under the sector, had become the largest contributor to the inventory at 2 861.17 Gg CO_2e (50.5%) followed by AFOLU at 2 416.97 Gg CO_2e (42.7%). The Waste sector contributed between 6.02% in 2011 and 6.54% in 2017, while the Industrial Processes and Product Use (IPPU) sector was the least contributor throughout the period averaging 0.14%.



	2011	2012	2013	2014	2015	2016	2017
Waste	338.06	343.78	349.08	354.38	359.70	365.01	370.39
AFOLU	2690.41	2515.92	2403.44	2350.74	2308.19	2294.52	2416.97
IPPU	5.18	6.03	6.03	7.23	8.76	10.24	11.91
Energy	2583.61	2513.68	2545.47	2713.05	2791.39	2869.92	2861.17

Figure 1: Lesotho's net GHG emissions for the period 2011 – 2017, by sector **(LMS, 2019)**

Figure 2 shows the changes in the percentage contributions of the different sectors to the national GHG inventory from 2011 to 2017.

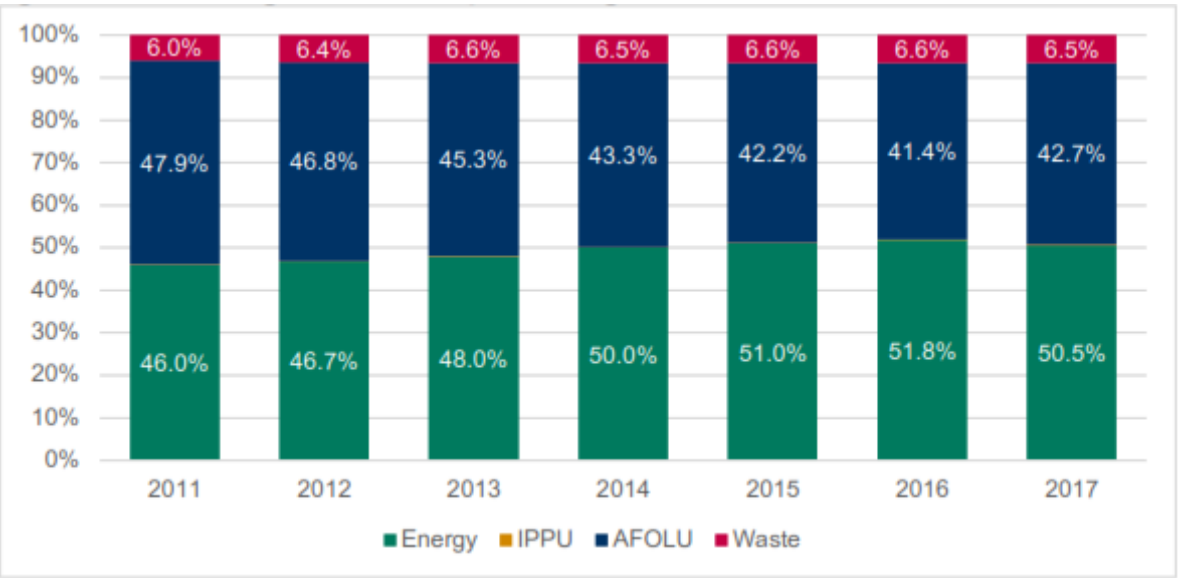


Figure 2: Changes in sector percentage contribution over time **(LMS, 2019)**

In terms of GHG contribution, CO_2 has been the most prominent gas in Lesotho's GHG inventories, contributing between 60.6% in 2011 and 62.4% in 2017 (Figure 3). On average, methane (CH_4) and Nitrous oxide (N_2O) have contributed 24.2% and 13.0% respectively over the period 2011 – 2017.

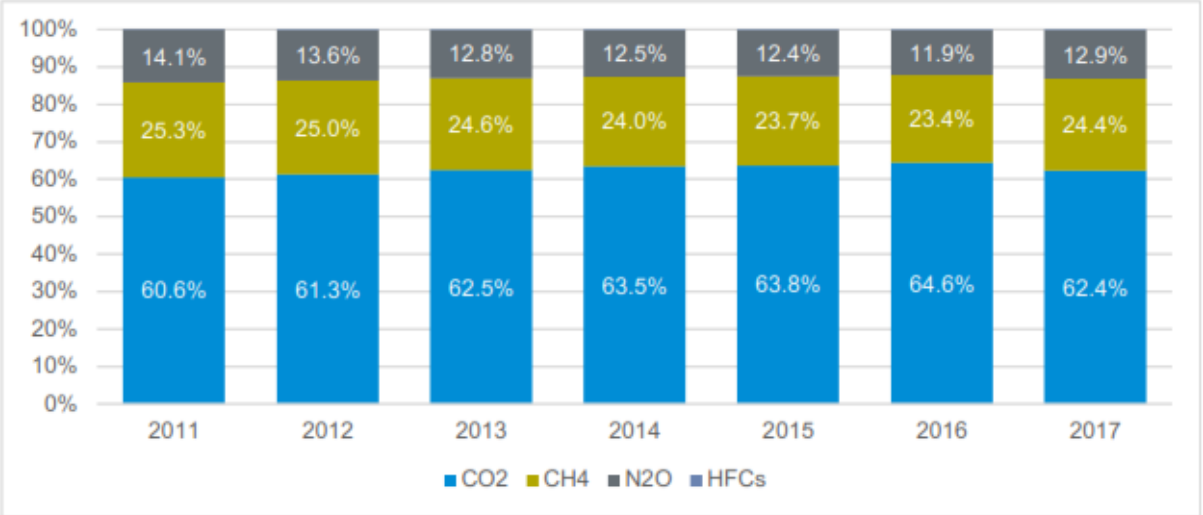
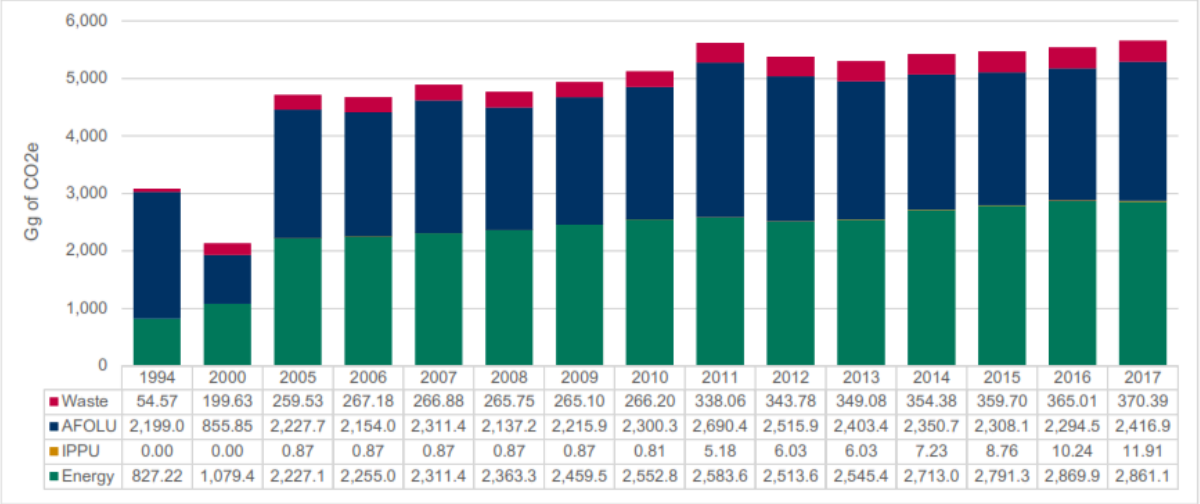


Figure 3: Changes in gas percentage contribution over time **(LMS, 2019)**

Figures 4 presents the trends in Lesotho's GHG emissions from 1994 to 2017. According to the Figure, the country's GHG emissions have increased by 83.7% from 3 080.7 Gg CO_2e in 1994 to 5 660.44 Gg CO_2e in 2017. This represents an average annual growth rate of 3.64%. The waste sector emissions have increased by 574.7%, the Energy sector increased by 245.9%, while the AFOLU sector increased by 9.9% in 2017 compared to 1994.

As can be seen in Figure 4, the fastest rate of growth occurred in the Waste sector followed by the Energy and industrial sectors. In general, the trend of increase in total GHG emissions closely follows the trend of emissions from the energy sector, which constituted 46% to 50.5% of total emissions during this period. While the other sectors continue to increase in overall emissions, the proportion of their contributions and profile will decrease over time. This significant growth in emissions reflects the growing energy demand, due in part to the changing socio-economic conditions and overall economic development of the country. As for the AFOLU sector, GHG emissions have conserved a steady state throughout the 1994 – 2017 period, with an average annual growth rate of 0.43%, mainly due to a decrease in the population of livestock and a decrease in forest fires from 1994 to 2017.

The inventory underscored the country's reliance on fossil fuel imports and the large contribution of the Energy sector to GHG emissions.

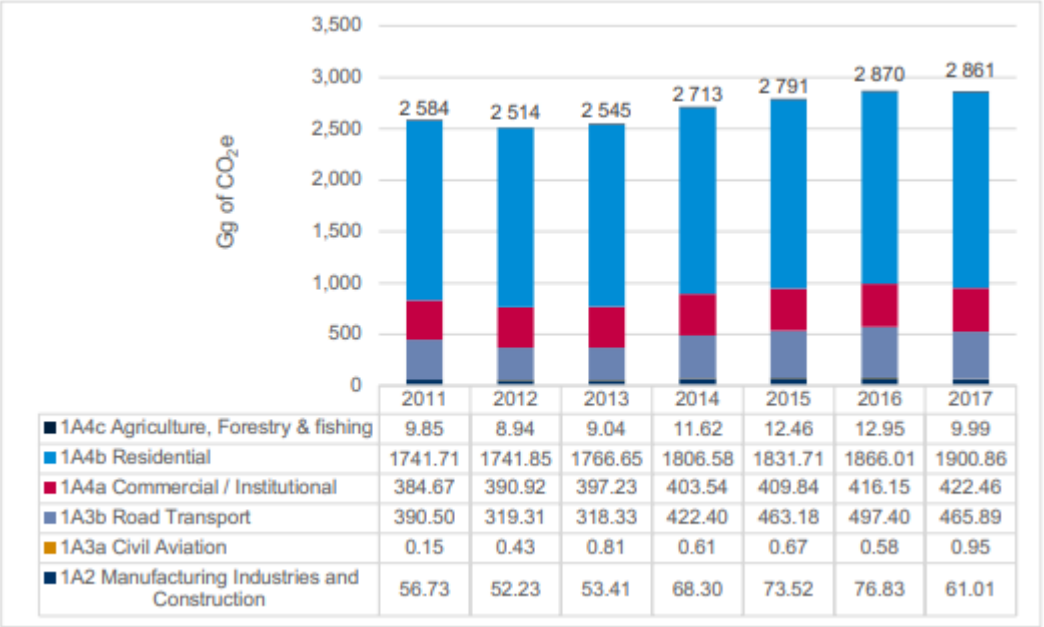


	1994	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Waste	54.57	199.63	259.53	267.18	266.88	265.75	265.10	266.20	338.06	343.78	349.08	354.38	359.70	365.01	370.39
AFOLU	2,199.0	855.85	2,227.7	2,154.0	2,311.4	2,137.2	2,215.9	2,300.3	2,690.4	2,515.9	2,403.4	2,350.7	2,308.1	2,294.5	2,416.9
IPPU	0.00	0.00	0.87	0.87	0.87	0.87	0.87	0.81	5.18	6.03	6.03	7.23	8.76	10.24	11.91
Energy	827.22	1,079.4	2,227.1	2,255.0	2,311.4	2,363.3	2,459.5	2,552.8	2,583.6	2,513.6	2,545.4	2,713.0	2,791.3	2,869.9	2,861.1

Figure 4: Totals per sector in Gg of CO_2e emissions from 1994 until 2017 **(LMS, 2019)**

1.3.1 Energy Sector GHG Emissions and Trends

Figure 5 and Figure 6 present the breakdown of national GHG emissions in Lesotho and the Energy sector emissions between 2011 and 2017, disaggregated by category.



	2011	2012	2013	2014	2015	2016	2017
1A4c Agriculture, Forestry & fishing	9.85	8.94	9.04	11.62	12.46	12.95	9.99
1A4b Residential	1741.71	1741.85	1766.65	1806.58	1831.71	1866.01	1900.86
1A4a Commercial / Institutional	384.67	390.92	397.23	403.54	409.84	416.15	422.46
1A3b Road Transport	390.50	319.31	318.33	422.40	463.18	497.40	465.89
1A3a Civil Aviation	0.15	0.43	0.81	0.61	0.67	0.58	0.95
1A2 Manufacturing Industries and Construction	56.73	52.23	53.41	68.30	73.52	76.83	61.01

Figure 5: Breakdown of GHG emissions in Lesotho: 2011 – 2017 (LMS, 2019)

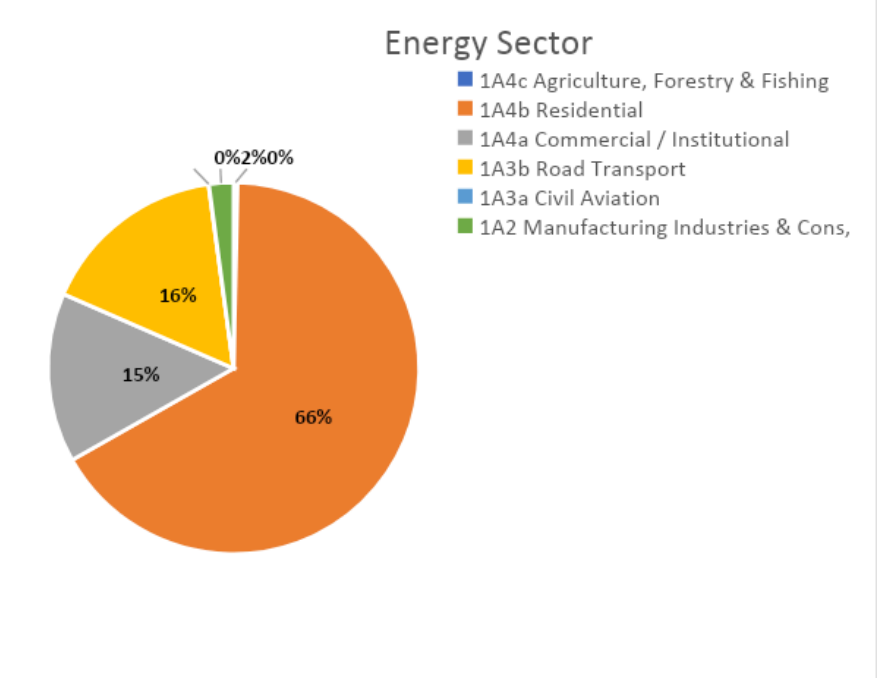


Figure 6: Energy Sector GHG emissions: 2017 (LMS, 2019)

Lesotho's GHG emissions from the energy sector amounted to 2,583.6 Gg CO_2e in 2011, and increased steadily to 2,861.2 Gg CO_2e by 2017, with the residential sub-sector (specifically the burning of biomass) accounting for the largest share in the sector's emissions at 66.44% in 2017. Reduced consumption of diesel and petrol in 2012 and

2013 led to a reduction in GHG emissions to 2,513.7 Gg CO_2e and 2,545.5 Gg CO_2e respectively. Overall, the emissions from the energy sector increased by 10.74% from 2011 to 2017.

The transport sector is one of the major emission-intensive sectors in Lesotho. According to Lesotho's 4th GHG Inventory Report[1], emissions from transport have grown consistently from 390.65 Gg CO2e in 2011 to 466.85 Gg CO_2e in 2017, with road transport accounting for over 99% of all the transport emissions throughout that period.

In terms of GHG accounting transport is counted within the energy sector and accounted for around 15.12% and 16.32% of all energy-related activities countrywide, in the same reference years. The transport sector has shown the highest emission growth rate of all energy sectors since inventory year 1994.

The on-road transportation, which includes passenger cars, light-duty trucks (e.g., vans and SUVs), medium- and heavy-duty trucks, buses, and motorcycles, in Lesotho accounts for a significant contribution to the GDP (6.9%) of the economy of Lesotho, and accounts for nearly 10% of the employment in the country. Petroleum supplies more than 99% of the sector's energy, and essentially all of its GHG emissions come from the combustion of petrol and diesel. Thus, managing emissions in this sector remains crucial for tackling climate change.

GHG emissions from commercial/institutional sectors amounted to 384.67 Gg CO_2e in 2011 and 422.46 Gg CO_2e in 2017.

Based on trends in the last ten (10) years of imported petroleum-based products, the transport subsector has grown as the country's largest user of total petroleum-based products. Consumption of petroleum products increased by 14% from 227,125 kilolitres in 2016/17 to 258 972 kilolitres in 2019/20. Inadequate mass transport systems, subpar vehicle maintenance, and poor road conditions are major factors that hinder efficiency in the transportation sector. Additionally, gaseous emissions from vehicles contribute significantly to air pollution and greenhouse gas emissions in urban areas.. It is therefore highly probable that emissions of CO_2 from the transport sector will increase in future due to the increased consumption of petroleum-based products in the sector. Consequently, the energy sector, based on trends and expert opinions, is likely to grow

[1]LMS, 2021. Lesotho's 4th GHG Inventory Report. Lesotho Meteorological Services. Maseru, Lesotho

significantly and concurrent with this would be an increase in the total GHG emissions (BoS, 2022).

Reviewing past and current mobility assessments for the Lesotho road transport sector, the level of car ownership has been increasing steadily since 2000, particularly in the three major metros, **Maseru**, **Maputsoe** and **Teyateyaneng**. For most people, private transportation is more convenient, reliable, and clean when compared to public transportation. Affordable secondhand import cars, and lending programs launched by local banks during the past ten years have encouraged private car ownership; and in the process inadvertently contributed to high levels of traffic congestion and associated air pollution in urban areas. On the other hand, the cost of importing petroleum products is increasing every year. Therefore, Lesotho urgently needs better management and optimization of fuel consumption, especially in the transportation sector.

1.4. Energy Sector Revised NDC of Lesotho

Lesotho is committed to contributing to the global fight against climate change, while prioritizing adaptation measures given its high vulnerability to climate change. Lesotho has set two key goals for climate change mitigation as part of its revised NDC to be submitted to the UNFCCC in 2024 in accordance with the Paris Agreement.

- Reduce GHG emissions against BAU scenario by 20% in all sectors (Energy, IPPU, AFOLU and Waste) by 2.3% unconditionally and an additional 17.7% conditionally by 2030
- Reduce GHG emissions in the energy sector against the Business-As-Usual (BAU) scenario by 4.2% (166 $ktCO_2eq$) unconditionally and an additional 25.8% (1,017 ktCO2eq) conditionally by 2030

Energy Sector Updated NDC: Lesotho's NDC related to energy sector consists of fourteen mitigation options listed in Table 1

Table 1: Mitigation options in Lesotho's NDC related to energy sector

No.	Revised/Updated Mitigation options
1	Efficient Woodstoves
2	Biogas plants
3	Solar LED Lamps
4	LPG Stoves Replacing Wood Stoves
5	Solar Cooking
6	Solar home systems

7	More efficient gasoline cars
8	More efficient diesel cars
9	Restriction of imported used cars
10	New bicycle lanes: ***Create secure and attractive urban cycling***
11	Electrification (*number of additional households connected to the grid*)
12	Solar water heater residential
13	Landfill gas plant with power production
14	Two wheelers

1.5. Overall Objectives and Outcomes of the Assignment

The primary focus of the ICAT initiative is on Lesotho's energy sector. The overall objective of the ICAT project in Lesotho is to support the establishment of institutional arrangements, including the design and implementation of legal frameworks, data collection, reporting and verification methodologies and procedures within and between the relevant stakeholders that will facilitate a robust and continuous national MRV system for the energy sector.

The main objectives of this assignment are to:

a) Assess selected methodologies for assessing GHG emission impacts of policies and actions in the energy sector, and
b) Harmonize methodologies for assessing greenhouse gas impacts of policies and actions in the energy sector of Lesotho in a series of reports prepared to address the objectives of ICAT and support ICAT in the development of the national MRV.

1.6. Scope and Limitations

There are 14 energy sector mitigation actions in the updated NDC of Lesotho. Several policies and projects are proposed under each mitigation action of the NDC. It is important to identify the most effective and measurable policies and projects to develop the MRV system. Therefore, the LMS, together with the UNEP-CCC, agreed to prioritize NDC-6 (Solar Home Systems) and NDC-7 (More Efficient Gasoline Cars) considering the following criteria: (1) financial feasibility, (i) political preference, (iii) GHG reduction and (iv) SD impacts, and (vii) because the two have clearer policy implications. Since this assignment only considers the impact of individual policies and actions, the ICAT methodologies were preferred for policy-related methodologies. Mitigation actions (policies and projects) attributed to each NDC were prioritized considering (i) the likelihood of implementation and (ii) the availability of data for analyses. Furthermore, the selection of the prioritized mitigation actions was further validated during a

workshop held for key institutions in transport, energy and statistics. The project-based approach was also compared with the UNFCCC CDM approach.

The ICAT Renewable Energy (RE) Methodology is applicable for assessing the impacts of a policy on GHG emissions reduction for only three types of policies: Feed-in tariffs, Auction/Tender, and Tax incentives. While Lesotho has implemented various renewable energy policies, it does not currently have specific targets exclusively focused on renewable energy development. The ICAT **Transport Pricing Methodology** is a valuable tool for policymakers to assess the impacts of pricing policies in the transport sector and improve their effectiveness. The methodology provides focus on the GHG impacts of fuel subsidy removals, raising fuel taxes or levies, implementing road pricing and offering incentives for the purchase of fuel-efficient vehicles

2. Methodology and Approach

Applicable ICAT Methodologies and Policy Assessment Guides

The ICAT Methodologies and Policy Assessment Guides are designed to help countries assess the impacts of their climate policies and actions. These guides provide a step-by-step approach to evaluating the effectiveness of climate policies and actions, and help countries identify areas for improvement. The guides cover a range of topics, including greenhouse gas emissions, energy use, and climate finance. They are a valuable resource for countries looking to enhance their climate policies and take meaningful action to address climate change.

- **The Transport Pricing Methodology** helps policymakers assess the impacts of pricing policies in the transport sector and improve their effectiveness, focusing on **fuel subsidy removals (***removal or reduction of subsidies that reduce the price of vehicle fuel below its fair-market cost*) **increased fuel taxes, road pricing (**road tolls and congestion pricing), and **vehicle purchase incentives for efficient vehicles**. Transport emissions are rising rapidly, requiring mitigation action. However, data availability and a lack of established MRV systems are often obstacles. Increased fuel prices may lead to reduced vehicle travel and/or increased switching to more efficient and alternative-fuelled vehicles.

- **The Renewable Energy Methodology** helps policymakers assess and communicate the impacts of renewable energy policies to ensure that they are effective in mitigating GHG emissions, advancing development objectives, and helping countries meet their sectoral targets and national commitments. The methodology focuses on three policy interventions: **feed-in tariff policies**, **auction policies**, and **tax incentive policies**.

- **The Sustainable Development Guide** helps policymakers and other users assess multiple development and climate impacts across the environmental, social and economic dimensions. These may include air pollution reduction, job creation, improved health, access to energy, poverty reduction, protection of ecosystems, and more.

The Approach

The main objectives of this assignment are to assess selected methodologies for assessing GHG emission impacts of policies and actions in the energy sector and to harmonize methodologies for assessing GHG impacts of policies and actions in the energy sector. Two main methods were utilized.

Firstly, a comprehensive desk review was conducted to identify institutional arrangements within the energy sector, appropriate methodologies to measure GHG impacts of prioritized NDC mitigation actions, and existing MRV/M&E methodologies to assess the GHG impacts of NDC mitigation policies and projects.

Methodologies published by the Initiative for Climate Action Transparency (ICAT), as well as other appropriate methodologies published by the *Center for Clean Air Policy, the Institute for Transportation and Development Policy, United Nations Framework Convention on Climate Change (UNFCCC), and the World Resources Institute (WRI),* were reviewed to gain an understanding of the requirements and modalities for reporting and verification. Methodologies were reviewed using the following nine criteria:

1. Applicability,
2. Scope of the mitigation projects,
3. GHG assessment boundary,
4. Process of estimating baseline emission,
5. Process of estimating project emission,
6. Availability of emission factor database,
7. Monitoring framework,
8. Reporting Framework, and
9. Verification Framework.

Furthermore, national documents were also reviewed to identify the achievements, progress, gaps and needs aimed at achieving the Enhanced Transparency Framework (ETF). National documents that were reviewed included National Communications (NCs), Biennial Update Report (BURs), NDC, NAMA, policy and legal documents such as National Climate Change Policy Implementation Strategy (CCPIS), National Energy Policy (NEP) amongst others.

The second method employed was stakeholders' consultation. This is an important method as it gives first-hand information on existing MRV/M&E systems and progress made by the country in aligning with the Paris Agreement (PA). Furthermore, the ICAT Renewable Energy (RE) Methodology recommends the use of country-specific data from sources such as national institutions related to the energy industry and international

agencies. Therefore, consultations were undertaken using guiding questions that aimed to assess stakeholders' participation, knowledge of MRV, experience, data quality and availability, challenges and areas that require harmonizing, strengthening, and improvement.

Key stakeholders consulted in the transport and energy sector included the Department of Road Transport and Safety, Department of Energy, Lesotho Meteorological Services, Private Sector, Department of Civil Aviation, Revenue Services of Lesotho (customs statistics, including vehicle imports), and the Bureau of Statistics (providing overall national statistics on energy and transport). . Consultation involved determining the following aspects:

- Level of knowledge on the PA, MRV, NDCs: *This aspect is crucial because institutions can only take part in the program if they have knowledge about it.*
- Institutional involvement and areas of involvements,
- Institutional arrangements,
- Data quality and sharing platforms,
- Presence of the monitoring and tracking NDC,
- Gaps, limitations, and area of improvements, and

The stakeholder consultations involved conducting questionnaire surveys (see Annex III) and making necessary follow-up phone calls. Annex IV shows the list of stakeholders' entities targeted by the ICAT project, including those in the energy and transportation sectors. There is a general understanding of the Paris Agreement and the NDC process. However, there is limited stakeholder engagement in MRV involvement, particularly in GHG inventories and to a lesser extent GHG mitigation, compared to MRV for support. Similarly, more stakeholders are familiar with monitoring tools and plans for GHG inventories, followed by GHG mitigation, and then MRV support.

Some of the MRV tools and monitoring plans known to stakeholders include the 2006 IPCC Guidelines and the 2006 IPCC Software. Greenhouse gas emissions are monitored through simple time series plotting and analysis of annual emissions. Reporting is done through National Communications (1st, 2nd, and 3rd), Biennial Update Reports (BURs), National GHG Inventory Reports (NIR), and Nationally Determined Contributions (NDCs).

The information collected during consultations was utilized to bolster the identification and analysis of gaps, the selection process for activities and the overall framework for the harmonized methodologies for evaluating the greenhouse gas impacts of policies and actions in the energy sector.

Some Examples of Cited Existing MRV Data:

- **Ministry of Transport:** National vehicle registration and licencing data system which categorise vehicles by make, model and type of fuel used. The data are stored at a department which is not a data centre and it has the relevance to MRV with the help of other data kept by other institutions.

- **Department of Energy:** The Department does not have a distinct data information system. The data at hand is in excel sheets, mostly, and fragmented among and between different officers depending on their areas of interest. Supply data as requested by the national focal institution, hence no any specific data reserved or collected for MRV.

- **Revenue Service Lesotho**: Customs Management System (CMS): Data on imported second hand motor vehicles, trade statistics, payments of customs duty and imports VAT, is stored in this system.

- **Statistics Lesotho**: Energy balance reports were produced locally till 2011, this has since stopped due to lack of capacity and funds. From there forth, an international source was used: International Atomic Energy Agency.

3. Measurement, Reporting and Verification Systems

3.1. Introduction

The United Nations Framework Convention on Climate Change (hereinafter referred to as the Convention) provides the foundation for the intergovernmental response to climate change and its impacts on humanity and ecosystems. In order to collectively address climate change and achieve the objective of the Convention and the purpose and goals of the Paris Agreement, countries need to mobilize actions. Furthermore, all the Parties are obliged to communicate to the Conference of the Parties (COP), through the secretariat, information on the actions they have taken or envisage they will take to implement the Convention. This is seen as a key implementation aspect of the Convention, as it allows Parties to inform one another of their national-level actions and serves as a basis for the COP to assess the implementation of the Convention by Parties.

The regular collection, analysis, and use of reliable information on climate action and support to reduce GHG emissions and increase resilience, and data on GHG emission trends, both historical and projected, is essential for evidence-based decision-making and information-sharing, which in turn builds trust and understanding and promotes stakeholder engagement. This data collection and reporting activity forms a critical component of what is commonly known as 'MRV' under the Convention and has recently been encapsulated by the term 'transparency' under the Paris Agreement (UNFCCC, 2020).

The arrangements for national reporting have evolved throughout the history of the Convention and its Kyoto Protocol into a more comprehensive measurement, reporting and verification framework (UNFCCC, 2014). Annex I illustrates the evolution of MRV arrangements for developing country parties. Several elements were introduced to the MRV framework through a set of decisions taken by COP over the years. Some of these elements are implemented at the international level and others at the national level. Annex II illustrates the key elements of the MRV framework.[2]

3.2. Situational Analysis of Lesotho MRV Systems in the Energy Sector

[2] https://transparency-partnership.net/publications-tools/infographic-mrv-developing-countries-evolution-mrv-framework-developing

The status of the existing MRV framework in the energy sector in Lesotho focuses on three main pillars: GHG Inventory, GHG Mitigation and Support required and received to promote implementation of the Paris Agreement in Lesotho and ETF related activities in particular. A brief background to ETF and MRV is presented in this report.

Important aspects with regard to this situational analysis are the useful data sets/statistics already being collected, compiled and reported (e.g. energy and transport statistics) and how these are being used to determine generic MRV indicators such as GHG inventories and the GHG reduction potential/impacts of mitigation actions determined according to agreed procedures and methods. This analysis was conducted to expose gaps in data requirements and barriers to collection that may be capacity-related or due to a lack of/unclear mandate on who should collect, process and report the data, as well as the necessary resources and capacity to analyse the impacts of energy measures for the energy sector.

The required institutional arrangements for tracking the progress of the NDC and reporting on its implementation at both international and domestic level are reviewed considering the various mandates of institutions, their inter-relationships and how coordination is achieved. The role of MEF and other stakeholders such as data providers, working committees and Sector Working Groups feeding into the MRV for the energy sector is presented and any gaps are identified.

Key national development reports that include NSDP II, Energy Policy, Transport Policy and Climate Change related initiatives that include latest National Communication, BURs, Climate Change Policy, NAMAs and draft NDC have been reviewed to indicate Lesotho's development objectives in general (and energy objectives in particular) and climate change policy framework and activities.

Stakeholder consultations, including telephone interviews and questionnaire have also been conducted to gather views on the data sets being collected, identified gaps that will require resource allocation and completeness of data for MRV in the energy sector.

In considering analytical capacity for harmonized MRV for the energy sector, both adequacy of data sets and ability to conduct GHG mitigation options, were analysed, especially with regard to some of the GHG reduction options mentioned in the TNC, NAMA, draft NDC and the ICAT Renewable Energy and Transport Guides. The stakeholders were also asked to indicate what capacity and resources they will require to adequately contribute to a functional MRV in the energy sector (Annex III).

3.3. Enhanced Transparency Framework (ETF) and existing MRV systems in Lesotho

The MRV system is a crucial part of the larger framework for climate action and accounting for emissions and the achievement of the Nationally Determined Contribution. The MRV system is the method by which the stated ambitions of the Paris Climate pact go from hope to reality. This tool will help us to stay on track with our climate change commitments, both for reducing emissions and tracking climate resilience and adaptation.

Article 13 of the Paris Agreement, adopted in 2015 at the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), established a requirement for an enhanced transparency framework for action and support. The article outlines the specific types of information required of Lesotho as a non-Annex 1 Party which includes:

a) national inventory report detailing progress made in achieving nationally determined contributions (paragraph 7);
b) information related to climate change impacts and adaptation (paragraph 8); and
c) information on finance, technology transfer and capacity building support needed and received.

Under the current international MRV Framework, reporting of the biennial report (BR)/biennial update report (BUR) under the Convention will be superseded by reporting of the biennial transparency report (BTR) for PA Parties. Parties under the Paris Agreement are required to submit their first biennial transparency report (BTR1) and national inventory report, if submitted as a stand-alone report, in accordance with the modalities, procedures and guidelines (MPGs) for the ETF as contained in decision 18/CMA.1MPGs, by 31 December 2024 at the latest (with least developed countries and small island developing states having discretion to submit their first BTR later). Party will continue to submit National Communications (NCs) every four years (decision 1/CP.16, para. 60(b)).

NCs are mainly for reporting on measures and policies undertaken to address climate change in the country. In addition to information on GHG inventories, NCs provide information on national circumstances, a general description of the steps and actions the country is taking or planning to take to mitigate and adapt to climate change,

describe gaps and constraints and state any needs for technical, financial or capacity building support.

Under the ETF, the game changer is the introduction of NDCs that are to be submitted every five years and are already developed with their own MRV framework. According to the ETF requirements, the main purpose of the MRV system is to transparently demonstrate progress made towards the targets defined in the NDC (e.g. GHG emissions and GHG mitigation {and adaptation} impacts), tracking the progress made in the implementation of mitigation and adaptation actions, and tracking the use and results of means of implementation and support (e.g. capacity building and technical assistance, technology transfer, and finance).

In addition, non-GHG impacts (e.g. Environmental, social and economic) of the NDC actions that would lead to transformational change in the country are captured by the MRV system.

MRV of Support is traditionally an area where developed countries are required to track support provided for climate change mitigation activities but developing countries are demonstrating a growing interest in the MRV of support received for reasons that include greater accountability of how allocated resources have been used as intended. One element that can benefit governments in data gathering, transparency, and verification is to create a national-level centralized data and information reporting system that considers the linked MRV system. At present, there are often different data management systems used for different mitigation actions or on a sub-sectoral and sectoral level. Creating this linkage to a master system on the national level will require standards and guidelines for data inputs and aggregation, especially when including applicable sector and sub-sector information, and individual mitigation/adaptation actions. This system can start with core national level input/output data, and gradually expand into sectors, sub-sectors, and individual mitigation/adaptation actions.

3.4. Key Elements of the MRV Framework at the International Level

The standard MRV components relate to measuring, reporting, and verifying

- MRV of GHG Emissions:
- MRV of Mitigations of GHG emissions
- MRV of Support required and received by the Paris Agreement parties

Three types of mitigation-related MRV (Figure 7) are discussed below:

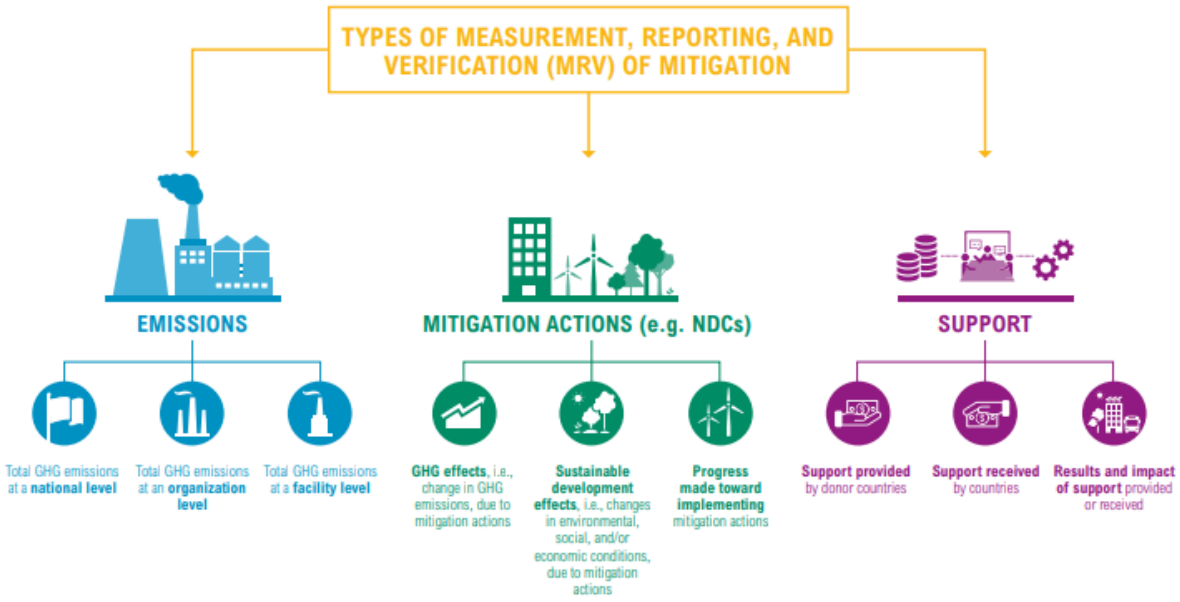


Figure 7: Three types of mitigation-related MRV (Singh, Finnegan and Levin, 2016)

MRV of GHG Emissions in Lesotho (*estimation of emissions at national and sectoral levels*): Since Lesotho is a party to the UNFCCC, it is mandatory to report the GHG inventory periodically as part of the national communications (every four years) and biennial transparency reports (every two years). As a result, Lesotho has the expertise and experience of MRV of emissions in developing national GHG inventories as part of national communications to the UNFCCC. So far, Lesotho has developed three national communications (First National Communication, Second National Communication and Third National Communication) under the leadership of Lesotho Meteorological Services. All three national GHG inventories in the three National Communications are developed based on the IPCC Tier 1 approach. However, the GHG emissions in the transport sector were estimated using the Tier 2 approach for the TNC.

MRV of GHG emissions refers to estimating, reporting, and verifying actual emissions over a defined period of time. This type of MRV can be performed at the national level, or by organizations and facilities. For example, national GHG inventories include an account of emissions from a country for a particular period, are reported to UNFCCC, and undergo some form of review.

MRV for emissions entails data collection on GHG emission by sector for the purpose of determining the performance of the parties in attaining their emission reduction targets. The scope of MRV of emissions can be undertaken at four levels:

- National level

- Project level
- Sectoral level, and
- Facility level.

Based on the National GHG Inventory Manual[3], the concept of transparency includes the provision of activity data, emissions sources, emissions factors and accounting methodologies that are fully documented and disclosed for verification purposes. The information provided should be sufficient for those outside the inventory process to use the same source of data and derive the same results. All other exclusions should be clearly identified and justified.

For all economic sectors, the three major GHGs, CO_2, CH_4 and N_2O should be monitored. The three GHGs must be converted to CO_2 eq. using 100 years Global Warming Potential (GWP) based on the IPCC guidelines for converting GHGs. The parameters to be collected for monitoring in the transport sector should include GHG emissions in Gigagrams (hereinafter Gg), activity data of, for example, the following:

- Consumption of all fossil by type (coal and petroleum products in appropriate units such as liters and tonnes).
- Number of vehicles by type and activity (private, commercial and freight).

MRV of mitigation actions (*MRV of the impacts of mitigation policies and actions*): Involves assessing (ex-ante or ex-post) GHG emissions reductions and/or sustainable development (non-GHG) effects of policies[4], projects[5], and actions, as well as monitoring their implementation progress. It also involves assessing progress toward mitigation goals[6]. An example would be a national government estimating the GHG and pollution reduction impacts of its transport policy to prevent old imported vehicles or reduce car use by the introduction of a bus transit system. While MRV of GHG emissions measures actual emissions, MRV of mitigation actions estimates the change in emissions and other non-GHG variables that result from those actions.

The Sustainable Development Goals (SDGs) and targets are integrated and indivisible, global in nature and universally applicable. They are designed to consider different

[3] https://unfccc.int/sites/default/files/resource/ReviewHandbook%20GHG%20Inventories%202021_clean.pdf
[4] Interventions to reduce GHG emissions made or mandated by a government, institution, or other entity, and may include: laws, directives, and decrees; regulations and standards; taxes, charges, subsidies and incentives; information instruments; voluntary agreements; implementation of new technologies, processes, or practices; and public or private sector financing and investment.
[5] A specific activity or set of activities intended to reduce GHG emissions, increase the storage of carbon, or enhance GHG removals from the atmosphere.
[6] A commitment by an entity to reduce, limit the increase of, or enhance the removal of GHG emissions, or to reduce GHG emissions intensity by a specified quantity, to be achieved by a future date.

national realities, capabilities and levels of development while respecting national policies and priorities. And each member's government are expected to take ownership and establish national frameworks, set nationally owned targets guided by the global level of ambition but taking into account country-level circumstances for the achievement of the 17 SDGs agreed upon.

In Lesotho context, mitigation actions will be included in the NDC communicated by Lesotho Government to the UNFCCC. In relation to MRV of policies, Lesotho has not established any MRV system yet. For MRV of actions, Lesotho has two different types of MRV of mitigation actions: MRV of NAMA and MRV of Carbon market-based mechanism projects (CDM, VERs). However, none of the above MRV systems was developed for transport and electricity sector mitigation actions. Even though transport sector mitigation actions do not have a proper MRV system in place, environmental assessment, including measuring GHG emissions, has been done. Currently, there is no monitoring of the information on the implementation of renewable energy projects. Ministry of Energy receives information from Department of Energy and LEC on energy consumption and the number of consumers connected to the national grid and off-grid solar plants. However, Ministry of Energy cannot monitor or verify the information from individual projects, so the only available sources of information are these reports by LEC and Department of Energy

MRV of support (*MRV of financial flows, technology transfer, capacity building and their impacts*): Focuses on monitoring the provision and receipt of financial flows, technical knowledge, and capacity building, and evaluating the results and impact of support. An example of this kind of MRV would be developing countries tracking climate-specific finance received through bilateral or multilateral channels[7].

MRV support coming as direct climate finance, technical assistance and technology transfer are not readily documented at national level but can be assessed from donor/development partner websites. There is a desire to monitor such resources required and received, especially as they will be required in the conditional financing of NDC mitigation measures and tracking their implementation. Climate finance, technical assistance and technology transfer are seen as critical in the creation of an effective MRV system for Lesotho. Stakeholders have also proposed the creation of a central facility for receiving, collecting and analyzing climate finance data to report to the NCCC locally and also as part of the MRV system.

[7] Understanding-measuring-reporting-and-verification-of-climate-change.pdf (ledsgp.org)

MRV encompasses two aspects, being monitoring plan and development of the template which are instruments for monitoring, reporting and verification. MRV is a cycle and entails monitoring which involves collection through measuring, data analysis, reporting of results and verifying the results though sampling and spot-check. The most significant issues for the success of the MRV are a robust and sound monitoring plan. A monitoring plan guides the monitoring processes for GHG emissions. The plan details methods of measurement or quantification for the GHG emissions for the various sectors, instruments to be used for data collection, parameters to be collected and monitored, frequency of data collection, and analyses of the results. In essence, a monitoring plan provides guidelines on monitoring processes for GHGs emissions.

It is thus important that MRV instruments in the form of templates (e.g. data collection) are developed and consistently used to ensure consistency and accuracy. The interactions among the various elements of the national MRV framework and the key information that is provided under each of the elements are presented in Figure 8.

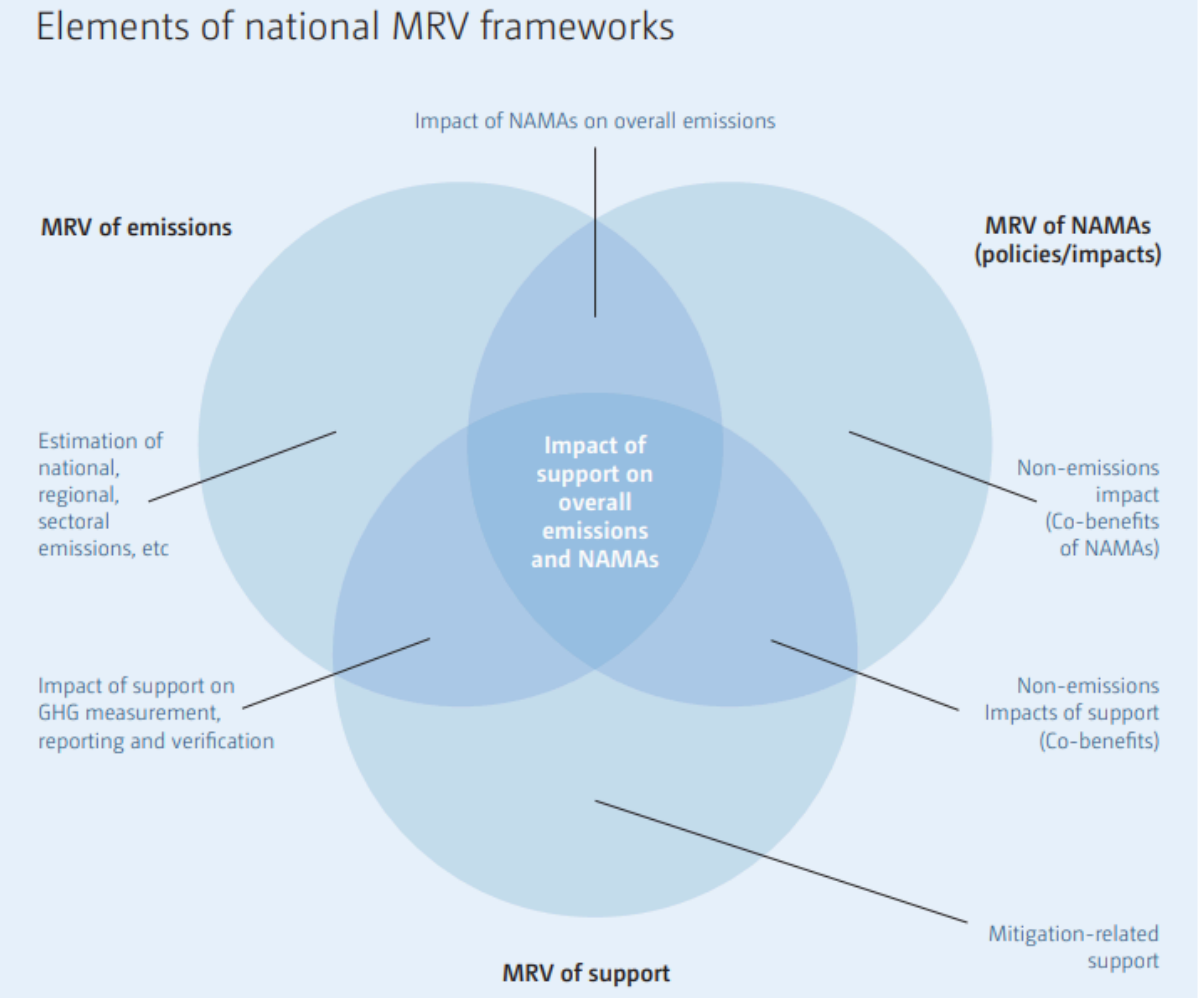


Figure 8: Elements of National MRV Frameworks (UNFCCC, 2014)

Source: *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): MRV-Tool. How To Set Up National MRV Systems. Version 4.1, 2013*

Interactions among the various elements of the national MRV framework and the key information that is provided under each of the elements is presented in Figure 8.

MRV is generally required to meet the national and international requirements. Following table, list the national and international drivers of MRV.

National drivers	International drivers
MRV systems underpin national GHG **data quality**	Improve **trust among Parties**
MRV helps identify **national priorities** (including NAMAs), as well as challenges and opportunities	International **recognition** for national performance
Policy **planning and prioritisation and improving** policy coherence – important to keep track of lessons learned from implementation of mitigation policies and action in order to develop better Provide lessons learned policies in the future (continuous improvement of MRV systems and implementing NAMAs)	Provide **lessons learned**
For internal national record: Keeping a record of mitigation policies and actions in place, **tracking progress of the effectiveness** of mitigation policies and actions (e.g. emission reductions and progress to achieve objectives)	Data quality is key to address national reporting obligations to the UNFCCC mechanisms and progress national engagement in the UNFCCC process.
Data quality assurance: important to access climate finance and participate in market mechanism (e.g. emission trading system)	
To **demonstrate to donors** the emission reduction and impacts of mitigation policies and actions.	

Table 2: Drivers of MRV .Source: How to set up national MRV system, draft 4.2, GIZ[8]

[8] https://transparency-partnership.net/system/files/document/mrv-tool-4-2.pptx__0.pdf

4. MRV and M&E Frameworks in Lesotho

4.1. Lesotho Context to MRV and M&E

Lesotho has some experience with MRV through reporting on NCs, BUR, NAMAs, and TNA. With the introduction of NDC reporting under the Paris Agreement, additional structures and efforts are necessary to establish an effective MRV system that meets ETF requirements. In its first BUR, Lesotho provided information on its proposed domestic MRV arrangements, with the goal of enhancing the tracking of GHG emissions, the impacts of mitigation and adaptation actions, and international, regional, and domestic climate finance flows. The description includes key aspects of the institutional arrangements, such as key institutions, the roles and responsibilities of relevant institutions in each sector, as well as the national climate change committee, the format and frequency of monitoring and reporting, data collection, processing, and internal QA/QC procedures, and data storage and archiving. The proposed climate change Monitoring and Evaluation System in Lesotho, as mandated by the National Climate Change Policy, will require key sectors to provide data on a biannual basis. The implementation of this system, along with clearly defined and agreed institutional arrangements for data collection and management, will help improve Lesotho's data collection and measurement processes.

Figure 9 (a) summarizes Lesotho's current MRV and M&E systems, while Figure 9 (b) outlines the proposed framework for Lesotho's BUR MRV systems. However, this study will specifically focus on attempting to harmonize methodologies for assessing GHG impacts of policies and actions in the energy sector.

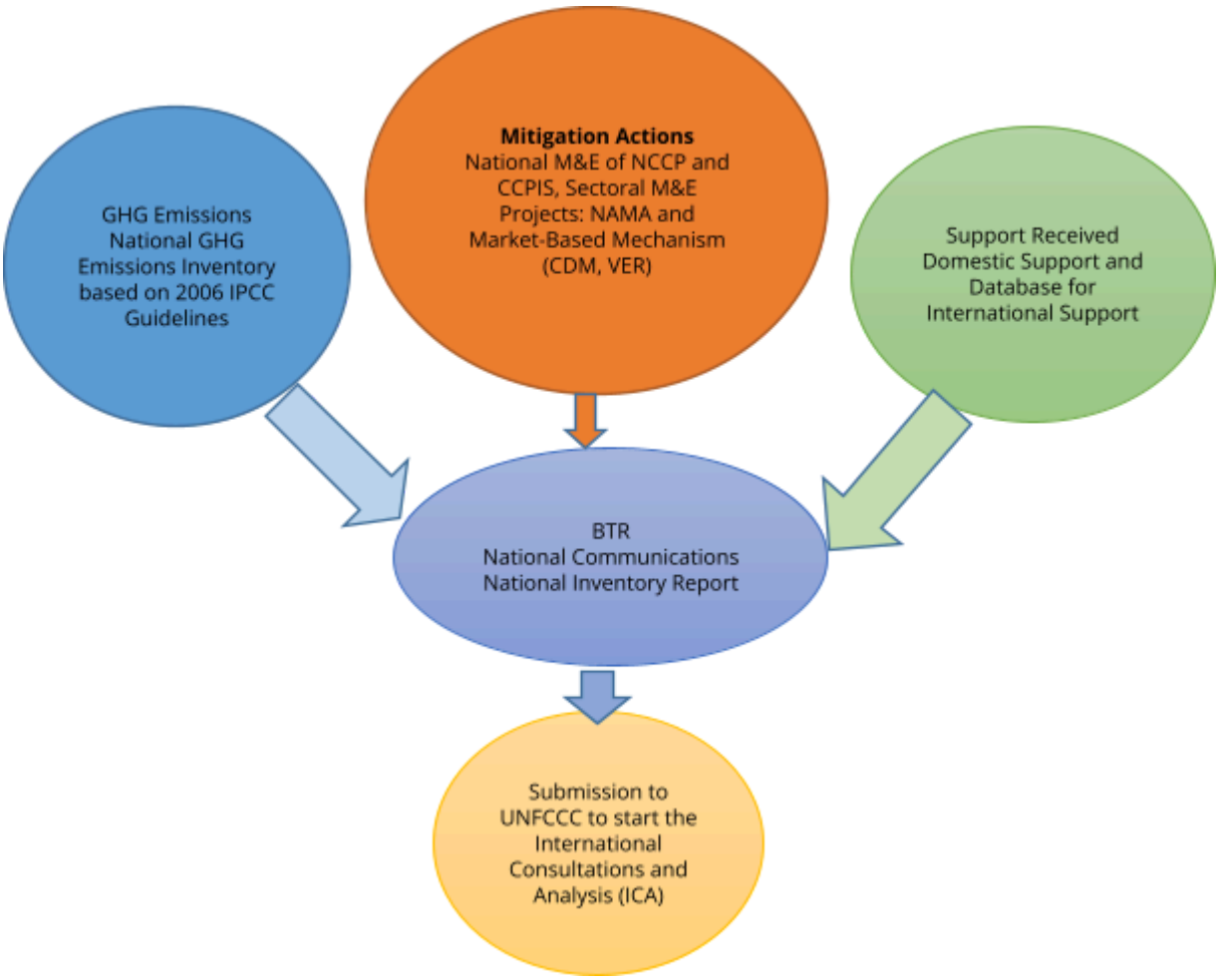


Figure 9 (a): Existing MRV systems of Lesotho

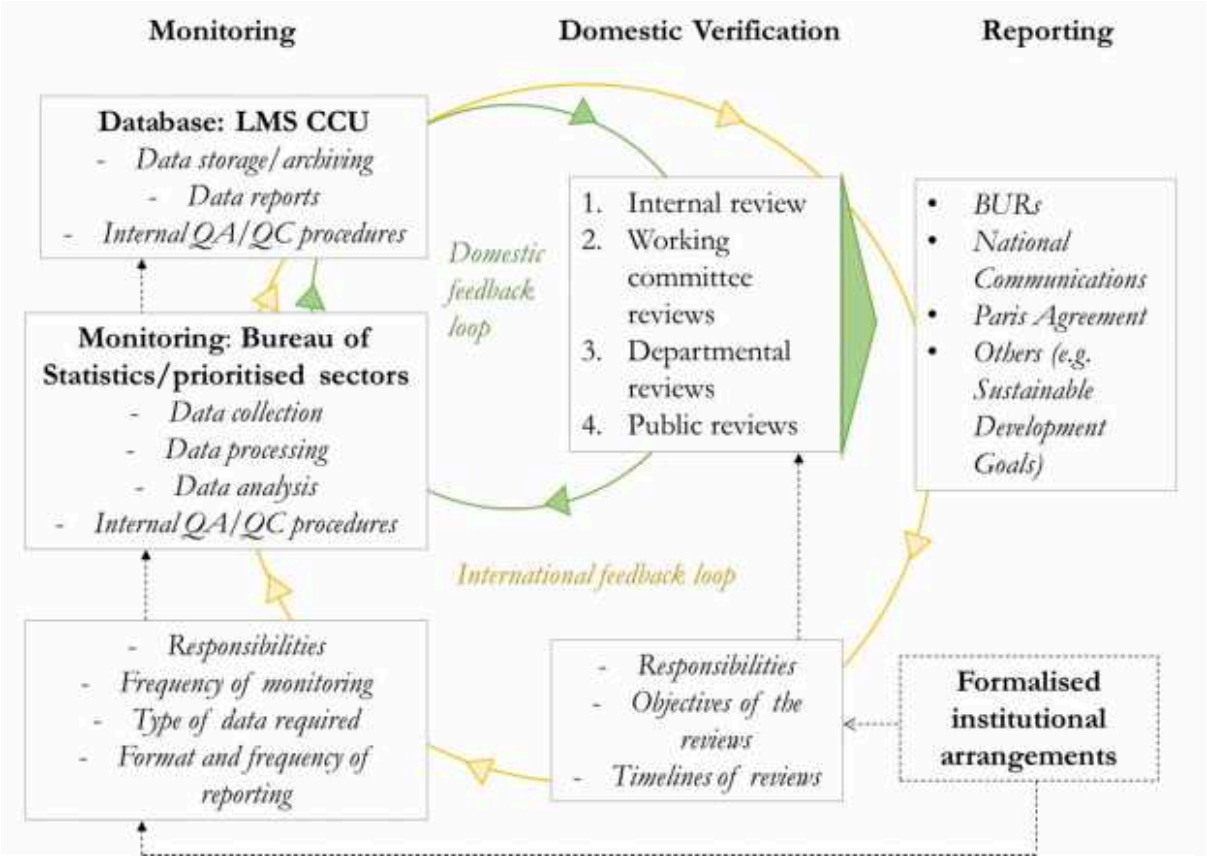


Figure 9 (b): Proposed framework for Lesotho's BUR MRV system

The first biennial update report of Lesotho was submitted to the UNFCCC in 2021, including emissions by sources and removals by sinks from 1994 to 2017.The report was prepared following the guidelines contained in decision 2/CP.17 of the COP. It included information on National circumstances, National GHG Inventory, Mitigation actions and other effects, proposed domestic measurements, reporting and verification framework, and the type of support required.

The GHG inventory has been developed following the 2006 IPCC Guidelines. Emissions from Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU), and Waste sectors were recorded as CO_2, CH_4, N_2O, and HFC emissions. A Tier 1 approach was used to estimate the emissions for all the sectors.

Lesotho reported in its first BUR information on its proposed domestic MRV arrangements, the aim of which is to enhance the tracking of GHG emissions, the impacts of mitigation and adaptation actions, and international, regional and domestic climate finance flows. The description covers key aspects of the institutional arrangements, including key institutions; the roles and responsibilities of relevant

institutions in each sector, as well as of the national climate change committee; the format and frequency of monitoring and reporting; data collection, processing and internal QA/QC procedures; and data storage and archiving. The MRV arrangements are designed at the national level and cover three main areas: the national GHG inventory (sectors, activities and gases), adaptation and mitigation measures (sectors, impacts and tracking methodologies) and support needed and received (technical and financial). The Party plans to enhance its MRV arrangements by building on the existing ad hoc systems, processes and infrastructure, rendering them cost-effective.

Domestic MRV systems of Lesotho aims to:

- Report on a) GHG Inventories, b) mitigation actions and their effects, c) support needed and received in a complete, transparent and timely manner; and
- Assure that existing sectoral and national climate change M&E systems integrate all MRVs at all levels in order to measure and monitor:
  a) GHG emissions trends
  b) GHG emissions or reductions attributed to a specific mitigation action (policy, programme, measure, or project) including the sustainable development benefits; and
  c) Climate-related support provided by the Government of Lesotho or received from donors or the market in the form of finance to enable implementation of a certain action or as a result of an action taken in a specific sector of the economy.

In order to support achieving its emission reduction targets, the Lesotho expects to establish an internationally recognized MRV System to assess the effectiveness of their mitigation activities.

The MRV of the progress on NDC implementation is needed to meet country's international reporting requirements, and "to build mutual trust and confidence and to promote effective implementation, an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities and builds upon collective experience."[9] The MRV of NDCs is also important to meet domestic requirements. These could include reports: (a) to the parliament and the public in order to improve transparency; and (b) to policy-makers informing decisions on changes to the existing mitigation or adaptation actions.

[9] Article 13.1 of the Paris agreement: Enhanced Transparency Framework For Action And Support

4.2. Benchmarking

Lesotho is a party to the Paris Agreement as well as to the UNFCCC (United Nations Treaty Collection, 2020). Therefore, aligning with the requirements of the UNFCCC, the country has submitted First, Second and Third National Communications, First Biennial Update and Nationally Determined Contribution (NDC). Lesotho also prepared a National Adaptation Programme of Action (NAPA), a National Adaptation Plan (NAP), a Technology Needs Assessment (TNA) and a Nationally Appropriate Mitigation Actions (NAMA) framework.

4.2.1 Socioeconomic and Policy Framework Guiding the MRV Framework

National Strategic Development Plan II (NSDP II), 2018/19 – 2020/22/23: The Lesotho National Strategic Development Plan II (NSDP II) aims to transform Lesotho from a consumer-based economy to a producer and export-driven economy. The pillars of NSDP II include:

- Promoting Inclusive and Sustainable Economic Growth and Private Sector–led Job Creation;
- Strengthening Human Capital (through developing human capabilities in Health, Education, Nutrition and Social Protection);
- Building Enabling Infrastructure; and
- Strengthening National Governance and Accountability Systems.

It serves as the blueprint for all development efforts over five years, and implements the sustainable development goals (SDGs), the African Union Agenda 2063 Goals, and the Southern Africa's Development Community (SADC) Regional Indicative Strategic Development Plan (RISDP). It emphasizes private sector development and gives priority to pursuing people-centred development.

The NSDP II sets employment creation and inclusive growth as the overriding goal for combating poverty and inequality. The four Key Priority Areas (KPA) embedded in the NSDP II are:

- KPA I: Enhancing inclusive and sustainable economic growth and private sector job creation (all 17 SDGs),
- KPA II: Strengthening human capital (SDG 3, 4, 5, 10),
- KPA III: Building enabling infrastructure (SDG 6, 7, 9, 11) and
- KPA IV: Strengthening national governance and accountability systems (SDG 5, 16, 17).

Linked to some form of MRV is that (NSDP II has a Monitoring and Evaluation component that may contribute to measurement of transformation change in terms of achievement of SDGs.

The cross-cutting themes are environment and climate change, gender, vulnerability and marginalised groups.

The NSDP II calls for increased **Sustainable Energy Production and Use** to attain self-sufficiency and export potential, expanded electricity access, and better, more efficient use of domestic energy resources. It proposes to change course in terms of energy supply for economic growth and rural electrification with the Government of Lesotho (GoL) promoting renewable energy by harnessing energy from wind, solar and water. When it comes to clean energy and green technologies NSDP II specifies how GoL is to "promote appropriate technologies to reduce biomass and fuel consumption to maintain low carbon emissions, reduce pollution while preventing loss of biodiversity and ecosystems" and how "opportunities exist for both local and international companies in supplying renewable energy products or developing renewable power generation in Lesotho".

The transport subsector objective is targeted at improving Sustainable Quality Transport Network by Enhancing Enabling Environment for Road Infrastructure, Maintaining Existing Roads and Access Routes, and Improving Access to Main Towns, Key Border Posts, and Productive sectors.

National Climate Change Policy (NCCP) 2017-2027: The Lesotho **National Climate Change Policy** recognizes the need to align with the boundaries of the UNFCCC, to which the country is a Party, with the objectives of mainstreaming climate change into development planning, promoting low carbon development pathways and ultimately reducing the country's GHG emissions. The policy calls for the various governmental departments and the private sector to identify mitigation projects/efforts and prepare mitigation plans for GHG emission reductions and co-benefits to the national economy.

The policy recommends a Monitoring and Evaluation Framework to enhance effective policy implementation, ensuring appropriate utilization of resources, communication of results to decision makers and stakeholders for future action specifying performance indicators and targets for each policy priority and strategic action to be monitored. In addition, the implementation of this policy calls for a robust MRV system to ensure that the emissions reduction can be measured and verified. Consequently, this will require

that the government builds and maintains its carbon emissions accounts which are transparent as per the Paris Agreement.

The policy recognizes that in terms of GHG emissions and energy consumption, transport, mining, commercial sector, agriculture and residential are the major sectors, hence opportunities for greenhouse gas emission reductions and enhancement of support (technology transfer, employment and foreign direct investment) can be found in these sectors.

Specific to transport, the sector is likely to increase its GHG emissions potential as a result of the increase of motor vehicles on the roads. Considering that road transport is one of the chief sectors in carbon emissions, there is need for a comprehensive approach towards reforming the transport sector with the intention to mitigate its greenhouse gas emissions potential while enhancing its performance. Key interventions for achieving these objectives are to:

- Conduct studies and research on vulnerability to the impacts of climate change and contribution to the global GHG emissions of the transport system;
- Establish disaggregated transport data collection and management systems;
- Strengthen the roads standards in order to climate proof roads infrastructure;
- Improve fuel efficiency and adopt green technologies in the transport sector with the objective of mitigating GHG emissions;
- Improve and encourage the use of public transport;
- Encourage the use of motorcycles and bicycles; and
- Establish an institutional and regulatory framework to monitor and regulate GHG emissions from the transport sector

National Climate Change Policy Implementation Strategy (CCPIS), 2017: CCPIS includes a climate change Monitoring and Evaluation (M&E) framework. Domestic MRV systems are proposed to be integrated into the existing M&E system to mobilise resources efficiently. It is a five-year implementation framework of the National Climate Change Policy. Guided by principles and pillars of: a) adaptation and climate risk reduction; b) mitigation and low carbon development pathways; c) governance d) Climate finance and investment framework as well as e) cross-cutting issues. The strategy establishes action guidelines for mainstreaming climate change into key socio-economic sectoral plans and programmes while safeguarding environmental integrity and sustainable development in Lesotho.

For the effective implementation of the Policy, the Strategy recognises the institutional framework for coordination, Monitoring and Evaluation (M&E) as key implementation arrangements. Furthermore, the CCPIS includes targets, responsibilities and estimated costs. The CCPIS is aligned with the second National Strategic Development Plan (NSDP II), the Ministerial Strategic Plan, the Intended National Determined Contribution (INDC), the National Adaptation Programme of Actions (NAPA) and the national Communications (NC).

M&E system of the CCPIS has been developed based on five principles, namely: i) use national systems and procedure; ii) mainstream M&E of climate change into national, sectoral and sub-national development planning; iii) strengthen accountability, equity and transparency; and iv) promote participatory learning; and v) address gender issues. This M&E system aims to

(i) **measure** to what extent adaptation efforts have been effective in keeping development on track in a changing climate;
(ii) **monitor** climate change mitigation actions and low-carbon development policies;
(iii) **generate evidence** and lessons as a basis for future policy development;
(iv) facilitate the coherent integration of M&E of climate change in national development planning and key sectors; and
(v) **provide the information required** to fulfil the reporting obligations towards the UNFCCC and development partners.

The system includes two sets of indicators. Upstream indicators track the effectiveness of climate risk management, while downstream indicators track changes in the development situation, emissions, and climate vulnerability of communities and ecosystems, considering the year 2017 as the baseline.

National Communications: Lesotho has been submitting its national communication every 4 years starting with the First, Second and Third National Communications reports in 2000, 2013 and 2021 respectively to provide GHG emissions by sources and removals by sinks.

National Communications were prepared under Articles 4 and 12 of the Convention. They presented information on:

- national circumstances;
- national GHG inventory and GHG emission projections;
- impacts and vulnerability to climate change;

- the situation concerning the implementation of climate change response in the country, including measures to mitigate and adapt to climate change and related plans, programmes and projects in these areas;
- financial commitments, technology transfer and international cooperation;
- systematic research and observation;
- education, training and public awareness; and
- constraints, gaps and related financial, technical and capacity needs.

National Communications were prepared with the financial support of the GEF and the active participation of line ministries and agencies.

Biennial Transparency Report (BTR)

Under the Enhanced Transparency Framework, Parties to the Paris Agreement are required to submit biennial transparency reports (BTR) every two years, with the first submission due by 31 December 2024. According to the modalities, procedures and guidelines (MPGs) for the Enhanced Transparency Framework (annex to decision 18/CMA.1), BTR include information on national inventory reports (NIR), progress towards NDCs, policies and measures, climate change impacts and adaptation, levels of financial, technology development and transfer and capacity-building support, capacity-building needs and areas of improvement. Small Islands Developing States (SIDS) and Least Developed Countries (LDCs) may submit the information required for the BTR at their discretion.

Lesotho submitted its first BUR in 2021 and the GHG inventory reported is for 2011–2017. The GHG inventory is consistent with the requirements for the reporting time frame. GHG emissions and removals for the BUR covering the 2011–2017 inventories were estimated using the tier 1 methodology from the 2006 IPCC Guidelines. The proposed MRV system on RE policies in Lesotho will help the country to report the required data on mitigation policies and measures for the BTR.

Lesotho transparently reported in its first BUR information on its existing institutional arrangements relevant to the preparation of its NCs and BURs on a continuous basis. The description covers key aspects of the institutional arrangements, including the legal status and roles and responsibilities of the overall coordinating entity, which is the Ministry of Energy and Environment, and the involvement and roles of other institutions and experts.

There are planned improvements to the information reported in the BUR, including enhancement of the tracking of GHG emissions, mitigation and adaptation actions, and climate finance flows through a new proposed MRV system.

National Transport Policy 2022: This is the key document addressing the national objectives and strategies for Lesotho's transport sector. The National Policy proposes specific steps to reduce dependency on petroleum fuels for its mobility requirements. This would be achieved by actively promoting the use of less energy consuming modes of transport, with an emphasis on increasing the share of users on public transport, reduction of unnecessary travel, improved vehicle technology and better management of transport systems including the road and public transport network. These proposed strategic areas would be implemented through fiscal and non-fiscal measures.

5. Harmonizing, Selecting Methodologies and Standards in the Energy Sector

5.1. Mapping Methodologies for MRV of Energy Sector

In order to monitor progress towards achieving the NDC, particularly in terms of mitigation actions (policies and projects), it is crucial to establish an effective MRV system for measuring the GHG impacts of these mitigation actions. One key aspect of operationalizing MRV is the development of methodological and technical guidelines. The methods for measuring, reporting, and verifying information vary depending on the scope and level of assessment. For example, there are multiple methods available for MRV of GHG impacts from mitigation projects, while for national inventories, the internationally accepted method is the IPCC Guidelines. Various methods and tools are available for conducting MRV (e.g., of emissions or emissions reductions) at different levels (see Table 3). These methods may need to be tailored or new methods may need to be developed to meet specific needs and circumstances. Therefore, a comprehensive assessment was carried out to identify the MRV methods developed for measuring the GHG impacts of mitigation actions. To

Table 3: Methods for MRV of Mitigation Actions

TYPE OF MRV	MEASUREMENT		REPORTING	VERIFICATION[b]
	Method[a]	Data Requirements		
GHG effects	**For mitigation goals and policies:** ■ *GHG Protocol Mitigation Goal Standard* for mitigation goals set by governments ■ *GHG Protocol Policy and Action Standard* for mitigation policies ■ Guidance to be developed for tracking of nationally determined contributions by countries as per the Paris Agreement **For mitigation projects:** ■ Methodological guidance developed under the Clean Development Mechanism (CDM) ■ *GHG Protocol Project Standard* ■ Gold Standard ■ Verified Carbon Standard (VCS)	**For mitigation goals:** ■ National GHG inventory ■ Other data requirements may include data on emissions and removals from the land sector, transferable emissions units (e.g., carbon credits and tradable allowances), depending on the kind of goal **For mitigation policies and projects:** ■ Defined by GHG emissions quantification method and the policy/project type ■ Typically include activity data, emission factors, and socio-economic data	■ To domestic stakeholders ■ To the UNFCCC as part of National Communications, Biennial Reports, and/or Biennial Update Reports[d] ■ To donors supporting the implementation of goals, policies, and projects ■ Any reporting requirements developed in future as per Paris Agreement for post-2020 contributions **For mitigation projects:** ■ To the relevant program (e.g., CDM or emissions trading program) under which the project has been undertaken	■ May be prescribed by domestic laws ■ Under the UNFCCC, review is carried out as part of International Consultation and Analysis (ICA) and International Assessment and Review (IAR) processes ■ The Paris Agreement sets up a technical expert review process for the information provided by countries ■ For credited mitigation projects, verification prescribed by crediting scheme (e.g. CDM, VCS, Climate Action Reserve (CAR))
Sustainable development impacts	■ Nationally Appropriate Mitigation Action (NAMA) Sustainable Development Evaluation Tool ■ CDM Sustainable Development co-Benefits Tool ■ Methods specific to the sustainable development effect concerned ■ May use guidance from relevant standards such as the *GHG Protocol Policy and Action Standard*[c]	■ Defined by the type of sustainable development effect under consideration ■ Typically include socio-economic data related to employment, health, air quality, etc.	■ To domestic stakeholders ■ To donors supporting the implementation of policies or projects	■ May be prescribed by domestic laws
Implementation progress	■ *Climate Policy Implementation Tracking Framework* ■ *Monitoring Implementation and Effects of GHG Mitigation Policies: Steps to Develop Performance Indicators* ■ Guidance from donor entities	■ Data related to performance indicators (such as permitting; licensing; procurement; financing; behavioral, technology, and process changes; changes in GHG emissions)	■ To domestic stakeholders ■ To the UNFCCC as part of National Communications, Biennial Reports, and/or Biennial Update Reports, and future reporting requirements yet to be determined for post-2020 contributions[d] ■ To donors supporting the implementation of mitigation actions	■ May be prescribed by domestic laws or as per donor or project funder requirements ■ Under the UNFCCC, review is carried out as part of ICA and IAR processes ■ Technical expert review for post-2020 actions, per the Paris Agreement

Source: MRV 101: *Understanding measurement, reporting, and verification of climate change mitigation by WRI, 2016*

5.2. Prioritized Energy Sector Mitigation Actions (Polices and Projects)

Out of the 14 mitigation options that were updated, two options were selected for the development of the MRV system for Lesotho's Energy Sector. In line with the methodology outlined in the '**Methodology**' section, certain mitigation actions (projects and polices) were given priority in order to choose the appropriate GHG methodology for assessing the GHG effects of those mitigation actions.

Each mitigation actions can have two selected methodologies: a policy-related methodology and a project-related methodology. The selected methodology can be used to quantify the GHG effects of each policy (using policy-related methodology) or projects (using project-related methodology) under the prioritized options. The selected mitigation actions will be used in the 4th deliverable, "*Report on designing the national MRV system for energy-related policy, including roles and responsibilities and recommendations for improving data collection and reporting for energy sector emissions.*"", to quantify the GHG effects of those identified mitigation actions. In addition, these elected mitigation actions will be used in this report to assess the data availability in order to quantify GHG effects.

Table 4: Summary Of Prioritized Energy Sector Mitigation Actions (policies and projects)

No.	Updated NDC-mitigation option	Policy	Source	Project
6	Solar home systems	• Introduction of Feed-in tariff and feed-in premium policies	National Energy Policy 2015 – 2025: **Policy Statement 14: Investment Framework and Financing**	• Capacity Building • Tax reduction for solar home systems products
		• Introduction of Auctions and tenders to increase RE (National Energy Policy 2015 – 2025)	None	
		• **Introduction of Tax incentive policies to increase RE**	National Energy Policy 2015 – 2025: **Policy Statement 14: Investment Framework and Financing**	
7	More efficient gasoline cars	• Financial incentives to encourage importation of efficient gasoline cars	None	• Capacity Building • Tax increase for inefficient fossil fuel cars • Tax reduction for more efficient gasoline cares
		• Financial disincentives (removal of fuel subsidies, carbon tax increasing for older and gasoline inefficient cars) to disincentivise older and inefficient gasoline vehicles (so efficient gasoline	None	

		cars become even more competitive)[10]		
		• Introduction of Road pricing	Transport Sector Masterplan 2022	
		• Purchase incentives for more efficient vehicles	Transport Sector Masterplan 2022	

5.3. Identifying methodologies for assessing GHG effects of mitigation actions proposed in the updated NDC

After identifying the prioritized updated mitigation options under the 1st deliverable and prioritized mitigation actions, in addition to ICAT Methodologies, other available methodologies / guidance / manuals available for these prioritized mitigation actions were also explored, as shown in Table 5

Table 5: Lists of methodologies available for each prioritized mitigation option.

No.	Mitigation action	Policy / Project	Methodology / Guidance / manual / etc.
1	Efficient Woodstoves	**Project**	AMS-III.B.: Switching fossil fuels --- Version 18.0 AMS-II.O.: Dissemination of energy efficient household appliances --- Version 1.0
2	Biogas plants	**Project**	AMS-I.I.: Biogas/biomass thermal applications for households/small users --- Version 6.0
3	Solar LED Lamps	**Project**	AMS-II.O.: Dissemination of energy efficient household appliances --- Version 1.0 AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems --- Version 8.0
4	LPG Stoves Replacing Wood Stoves	**Project**	AMS-III.B.: Switching fossil fuels --- Version 18.0

[10] ICAT guidance (Chapter 10) covers the policy related to financial incentives however does not cover for the second policy related to carbon tax (disincentives).

			AMS-II.O.: Dissemination of energy efficient household appliances --- Version 1.0
5	Solar Cooking	**Project**	AMS-I.K.: Solar cookers for households --- Version 1.0
6	Solar home systems	**Project**	**ICAT-Renewable Energy Methodology** AMS-I.L.: Electrification of rural communities using renewable energy --- Version 4.0
7	More efficient gasoline cars	Policy	**ICAT Transport Pricing Methodology (Simplified Approach for calculating GHG Impacts of Purchase Incentives)** AMS-III.BC.: Emission reductions through improved efficiency of vehicle fleets --- Version 3.0
8	More efficient diesel cars	Policy	**ICAT Transport Pricing Methodology (Simplified Approach for calculating GHG Impacts of Purchase Incentives)** AMS-III.BC.: Emission reductions through improved efficiency of vehicle fleets --- Version 3.0
9	Restriction of imported used cars	Policy	ICAT Transport Pricing Guidance AMS-III.BC.: Emission reductions through improved efficiency of vehicle fleets --- Version 3.0
10	New bicycle lanes: ***Create secure and attractive urban cycling***	Project	AMS-III.BM.: Lightweight two and three wheeled personal transportation --- Version 2.0
11	Electrification (*number of additional households connected to the grid*)	**Project**	AMS-I.L.: Electrification of rural communities using renewable energy --- Version 4.0 AMS-III.BB.: Electrification of communities through grid extension or construction of new mini-grids --- Version 3.0
12	Solar water heater residential	Project	AMS-I.J.: Solar water heating systems (SWH) --- Version 2.0 AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user --- Version 13.0
13	Landfill gas plant with power production	**Project**	AMS-III.G.: Landfill methane recovery --- Version 10.0

			AMS-III.H.: Methane recovery in wastewater treatment --- Version 19.0
14	Two wheelers	Policy	AMS-III.BM.: Lightweight two and three wheeled personal transportation --- Version 2.0

Assessing the MRV standard and guidance against the nine criteria (mentioned in the Methodology Section): It was found that all updated prioritized mitigation options have at least one possible MRV methodology for quantifying the GHG effects. **ICAT Methodologies** (*Renewable Energy Guide and Transport Pricing*) and other identified methodologies were reviewed against the nine criteria in order to compare the available methodologies for NDC-6 and NDC-7. Table 6 shows the evaluation of the two MRV methodologies available for NDC-6 and NDC-7 against the nine criteria for comparison with other suitable methodologies.

The ICAT RE Methodology recommends using country-specific data from sources such as national institutions related to the energy industry and international agencies (e.g. International Energy Agency or the International Renewable Energy Agency). Where country-specific data is not available for requested parameters, expert judgments and assumptions are acceptable in the ICAT RE Methodology for the assessment.

Table 6 (a): Assessing the MRV standard/guidance for NDC-5: Solar Home Systems (SHS)

MRV Guidance/Methodology	**ICAT-Renewable Energy Methodology[11]**	**AMS-I.L.: Electrification of rural communities using renewable energy - Version 4.0**
Scope or Purpose	This **guidance** provides general principles and concepts, as well as a stepwise method for estimating the GHG impacts of three types of RE policies: • **feed-in tariff policies (including feed-in premiums)** – policies that aim to promote RE deployment by offering	This methodology is applicable to the electrification of a community achieved through the installation of renewable electricity generation systems that displace fossil fuel use, such as fuel-based lighting systems, stand-alone

[11] As per ICAT RE methodology, ex-ante assessment period, which is determined by the longest-term impact included in the GHG assessment boundary, can be "longer than the policy implementation period, and should be as long as possible to capture the full range of significant impacts based on when they are expected to occur".

	long-term purchase agreements with power producers at a specified price per kilowatt-hour (kWh) • **auction policies (including tender policies**) – competitive bidding procurement processes for renewable electricity in the form of either capacity (megawatt – MW) or electricity generated (megawatt-hour – MWh) • **tax incentive policies** – policies under which authorities at the national, subnational or municipal level offer tax incentives for the installation and operation of RE installations	power generators, and fossil fuel based mini-grids. The two categories of applicable project activities are: • Implementation of individual, renewable energy systems such as roof top solar photovoltaic systems; • Installation or extension of an isolated mini-grid which distributes electricity generated only from renewable energy systems.
GHG Assessment Boundary	**The GHG assessment boundary defines the scope of the assessment in terms of the range of GHG impacts that are included in the assessment.** • Reduced GHG emissions from grid-connected fossil fuel–based power plants • Reduced air pollution from grid-connected fossil fuel–based power plants • Increased renewable energy generation from increased solar generation • Increased access to clean, affordable and reliable electricity • Increase in training for skilled workers in solar-relevant sectors • Increased jobs in the solar installation, operations and maintenance sectors	Two parameters are required to be known to determine the baseline: • The amount of renewable electricity utilized by the consumers served by the project renewable electricity generation systems; • The number of consumers supplied with renewable electricity by the project activity.

		• Increased income for households, institutions and other organizations due to reduction in energy costs • Increased energy independence from a reduced imports of fossil fuels	
Estimating Baseline Scenario	**Parameters** Baseline values of total renewable energy without the policy (MW) • Standard solar system size for each type of installation (kW) and total installed capacity targets in eligible sector (i.e. residential, institutional, industrial, commercial and government) (MW • Target for new skilled trainees and workers on the ground per year	**Baseline** • **Renewable energy installed capacity (MW):** Total renewable energy installed capacity (MW) = renewable energy capacity in baseline scenario – renewable energy capacity in policy scenario • **Access to clean, affordable and reliable energy:** Number of installations = total installed capacity target in eligible sector (i.e. residential, institutional, industrial, commercial and government)/ standard solar rooftop installation size for each type of installation/1,000 • **Capacity, skills and knowledge development**: Target for new skilled trainees and workers on the ground per year • Energy demand per capita – $EdpC_t$ (kWh/ capita) • Average annual growth rate of demand – GR_t (%/year) • Technology-specific emission factors – EF (tCO2/MWh)	Baseline emissions for the entire project activity are calculated as: Baseline emissions for the entire project activity are calculated as: $BE_y = BE_{55,y} + BE_{55\ plus,y}$ Where: BE_y = Baseline emissions in year y (t CO_2) $BE_{55,y}$ = Aggregate baseline emissions for consumers that consumed equal to or less than 55 kWh of renewable electricity from project renewable electricity systems in year y (t CO_2) $BE_{55\ plus,y}$ = Aggregate baseline emissions for consumers that consumed more than 55 kWh of renewable electricity from project renewable electricity systems in year y (t CO_2)

Estimating Project Scenario	**Ex-ante**	**Parameters**	• GHG emissions (MtCO2 e) from the electricity grid • Renewable energy installed capacity (MW) • Increase in number of houses/buildings/facilities with access to clean energy • Number of new skilled trainees and workers on the ground • Savings in annual electricity bill for households and businesses ($) • Reduction in fossil fuel imports (t) • Estimated renewable energy addition (MW) due to the policy/ project. • Specific yield of solar PV • Technology-specific emission factors – EF (tCO2/MWh)	Project emissions are considered zero (i.e. PEy = 0)
Availability of emission factor data base			Country specific data or IPCC default value or Average emission factors provided in the ICAT Renewable Energy Methodology	Country specific data or IPCC default value
Monitoring Framework			Available (Chapter 11 of methodology). To monitor progress and estimate GHG effects ex-post, users need to collect data on parameters during and/or after the policy implementation period. Methodology provides the parameters need to be monitored, parameter type, potential sources to collect date, suggested monitoring frequency and addresses the needs of decision makers and other	Title 6 of the CDM methodology outlines the monitoring methodology for various parameters, including possible measurement procedures and monitoring frequency. The applicable requirements for monitoring plan also specified in the "General guidelines for SSC CDM methodologies" are an integral part of the

		monitoring guidelines.
Reporting Framework	**Available (Chapter 12 of methodology)** **Recommended information report** **a) General Information** **b) Objectives of Assessing the GHG Impacts of Pricing Policies** **c) Steps and Assessment Principles** **d) Describing the Policy** **e) Identifying Impacts: How Pricing Policies Reduce GHG Emissions** **f) Estimating Baseline Emissions** **g) Estimating GHG Impacts Ex-Ante** **h) Estimating GHG Impacts Ex-Post** **Monitoring Performance Over Time**	**CDM Standard reporting formats to UNFCC**
Verification Framework	No specific verification framework is mentioned. The methodology allows for the use of any monitoring, reporting, and verification procedures associated with implementing the policy.	**Standard CDM verification procedure**
Strength/Advantages	**Exist proper monitoring and reporting system**	**All the necessary parameters for the calculation and monitoring has been given in the methodology document.**
Weaknesses	• **Not mentioned about a verification framework**	**Require more data and parameters to measure the GHG effects**

Table 6(b): Assessing the MRV standard/guidance for NDC-7 - More Efficient Gasoline Cars

MRV Guidance/Methodology	**AMS-III.BC.: Emission reductions**	**ICAT Transport Pricing Methodology (*Simplified***

		through improved efficiency of vehicle fleets - Version 3.0	***Approach for calculating GHG Impacts of Purchase Incentives*)**
Scope or Purpose		**This methodology is for project activities that aim to improve the efficiency of vehicle fleets (e.g. fleets of trucks, buses, cars, taxis or motorized tricycles), resulting in reduced fuel usage and GHG emissions.**	**This guidance provides general principles, concepts and a stepwise method for estimating the GHG impacts of following types of transport pricing policies.** **• Fuel subsidy removal** **• Increased fuel tax or levy** **• Road pricing (road tolls and congestion pricing)** **• Vehicle purchase incentives for more efficient vehicles**
GHG Assessment Boundary		**The project boundary is the physical, geographical location of the vehicles that are part of the project activity. The spatial extent of the project boundary encompasses the geographical area of the trips of these project vehicles**	**The GHG assessment boundary defines the scope of the assessment in terms of the range of GHG impacts that are included in the assessment.** **• Reduced GHG emissions from reduced vehicle kilometres travelled (VKT) in road transport (LDV/HDV)** **• Reduced GHG emissions from use of less GHG-intensive modes** **• Reduced GHG emissions from more efficient VKT**
Estimating Baseline Scenario	**Parameters**	**Baseline** $SFC_{BL,i,x,y}$: Specific baseline fuel consumption of control group vehicle category i using fuel type x in year y (g/km) $NCV_{x,y}$: Net calorific value of	**Baseline** $F_{i,j,y}$**: Total fuel energy** i **(from gasoline / diesel / electricity) used per mode** j **of passenger transport (road / rail) in year** y $PMK_{i,j,y}$**: Total PKMs travelled per mode** j **of passenger transport (road / rail) in year** y**.** $d_{i,j,y}$**: Vehicle kilometres travelled (with fuel type** i**, mode** j**, in year** y **).**

			fuel type x in year y (MJ/g) $EF_{CO2,x,y}$: CO2 emission factor for fuel type x in year y (gCO2/MJ) $AL_{km,ix,y:}$ Activity level of project in km, of vehicle category i using fuel type x in the year y (km)	$l_{j,y}$ **: Average (per VKT) number of persons travelling in same vehicle (with mode j in year y).** $sfc_{i,j,y}$ **: Specific fuel consumption.** **Average consumption per VKT in municipal, regional or national fleet** **<u>Calculating</u>** $F_{x,i,y}$ ρ_i**: Density of fuel type** i NCV_i**: Net Calorific value of fuel type** i
Estimating Project Scenario	**Ex-ante**	**Parameters**	$SFC_{PJ,i,x,y}$: Specific project fuel consumption of project group vehicle category i using fuel type x in the year y (g/km) $NCV_{x,y}$: Net calorific value of fuel type x in year y (MJ/g) $EF_{CO2,x,y}$: CO2 emission factor for fuel type x in year y (gCO2/MJ) $AL_{km,ix,y:}$ Activity level of project in km, of vehicle category i using fuel type x in the year y (km)	• **Average value of the rebate** • **Vehicle retail price** • **Market Share** • **Per km emission reduction** • **Annual New Vehicle Sale** • **Average life time km per vehicle**
Availability of emission factor data base			**Country specific data or IPCC default value**	**Country specific data or IPCC default value or** factors provided in the ICAT Transport Pricing Guidance
Monitoring Framework			**The applicable requirements specified in the "General guidelines for SSC CDM methodologies" (e.g. calibration requirements,**	**Available (Chapter 11 of methodology).** **To monitor progress and estimate GHG effects ex-post, users need to collect data on parameters during and/or after the policy implementation period.**

	sampling requirements) are also an integral part of the monitoring guidelines specified in the tables 6.1 V4 shall be referred by the project participants	**Methodology provides the parameters need to be monitored, parameter type, potential sources to collect date, suggested monitoring frequency and addresses the needs of decision makers and other**
Reporting Framework	**CDM Standard reporting formats to UNFCC**	**Available (Chapter 12 of methodology) Recommended information report** **i) General Information** **j) Objectives of Assessing the GHG Impacts of Pricing Policies** **k) Steps and Assessment Principles** **l) Describing the Policy** **m) Identifying Impacts: How Pricing Policies Reduce GHG Emissions** **n) Estimating Baseline Emissions** **o) Estimating GHG Impacts Ex-Ante** **p) Estimating GHG Impacts Ex-Post** **q) Monitoring Performance Over Time**
Verification Framework	**Standard CDM verification procedure**	The ICAT Transport Pricing Guidance refers to Validation and Verification Standard by the UNFCCC via gis transport MRV.
Strength/Advantages	**All the necessary parameters for the calculation and monitoring has been given in the methodology document.**	**Exist proper monitoring and reporting system**

Weaknesses	**Require more data and parameters to measure the GHG effects**	The ICAT Transport Pricing Guidance refers to Validation and Verification Standard by the UNFCCC via gis transport MRV. • Focuses on taxes, charges, subsidies and incentives, rather than all transport sector actions.

5.4. Selection of appropriate MRV criteria for determining GHG impacts

The MRV methodologies were analyzed and reviewed using 9 criteria. The most appropriate methodologies were selected based on the strengths, weaknesses, and international recognition.

When the UNFCCC CDM methodology is available to measure the GHG effects of mitigation action, it is used by default as it enjoys a high level of international recognition compared to other methodologies. Based on this analysis, Table 7 provides the selected methodologies.

Table 7: Selected MRV standard/guidance

No.	Mitigation actions	Policy / Project	Applicability of methodology	Methodology / Guidance / manual / etc.
6	Solar home systems	Policy	Feed-in tariff policies, including feed-in premiums	**ICAT-Renewable Energy Methodology**
			Feed-in tariff policies, including feed-in premiums	
			Tax incentive policies	
7	More efficient gasoline cars	Policy	Reduction of Import tax for Gasoline efficient cars	**ICAT Transport Pricing Methodology (*Simplified Approach for calculating GHG Impacts of Purchase Incentives*)**
		Policy	Introducing carbon tax for the vehicles	
		Project	Introduction of Road pricing (also road user charges)	
		Project	Introduction of Fuel taxes and levies	

In addition to selecting appropriate MRV methodologies to quantify the GHG impacts, this assessment also identified the required parameters and the sources of these parameters, as shown in Table 8 below.

Table 8: Summary of the parameters required to quantify GHG impacts and their sources

Selected NDC	Parameters required to quantify GHG impacts	Source
NDC 7- More Efficient Gasoline Cars (*ICAT Transport Pricing Guidance*)	**Baseline Scenario**	
	$F_{i,j,y}$: Total fuel energy i (from gasoline / diesel / electricity) used per mode j of passenger transport (road / rail) in year y	To be calculated
	$PMK_{i,j,y}$: Total PKMs travelled per mode j of passenger transport (road / rail) in year y.	To be calculated
	$d_{i,j,y}$: Vehicle kilometres travelled (with fuel type i, mode j, in year y).	To be calculated
	$l_{j,y}$: Average (per VKT) number of persons travelling in same vehicle (with mode j in year y).	
	$sfc_{i,j,y}$: Specific fuel consumption. Average consumption per VKT in municipal, regional or national fleet	
	ρ_i: Density of fuel type i	ICAT transport pricing guidance.
	NCV_i: Net Calorific value of fuel type i	IPCC default Value
	Project Scenario	
	Average value of the rebate	Budget
	Vehicle retail price	Custom / Vehicle retailers
	Market Share	Custom
	Per km emission reduction	To be calculated
	Annual New Vehicle Sale	Revenue Services Lesotho
	Average life time km per vehicle	Default IPCC

6. Conclusions, Next Steps, Recommendations and Areas of Improvements

Based on the analysis in this report, the ***ICAT- Renewable Energy Methodology*** (ICAT, 2020a) and the ***ICAT- Transport Pricing Methodology*** (ICAT, 2020b) (a *simplified approach to calculating GHG impacts of purchase incentives*) were identified as effective methodologies to quantify the GHG effects of the mitigation actions under the prioritized NDCs**.** In addition to identifying high-priority MRV standards/guidance, this analysis also identified the parameters needed to assess the GHG effects and sources for prioritized mitigation actions.

Among the three policy types in the ICAT's Renewable Energy Methodology Framework, Lesotho Renewable Energy Policy falls in the type of Tax Incentive and Feed-in Tariff and Feed-in Premium policies. Lesotho's transport policies, "Reduction of import tax for gasoline-efficient cars" and "Introducing carbon tax for vehicles," fall under the ICAT policy type "Vehicle purchase incentives for more efficient vehicles" while Lesotho's transport project "Introduction of Road pricing (also road user charges)" falls under the ICAT policy type "Road pricing (road tolls and congestion pricing)," and "Introduction of Fuel taxes and levies" is classified under the ICAT policy type "Increased fuel tax or levy". This implies that Lesotho's Energy Policies, with a focus on transport and electricity, are well-suited for applying the methods outlined in the ICAT's framework for conducting the MRV formulation.

Lesotho has set ambitious goals for reducing GHG emissions in its updated NDC, as well as outlining mitigation actions and options available in the TNCs and NDC. However, the MRV framework for the adopted policies, strategies and action plans is not fully developed. Therefore, this lack justifies the proposal of the ICAT's MRV frameworks.

After examining all the current national frameworks for climate change monitoring and evaluation, the suggested ICAT Methodologies in the guidance manuals are found to be highly relevant to Lesotho's existing MRV framework. The key advantage of these ICAT frameworks is their focus on greenhouse gas emissions, which aligns with Lesotho's Energy Policy. The flexible and optional nature of the framework allows for integration with the existing monitoring and evaluation framework, creating more opportunities for effective and efficient energy policy implementation by building on previous progress. The additional applicability of the ICAT frameworks will provide standardized methods for tracking greenhouse gas emissions and reduction potential within the monitoring and evaluation framework. Furthermore, the frameworks offer potential benefits

without requiring additional investment costs and resources for developing the MRV framework for the energy sector in Lesotho.

Methodological gaps:

- **ICAT transport pricing guidance**: The ICAT Pricing Guidelines can be used to quantify the GHG effects of two policies: Financial Incentives to encourage the purchase / importation of more gasoline efficient vehicles, and financial disincentives to discourage the purchase of older, inefficient fossil fuel-based vehicles. However, these guidelines can only be applied one at a time to quantify the GHG effects. As such, this can lead to double counting of emissions when there is more than one GHG reduction policy in the transport sector
- Although the second NDC does not specifically mention REFIT, it is expected to be part of the implementation of the NDC. REFIT aligns with the NEP policy and its strategy, as well as the objectives of the NDC. The main challenge in assessing the impacts of the REFIT policy is that it has not been implemented yet, so there is no available data to evaluate its effects. Additionally, the RE ICAT guidance alone does not provide the necessary tools for modelling and conducting emission reduction calculations, so it should be used in conjunction with other tools and methods.

Next steps:

- Using the identified MRV standards/guidance, the parameters and their sources, the GHG effects of prioritized mitigation actions will be quantified in the next report (Report on designing the national MRV system, using the ICAT guidance tailored to the energy related policy, establishment of roles and responsibilities and providing recommendations on how to address barriers / gaps / issues to improve data collection and reporting for the Energy sector emissions). The same information will also be used while designing the institutional arrangement for the proposed MRV under the next report.

Lesotho has some experience with MRV through reporting on NCs, BUR, NAMAs and TNA. With the advent of the NDC reporting under the Paris Agreement, additional structures and efforts are needed to establish an effective MRV system that meets ETF requirements. While national development imperatives are in place, improvements in policy and the legal framework will be required for a coordinated effort to undertake proper MRV for GHG Emissions, GHG Mitigation and MRV for Support, which are key pillars of the MRV system.

At the cross-cutting level, institutional arrangements exist for MRV for GHG Emissions and MRV GHG Mitigation, but they need strengthening, involving relevant sectors in the provision of data and undertaking GHG mitigation analysis. Coordination and policy/legal framework need strengthening to ensure that data providers comply and all data for MRV are centralized.

In order to establish an MRV system for Lesotho, it is essential to have strong political backing and secure long-term funding to implement the necessary institutional structures. This will help integrate the transparency framework into the country's climate agenda and sectoral plans. Additionally, capacity building for government staff and ongoing technical support are crucial for continuous improvement.

Recommendations and Areas of Improvement

1) **Institutional arrangement:** Currently, Lesotho does not have a formalized institutional arrangement to regulate MRV activities. Existing MRV activities are conducted through technical working group, which includes line ministries and national entities. Adopting the proposed institutional arrangement will help authorities assign roles and responsibilities to stakeholders, manage the data collection process, calculations and reporting, and improve the verification process; efficiently and systematically.

2) **Establishment of Detailed Implementation Plan with Proper Legislative Backstopping:** Human capacity is required to ensure that the necessary data is collected and reported periodically and systematically. Lack of required human, financial, and technical resources were major barriers in the existing MRV system as well as energy sector projects. Therefore, it is recommended to establish a comprehensive implementation plan for the proposed energy sector MRV system.

   The implementation plan needs to include the following information, which will ensure successful monitor of the progress of the identified mitigation actions.
   - **Definition of goals/objectives** - defines the goals to be accomplished, who will be impacted, and how the plan will improve operations and efficiency.
   - **Allocation of resources** – Identify the resources needed. Ensure availability of adequate resources, including time, finances, and staffing, for successful implementation. During this stage, resources need to be defined, and gaps need to be identified and addressed.
   - **Planning milestone** - Identify tasks, dependencies, and outcomes required.

- **Designation of responsibilities** - Assign roles and tasks to staff members.
- **Identification of contingencies** - Backup plans allow the team to act quickly when issues arise at any phase.
- **Define success** - The first component is the definition of goals. The final is knowing what a successful outcome looks like.

The legislative framework will provide certainty, continuity to the implementation plan, which will ultimately ensure the successful implementation of the project.

3) **Strategy to Integrate Mitigation Measures into National Development Priorities:** The unavailability of required policies, resources, and capacity are barriers to the successful implementation of mitigation actions and MRVs. Aligning mitigation actions with national priorities will enhance the possibility of acquiring resources such as financial, political, and human resources for the successful implementation of the project.

4) **Capacity and awareness building:** Stakeholders should be properly trained to enhance technical skills. They should be educated on the roles and responsibilities of individuals in each institution and the MRV process and procedures. A well-structured training programme should be conducted for the "Existing working group at the ministry". After training the stakeholders, user-friendly manuals can be provided for reference. Performance review meetings on the MRV system should be held annually to reflect on performance and identify challenges in implementing the RE policy MRV system.

5) Establish and Institutionalize Data Management System and QA/QC Procedures.

The quality of all the analysis depends on the availability and quality of the data. Unavailability or lack of data, and quality assurance procedures, were identified as major barriers to the implementation of existing MRV systems. As such, a proper data management system must be developed and institutionalized for the proposed energy sector MRV system. This will ensure continuous data availability for the MRV system. Furthermore, QA/QC procedures also need to be included in the proposed MRV system to ensure the quality of the data and the emissions assessment.

6) **High Level Support:** Support from high-level officials is essential "*because the benefits of monitoring and reporting systems do not necessarily accrue directly to the entities that provide data to such systems. These entities may see few incentives in*

providing data. For this reason and especially in the context of centralized monitoring and reporting systems, a clear mandate and high level support are often needed" (Bakhtiari, Hinostroza and Puig, 2018). Therefore, it is necessary to ensure support from the officials of the MME as well as from other related ministries in order to effectively implement the MRV system. This can be achieved by raising awareness among all government agencies about the needs and benefits of an MRV system.

7) **Regulatory framework revision:** Currently, Lesotho does not have a mandatory GHG reporting system or regulations. This causes difficulties in obtaining activity data due to the unavailability of data, confidential nature of some data, unavailability of designated officers to collect and disseminate data, etc. As part of the implementation of the MRV system for RE policies, the required regulations and mandates for reporting should be developed to empower the "*Existing working group at the ministry*" in order to collect data. This ensures regulated access to confidential data and provides additional assurances for data providers. Introduction of mandatory reporting regulations also ensures that the identified data gaps are addressed for effective reporting to the system and that the MRV system is periodically compiled in a sustainable manner. Any changes in regulations have to be properly communicated to all the relevant stakeholders. At the same time, the existing regulatory framework should be revisited if all the NDC are translated to policies.

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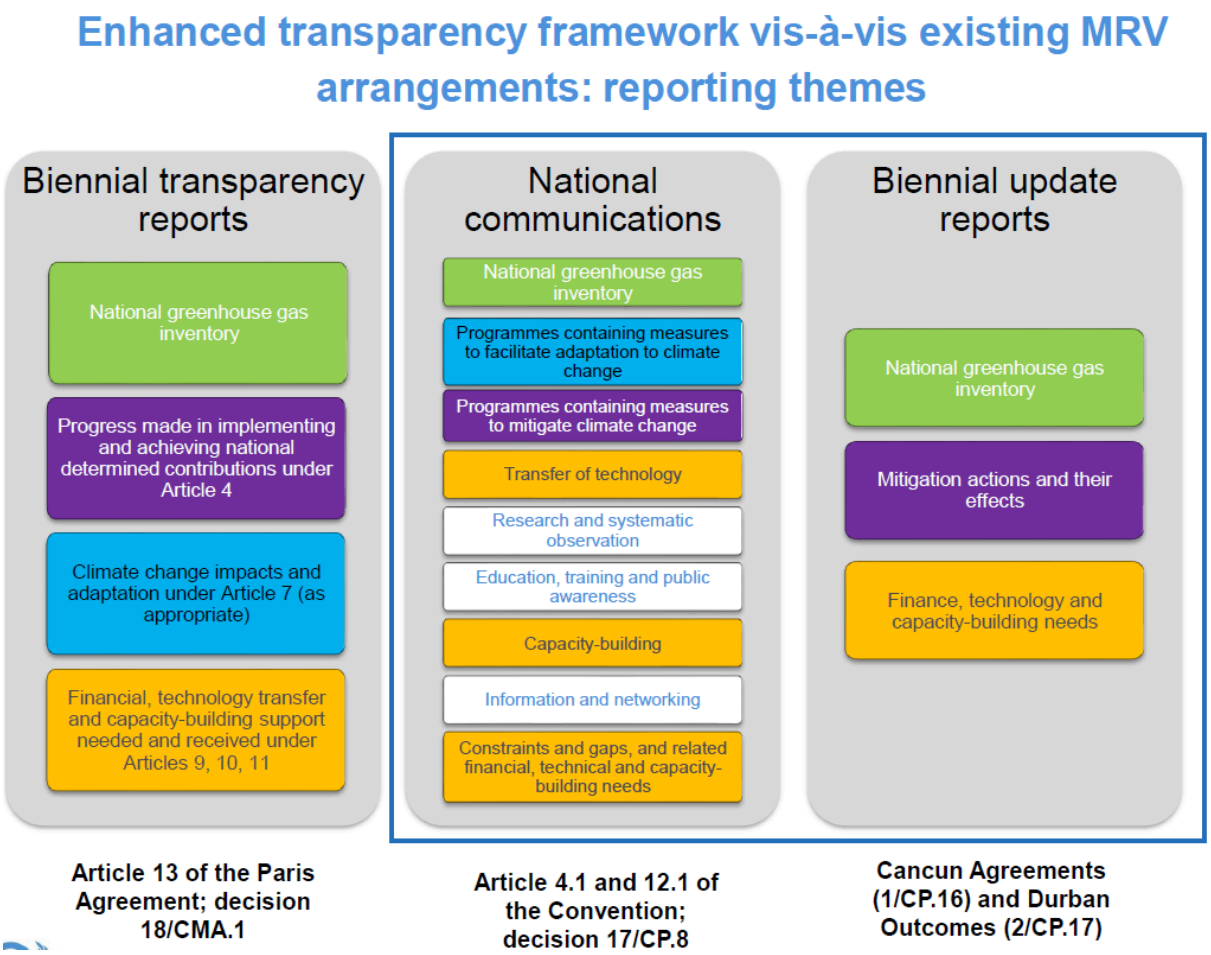
8. Annexes

Annex I: Evolution of MRV arrangements for developing country parties

Key milestones in the development of the MRV framework for developing country Parties

1992/1994	The Convention establishes reporting obligations for all Parties and timelines for the initial national communications from developing country Parties (Article 12, paragraph 5, and Article 4, paragraph 3)
1996	The guidelines for the preparation of national communications from developing country Parties: scope, structure and content (decision 10/CP.2)
1997	The first reporting under the Convention by developing country Parties through the initial round of national communications
1999	The Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) is established to assist countries in their reporting obligations
2002	COP 8 adopted the revised guidelines for the preparation of national communications (decision 17/CP.8) and extended the term of the CGE for the period 2003-2007 with a broader mandate for technical assistance (decision 3/CP.8)
2007	COP 13 agreed to the principle of applying measurement, reporting and verification (MRV) to developing country Parties in the context of undertaking enhanced national/international action on mitigation of climate change (decision 1/CP.13)
2009	CGE is reconstituted for the period 2010-2012 to continue providing technical support and enhancing the capacity of developing country Parties to prepare their national communications
2010	COP 16 defined the frequency of the national communications every four years, and introduced additional elements of MRV (decision 1/CP.16): enhanced reporting in national communications, including inventories, on mitigation actions and their effects, and support received; biennial update reports (BURs) every two years; international consultation and analysis (ICA) of BURs; and domestic MRV of domestically supported mitigation actions
2011	COP 17 adopted the guidelines for the preparation of BURs and the guidelines and modalities for ICA: the first BUR to be submitted by December 2014, consistent with the capabilities and the level of support provided for reporting; least developed country Parties and small island developing States may submit this report at their discretion; the first BUR is to cover, at a minimum, the inventory for the calendar year no more than four years prior to the date of submission; ICA will commence within six months of the submission of the first round of BURs; ICA will include a two-part technical analysis and facilitative sharing of views
2013	COP 19 adopted several decisions on the elements of the MRV framework: composition, modalities and procedures for the team of technical experts under ICA (decision 19/CP.19); general guidelines for domestic MRV (decision 21/CP.19); seven decisions of the Warsaw Framework for REDD-plus; and the term of the CGE continued for the period 2014-2018 with a broader mandate

Annex II: Key elements of the MRV framework



Annex III: Questionnaire for Stakeholder Consultations

The ICAT Questionnaire for Lesotho on Climate Action Transparency Initiative

This questionnaire has been created to evaluate the Government of Lesotho's progress in developing the Measuring Reporting and Verification (MRV)/transparency agreement in accordance with the UNFCCC and the Paris Agreement protocols, specifically within the Energy sector. This includes the establishment of institutional arrangements, as well as the design and implementation of legal frameworks, data collection, reporting, and verification methodologies and procedures among relevant stakeholders to support a strong and ongoing national MRV system. In addition to conducting a thorough literature review, the assessment also involves consultations with relevant stakeholders

in the energy and transport sectors. The findings will be used to standardize methodologies for assessing the greenhouse gas impacts of energy sector policies and actions, and to support the development of a strong and ongoing national MRV system. The interview questions cover various topics, including knowledge of the Paris transparency Agreements, the existence of an MRV framework, expertise in MRV, GHG and gap analysis, use of existing MRV, challenges and barriers to implementing MRV transparency frameworks, and areas of capacity needs.

1. Name and title of person and institution responsible for the completion of the stakeholder consultation

Name:	
Role/Position:	
Organisation / Institution	
Mandate/Activity:	
Contact Information	
Website:	
Phone:	

2. Are you familiar with the requirements of the Paris Agreement MRV/Enhanced Transparency Framework? ***Yes*****____ / *No*__**
3. If **yes**, please explain the requirements: _____

_____

4. Are you aware of the country's Nationally Determined Contributions (NDC) and its mitigation and adaptation actions to reduce greenhouse gas (GHG) emissions? *Yes*____ / *No*____

5. Is your organization involved in MRV (Measurement, Reporting, and Verification) for the following?

   *a)*____MRV for GHG emissions *Yes*____ / *No*___

   *b)*____MRV for mitigation and their potential reduction *Yes*____ / *No*___

   c) MRV for financing and technological transfers *Yes*____ / *No*___

6. If yes, please provide details on your organization's level of involvement, the availability and reliability of data, and the accessibility of information during the development of the MRV:

_____

_____

7. What existing data information systems are currently in place within your sector, and what type of data is being stored? How is this data relevant to MRV (Measurement, Reporting, and Verification)? _____

_____

8. What additional data do you believe is necessary for?
   a) GHG Emissions for the sector: _____
   b) GHG Mitigation analysis: _____
   c) Financing and technical support received: _____

9. What resources are needed to fill in those data gaps? _____
   _____

10. Please provide a description of the data quality in the undertaking.
   a) GHG emissions: _____
   b) Mitigation efforts: _____
   c) Financing and technical support received: _____

11. What measures have been implemented for data Quality Control/Quality Assurance (QA / QC)? _____

12. Are you aware of any instruments, tools, or monitoring plans for tracking the following in your sector?
   a) GHG emissions *Yes___ / No____*
   b) Mitigation measures *Yes___ / No____*
   c) Adaptation measures *Yes___ / No____*
   d) Finance and technical support *Yes____/ No____*

13. If yes, please provide these instruments/tools: _____
   _____
   _____

14. If you answered yes to question 12, have you used these instruments/tools to monitor and track?
   a) GHG emissions *Yes____/ No____*
   b) Mitigation efforts *Yes____/ No____*
   c) Finance and technical support *Yes____/ No____*

15. Are there any existing institutional arrangements in your sector in terms for the development of MRV (Measurement, Reporting, and Verification) for?
   a) GHG emissions *Yes____/ No____*

b) Mitigation measures *Yes____ / No____*

c) Adaptation measures *Yes____ / No____*

d) Finance and technical support *Yes____ / No___*

16. If the answer is yes to question 15, please provide details on the institutional arrangement, including who is responsible for collecting, analyzing, and reporting on the data, as well as who validates the results and to whom they are reported. _____

_____

17. How can the institutional arrangements be improved to enhance the country's ability to comply with the transparency framework for:

a) GHG emissions: _____

b) Mitigation efforts: _____

c) Finance and technical support: _____

18. Is there an existing information storage and exchange platform for your sector that allows for tracking and monitoring?

a) GHG emissions *Yes____ / No___*

b) mitigation measures *Yes____ / No___*

c) adaptation measures *Yes____ / No___*

d) finance and technical support Yes____ / No___

19. Please provide a description of your institution's capacity and any needs related to undertaking MRV (Measurement, Reporting, and Verification) for the following:

a) GHG emissions: _____

b) Mitigation measures: _____

c) Adaptation measures: _____

d) Finance and technical support: _____

20. Please identify areas where capacity can be improved to meet the requirements of the transparency framework. _____

_____

21. Over the years, the Government has submitted National Communications, NAMAs, and NDCs. Please provide a description and, if possible, a review assessment of the quality of these reports in relation to the requirements of the Paris Agreement _____

_____

22. What are your thoughts on the current policy and legal framework for an effective MRV system

_____

23. What additional policy and legal framework would be necessary to establish an effective MRV system for your sector in Lesotho? _____

_____

_

General Comments

_____
_____
_____
_____
_____
_____
_____
_____

Thank you for taking the time to complete this questionnaire. Your input is valuable to us**.**

Annex IV: Stakeholders Targeted by ICAT Project for both Energy and Transport Sectors

SN	Stakeholders Entities
1	Lesotho Meteorological Services (Climate Change and Planning Unit)
2	Ministry of Energy (Department of Energy, Planning Division)
3	Ministry of Transport
4	Lesotho Bureau of Statistics (Environment and Energy Division)
5	Researchers involved in National GHG Inventory
6	Energy Research Centre