# Report on situational analysis

# on

# MRV mechanisms and the climate data analysis

# Transport sector

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## ABBREVIATIONS

| | |
|---|---|
| ACI | Airports Council International |
| AFOLU | Agriculture, Forestry, and Other Land Use |
| BAU | Business as Usual |
| BDQAF | Botswana Data Quality Assessment Framework |
| BITRI | Botswana Institute for Technology Research and Innovation |
| BSDS | Botswana Strategy for Development of Statistics |
| BURS | Botswana Unified Revenue Service |
| BURs | Biennial Update Report |
| CAAB | Civil Aviation Authority of Botswana |
| CCO | Continuous Climb Operations |
| CDO | Continuous Descent Operations |
| $CH_4$ | Methane |
| CMS | Customs Management System |
| $CO_2$ | Carbon Dioxide |
| CORSIA | Carbon Offsetting and Reduction Scheme for International Aviation |
| CTO | Central Transport Organisation |
| DMS | Department of Meteorological services |
| DoE | Department of Energy |
| DRTS | Department of Road Transport and Safety |
| DTU | Technical University of Denmark |
| ETF | Enhanced Transparency Framework |
| EU | European Union |
| GCF | Green Climate Fund |
| GEF | Global Environmental Facility |
| Gg | Gigagram |
| GHG | Greenhouse Gas |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| GWP | Global Warming Potential |
| IAEA | International Atomic Energy Agency |
| ICAO | International Civil Aviation Organization |
| ICAT | Initiative for Climate Action Transparency |
| IEA | International Energy Agency |
| INDC | Intended Nationally Determined Contributions |
| IPCC | Intergovernmental Panel on Climate Change |
| IPPU | Industrial Processes and Product Use |
| ISPRA | Italian National Institute for Environmental Protection and Research |
| LDV | Light Duty Vehicle |
| LED | Light Emitting Diode |
| LUCF | Land Use Change and Forestry |
| M&E | Monitoring and Evaluation |
| MENT | Ministry of Environment, Natural Resources and Tourism |
| MFED | Ministry of Finance and Economic Development |
| MPGs | Modalities, Procedures and Guidelines |
| MRV | Measuring Reporting and Verification |
| MVIS | Motor Vehicle Information System |
| NAMAs | Nationally Appropriate Mitigation Actions |
| $N_2O$ | Nitrous Oxide |
| NAPs | National Adaptation Plans |
| NCCC | National Climate Change Committee |
| NCCSAP | National Climate Change Strategy and Action Plan |
| NCs | National Communications |
| NDC | Nationally Determined Contributions |
| NDP | National Development Plans |
| NICCDIES | National Integrated Climate Change Database and Information Exchange System |
| NIR | National GHG Inventory Report |
| NSDS | National Strategy for Development of Statistics |
| NSS | National Statistical System |

| | |
|---|---|
| NTP | National Transport Policy |
| NTMP | National Transport Master Plan |
| PBN | Performance Based Navigation |
| PGHGIMRS | Philippine Greenhouse Gas Inventory Management and Reporting System |
| PPM | Parts Per Million |
| QA/QC | Quality Assurance & Quality Control |
| RTMS | Road Transport Management System |
| SB | Statistics Botswana |
| SDGs | Sustainable Development Goals |
| SEMS | Smart Emissions Measurement System |
| SHEQ | Safety, Health, Environment and Quality |
| SSC | Significant Safety Concerns |
| STM | Steering Technical Meeting |
| TNAs | Technical Needs Assessments |
| TNC | Third National Communication |
| TOR | Terms of Reference |
| TSM | Towards Sustainable Mining |
| UDP | UNEP DTU Partnership |
| ULP | Unleaded Petrol |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNFCCC | United Nations Framework Convention on Climate |
| UVs | Ultra-violet Spectrometer |
| VAT | Value Added Tax |

## GLOSSARY

**Accuracy**

A relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, so far as can be judged.

**Activity**

A practice or ensemble of practices that take place on a delineated area over a given period of time.

**Activity data**

Data on the magnitude of a human activity resulting in emissions or removals taking place during a given period of time. Data on energy use, metal production, land areas, management systems, lime and fertilizer use and waste arising are examples of activity data.

**Carbon dioxide equivalent emission**

The amount of carbon dioxide ($CO_2$) emission that would cause the same integrated radiative forcing or temperature change, over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs. There are a number of ways to compute such equivalent emissions and choose appropriate time horizons. Most typically, the $CO_2$-equivalent emission is obtained by multiplying the emission of a GHG by its global warming potential (GWP) for a 100-year time horizon.

**Transparency[1]**

Transparency means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of information

**Enhanced Transparency Framework (ETF)**

ETF is designed to build trust and confidence that all Paris Agreement Parties are contributing their share to the global effort through MRV of Implementation of their Nationally Determined Contributions (NDC) in order to track if the global goal of achieving 1.5 to 2 Degrees Celcius is being achieved.

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[1] Glossary to be developed further

## E. EXECUTIVE SUMMARY

Botswana has been a signatory Party under the United Nations Framework Convention on Climate Change (UNFCCC) since 1994 and Paris Agreement since 2015.

Under the UNFCCC, Botswana has been providing international reporting in form of National Communications (3rd 2019) and Biennial Update Reports (2016), National Appropriate Mitigation Action and National Adaptation Plan and Technical Needs Assessment (2004). In the context of the Paris Agreement, Botswana submitted its Intended Nationally Determined Contributions (INDC) in 2015 with the intention to undertake GHG ($CO_2$eq) emissions reduction of about 15% by 2030 relative to its BAU scenario of 2000-2030.

In all the reporting, the key reporting content as expected under the MRV of GHG inventory, GHG Mitigation and Support requirements (Technology transfer, financial support, capacity building) have been alluded to comprising energy (+transport), IPPU, AFOLU and waste.

In the context of GHG Inventory, the transport sector, which is the subject of this situational analysis, is included under energy sector as per 2006 IPCC Guidelines. In the overall picture the transport sector is presented as a significant GHG emitter and hence has been selected as a priority sector for this ICAT initiative, together with the rest of the energy subsectors.

For the 2015 GHG inventory, transport sector contributed 27% to the Fuel Consumption Activities, with the road transport accounting for 98.8% whereas the rest 1.2% arose from the domestic aviation.

Transport statistics that are produced have not been used in the determination of the GHG inventory for the sector and only fuel consumption allocated to the sector have been used in the latest 2014/15 GHG Inventory of the country using Tier 1 of the 2006 IPCC Guidelines. Fuel consumption, as determined by the Department in charge of Energy and sometimes IEA data have been the sources of data for the inventory. These GHG inventory data are the ones reported in the Third National Communication submitted in 2019 and BUR of 2016.

Under this ICAT initiative, Botswana is to create a functional MRV system that meets the requirements of the Enhanced Transparency Framework (ETF) that will inform better if the targets under the Paris Agreement of limiting global warming to 2°C or less, better at 1.5°C are being achieved at global level. Key to this MRV is the transparency in reporting to be convincing that what the GHG emissions and GHG reduction purported to be achieved are reliable and determined in a verifiable fashion. In the same vein, ICAT is designed to help improve the availability and quality of data, analysis of the impacts of GHG reduction measures leading to supporting participating countries like Botswana to promote formulation of efficient, cost-effective policies.

This Deliverable 1 is reporting on the Situational analysis of the status of the MRV systems and activities with regard to the key elements of reporting that include GHG Inventory, GHG Mitigation and Support required and received by the Paris Agreement Parties.

Botswana is currently transitioning from INDC of 2015 to NDC that has a time frame of 2030. The Draft MRV framework for the NDC and the Draft NDC Document are under preparation.

In the case of transport sector, the GHG Inventory shows that the sector contributes 27% to the total national GHG Inventory basing on the 2014/15 National Greenhouse Inventory Report.

The only mitigation option that has been selected for the transport sector is to *Regulate the importation of pre-owned vehicles and regular monitoring of old fleet: To ensure that imported vehicles and old fleet fall within the desired vehicle emissions standards.*

In previous efforts, the TNC and INDC mention the *improvement in public transport* with assumption that the option will reduce 10% of annual mileage of private cars (-3,000km per vehicle per year), resulting in 1,357 Gg $CO_2$ eq in 2030. The NAMA mentions "*Introduce tax on petroleum products and Introduce parking fees and control parking on empty spaces*". In the framework of ICAT Transport Guide, several policy measures can be applicable and combining with other potential options, much more transport options (Refer to Box 1 below) can be applied and impacts analysed for Botswana.

**BOX 1- range of transport mitigation options available to Botswana**

*Source ICAT Transport Guide*

*1.* *Fuel subsidy removal: Removal of subsidies that reduce the price of vehicle fuel below its fair- market cost.*

*2.* *Increased fuel tax or levy: An increase in the tax imposed on each unit of vehicle fuel, which may include general taxes that apply to many goods and special taxes specific to vehicle fuel.*

*3.* *Road pricing (road tolls and congestion pricing): Motorists pay directly for driving on a particular roadway in a particular area. Road pricing has two general objectives; revenue generation and congestion management.*

*4.* *Vehicle purchase incentives for more efficient vehicles: Governments increase the fuel efficiency of the vehicle fleet and/or promote a shift to lower-carbon fuels by providing incentives for the purchase of selected vehicles.*

> *This policy is most applicable to electric, plug-in hybrid- electric, hydrogen-fuelled and other vehicles that are not powered by gasoline or diesel, and is applied by governments through lower purchase taxes, purchase rebates, income tax credits and lower vehicle taxes.*

*Other transport actions that may be of interest to Botswana are :*

*1.* *Vehicle import duty to guide what vehicles may be imported and limit no of imported old vehicles*

*2.* *Non-Motorised Transport in urban areas to limit use of fuelled vehicles and hence pollution and congestion*

*3.* *Traffic regulation measures including technological applications for smooth flow of traffic.*

*4.* *Public transport substitution*

*5.* *Vehicle emissions control*

*6.* *Urban planning*

*7.* *Fuel efficiency standard of internal combustion engines*

*8.* *Subsidy for early scrapping of old vehicles, which can also contribute to reducing air pollution.*

Impact analysis of these measures mentioned and listed above remain un-quantified with unclear assumptions due to limited data and capacity to conduct the impact analysis.

Institutionally, GHG Inventory, Mitigation reduction analysiss conducted under the MENT, precisely under the Department of Meteorological Services (DMS) guided by the National Climate Change Committee. There is a **National GHG Inventory team** that compiles the National Inventory Report (NIR) and also some form of peer review undertaken to ensure that data quality and step by step methods are used.

Various Ministries participate in these MRV aspects-in the NCCC, or GHG Inventory Team or as data providers. In the case of Transport, the DRTS, under the Ministry of Transport and Communications generates most of the road transport data (National vehicle registration and licencing data system which categorize vehicle by make, model and type of fuel used- passenger cars and light-duty trucks, including sport utility vehicles, pickup trucks and minivans.); Department of Energy under Ministry in charge of energy provides fuel consumption allocated to the transport sector. The Civil Aviation Authority of Botswana (CAAB) provides air transport data sets (air traffic data that includes departures, arrivals and overflight movements). Statistics Botswana is compiling quarterly statistics of the transport sector, among other sectors. It is however evident that, both public and private sector entities (e.g. diesel/petrol usage) are collecting useful data for their transport activities but are not shared across the various stakeholders including the lead coordinating agency, DMS. There is thus no central data system that exists to harness all the transport data being generated by the various data generators.

On the Support required and received, there is general receipts for Climate Change activities for Botswana, but transport sector allocation is not disaggregated and the indications are that government budgets are used to collect the transport statistics being collected by the government entities. Support that has been provided for climate change can be accessed from the websites of the supporting donors and IFIs.

Key gaps are that data required for comprehensive determination of GHG inventory for the transport sector are not adequate and whatever is generated are not used to derive higher tier transport GHG emissions. Effort is needed to migrate from Tier 1 to Tier 2 of 2006 IPCC Guidelines using data collected and boosting collection of additional data.

Capacity and data availability and completeness limits the GHG mitigation options that can be analysed for the country for the transport sector, including for those in the draft NDC and presented in the ICAT Transport Guide. There is evidence from the stakeholder consultations that, capacity is required to collect relevant data and that sector coordination is required, hence calling for both financial resources and technical assistance for capacity building.

# 1. INTRODUCTION

## 1.1 CONTEXT FOR THE ICAT STUDY FOR BOTSWANA.

The **Initiative for Climate Action Transparency** (ICAT) was founded to respond to the critical need to support improved transparency and capacity building under the Paris Agreement. ICAT aims to help governments build capacity to measure the effects of their policies and report progress publicly, thus fostering greater transparency, effectiveness, trust and ambition in climate policies worldwide. The ICAT exercise will also assist Global stocktaking towards the goal of 2°C to 1.5°C under the Paris Agreement. This ICAT initiative is piloted with developing countries. Thus far, 40 developing countries have been invited to join ICAT, including Botswana and other African countries and have accepted the offer:[2].

ICAT integrates guidance, capacity building and knowledge sharing to engage countries in the use of a common framework to assess the impacts of their policies and actions and will improve the availability and quality of data and will thus enable countries to promote efficient and cost-effective policies. The Initiative will also provide a platform for countries to share lessons learned and build mutual confidence in their climate actions.

Specific to the participating countries, **ICAT** supports the implementation of domestic monitoring, reporting and verifications (MRV) efforts and goals through:
- capacity building programs of national stakeholders,
- training on MRV concepts, methods and tools,
- iterative testing and application of ICAT Guides, such as the Transport Guide, transformation guide
- continued observation of future UNFCCC transparency requirements and variations in the IPCC Guidelines,
- development of a road map to sustain ICAT outcomes.

Botswana has prioritized the Energy and Transport sectors for its ICAT activities and is being assisted through its Botswana Ministry of Environment, Natural Resource Conservation and Tourism (MENT) by UNEP DTU Partnership (UDP) and Italian National Institute for Environmental Protection and Research (ISPRA), the latter two being the international Implementing partners for ICAT. The focus of this Report is on the transport sector (a parallel effort is being conducted for the other energy sectors) presenting situational analysis of status of the MRV system with regard to complying with the ETF requirements under the Paris Agreement.

## 1.2 SITUATIONAL ANALYSIS OBJECTIVES

The overall objective of the ICAT project for Botswana has been presented in the Inception Report as to support the development and implementation of a functional MRV system for Botswana focusing in this case on the transport sector (and energy sector) that will be coordinated by MENT to support MRV/transparency tracking tool for NDC implementation ensuring synergies between the two priority sectors. The mapped common deliverables for the two sectors are presented in Box 2 below.

The emphasis of this report is on the Situational analysis (Deliverable 1) related to MRV for the transport sector.

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[2] **Africa:** Botswana, Chad, Eswatini, Ethiopia, Ghana, Kenya, Liberia, Morocco, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Tunisia, Zimbabwe

**Asia:** Bangladesh, Cambodia, China, India, Maldives, Philippines, Sri Lanka, Thailand, Viet Nam

**Latin American and the Carribean:** Antigua and Barbuda, Argentina, Belize, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Mexico, Peru, Trinidad and Tobago

**Pacific:** Fiji

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**Box 2. TOTAL DELIVERABLES OF ICAT BOTSWANA (2021-2022)**
1.      Develop Situational Analysis on MRV in Botswana
1. Conducts needs and gap assessment for MRV in the transport sector (synergizing with the energy sector).
2. Strengthening institutional arrangements for MRV in the transport sector.
3. Develop a list of indicators for NDC tracking and monitoring in the Transport sector
4. Develop capacity for data management and impact assessment to track NDC implementation in the transport sectors based on ICAT methodologies and/or other available tools
5. Develop a road map to ensure the achievement and sustainability of ICAT outcomes.
6. Develop an M&E to track implementation of the roadmap

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The status of the existing MRV system in the transport sector in Botswana is focusing on the three main pillars of GHG Inventory, GHG Mitigation and Support required and received to promote implementation of the Paris Agreement in Botswana and ETF related activities in particular. A brief background to ETF and MRV is briefly presented in this report for appreciation of linkages with ICAT and to indicate requirements for MRV.

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

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

Key national development reports that include Vision 2036, NDP 11, 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 Botswana's development objectives in general (and transport objectives in particular) and climate change policy framework and activities.

The analysis has also benefited from benchmarking with some of the countries undertaking ICAT initiatives.

Stakeholder consultations have also been conducted to get views on the data sets being collected, gaps realized that will require resource allocation and completeness of data for MRV in the transport sector.

Key stakeholders consulted that were important to the transport sector were DRTS (road transport statistics), CAAB (aviation statistics), Botswana Railways (rail statistics), Department of Energy (Fuel sector allocation-energy balance), Botswana Oil (petroleum fuel supply statistics), BURS (Customs statistics- including vehicle imports) private sector transport companies -UNITRANS, large fuel consumer companies – Debswana, Statistics Botswana (Overall national statistics, including for transport).

In considering analytical capacity for MRV for the 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 transport Guides. Stakeholders were also asked to indicate what capacity and resources they will require to adequately contribute to a functional MRV in the transport sector.

The main outcome here are the identified gaps in data sets, capacity, institutional framework and coordination and resource requirements.

## 2.	THE PARIS AGREEMENT AND TRANSPARENCY FRAMEWORK

A compressive presentation of the Paris Agreement origin, background has been presented in the energy sector report. In this transport chapter only key linkages of ETF and requirements for MRV are presented including what constitutes the MRV and expected outcomes of a functional MRV system. Some benchmarking with activities in other countries conducting ICAT initiatives have been summarized for lessons to map gaps and also best practices.

### 2.1 ETF AND MRV

**Enhanced Transparency Framework**

Specifically, the ETF guides countries on reporting their greenhouse gas emissions, progress toward their NDCs, climate change impacts and adaptation, support provided and mobilized, and support needed and received. The enhanced transparency framework also includes processes for technical experts to review reported information and a multilateral peer review where countries can ask questions of one another.

Under the current international MRV Framework, all countries are submitting their National Communications (NCs) every 4 years (including the GHG inventory), Biennial Update Reports (BURs) every 2 years; present their NAPs and NAMAs and TNAs. (Figure 1)

NCs are mainly to report on measures and policies undertaken to address climate change in the country. Besides information on GHG inventories, NCs are providing information on national circumstances, a general description of what steps and actions the country is taking or planning to mitigate and adapt to climate change, describing gaps and constraints and to state any needs for technical, financial or capacity building support.
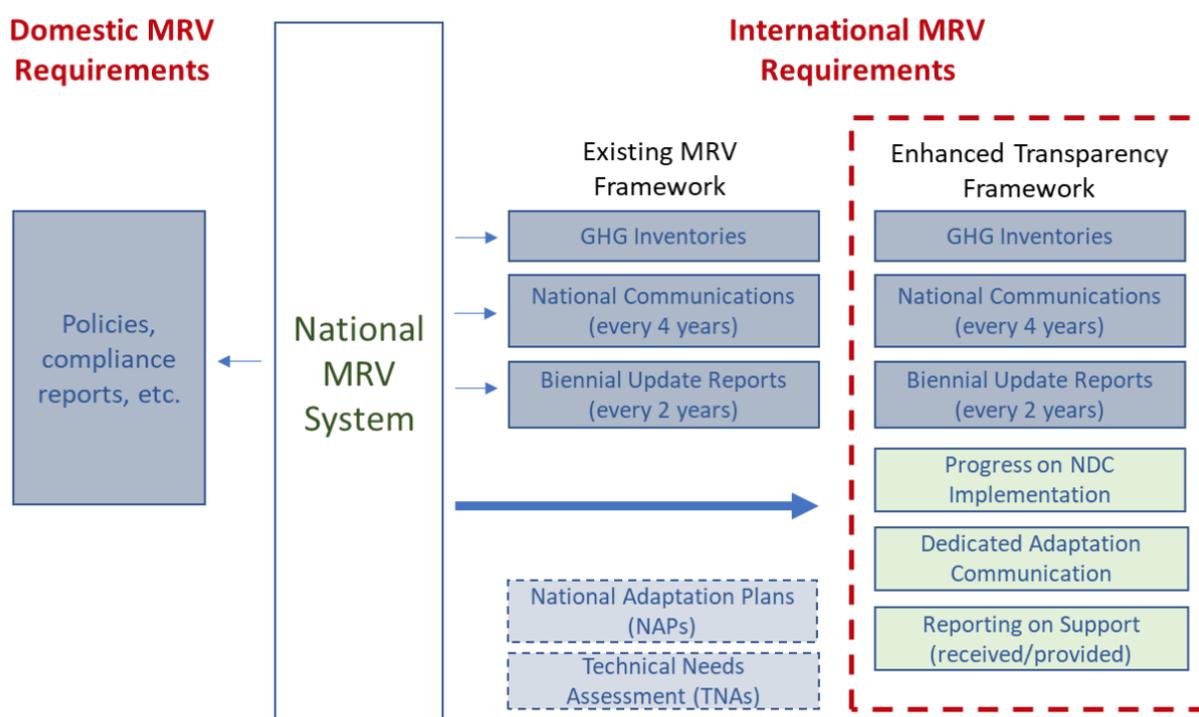


*Figure 1 – General Requirements (International and domestic) for national MRV systems*

**Figure 1  Existing and ETF required MRV Systems (Marr et al. 2018)**

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 (Figure 1). According to the ETF requirements, the main purpose of the NDC 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 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 which can benefit governments in data gathering, transparency, and verification is to create a national level centralized data and information reporting system which considers the linked MRV system. At present, there are often different data management systems used for different mitigation actions or on sub-sectoral and sectoral level. Creating this linkage to a master system on 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]

## 2.2 KEY ELEMENTS OF THE MRV FRAMEWORK AT THE INTERNATIONAL LEVEL

### 2.2.1 MRV of GHG emissions

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 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 GHGs emission by sector for purposes of determining the performance of the parties in attaining their emission reduction targets. Scope of the MRV emissions can be undertaken at four levels being:
- National
- Sub-national
- Sectoral, and
- Facility levels.

Based on the GHG Manual, the concept of transparency includes the provision of activity data, emissions sources, emissions factors and accounting methodologies that are fully documented and disclosure for verification purposes. The information provided should be enough 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 being $CO_2$, $CH_4$ 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 Giga grams (hereinafter Gg), activity data of e.g. the following:

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

### 2.2.2 MRV of mitigation actions

Involves assessing (ex-ante or ex-post) GHG emissions reductions and/or sustainable development (non-GHG) effects of policies, projects, and actions, as well as monitoring their implementation progress. It also involves assessing progress toward mitigation goals. 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 introduction of 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 results from those actions.

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[3] https://www.transparencypartnership.net/system/files/document/GH_New%20Climate_MRV%20in%20Practice_2018.pdf

The Sustainable Development Goals (SDGs) and targets are integrated and indivisible, global in nature and universally applicable, and are designed to consider different national realities, capabilities and levels of development and 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.

### 2.2.3 MRV of support

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. [4]

### 2.2.4 MRV System

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 entails collection through measuring, data analysis, reporting of results and verifying the results though sampling and spot-check.

The most significant issues to 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 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 the main, a monitoring plan gives 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.

### 2.3 BENCHMARKING

As already alluded to, currently there are 40 nations in four regions across the globe that have welcomed and accepted the offer of ICAT. These countries were selected based on their interest to upscale their current MRV capacity and their climate vision and sustainable development goals.

The ICAT 2020 report reveals that at the moment there is no cross-cut methodological framework to measure, report and verify the progress made using the GHG mitigation measures that is suitable for all fraternities and countries. The main objective of the ICAT support is hinged upon its stocktaking and gap analysis seen through consultations conducted with the country`s need in mind.

Experiences and focus of a few countries participating in ICAT are presented below.

**Philippines Experience**

The Philippines has a similar status with UNFCCC and NDC development status as Botswana. Its situational analysis is highlighting the various climate policies and actions and its related MRV/transparency approach. The Philippines is in the process of moving from INDC to NDC, initial document review reveals that the Philippines has already tried to address the initial requirements of ETF through its initial work on MRVs.

The country established policy mechanism for GHG inventory via Philippine Greenhouse Gas Inventory Management and reporting System (PGHGIMRS) and the National Integrated Climate Change Database and Information Exchange System (NICCDIES).

In addition, the ICAT for Philippines project was designed to assess and help build the Philippines` institutional capacity on understanding the different methodological frameworks available, help develop tools and implement appropriate MRV/M&E tools for mitigation, adaptation, and climate finance.

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[4] https://ledsgp.org/wp-content/uploads/2016/09/Understanding-measuring-reporting-and-verification-of-climate-change.pdf

The Transport sector also registers the road transport as the main GHG emitter. Some earmarked GHG mitigation options that will be analysed for impacts are deployment of biofuels (Bioethanol (8,3%) and biodiesel (2%)), Buses and BRT[5] and Compressed Natural Gas[6].

Other Mitigation actions proposed include, congestion changing, driver training, Electric Light Duty Vehicle, Electric Motorcycle and tricycle (MC and TC), Euro IV MVIS which encompasses MVIS with the implementation of EURO 4 standards of new LDV, Light Duty Vehicle Efficiency, Jeepney Modernization, Motor Vehicle Inspection Systems (MVIS) and rail network positive capacity building and expansion.

Moreover, road maintenance is significant because poor road quality increases vehicle operating costs and associated fuel use. Also two-stroke replacement is another proposed measure because two stroke engine is a type on internal combustion engine which completes a power cycle with two strokes (up and down movements) of the piston during only one crankshaft revolution, causing more emission as compared to a four-stroke engine.

**Malawian Experience**

Malawi, with support from the EU and UNDP, has concluded revision of its NDC and the transport sector was one of the significant sectors chosen for a comprehensive analysis. The transport sector in Malawi contributes to around 45% of energy related emissions. Therefore it was paramount to undertake a deep GHG analysis of the sector in a bid to support low carbon transport pathways.

The transport expansion and development was analysed in alignment with National Transport Policy (NTP, 2025), National Transport Master Plan (NTMP) which runs from 2017 to 2037. These contributed to inform baseline GHG emissions.

Mitigation options in the transport sector mainly focus in minimizing the amount of petroleum utilized in the road transport segment through application of technologies that include: fuel efficiency, fuel switch, renewable energy and technologies for vehicle decongestion. The NDC zeroed in on the following GHG mitigation options:
   a) Shifting mode of transport from private to mass transportation.
   b) Shifting mode of transporting freight-from road to rail.
   c) Increasing blend of fuel grade ethanol with petrol as transportation fuel.
   d) Blending biodiesel with diesel as transportation fuel.

Assessment of Data Management Systems and proposed areas of Improvement

Direct GHG emissions from mobile sources come from the combustion of various types of fuels. The direct GHG emissions cover carbon dioxide , methane and nitrous oxide. The rate of emissions ( also referred to as emission factor) depends on the fuel type, vehicle size and technology, distance travelled and the driving conditions which depends on road conditions and traffic.

There is realization that it is crucial to have as much data as possible about the emission source so as to migrate to 2006 IPCC Guidelines, Tier 2 and Tier 3. Hence greater details will be required in the development of mitigation measures.

The variables that are recommended in the 2006 IPCC guidelines for undertaking GHG national Inventory, in the energy sector, mobile transport category are as follows:

   o Fuel type ( gasoline, natural gas, diesel) considering, if possible, fuel composition (studies have revealed decreasing fuel Sulphur level may lead to significant reduction in N2O emissions).

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[5] Changing and expanding public transport in Metro Manilla and other cities nationwide including C5 and Manila bus rapid transport systems: express buses with dedicated lanes and facilities ;ITS that support bus monitoring , priority signaling and remote traffic enforcement.

[6] 15000 GNG buses on the road is the target for 2030 . New GNG buses are assumed to be purchased in place for conventional diesel buses. The assumption is the GNG buses meet the same emission standards as the benefits could be higher if these were required to meet Euro VI equivalent standards.

       o   Vehicle type( i.e. passenger cars, light trucks , heavy trucks, motor cycles).

Other IPCC guidelines for undertaking GHG emissions include Emission control technology considering the presence and performance (e.g. as function of age) of catalyst converters (e.g. typical catalysts convert nitrogen oxides to $N_2$, and $CH_4$ into $CO^2$). The impact of operating conditions (e.g. speed, road conditions, and driving patterns, which all affect economy and vehicle systems performance. Consideration that any other fuel emission factor estimates tend to have a high level of uncertainty, given the wide range of engine technologies and varied sample sizes associated with existing studies.

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## 3. BOTSWANA CONTEXT TO MRV

### 3.1 SOCIO- ECONOMIC AND PLAN POLICY FRAMEWORK GUIDING THE MRV FRAMEWORK

### 3.1.1 Vision 2036

Botswana's Vision 2036 is a transformational plan which set forth the nation`s goals and aspirations for the country. In the Vision, global warming and climate change are recognized as potential threats to the country`s desired economic growth and development. Therefore the Vision has taken care of climate vulnerability assessments, adaptation and mitigation into the government`s development planning.

On the mitigation side, Botswana aims for a low carbon footprint, with a society that is aware of and resilient to the consequences of climate change. The mitigation target of 15% by 2030 is mentioned and is to be achieved through NDCs and implementation of other appropriate mitigation measures (GoB, 2015).

### 3.1.2 NDP 11.

The NDP 11 is the first Plan towards the implementation of Vision 2036 and has as its broad objectives: strengthening implementation and effectiveness of policies and adding value. The set of priorities for the period 2017-2023 include eradicating extreme poverty, and reducing inequality; strengthening human development outcomes; generating diversified export-led economic growth and employment creation. It further seeks to manage the trade-off between income generation and environmental management.

NDP 11 is also aligned with the world working towards 2030 Agenda for Sustainable Development. Linked to some form of MRV is that NDP11 has a Monitoring and Evaluation component that may contribute to measurement of transformation change in terms of achievement of SDGs.

Related to the broad objective of addressing climate change, the NDP 11 recognizes the significance of developing a National Climate Change Strategy and Action Plan ( NCCSAP).

The Transport Sub-sector objective is targeted at construction and maintenance of the transport related infrastructure such as roads, rail, and air basing on principle of cost recovery with users sharing the costs of building and maintaining these infrastructure. According to GoB (2017) these would address some of the challenges experienced during NDP 10 that include:

- Old locomotives and rolling stocks, which have to be extremely maintained at high costs;

- The Significant Safety Concerns ( SSC) raised by the International Civil Aviation Organisation Audit resulted in the country not being able to license prospective airlines. The concerns were addressed to avoid the country being blacklisted. Periodic breakdowns of the Air Botswana aging fleet resulted in poor performance of the airline;

- Projects involving upgrading of CTO workshops continued to be postponed, due to budgetary constraints. The upgrading of the workshops will result in minimizing the time that vehicles take off the road waiting for repairs, either in-house or  subcontracted to the private sector; and

- Lack of integration of the transport sub-sectors resulted in the silo planning by the subsectors with little scope by the subsectors with little scope of interface, thereby losing opportunities for creating synergy and optimization between the transport sectors.

### 3.2 CLIMATE CHANGE FRAMEWORK

### 3.2.1 Botswana Climate Change Response Policy

The Botswana Climate Change Response Policy (2019.b) recognizes the need to align with the boundaries of the UNFCCC which the country is Party to, with 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 the GHG emission reductions and co-benefits to the national economy.

Another important aspect that is emphasised in the policy is consideration of carbon markets and trading. Inevitably, carbon trading calls for a robust MRV system to ensure that emissions reduction can be measured and verified. Consequently, this will require that the government build and maintains its carbon emissions accounts which are transparent as per the Paris Agreements.

The policy recognizes that in terms of greenhouse gas 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.

Institutionally, the policy calls for the establishment of a National Climate Change Unit to implement, monitor and ensure compliance with climate change requirements as defined by the domestic and international framework.

Specific to transport is that the sector is likely to increase its greenhouse gas emissions potential as a result of the increase of motor vehicles on the roads. Putting into consideration 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 whilst enhancing its performance. In a bid to institute climate related reforms, the climate change policy was set to promote as stipulated in GoB (2019.b):
- Development of a public transport network that is reliable and can advocate for GHG emission reduction.
- Enhancement of the safety and operational standards for public transport and roads to attract commuters into using public transport.
- Setting guidelines for the contribution of the aviation sector towards reduction of GHG emissions
- Establishment of legal frameworks for the transformation and regulation of climate related transport emissions.
- Formulation, implementation and enforcement of emission standards for motor vehicle emissions.

### 3.2.2. Nationally Appropriate Mitigation Actions.

Botswana's Nationally Appropriate Mitigation Actions have paid particular attention to the energy fraternity both mobile and transformation energy sectors, and the waste sector.

An enhanced public transport sector is a mitigation project mentioned in Botswana's NAMA. Botswana consumes a huge quantity of petroleum products which can be more than 800 million litres ( diesel and petrol) as a result of the utilization of private vehicles. Therefore enhancing the public transport area is expected to minimize GHGs emissions in Botswana. It is forecasted that by 2030, enhanced public transport network would lead to emissions reductions of approximately 1,350 Gg $CO_2$ eq.

The table below shows proposed instruments for viable implementation and operations of proposed mitigation projects related to the transport sector (Table 1).

**Table 1 Transport GHG Mitigation Options proposed in the NAMA (2016)**

| Policy Instrument | Anticipated impacts |
|---|---|
| Introduce tax on petroleum products | • Increase in the cost of using private vehicles<br>• Discourage individuals to use large engine vehicles. |
| Introduce parking fees and control parking on empty spaces | • Increase the cost of using vehicles<br>• Increase the number of people using public transport |

Source: GoB (2016)

These mitigation measures and other sector measures are counted to contribute to the national target of GHG emissions reductions of 15% by 2030 based on 2010 as the base year.

**National Communications**

The GoB has been submitting its national communication every 4 years starting with the First, Second and third National Communications report in 2000, 2012 and 2019 respectively with content as already alluded to.

Ultimately, the National communications informed the development of the NDC with emphasis on the adaptation and mitigation.

Some of the recommendations from the third national communication on implementation of the adaptation and mitigation as reported in GoB (2019.a) include:

- Develop a national mitigation strategy and action plan that will guide the implementation and operation of the mitigations in the country. The national strategy and action plan should be used to implement the NAMAs and INDCs.
- Develop resource and financial mobilisation strategy for the climate mitigation sectors with emphasis of using funds collected from the petroleum sector and using it to finance and subsidise solar appliances and projects.
- Strengthen collaboration between Climate Change focal point, Department of Energy, BITRI and BPC to facilitate a platform for coordinated implementation of the project.
- Conduct a thorough financial and economic analysis for mitigations to achieve cost-effectiveness. For instance, it is cost-effective to install solar streetlights or building a mini solar PV station and power conventional LED streetlights.
- The government to play an active role of encouraging Public Private Partnership and act as a guarantor for mitigation projects.
- Removal of all the barriers by introducing the recommended policy instruments.
- In relation to the transport sector, the TNC only mentions *Improved Public transport.*

### 3.2.3 Carbon tax for Botswana

The Government of Botswana is exploring the feasibility of developing a carbon tax to support the mitigation of greenhouse gas (GHG) emissions nationally with support of the World Bank (WB)[7]. In addition to achieving climate mitigation objectives, the relative strengths of a carbon tax include its potential for raising government revenue, along with its relative administrative simplicity compared with other instruments.   This is with the recognition that electricity/heat (55%) and transportation (26%) contribute the most to the GHG NIR (2014/15) making these energy subsectors targets for carbon tax.

Botswana currently levies a tax of 31 thebe per litre of petroleum but does not impose VAT on fuel. The Minister of Finance and Economic Development proposed increasing this tax by 1 pula in February 2021.

The development of the carbon tax with WB support is work in progress and hence has no firm proposals  but will be relevant for the transport sector particularly petrol (and perhaps diesel) and if applied downstream (pump level) may influence use of the private vehicles depending on how the carbon tax will be structured. Other countries in the region such as Zambia, Namibia and Zimbabwe have already been operating carbon tax regimes targeting the transport sector, although there was no clear evidence that the revenue raised was used to mitigate impacts of climate change and GHG emissions.

### 3.3 TRANSPORT SECTOR FRAMEWORK

### 3.3.1  Transport policy.

Botswana formulated Integrated Transport Policy (ITP) and the policy aims at improving the transportation system in the county. The ITP calls for reduced dependence on road transport and proposes the integration of aviation, road, riverine and other alternative modes of transport such as fuel pipelines.  Botswana`s road traffic volumes grow daily and this could be avoided through integrated transport planning with other economic sectors as well. The ITP also calls for reduced dependence on rail transport.
The ITP also recognizes the fuel tax regime in place of levying a tax of 31 thebe per litre of petroleum without imposing VAT on fuel and the Minister of Finance and Economic Development's proposal to increasing this levy tax by 1 pula in February 2021.

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[7] WB pers communication

The transport sector falls under the energy sector and classified as mobile sources. It can be categorized as rail, road, air and water. The Draft Energy Policy indicates that the sector relies on imported petroleum fuels (well over 800million litres per annum) and is the major consumer of petroleum products in Botswana (38%), of which more than 90% of petroleum is used on road transport. All rail traction is diesel powered and accounts for 3 % of diesel usage in the transport sector. Road and air transport and associated transport fuels are consumed primarily as intermediates and benefit from petroleum products being regulated where appropriate.

According to the Republic of Botswana (2011), the objectives of the mitigation action stipulated in the ITP focus on:
- Improving the public transport systems which will encourage the public to use public transport systems.
- Reducing high import bill from petroleum imports
- Reducing traffic congestion in the capital city.
- Reducing GHG emissions and contribute to global efforts to achieve the Paris Agreement target of keeping global temperature from above dangerous levels.


### 3.3.2 Energy-transport section.

Botswana`s energy sources consist mainly of fuel wood, petrol, diesel, aviation gas,  electricity and Liquefied Petroleum Gas (LPG). Biogas, solar, and biodiesel constitute a small fraction, about 1%.

All the petroleum based fuels are imported hence due to projected economic growth and population increase Botswana's GHG emissions are expected to increase with transport and energy sectors experiencing the vast obvious increase. The major energy consumers in Botswana are, residential, transport and industry at 42, 27 and 23 % respectively (SNC,2011). In 2005, the Energy Sector accounted for  proximately 73,8% of total national direct GHG emissions (without  LUCF).

 A combination of direct and indirect GHG emissions from energy use in the transport subsector is the cause for this. Vehicles themselves are also labelled as direct emissions or  tank-to-wheel emissions sources. Production of transport fuel including biofuels, fossil fuels, and electricity are what makes indirect emissions and this is categorized under the energy sector.

Transport emissions come from rail, road, domestic shipping, and domestic aviation. Between 2015 and 2030, 85% or above of transport sector GHG emissions and energy demand is anticipated to come from the road sector. It is significant to know that while trucks and UVs constitute a small percentage of the speculated vehicle demand, the average utilization is high leading to a larger part of vehicle activity. The intensive utilization combined with high energy needs per kilometre travelled is what constitutes to a greater portions of final energy demand and high GHG emissions.


### 3.3.3 Road Traffic Act.

It is an Act to provide for the registration and licensing of motor vehicles; for the creation of offences relating to the use of vehicles and for the regulation of traffic; and  related matters that may result in GHG emissions reduction in the transport sector. However, the Ministry of Transport and Communication at this juncture is drafting policy and legal guidance that will introduce emissions regulations[8].

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[8] Road Traffic Principle Legislation, 2021, Blackhall Publishing
https://botswanalaws.com/alphabetical-list-of-statutes/road-traffic

## 4.0    SITUATIONAL ANALYSIS ON BOTSWANA MRV SYSTEMS

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

### 4.1    MRV FOR GHG INVENTORY

Two of the most widely applied approaches to estimate GHG emissions from transport sector are: Top-down approach and Bottom-up approach these align with Tier 1 and Tier 2 and 3 respectively in the context of the 2006 IPCC Guidelines.

The **Top-down** approach is based on final energy consumption. This approach estimates final fuel

consumption in the transport sector based on fuel sales. The final fuel consumption is then multiplied by $CO_2$ emission factor for each fuel type to estimate the total emissions. As top-down approach does not take into account the activity level data, it is usually undertaken at the national level or at sectoral level (GIZ, 2016).

The **Bottom-up** approach, takes into account transport activity levels (A) such as the mode share (S), fuel intensities, (I) and emissions per unit of fuel by mode and type (F). The bottom-up approach gives a detailed overview of the emissions by vehicle type, fuel type, travel extent, trip purpose, etc. and hence can be used for evaluations of specific projects and policies. Through this approach, the impact of specific investments in transportation systems can be observed (Schipper, Fabian, & Leather, 2009) and hence transportation measures targeting vehicle types in the transport sector can be analyzed.

GHG NIR for the transport sector has been based on the Top Down/Tier 1 approach using fuel allocated to the sector.  Although some activity data such as transport modes (air, rail, road, water) and related tonnages and passengers, road transport vehicle types (e.g. passenger cars, light trucks, buses, heavy trucks, motor cycles and fuel used (petrol, diesel) are collected and compiled Quarterly, these have not been used in deriving Tier 2/Tier 3 GHG emissions.

The energy sector is the largest emitter of GHG in Botswana. 71% of Botswana's GHG emissions reported in 2015 are attributed to the energy sector. The largest two categories are electricity generation and road transport, constituting 55% and 26% respectively. Thus, the highest potential for GHG mitigation lies within these sectors, especially in the shift to renewable energy sources for electricity generation.

Emissions from road transport constitute emissions from the combustion of fuel for transport from 2006 to 2015, the national vehicle stock increased by 122.03 percent, growing at an average annual rate of 10.0 percent. The most notable growth is in privately owned passenger vehicles, which is accelerated by the increase in imported pre-owned cars from Asia and the United Kingdom which are proving to be more affordable to the low-income market. Privately owned vehicles constitute about 97% whilst only 2.6% are government owned.

The key challenge comes from the increasing number of imported vehicles, old fleet, and the poor public transport system. These are the key areas to target for emission reductions in road transport.

### 4.2    MRV OF MITIGATIONS

The INDC 2015 reports states that a survey for transportation usage in the country, revealed that most of the urban commuters use private cars within the cities.  The INDC 2015 report further outlines a number of measures that could reduce private car usage. These include:

  i. improving the attractivity of public transport by;
    ● substituting the mini-buses with large buses
    ● improving the buses routes with a timetable at each bus station and increasing the punctuality of the buses
  ii.encouraging the use of non-motorised transportation by;
    ● improving cycling paths
    ● introducing shower facilities at workplaces

Based on these measures, the INDC 2015 report projects that the cumulative effects of the improved transport system and cycling will result in reduced mileage of approximately 3000 km per vehicle per year. Total

reduction in $CO_2$ emissions is estimated at 1,347.8 Gg $CO_2$ eq by 2030, 5 Gg $CO_2$ eq for Methane and 4.4 Gg $CO_2$ eq for $N_2O$ by improving the transport system.

A feasibility study that was to inform GHG reduction from improved public transport completed in 2016 is still awaiting cabinet approval and all the other measures are depending on this approval.

The Ministry of Transport and Communication is currently drafting a Transport Policy and a Road Traffic Act exclusively to introduce emissions regulations. Since these are still under development, copies could not be shared for purposes of this assignment. A copy of the 2016 feasibility study could not be shared either.

The measures in the transport sector are formulated in rather general terms with unclear assumptions for baseline and penetration rates of the measures. Available data are also not adequate and well streamlined to inform GHG Mitigation impacts of several transport measures that can be implemented in the country such as those in the ICAT transport guide and other measures listed in the various climate change framework documents above.

An attempt at analysing data requirements for the ICAT Transport Guide measures and other are presented in Annex 1.

Out of the 12 listed mitigation measures proposed in the NDC Draft, only one is for transport and its GHG reduction potential is not quantified.

## 4.3     MRV OF SUPPORT

MRV support presents country resource needs priorities, plans, and strategies (Finance, Technology transfer and capacity building) to perform better in both UNFCCC and meeting the Paris Agreement ETF-MRV.

**Of immediate relevance is that Botswana  has received resources from GCF to establish the**  National Designated Authority (NDA) in 2018 and has started undergoing capacity building.   The total amount indicated by March 2020 for Readiness was U$787,000 for readiness with US$209,400 already disbursed. Same resources are the ones that have probably been utilized for preparation to undertake TNA for the energy, water, and agriculture sectors revising the TNA 2004.

Botswana never benefited from CDM projects as none were registered. Some resources were deployed for preparation of projects and capacity building of project proponents, but may not have been properly documented.

The NDC being developed has indicated tentative GHG reduction potentials but has no resource requirements, both conditional and unconditional. The assessment of national resources and required assistance is currently ongoing. Preliminary outcomes point to towards limited national means for the implementation and the need for substantial international support to achieve the mitigation target.

GEF provided Botswana with US$7.9 million between 2003 and 2018 (GEF 1 to 6) and in GEF 7 indicated support of US$7.3 million with US$1.0 million allocated to climate change initiatives.

The country also has access to other climate financing through bilateral and development partner provisions such as UNDP and GIZ.

In all these resources that could be itemized, there is no breakdown of the amounts allocated to the energy or transport sector.

It appears that all transport statistics are being supported by government budgets.

In that regard data for financed projects by GCF is available and accessible from the GCF webpage as with other multination's who have extended funding to Botswana, data easily available and accessible on their webpages. There is a need for the country to define/come up with and show how climate change indicators can be used to detect interventions for domestic funded development projects as government is already doing something but, because of that missing link, climate finance data is not yet gathered in a centralised manner.

## 4.4 INSTITUTIONAL CAPACITY TO IMPLEMENT THE MRV

Botswana has systematically and progressively concentrated its effort in building an interfaced institutional architecture to ensure that it implements climate change interventions and also comply with UNFCCC requirements. The following are the existing institutions and their responsibilities are the country endeavours to address the challenges of the climate change both locally and internationally.

Certain institutions such as DMS, NCCC, GHG Emissions team, Statistics Botswana are overarching and are well presented in the energy sector report.  The critical stakeholders for the transport sector are presented in Table 2 below.

**Table 2  Key Transport Stakeholders and Roles**

| Transport entity | Role in the MRV system |
|---|---|
| Ministry of Transport and Communications | Policy and legal formulation |
| DRTS | The Department / organisation is mandated to register and licence all vehicles in the country which are contributing sources of transportation-related GHG emissions that include passenger cars and light-duty trucks, sport utility vehicles, pickup trucks and minivans. Most of the fuel burned is petroleum-based which including petrol (gasoline) and diesel. The status of data availability is limited and not centralized as it is housed by various institutions which make MRV development complicated. |
| CAAB | CAAB submits air traffic data to Airports Council International (ACI) and International Civil Aviation Organisation (ICAO). |
| Botswana Oil | National oil procurement and storage |
| Business Botswana-Petroleum | Sells petroleum products, e.g. petrol (ULP 95), diesel (50PPM) and so on. Diesel (50PPM) is a low sulphur diesel which contributes to low carbon emission, which is opposed to the use of Diesel 500 PPM. Quantities of liquid fuel purchased/imported, number of vehicles fuelled, and revenue generated is stored in a computer using Excel. |
| Department of Energy Department of Energy-Statistics & Modelling | The Dept. of Energy is keeping track of energy mitigation initiatives, especially those implemented by government organisations. The DoE is relying on other entities for the available data that to date, are not adequate although available on request<br>Partially involved and many occasions in petroleum supply data and policy directions |
| Botswana railways | In charge of Rail transport which is mainly catering for freight at the moment |
| Private sector-fuel supply-UNITRANS | Indicated No participation in MRV but can be data provider on petroleum freight transportation |
| Private sector- fuel consumers-DEBSWANA | Debswana has a reliable inventory of energy data (electricity and diesel, being the most significant emissions sources) for the past many years.<br>Energy performance is formally reported on monthly basis and annually reviewed by external assurance providers. Energy efficiency initiatives have been deployed to reduce energy intensity at the Debswana operations.<br>Anglo American (South African) conversion factors are used to derive GHG emissions. |
| BURS | Records data on imported second hand motor vehicles which might be contributing to greenhouse emissions (GHG), as well as trade statistics, payments of customs duty and imports VAT. Data are accessible when requested. |
| Statistics Botswana | As a custodian of official statistics, Statistics Botswana (SB) provides most of the activity data needed for estimation of GHG emissions and removals. Statistics Botswana has representatives in the National Climate Change Committee, as well as the National GHG Inventory Team hence participates in the production of the National GHG Inventories, and National Communications.  Most of the data sourced from Statistics Botswana are reliable, and have been verified through the Botswana Data Quality Assessment Framework (BDQAF) of Statistics Botswana. Data are available |

| | | |
|---|---|---|
| | | upon formal request and SB data portal provides free access to the published reports. |
| Ministry of Finance & Economic Development (MFED) | | MFED is the focal point for GCF and not climate finance in total. The Ministry is heading carbon tax formulation. |

## 4.5 STAKEHOLDER RESPONSE ANALYSIS

The stakeholder consultation was carried through a questionnaire survey and making the necessary telephonic follow ups. The organizations that were consulted of relevance to the transport sector were public (DRTS, CAAB, Botswana Railways, BURS, Department of Energy) and private (UNITRANS, Debswana, Business Botswana). For general overview of the climate change issues and related MRV status, other organizations such as the MENT/DMS, MFED were consulted. Statistics Botswana compiles and is custodian of all national statistics including transport statistics- that are produced quarterly.

The content of the consultations sought responses on the questionnaire presented in Annex 2 that enquired on the following:

- Awareness of Paris Agreement- ETF- ICAT

- Stakeholder involvement in Botswana Reporting process i.e. What climate change related reporting they are involved with and extent of their participation whether is just data provision or analytical work as well.

- Data status for their sector and adequacy and quality for MRV

- What data information system already exists for their sector and data stored and relevance to MRV

- What additional data would be required in their opinion

- What resources would be required to meet those data gaps

- What MRV tools stakeholders are using and or familiar with

- Capacity needs of stakeholders to participate better in MRV and use of MRV tools

- How the data information system can be improved

- Any ideas how a national data information system could be created or consolidated to better serve the MRV process

- What key stakeholders should participate in MRV

- Proposals on a working governance structure (who to coordinate and other structures under that governance structure)

- What stakeholder see as necessary technical committees/groups for their sector and to serve what purpose.

- What stakeholders see as the role of the NCCC and whether such sub committees/groups would be formed within the NCCC.

- Stakeholders views on existing policy/legal framework with regard to having an effective MRV systems

- What additional policy/legal framework would be required to achieve effective MRV system for sector and Botswana

The stakeholder responses that have been analysed are presented below.

Awareness of Paris Agreement- ETF- ICAT, NDC, and involvement in some form of MRV and of some Monitoring tools for GHG emissions, Mitigation and MRV support are provided below based on the responses of the 12 relevant stakeholders who responded to the questionnaire (Table 3).

**Table 3  Awareness levels of stakeholders on MRV Processes and Systems**

| Awareness of Paris Agreement | NDC awareness | Involvement in some of MRV | Awareness of Tools/Monitoring plans for MRV |
|---|---|---|---|
| 9/12 (75.0%) | 8/12 (66.7%) | GHG emissions 9/12 (75.0%) | GHG emissions 8/12 (66.7%) |
| | | GHG Mitigation 8/12 (66.7%) | GHG Mitigation 6/12 (50.0%) |
| | | MRV Support 2/12 (16.7%) | MRV Support 3/12 (25.0%) |

There is general familiarity with Paris Agreement and NDC process.  On the MRV involvement, as expected more stakeholders are engaged with GHG Inventories and to some extent GHG mitigation than issues of MRV for Support.  Similarly, more stakeholders are familiar with monitoring tools/plans for GHG inventory followed by GHG mitigation and then MRV Support, in that order.

Some of the MRV Tools and Monitoring plans familiar to the stakeholders are as follows:

**Generic tools**

- 2006 IPCC Guidelines & 2006 IPCC Software.
- GHG emissions are tracked by simple time series plotting and analysis of annual emissions.
- World Bank for financial support.
- Reporting through National Communications (1st, 2nd, & 3rd), Biennial Update Reports (BURs), National GHG Inventory Reports (NIR), and Nationally Determined Contributions (NDCs).

**Road Transport and GHG Inventory**:

- Monitoring and evaluation tools, Network traffic monitoring software and IPCC software
- Use of remote sensing technology for vehicle emissions monitoring, Smart Emissions Measurement System (SEMS), Catalyst Converters (changes bad gases to less harmful ones)
- Debswana currently utilises ENABLON and ECO2MAN – Environmental management tools for tracking energy and GHG emissions as well as the benefits from deployed energy efficiency
- For issues of compliance with the ISO, customer and legal requirements, an integrated SHEQ management system to manage and control all Policies, Procedures and Safe Work Instructions and invested in an electronic document control management system called Isometrix.[9]

**For aviation**
- Implementation of Continuous Climb and Descent (CCOs and CDOs) facilitated by Air Traffic Control. These allow aircraft to follow flexible, optimum flight paths, thus reducing fuel burn, gaseous emissions, and noise pollution.
- Implementation of Performance Based Navigational (PBN) concept (satellite). This enables remote flying without having to go through conventional landing systems.
- CAAB in partnership with relevant stakeholders is currently developing an Action Plan which is a guiding document that outlines Botswana's policies and actions for addressing $CO_2$ emissions from international aviation. This will be a tool used by the State to showcase and report both at the national and international levels its efforts to address $CO_2$ emissions from international aviation.
- Botswana under CAAB has also shown interest in joining the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). This is a global scheme that obliges airlines to monitor

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[9] UNITRANS systems

and report their emissions and to purchase emission reduction units generated by projects in other sectors, to cover any growth in $CO_2$ emissions above 2020 levels.

Data are being collected and the additional data needed to enhance MRV performance among consulted transport stakeholders are summarized in the Table 4 below.

**Table 4  Cited existing MRV Data and additional data required**

| Organization | Existing data sets | Additional data indicated |
|---|---|---|
| Ministry of Transport and Communications | Transport Policy | Not indicated |
| DRTS | National vehicle registration and licencing data system which categorise vehicle by make, model and type of fuel used. The data are stored at Department which is not a data centre and it has the relevance to MRV with the help of other data kept by other institutions. | Establishment of National GHG inventory and movable and non-movable sources. Reinforced vehicular emission legislative and improved data based monitoring mechanism. Technology transfer and establishment of coordinated GHG Data centre which will enable proper monitoring. |
| CAAB | SPATIA a system used to manage dynamic aeronautical data such as NOTAM (notice to airmen), Flight plan and Meteorological data. Excel: air traffic data that includes departures, arrivals and overflight movements | Not indicated |
| Botswana Oil | No response yet | Not indicated |
| Business Botswana-Petroleum | Data is stored in an office computer in excel. | Emissions from vehicles (cars, trucks, & buses) |
| Department of Energy Department of Energy- Statistics & Modelling | 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. | Number of installed Solar PV systems including solar for water pumping, lighting, etc. Energy efficiency initiatives from government and private sector (applies to Energy sector) |
| Botswana railways | No response YET | |
| Private sector-fuel supply-UNITRANS | Sort data on excel sheets. Data include quantities of petroleum products to be distributed, statistics on fleet of trucks, etc. | Emission Measurement, and Introduction of toll gates/pay points. |
| Private sector- fuel consumers-DEBSWANA | Energy management systems (different for electricity and diesel) have been deployed to read, record and store energy data for Scope 1 and Scope 2 emissions. Monthly reports are generated and used to inform business plans and other interventions. ENABLON is used to report performance for all energy streams. | Botswana Specific Emission Factors Guidance from National Policy |
| BURS | Customs Management System (CMS): Data on imported second hand motor vehicles, | Data on: imported second hand motor vehicles, and all commodities with |

| | | |
|---|---|---|
| | trade statistics, payments of customs duty and imports VAT, is stored in this system. | potential of releasing gases which are harmful to the environment.<br><br>Need to introduce carbon tax on emissions.<br><br>Financing and technical support. |
| Statistics Botswana | For transport sector, data on the newly registered vehicles by type is available from Statistics Botswana website: www.statsbots.org.bw<br>Energy balance reports were produced locally till 2009 (www.statsbots.org.bw), this has since stopped due to lack of capacity and funds. From there forth, an international source was used: International Atomic Energy Agency.  For the nationally produced energy accounts, reports can be sourced from: www.wavespartnership.org | Annual energy balances produced locally; energy accounts developed annually; and Vehicle Kilometre Travelled and technology type available, and their specific emission factors.<br><br>Develop indicators to measure progress made in achieving the targets set under the NCDs & NAMAs.<br><br>The Government to consider formulating and implementing transport pricing policies, fuel subsidy removal, road pricing, vehicle purchase incentives for more efficient vehicles, to mention but a few. |
| Ministry of Finance & Economic Development (MFED) | Mostly rely on data sources from the World Bank. Ministry has a monitoring computerised system for development projects that can be probed to identify possible climate related project funding-provided there are guidelines on what constitutes a climate related project. | |

The support expressed by the stakeholders as needed to meet the additional MRV data sets are:

- Capacity building on the area, establishment of GHG monitoring infrastructure with a dedicated centre with a modern vehicular monitoring centre and well established data centre.

- Funds to buy emission monitoring devices.

- Funds to put up structures for emission measurement. Encourage private sector to import hybrid and electric cars in bulk.

- Financial and human resources to resuscitate the production of the National Energy balances, for conducting Energy Statistics Surveys, and to develop Energy Accounts on a yearly basis.

- Financial support to fund research institutions to conduct research in order to develop country specific emission factors for the sectors- energy and transport as required by the UNFCCC.

- Need for financial resources and capacity building to develop indicators to measure progress against set targets under the NDCs, SDGs, NAMAs, etc. A review of each of the aforementioned is needed.

- Linked databases; personnel (trained on data capture & storage); quality checks; common understanding of indicators.

- Capacity building, thematic working groups, funds for collecting data.

- Guidance from relevant Government Ministries.

- Training of personnel.

- Funding for data collection.

- Technology for data collection,  management, and storage.

- Financial resources to support and build capacity on data management and sustainability and integration to the existing data and systems.

- Need to conduct studies to determine the mitigation required.


Quality of data for MRV for GHG emissions, GHG Mitigation and quality control in place for some organizations. However, in general, quality of data for MRV are considered to be limited  and the majority of activity data for estimating emissions from both the energy and transport sectors are sourced from the Energy Balances published by the International Atomic Energy Agency (IAEA). This is a credible source, but if there is lack of country-specific activity data, then reliability becomes limited hence some of the data used could be improved to be more representative.

Specific to the GHG emissions, sectoral achievements  have been made as the statistics  used for GHG emissions in the National GHG Inventory Reports (NIRs) are internationally reviewed and are guided by the 2006 IPCC Guidelines. During NIR preparation, some external experts were used to verify the data.

Specific to GHG Mitigation, some of the stakeholders indicated that they are not accustomed to the data for mitigation hence Technical Assistance to improve on the good quality is needed since some of the data are sourced from international agencies such as the World Bank and UNDP.

In general QA/QC is considered to be still at an infant stage as the legislation is not yet in place and Quality Assurance mechanism insufficient as the data availability is limited.  There is no QA/QC Plan in place for compilation of GHG emissions applied across the whole sector and some organizations have their own systems as indicated by some examples below.

- Statistics Botswana, data and statistical reports are validated by Senior Statisticians, followed by Statistical Managers, and Directors responsible for their respective Directorates. They are guided by Botswana Data Quality Assessment Framework (BDQAF) of Statistics Botswana, and Other International Statistical Standards, e.g. ISIC, United Nations Framework for Development of Environment Statistics (UNFDES), etc.

- There is internal audit which has in the past identified some gaps and greatly assist in improving the data quality of CAAB.

- UNITRANS is an ISO certified company having an integrated management system of ISO9001:2015 Quality Management System, ISO14001:2015 Environmental Management System and

ISO45001:2018 Occupational Health and Safety Management System. Unitrans is also certified on SANS 1395-1:2014, Road Transport Management System (RTMS).

- Debswana conducts data integrity audits, to assess and verify the credibility and quality of energy information. External assurance providers are used in the exercise. The data are verified against other available datasets and recalculations are performed with each new inventory.

- BURS follows standards stipulated under the World Customs Organisation & World Trade Organisation.

Below is participation of stakeholders in some form of MRV and use of MRV tools.

**CAAB** has been selected to participate in the Capacity Building for $CO_2$ Mitigation from International Aviation Assistance Project organised jointly by ICAO and the European Union. The nominated focal points are responsible for collecting all the relevant information and liaising with ICAO in ensuring the successful development of the National Action Plan for mitigating $CO_2$, and implementation of CORSIA.

**Business Botswana** has membership from different private companies, in particular those involved in the petroleum and transportation industry. Data that are generated are collected and sent to the franchise families (e.g. Engen, Shell, Puma, Caltex, etc.) for verification.

**UNITRANS** subscribe to ISO9001:2015 Quality Management System, ISO14001:2015 Environmental Management System, which promotes sustainable management or conservation of the environment. Botswana Bureau of Standards does regular visits to do audits on compliance.

There is a strong Institutional Arrangement for the National GHG Inventory which is led by the Focal Point- Department of Meteorological Services (DMS) of MENT. The national experts under each sector collect data from their respective agencies and submit it to the coordinator and archivist. Data analysis and report writing is done by the experts, and all activities are managed by the coordinator. As for the Institutional Arrangement in the National Statistical System (NSS), the structures under National Strategy for Development of Statistics (NSDS) gives a clear picture of how the Institutional Arrangement is like for data sharing purpose, technical assistance, and other partnerships.

Statistics Botswana collects administrative data from many of the agencies under sector statistics, and administrative data is also shared within agencies themselves. Statistics Botswana operates as the Lead Agency in the NSDS structure. Some officers from Statistics Botswana have been seconded to some agencies (e.g. Ministry of Transport of Communications, Ministry of Health and Wellness, Ministry of Education & Skills Development, Ministry of Agriculture & Food Security) to provide technical support, and for easy collection of administrative data.

**Debswana** has put up its own systems to measure and record energy consumption at its operations. Energy performance reports are generated for internal use and GHG emissions are derived using conversion factors from Anglo American. The reports are for Management and are used to gauge performance against plans, to identify areas requiring attention, to inform business plans, and further improvements. Energy and GHG data is validated through internal structures and it gets captured on ENABLON/ECO2MAN, an Anglo American environmental management system. Annual verifications are done by external assurance service providers. Debswana subscribes to Towards Sustainable Mining (TSM), a globally recognized sustainability program that supports mining companies in managing key environmental and social risks. TSM was the first mining sustainability standard in the world to require site-level assessments and is mandatory for all companies that are members of implementing associations. Through TSM, eight critical aspects of social and environmental performance are evaluated, independently validated, and publicly reported against 30 distinct performance indicators. With regard to Transparency, members commit to a set of TSM Guiding Principles and report their performance against the program's 30 indicators annually in MAC's TSM Progress Reports. Each facility's results are publicly available, and are externally verified every three years.

For BURS, their system for data capture is interfaced with Statistics Botswana database. BURS also shares international merchandise and trade statistics as and when it's ready for transmission but the institutional arrangement for such MRV related activities is considered weak.

**MFED-** Green Climate Fund (GCF) National Designated Authority Unit collects data, analyse, and produce the report on its own. Most of the data for development partner funded projects are sourced from the internet (World Bank, and UN websites).

Required strengthening of existing Institutional arrangements to meet ETF requirements were proposed by the consulted stakeholders for the three MRV pillars as in Table 5 below.

**Table 5  Proposed Strengthening Institutional requirements for MRV Pillars**

| GHG Emissions | GHG Mitigation | MRV Support |
|---|---|---|
| Train stakeholders on GHG Inventory and Capacity development for the monitoring, reporting and verification of greenhouse gas emission. Need for capacity building in the value chain of statistical production. Capacity building for producing GHG inventories and quantification of gases.<br><br>Expertise and funding for data collection.<br>Training of personnel in software usage.<br><br>Raise awareness<br><br>Include more sectors in the National GHG Inventory Team with clear roles.<br>Expedite the formulation and implementation of the Data Management Strategy at Statistics Botswana as part of operationalizing the Botswana Strategy for the Development of Statistics (BSDS). This will take care of the data sharing and data management aspects which will strengthen the country's capacity to meet the transparency framework.<br><br>Involving data suppliers in plenary sessions.<br>Effective partnerships and collaboration of information providers from public and private sectors.<br><br>Memoranda of agreements should be put in place between the lead organisation and other supporting institutions.<br><br>Establish a nationwide long-term low carbon development strategy that is informed by global benchmarks. This strategy in turn should then guide national sectoral policies. Several cross-cutting measures directed at setting up an effective implementation framework are proposed. | Strengthen technical capacity<br><br>Capacity building /Training on impacts on Transport mitigation measures.<br><br>Impose heavier penalties for those that ignore their responsibilities to reduce GHG emissions[10]<br><br>Involving data suppliers in plenary sessions.<br><br>Need for capacity building for developing indicators to assess progress made in achieving the set targets in NAMAs and NDC, as well as capacity building to undertake review of NAMAs and NDCs.<br><br>Expertise and funding for data collection. | Need for more Climate finance and Technical transfers<br><br>Financial support to buy and install Smart Emissions Measurement System (SEMS).<br><br>Capacity building focusing on evolving technology.<br><br>Involving data suppliers in plenary sessions.<br><br>Have a central institution for receiving, collecting and analysing climate finance data to report to the NCCC.<br><br>Technical capacity and technology transfers<br><br>Need for financial support to be able to mitigate against high carbon emissions.<br>Expertise and funding for data collection activities.<br><br>Assistance to develop and use climate change indicators. |

Areas of Capacity Improvements to meet ETF that were suggested included:

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[10] Stealing of catalytic converters was mentioned as deserving penalty

- The starting point will be human resource building capacity on specific areas of the transparency framework, financial support to establish a robust implementation and monitoring structures.

- Development of data centre where all climate change information can be accessible.

- The establishment of effective data collection, compilation and monitoring tools, and provision of technological assistance.

- Educating stakeholders on the Paris Agreement MRV/Enhanced Transparency Framework.

- Capacity Building in the value chain of statistical production, capacity building with regards to estimating GHG emissions, reviewing NDCs, SDGs and related Climate Change Policies and programmes.

- Effective coordination by the MENT, and inclusion of the private sector in appropriate forums.

- Funding for more data collection and training in the use of relevant softwares.

- To improve the transparency of mitigation efforts and also to satisfy reporting requirements from international donors who potentially support conditional NDC measures, indicators for each measures need to be defined and tracked.

- Indicators need to be defined on a project basis and reporting procedures to a central location need to be established, allowing national aggregation. (Designing an MRV system that allows the smooth transition to the ETF and an early preparation of the BTR will allow Botswana to be at the forefront and be a leader in applying the MPGs and benefiting from the support available, enhancing its capacities to fully embrace a low carbon and resilient future.)

- Educate the public on climate change impacts caused by carbon emissions.

Stakeholders reflected on MRV that transpired through NC, BUR, NDC, NAMAs and indicated that ( although others didn't know much about these deliverables to the UNFCCC and Paris Agreement).

- Though the Focal Point would be better placed to comment, the reports are considered to be of good quality as they are guided by the guidelines put forth by the UNFCCC. The reports are quality assured by the International experts identified by the UNFCCC.

- In terms of energy-related data,  the data used in those reports is not a true reflection of what is on the ground. There is a lot of arbitrary figures used, based on 'thoughts' and not actual projects on the ground.

- Some have not been able to access and familiarise with the submissions.

- A significant achievement on NAMAs dating back from 17 – 19 August 2015 Kigali, Rwanda – African Regional workshop.

- At least for the BUR which underwent a technical review and analysis, the quality was enhanced hence was closer to the transparency requirements of the Paris Agreement.

- An MRV system for the collection of relevant data to keep track of mitigation results achieved by individual NDC measures in Botswana is not established.

Stakeholders also indicated relevant existing policy/legal and additional requirements to support effective MRV in the transport sector (Table 6).

**Table 6 Existing and additional Policy/legal requirements to support MRV**

| Existing Policy/Legal framework for effective MRV system | Additional policy/legal framework required to achieve effective MRV system |
|---|---|
| The existing policy / legal framework mentioned that are of relevance to the MRV are the Polices and Acts below that can help in the formulation and implementation of the National MRV: | - Stakeholders expressed that development, review and preparatory exercise for climate change including MRV |

| | |
|---|---|
| ● Botswana Energy Regulatory Act of 2016, Petroleum (Exploration and Production) Act.<br>● Climate Change Policy, Road Traffic Act, Integrated Transport Policy, Botswana Customs and Excise Duty Act.<br>● Statistics Act of 2009: facilitates data access during data collection, particularly for difficult to attain data.<br>● BURS operates under the Revised Customs Act of 2018.<br>There is need to enact legislation on Carbon emissions.<br>● Stakeholders also alluded to other international treaties and declarations that Botswana has ratified including UNFCCC, Paris Agreement, SDGs and set targets.<br><br>Overall stakeholders expressed the need to strengthen existing policy/legal framework with a much organised coordination. | should be legislated. As the current framework does not adequately address a complete and fully working system.<br>● A robust Botswana National GHG Policy and legislative framework which covers all the sectors and strength the implementation monitoring system.<br>● Successful development of the National Action Plan on $CO_2$ emissions.<br>● It could be improved by signing legally binding agreements with all the institutions which are involved with data collection and sharing including the private sector.<br>● The transparency framework is critical to institutionalise the roles and responsibilities of the various stakeholders and promote its timely, effective and efficient coordination and collaboration.<br>● High level political support and long-term funding is required to set-up the institutional arrangements in order to mainstream the transparency framework.<br>● The Paris Agreement enshrines a very important concept related to transparency: continuous improvement over time. Botswana can adopt this concept as on overall principle for the MRV system planning and implementation.<br>● Introduce tax on Carbon emissions to control importation of second hand motor vehicles.<br>● Collaboration of all sectors to come up with ONE effective system is important, avoiding multiple silo systems. The National Strategic Office is crucial in the development of the tool. |

## 5 AREAS OF. MRV IMPROVEMENTS

### 5.1 MRV FOR GHG EMISSIONS

Significant improvements in the compilation and reporting has been made over the times as part of the NC, BUR reporting. However, data for the transport sector used in the NIR is still for Tier 1 using IEA energy balance as the last locally produced energy balance was in 2009. The several disaggregated data collected for road, rail, air and compiled by Statistics Botswana are not yet used in the compilation of the NIR. Data collection for the transport sector still needs enhancement to include various data providers in the public and private sectors. The private sector stakeholders like UNITRANS and Debswana have indicated their efforts in compiling useful data on fuel consumption and vehicle travels that may be used in Tier 2 and Tier 3 GHG emissions Inventory.

It is clear that some of the data pertaining to the transport sector are collected within such private organizations for their own business planning but may not be submitted to the lead organization DMS/MENT for more reliable GHG inventory preparation.

For MENT to effect complete data collection required for the GHG Inventory, a legal framework will be required and enforced so that all potential data providers comply.

Apart from data providers, third party verifiers will be needed, not only on an ad hoc basis when some reporting is required but as an on-going resource complementing the role played by the Focal Point, NCCC and National GHG Emission Team.

The Global Warming Potential used in the NIR 2014/15 for CH4 and N2O emission factors have changed and will need revision (Table 7).

## Table 7 Old and Revised GWP for GHG gases

| GHG | Old factor. GWP | Revised GWP |
|-----|-----------------|-------------|
| $CO_2$ | 1 | 1 |
| $CH_4$ | 21 | 28 |
| $N_2O$ | 320 | 265 |

Country specific emission factors will also be required and are more critical in the transport sector when deriving emission factors for v-km, passenger-km and similarly on the freight side etc.

A centralized data base that also captures relevant transport sector statistics relevant for Tier 2 and Tier 3 GHG emissions Inventory is required. This database can be part of the national data system that can be used for all MRV related to GHG Emissions.

### 5.2 GHG MITIGATION

The various GHG Mitigation options that have been presented in the NCs, NAMA, and INDC etc. have not been quantified to indicate their impacts on GHG reduction. Similarly, other applicable transport measures presented in Section 4.3 cannot be analysed now and the major hindrance is partly data but more importantly capacity for analysis of the impacts.

The NDC mitigation measures as defined in 2015 have not been anchored on clear assumptions and have no data that can be used for quantification of their impacts. Most of them do not show active participation of the relevant implementing departments and lack consistent monitoring. Gathering data on progress achieved on the current set of NDC measures posed a challenge as monitoring needs have often not been defined by stakeholders. It was therefore in some cases difficult to assess the state of implementation of the measures, and to quantify their achieved emissions reduction.

Lack of human and institutional capacity and resources is realized as another hindrance. The issue of sufficient resources and appropriate capacity should be a major factor in determining what is achievable as NDC

measures. Strong capacity building for transport impacts analysis will thus be required, with clear assumptions how the mitigation options will reduce GHG emissions.

On the policy/legal framework, formulating and implementing transport pricing policies, fuel subsidy removal, road pricing, vehicle purchase incentives for more efficient vehicles, will be some of the reforms required in analysing the GHG mitigation options such as those in the ICAT Transport Guide (Annex 1).

## 5.3 MRV FOR SUPPORT

Climate finance, technical assistance and Technology transfer are seen as critical in the creation of an effective MRV system for Botswana.

Climate Finance is provided for a number of international and domestic activities but the MEFD does not have a read compilation of these resources provided in the past (although they can be compiled when needed) and are usually resident on the websites of the donors/development partners and financing institutions. Stakeholders have also proposed creation of a central facility for receiving, collecting and analysing climate finance data to report to the NCCC locally and also as part of the MRV system.

Technical assistance has been mentioned as important to build capacity in the country particularly for impact analysis of transport GHG mitigation options. The TA is needed to support building of expertise and funding data collection. In the case of the transport sector, indications are that data collection is currently funded through government budgets.

Technology transfer and establishment of a coordinated GHG Data centre will be required support to enable proper monitoring.

The MFED reacted if creation of such effective MRV, will come at an extra cost in terms of resources (financial and human) in which case a climate finance fund for ease of tracking funds as through domestic funded projects, interventions are mixed with other initiatives. The proposal was to redesign the National Environment Fund.

# 6    CONCLUSIONS

Botswana has had experience in some form of MRV through its reporting on NC, BUR, NAMA, TNA and with the advent of the NDC reporting under the Paris Agreement, additional structures and effort is required to have an effective MRV system that will meet ETF requirements under Paris Agreement.

The national development imperatives are in place although some improvements in policy and legal framework will be required for a coordinated effort to undertake proper MRV for GHG Emissions, GHG Mitigation and MRV for Support, which are the key pillars of the MRV system considered.

Indications are that stakeholders are more familiar with preparation of GHG emissions although only Tier 1 2006 IPCC methodology has been used in the latest 2014/2015 GHG NIR.  Some quality assurance/control and verification are also undertaken.

However, in the case of transport additional data being collected are not used to migrate to Tier 2 and Tier 3 GHG inventory approach.  Additional discrete data and emission factors will also require revision and refinement. Statistics Botswana is compiling quarterly statistics of the transport sector, among other sectors. It is however evident that, both public and private sector entities (e.g. diesel/petrol usage) are collecting useful data for their transport activities that may not be shared across the various stakeholders including with the lead coordinating agency/focal point. There is thus a need for a central data system to harness all the transport data being generated by the various potential data providers.

A significant achievement has been made on other sectors but in a transport sector, there is a need to improve the status quo especially with regard to technology transfer, development of transport sector resilience programmes, development of National Vehicular emission inventory which includes vehicular Air pollution information system. Capacity building and technical transfer is needed on the sector especially on capacity development for the monitoring, reporting and verification of greenhouse gas emission.

Transport data is usually not readily available particularly for GHG Mitigation and although many GHG reduction options exist, they are not quantified and they will need clear assumptions and analytical skills to report on their impacts on GHG reduction. A strong capacity building component will be required and some policy/legal reforms will be needed for some of the transport options that are widely applicable particularly in the road sector that is the major GHG source from transport.

The system described in relation to the development of the national greenhouse gas emission inventory report can be used as a starting point to also include the data collection and processing of mitigation measures.

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 will be required in conditional financing of NDC mitigation measures and tracking their implementation.

At cross cutting level, institutional arrangements exist for MRV for GHG Emissions and MRV GHG Mitigation, but they need strengthening, involving relevant sectors in 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.

To set up an MRV system for Botswana, high level political support and long-term funding is required to install the institutional arrangements in order to mainstream the transparency framework in the climate agenda and sectoral plans. It further requires capacity building within government staff and supporting technical assistance to enable improvement over time. Special focus is also required to improve general computer literacy among Government staff and supply the necessary devices to enable digital data collection and management.  A robust MRV framework with clearly allocated responsibilities and resources is the foundation for any functioning MRV system.

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# ANNEXES

## ANNEX 1. GHG MITIGATION MEASURES AND DATA REQUIREMENTS

|  | Activity data needed | Emission factors | Data Collected | Other data sources | Data to collected |
|---|---|---|---|---|---|
| 1.0 Fuel subsidy removal: Removal of subsidies that reduce the price of vehicle fuel below its fair- market cost. | Fuel economy old versus new. Litres of fuel consumed by vehicles annually, gasoline/diesel Km/ travelled/ vehicles annually. Number of first registration of electric trains replacing diesel trains. Number of electric, cars, buses and trucks first registration. Bicycle users. Number of fuel vehicle first registration. Current fuel price for gasoline and diesel vs the old fuel price. Number of vehicles by engine size. | Gasoline and diesel factors-kg $CO_2e$/GJ. | Annual vehicle stock. Annual figures for first time registration of privately owned vehicles. Annual number of privately owned vehicles. Air transport traffic figures, annually. Yearly, rail road traffic figures. |  | Kms travelled/ yearly/ vehicles. Litres of gasoline and diesel consumed yearly. Gasoline Price. Diesel price. |

| | | | | | |
|---|---|---|---|---|---|
| 2.0 Increased fuel tax or levy: An increase in the tax imposed on each unit of vehicle fuel, which may include general taxes that apply to many goods and special taxes specific to vehicle fuel. | Fuel consumed per year I e.g. from national energy balance Disaggregation of cars by type and year of registration, road, rail; passenger (car versus Bus), freight Shares of gasoline and diesel Average distance travelled by each vehicle type- passenger, freight, rail Occupancy of passenger cars/buses; tonnage of freight vehicles | $CO_2$e/p-km car. | Air transport- International and local traffic figures. Annual railroad traffic figures by direction. Annual vehicle stock. | | Fuel tax/ levy rate. Litres of Gasoline consumed yearly. Litres of Diesel consumed yearly. Km travelled yearly/ vehicle. |
| 3.0R oad pricing (road tolls and congestion pricing): Motorists pay directly for driving on a particular roadway in a particular area. Road pricing has two general objectives; revenue generation and congestion management. | Yearly amount of money raised from road pricing. Fuel consumption for gasoline and diesel. Number of road traffic collisions annually. Kms travelled/ yearly/vehicle. Vehicle density on priced roads. Number of private car versus public transport trips on priced roads. Number of bicycle users using priced roads. Annual number of passengers ferried in trains. | $CO_2$e/p-km for car. $CO_2$e/p-km for bus. $CO_2$e/vehicle km. | Total road Accidents. Annual number of privately owned vehicles. Annual figure of railway traffic by direction. Number of transport accident causalities. | | Litres of gasoline consumed yearly. Litres of diesel consumed yearly. Amount of money raised from road pricing per year. Annual figure of road traffic by direction. |

| | | | | | |
|---|---|---|---|---|---|
| 4.0 Vehicle purchase incentives for more efficient vehicles: Governments increase the fuel efficiency of the vehicle fleet and/or promote a shift to lower-carbon fuels by providing incentives for the purchase of selected vehicles. This policy is most applicable to electric, plug-in hybrid-electric, hydrogen-fuelled and other vehicles that are not powered by gasoline or diesel, and is applied by governments through lower purchase taxes, purchase rebates, income tax credits and lower vehicle taxes. | ● No of vehicles by engine size (LDV, passenger, truck, buses etc) <br> ● Prices of old and new vehicles <br> ● Km travelled/year/vehicle <br> ● Market share/penetration rate/year <br> ● Fuel prices gasoline/diesel versus e.g. electricity/hydrogen/biofuels. OR vehicle efficiency of old versus new <br> ● Incentive/tax value | $CO_2e$/vehicle km | Annual vehicle stock figures. Data on first time registered-privately owned vehicles, annualy. | | |
| | | | | | |
| Other transport actions that may be of interest to Botswana are : | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 5. Vehicle import duty to guide what vehicles may be imported and limit no of imported old vehicles | ● No of vehicles imported/year by size<br>● Duty/tax/incentives $/l size old versus new<br>● Gasoline price<br>● State subsidy/tax<br>● Fuel economy old versus new<br>● Annual distance ravelled by car | Gasoline emission factor kgCO$_2$e/GJ | Annual vehicle stock figures. Annual figures of of privately owned vehicles registered for the first time. | | |
| 6.0 Non-Motorised Transport in urban areas to limit use of fuelled vehicles and hence pollution and congestion | ● No of vehicles used per year by size in boundary area<br>● Fuel economy of average vehicles<br>● No km travelled per vehicle/per year in urban area/occupancy<br>● No of km travelled on non motorised per year<br>● Bicycle network km<br><br>● Bicycle users | CO$_2$/vehicle Km. | Annual figures of rail road traffic by direction. | | |
| 7.0 Traffic regulation measures including technological applications for smooth flow of traffic. | Kms/ vehicles/ yearly.<br>Fuel consumed by vehicles yearly, diesel or gasoline.<br>Number of vehicles charged with emissions related offenses.<br>Number of car crushes in urban areas. | CO$_2$e/p-km for car.<br>CO$_2$e/p-km for bus.<br>CO$_2$e/vehicle km.<br>Diesel and gasoline emission factors-kgCO$_2$e/GJ. | Annual number of road accidents. Annual figure of road accident casualities. | | |
| 8.0 Public transport substitution | **Car versus bus**<br>● No of passenger cars used in boundary area<br>● No of passengers per car<br>● Gasoline consumption per car<br>● No of buses to substitute cars/no of passengers per bus<br>●<br>● Annual distance travelled-pkm<br>● Diesel consumption per year or l/p-km | ● CO$_2$e/ p-km for car<br>● CO$_2$e/ p-km for bus<br>● Diesel and gasoline emission factors-kgCO$_2$e/GJ | ● | ● | ● |
| 9.0 Vehicle emissions control | Number of vehicles by engine ( buses, cars, LDV, trucks, passenger etc).<br>Vehicle<br>Number of old vs new vehicles.<br>Litres of fuel consumed per year, gasoline/ diesel.<br>Fuel economy | CO$_2$e/p-km for car.<br>CO$_2$e/p-km for bus.<br>Diesel and gasoline emission factors-kg CO$_2$e/GJ | | | |
| 10. Urban planning | Litres of fuel consumed per annum in urban areas.<br>Traffic volume in CBDs.<br>Bicycle network kms in urban areas.<br>Kms travelled by non-motorised vehicles in urban areas per year.<br>Kms/travelled/vehicles per year in urban areas. | CO$_2$e/vehicle km. | | | |

## ANNEX 2. QUESTIONNAIRE USED FOR STAKEHOLDER CONSULTATIONS

The Initiative for Climate Action Transparency (ICAT) Questionnaire for Botswana

This questionnaire is developed to assess the extent to which the Government of Botswana has developed the Measuring Reporting and Verification (MRV)/transparency agreement as per the UNFCCC and the Paris Agreement protocols. The assessment is realized through consultations with relevant stakeholders under the energy and transport sectors, and it will form basis for the situational analysis. The interview questions are guided by the following topics, among others:  knowledge on Paris transparency Agreements, existence of MRV framework, level of expertise in MRV, the GHG and gap analysis, use of the existing MRV, challenges and barriers that exist to implement the 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: | |
|---|---|
| Position: | |
| Institution: | |
| Mandate/Activity: | |
| Email: | |
| Website: | |
| Phone: | |

2.   Are you familiar with requirements of the Paris Agreement MRV/Enhanced Transparency Framework
    *Yes____ / No____*
3.   If Yes, kindly explain their requirements_____
    _____
    _____
4.   Are you aware of the country's NDC/mitigation and adaptation actions for reduced GHG emissions
        *Yes____ / No____*

5.   Is your organisation involved in MRV 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, kindly explain the extent of your organisation's participation, status of data availability, reliability and accessibility when developing the MRV
    _____
    _____
    _____

7.    What data information system already exists for your sector and data stored and relevance to MRV

    _____

    _____
    _____

8.    What additional data would be required in your opinion for
    a.   GHG Emissions for the sector_____
    b.   GHG_Mitigation analysis_____
    c.   Financing and technical support received_____
9.    What resources would be required to meet those data gaps
-    _____
    _____
    _____

10. Kindly describe the data quality in undertaking
    a.   GHG emissions_____
    b.   Mitigation efforts_____
    c.   Financing and technical support received_____
11. What plans are in place for data Quality Control/Quality Assurance
    (QA/QC)_____

_____

_____

12. Are you aware of any instruments/TOOLS/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, kindly provide these instruments/TOOLS

_____

_____

_____

14. If yes to 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 of development of MRV 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 yes to 15, kindly explain the institutional arrangement (e.g. who collects data, who analyses data, who reports on results and to Who, who validates the results)

_____

_____

_____

_____

17. How can the institutional arrangements be improved to strengthen the country's capacity to meet the transparency framework for:
    a. GHG emissions_____
    b. Mitigation efforts_____
    c. Finance and technical support_____

18. Are there any existing information storage and exchange platform for your sector 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. Kindly describe your institutional capacity (capacity needs) in terms undertaking and MRV for the following:
    a. GHG emissions_____
    b. Mitigation measures_____
    c. Adaptation measures_____
    d. Finance and technical support_____

20. Kindly identify areas of capacity improvements to meet the transparency framework_____

_____

_____

21. Over the years, the Government has submitted National Communications, NAMAs, NDC, kindly describe and if possible provide review assessment in terms of quality and the report as measured against the Paris agreement requirements_____

_____

_____

22. What is your view on existing policy/legal framework for an effective MRV system_____

_____

_____

_____

23. What additional policy/legal framework would be required to achieve effective MRV system for your sector and Botswana

_____
_____
_____
_____

**General Comments:**

THANK YOU.

# 7. WORKPLAN

The work plan below presents the deliverables and activities to be carried out as per TOR and the anticipated timeframes. The deliverable approval process will and availability of stakeholders and effect of COVID-19 may affect the timelines indicated.



Combined ICAT Botswana Workplan 2021-2022 — Gantt chart of deliverables and activities.

| DELIVERABLES / ACTIVITIES AS PER TOR | mandays Transport | mandays Energy |
|---|---|---|
| **Deliverable 0: Inception Phase and Work Plan Development** | 6 | 10 |
| 0 Inception Phase and work plan development | | |
| 0.1 Draft Inception Report (IR) for the Work Plan Development | | |
| 0.2 IR of the Work Plan - Reviews & Validation | | |
| 0.3 Final IR of the Work Plan | | |
| **Deliverable 1: Report describing current MRV mechanisms in the relevant institutions and relevant climate change data and information currently generated, also taking the information quality and frequency into consideration and which gaps exist.** | 14 | 20 |
| 1.0 Situational Analysis | | |
| 1.1 Desk Study | | |
| 1.2 stakeholder consultations | | |
| 1.3 MRV needs and gap assessment | | |
| 1.3a Analysis of existing MRV/ transparency system and related support initiatives in the country | | |
| 1.3b Support regular updates of the MRV/ transparency initiatives | | |
| 1.3c Finalise work plan for ICAT support based on the needs and gaps assessment report | | |
| 1.4 Draft Reporting | | |
| 1.5 Stakeholder/ Technical Meeting 1 (STM1) | | |
| 1.6 Deliverable Report | | |
| **Deliverable 2: Report consolidating the inter-institutional consultations and policy/strategy analysis, the method and summary of each consultation and analysis.** | 8 | 15 |
| 2.1 Building Institutional Framework | | |
| 2.1a Provide an analysis on recommendations strengthen the institutional arrangements for coordination of national MRV/transparency system. | | |
| 2.1b Support Botswana Ministry of Environment, Natural Resource Conservation and Tourism in tracking MRV/transparency initiatives and report support received in BUR. | | |
| 2.1c Support Botswana Ministry of Environment, Natural Resource Conservation and Tourism to set up a Steering Committee coordination of inter-ministerial support to MRV/transparency. | | |
| 2.1d Support Botswana Ministry of Environment, Natural Resource Conservation and Tourism to set up a Technical Management Unit for the national MRV/transparency system | | |
| 2.2 Drafting Report | | |
| 2.3 STM2 | | |
| 2.4 Deliverable Report | | |
| **Deliverable 3: Report on information necessary to track progress made in implementing and achieving Botswana's NDC, based on the Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris** | 10 | 20 |
| 3.1 Capacity Building | | |
| 3.1a Application of selected ICAT Renewable energy and Transport guides such as Solar PV for household use either nationally or a selected communities & Transport policies, practiced by the Government of Botswana. | | |
| 3.1b Identify links and synergies with other support initiatives in Botswana to ensure ICAT outcomes are sustained. | | |
| 3.1c Develop an MRV/transparency tracking tool for NDC implementation in the energy and transport sectors. | | |
| 3.1d Support the team of international experts in the provision of training and capacity building support to the country | | |
| 3.2 Drafting Report | | |
| 3.3 STM3 | | |
| 3.4 Deliverable Report | | |
| **Deliverable 4: Final report on barriers assessment.** | 4 | 15 |
| 4.1 Barrier analysis and enabling environment for proposed actions and policy changes | | |
| 4.1a analytical work on gap and barrier analysis | | |
| 2 Drafting report | | |
| 3 STM4 | | |
| 4 Deliverable Report | | |
| **Deliverable 5: Roadmap, including key steps and instruments for facilitating data sharing** | 10 | 15 |
| 5.1 Roadmap development | | |
| 5.1a Framing of interventions and roadmap & implementation plan | | |
| 5.1b M&E Framework | | |
| 5.2 Draft report for submission | | |
| 5.3 STM5 | | |
| 5.4 Deliverable Report | | |
| **Deliverable 6: Report documenting the final validation workshop (agenda, presentations, list of participants, photos/videos) and main outcomes of ICAT Botswana.** | 5 | 10 |
| 6.1 Validation workshop | | |
| 6.1a Support the government to organize project related workshops, help facilitate and provide workshop minutes and reporting (after the workshop) | | |
| 6.1b Organise workshop and presentations. (STM6) | | |
| 6.1c workshop participation (STM6) | | |
| 6.2 Drafting workshop report | | |
| **Submission of final deliverables** | 2 | 20 |
| 7.1 Refinement of all deliverables | | |
| 7.2 Submission of deliverables 1, 2,3,4, 5,6 | | |
| **Total** | 59 | 125 |