Initiative for Climate Action Transparency

Development and Institutionalization of a Framework to Track NDC Action and Build Capacity in Relevant Areas

Report on NDC tracking indicators and data gaps

St. Kitts & Nevis

20th December 2024

Submitted to:

The Government of St. Kitts and Nevis' Ministry of Sustainable Development, Environment, Climate Action, and Constituency Empowerment

Prepared by:

Caribbean Cooperative Measurement, Reporting & Verification Hub

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PREPARED UNDER

The Initiative for Climate Action Transparency (ICAT), supported by Austria, Canada, Germany, Italy, the Children's Investment Fund Foundation, and the ClimateWorks Foundation.

The ICAT Secretariat is managed and supported by the United Nations Office for Project Services (UNOPS)

Report on NDC Tracking Indicators and data gaps

Initiative for Climate Action Transparency – ICAT

Deliverable # K – Output 2.3.1

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20th December 2024

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Acronyms

BUR	Biennial Update Report
CCMRVH	Caribbean Cooperative Measurement, Reporting and Verification Hub
COP	Conference of Parties
EV	Electric vehicle
GDP	Gross Domestic Product
GHG	Greenhouse gas
GHGMI	Greenhouse Gas Management Institute
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ISO	International Organization for Standardisation
LEAP	Low Emissions Analysis Platform
MPG	Modalities, Procedures and Guidelines
MRV	Measurement, reporting and verification
MW	Megawatt
MWh	Megawatt hours
NC	National Communication
NDC	Nationally Determined Contributions
NEVLEC	Nevis Electricity Company Limited
PV	Photovoltaic
QA/QC	Quality Assurance/Quality Control
SAGE	Sectoral Activity Data for GHG Emissions
SCADA	Supervisory Control and Data Acquisition

SIDS	Small Island Developing State
SKELEC	St. Kitts Electricity Company Limited
SKN	St. Kitts and Nevis
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

1.1 Background on NDCs

At the 21st Conference of Parties (COP21), held in Paris in December 2015, 195 countries adopted an international climate treaty which was aimed at combating climate change called the "Paris Agreement". Under this treaty, countries are legally required to outline their climate action plans within a document called a Nationally Determined Contribution (NDC), which is expected to be updated every five years with increasing ambition. NDCs highlight the global effort taken to limit rising temperatures and mitigate against climate change. They provide detailed insights into each country's specific climate change mitigation and adaptation plans, including their emissions reduction targets, adaptation goals and overall national circumstances.

Through Article 4 of the Paris Agreement, countries were provided general guidance on the preparation and communication of NDCs which reflect their highest possible ambition, and progress made over time. In addition, through CMP Decision 18/CMA.1, more detailed guidance is given on how NDCs should be formulated, communicated and monitored.

Once NDCs are submitted, countries employ various strategies to aid implementation. This implementation can be tracked using various indicators which help evaluate the overall effectiveness of NDCs, inform policy, and in ensuring what is reported leads to tangible action. Indicators provide quantifiable metrics which make it easier to track progress over time. Clear indicators make it easier to hold governments accountable to their commitments and ensure countries are meeting their targets.

1.2 Purpose of the report

In adherence to its international commitments, as a party to the United Nations Framework Convention on Climate Change (UNFCCC), St. Kitts and Nevis submitted its first NDC in 2015 and its updated NDC in 2021. In its updated NDC, the nation communicated its ambition to reduce economy-wide carbon dioxide emissions by 61% relative to 2010 levels by 2030. This target is conditionally dependent on adequate international financial and capacity-building support. Multiple interventions were also identified to achieve the target:

- Transition to 100% renewable energy in power generation;
- Improve efficiency in the transmission and distribution of electricity;
- Electrification of 2% of the total vehicles;
- Development of electric vehicle (EV) infrastructure.

In addition, SKN identified several mitigation measures which could be implemented to achieve the overall target:

1. 35.7 MW of utility-scale solar photovoltaic (PV) capacity for SKN
2. 6.6 MW of wind power capacity in SKN
3. 25 MW of geothermal power capacity (10 MW in Nevis and 15 MW in SKN)
4. Improvement in transmission and distribution lines to reduce losses on both islands
5. Two solar PV plants of 0.75 MW each to supply two desalination plants
6. 5% reduction in the power demand by introducing Solar Water Heaters
7. Penetration of EVs reaching 2% of the vehicle fleet

In order to adequately track its overall progress toward the implementation of these mitigation measures, and ultimately achieve its reduction target, the Government of SKN sought project-level support under the Initiative for Climate Action Transparency (ICAT).

ICAT helps countries better assess the impacts of their climate policies and actions and fulfil their transparency commitments. It does this by increasing the overall transparency capacities of countries, including the capacity to assess the contribution of climate policies and actions on countries' development objectives, and providing appropriate methodological information and tools to support evidence-based policymaking.

The Government of SKN has undertaken this ICAT project, with the support from consultants at the Caribbean Cooperative Measurement, Reporting and Verification (MRV) hub to support the development of an NDC tracking framework to help manage and track the implementation of the NDC in the electricity generation and transport subsectors. This includes data collection for emissions and assessment of policies in the identified subsectors. In addition, the project seeks to establish the sustainable capacity to conduct projections of GHG emissions for the electricity generation and transport subsectors. The main objectives of the project are as follows:

- To develop an MRV framework for the electricity generation and transport subsectors with GHG emissions estimation, compilation and reporting
- To develop an NDC tracking framework that will manage and track the implementation of the NDC in the electricity generation and transport subsectors. Including data collection for emissions and assessment of policies in the identified subsectors
- To develop appropriate indicators for reporting on NDC progress achieved
- To strengthen the capacity of the St. Kitts and Nevis Government to maintain the two frameworks and improve modelling capabilities

This report presents a detailed look at the specific indicators which were chosen to track SKN's NDC implementation within their key emitting subsectors – electricity generation & transport. The overall relevance of each indicator chosen as well as specific gaps within the data available and data processes used to measure the indicators will be highlighted.

Some of the key deliverables completed under this ICAT project which provide substantial background to the development of this report include:

- Deliverable E – Report on data collection, management and data gap assessment for the energy sector, which presents an analysis of the data collection and management strategies in the energy sector as well as identifies the gaps which exist in this sector.
- Deliverable I - Documentation on the NDC tracking tool for the electricity generation and transport subsectors: This report provides guidance on the proposed software platform for NDC tracking within SKN which would feed into the overall NDC Tracking framework being developed.
- Deliverable H - Report on NDC tracking indicators for the Electricity Generation and Transportation Subsectors: This report highlights the selection and development of the proposed SKN NDC tracking indicators, including general data collection considerations, anticipated challenges and recommendations for monitoring indicators.

This report presents necessary quality assurance (QA)/quality control (QC) procedures which will promote accuracy and reliability in the data and data processes used for the NDC indicators and is a complement to the report on NDC tracking indicators – Deliverable H. In addition, the report outlines a roadmap with the criteria for prioritizing data gaps, as well as specific actions which SKN can take to address existing data gaps.

Sector/ Subsector	Proposed Indicator	Unit	Description	Source of information
	1.Total Annual GHG Emissions	Gg CO2	This describes the total estimated greenhouse gas (GHG) emissions in carbon dioxide equivalents.	Deliverable H – Chapter 3.1, Table 2
Electricity Generation	2. Annual generation of renewable energy from various sources	GWh	The total amount of electricity produced from renewable energy sources.	Deliverable H – Chapter 3.1, Table 2
	3.Total Installed Capacity of solar PV	MW	This describes the total installed MW of power contained in the installation of solar PV systems	Deliverable H – Chapter 3.1, Table 2
	4.Total Installed Capacity of wind power	MW	This describes the total installed MW of power contained in the installation of wind power systems.	Deliverable H – Chapter 3.1, Table 2
	5.Total Installed Capacity of geothermal power	MW	This describes the maximum amount of power that each geothermal installation can produce under specified conditions.	Deliverable H – Chapter 3.1, Table 2
	6. Total Installed Capacity from renewable sources	MW	This describes the amount of power that all renewable installations can produce under specified conditions.	Deliverable H – Chapter 3.1, Table 2
	7. Annual % transmission & distribution losses	%	This measures the proportion of electricity lost during transmission (electricity received from producers - electricity delivered to the distribution grid/direct consumers on the transmission grid) and distribution (electricity received from transmission + production at the distribution level - electricity delivered to consumers).	Deliverable H – Chapter 3.1, Table 2
Transport	8. Number of electric vehicles sold annually	# of vehicles	This describes the total number of electric vehicles sold annually.	Deliverable H – Chapter 3.1, Table 2
	9. Annual % share of total vehicle sales representing electric vehicles	%	This describes the proportion or percentage of the total vehicle fleet sales which comprise electric vehicles.	Deliverable H – Chapter 3.1, Table 2
	10. Annual number of operational public and private charging stations	# of charging stations	This describes the total number of charging infrastructure available for use in SKN within a given year.	Deliverable H – Chapter 3.1, Table 2

2 Proposed NDC Tracking Indicators

2.1 Overview of proposed indicators

A total of ten (10) indicators were proposed and chosen for the tracking of SKN's NDC implementation. Six (6) of these indicators are specific to the electricity generation subsector, three (3) specific to transportation and one (1) indicator is general to all sectors. The specific indicators chosen are as follows:

Table 1: St. Kitts and Nevis' NDC Tracking Mitigation Indicator List and Description

This indicator table was adapted from the "Mitigation Indicators for NDC Tracking" table available within ***Deliverable #H, Output 2.1.1: Report on NDC Tracking Indicators for the Electricity Generation and Transportation Subsectors (See Annex 1 – Related Deliverables***). The full table includes details on the Base year values (2010) and 2030 target values for each indicator.

2.2 Relevance of Indicators

The indicators proposed within Deliverable #H, Output 2.1.1, as mentioned above, are relevant for use by SKN as they align with the specific mitigation measures highlighted within SKN's NDC as well as the following:

1. The indicators can address the unique challenges faced by SKN as a small island developing state:
    - Like many SIDS, SKN is heavily dependent on fossil fuel imports to meet its growing energy demand. In addition, limited access to resources, as well as increased vulnerability to the impacts of climate change, continue to plague SIDS. The indicators chosen help address some of these challenges by promoting accurate and regular monitoring of critical energy sector components. This monitoring helps track energy usage, which can influence policy decisions. It can also actively assess the overall progress toward achieving emissions reductions so adjustments can be made where necessary. In addition, a more streamlined and targeted approach to data collection and management of the indicator-specific data can help facilitate access to international funding through climate financing, which is typically contingent on SIDS being able to show measurable progress toward emissions reductions.
2. The indicators contribute directly (or indirectly) to the overall emissions reduction goal, which can be verified due to their measurability.

- For example, knowledge of the annual RE generation (Indicator #2), can be used to calculate the emissions avoided, hence the emissions reductions on an annual basis, which would provide an overall clear picture of the environmental benefits of investment in renewables.

3. The indicators can be measured/estimated using existing datasets, monitoring practices and methodologies.
    - As highlighted in Table 3 of Deliverable #H, Output 2.1.1 (***See Annex 1 – Related Deliverables***), most of the indicator data has already been collected and stored.
4. The indicators support sustainable development goals, which improve energy access and enhance public health through cleaner transportation.
    - More specifically, the indicators help support ***SDG 7: Affordable and clean energy***, which aims to ensure universal access to affordable, reliable, sustainable, and modern energy for all by 2030, and ***SDG 11: Sustainable Cities and Communities*** which emphasises the importance of sustainable transport systems, which can reduce air pollution, promote physical activity (like walking and cycling), and ultimately improve public health.
5. The indicators chosen can be integrated with other local policies within SKN, and especially align with the proposed energy and transportation mitigation measures outlined within SKN's NDC (See ***Section 1.2)*** and other national reports.

3 Data Gap Assessment

3.1 Identified Data Gaps and Impacts

A preliminary overview of the data gaps which exist within the Energy sector in SKN, revealed the major gaps for NDC indicators as identified in ***Table 2***. The table also features some proposed measures which can be taken to address these gaps.

Table 2: St. Kitts and Nevis' NDC Tracking Indicators and Data Gaps and impacts

Sector /Subsector	Indicator	Current Status and Data Gaps	Proposed Methods to address gaps	Impact of Gaps
All Sectors	Total Annual GHG Emissions	Most recent data are available for 2018. This data is obtained from the national inventory reports for SKN.	Establish a process to collect and/or obtain activity data on an annual basis. This would be aligned with the inventory system for SKN and reporting for the biennial transparency reports (BTR) and national communication (NC).	Inaccurate or outdated emissions data hampers the ability to track progress towards NDC targets and assess alignment with the Paris Agreement. Without regular data collection, there is limited ability to identify key emission sources and implement targeted mitigation actions.
Electricity Generation	Annual generation of renewable energy from various sources	This data can be obtained from the utilities for utility-scale systems but is not readily available in the Climate Action Department, which is responsible for NDC tracking.	The Climate Action Unit is encouraged to work closely with the utilities and the Energy Division to ensure that a system is established to record renewable energy generation from both utility-scale systems and distributed generation	The inability to produce an annual generation of renewable energy sources would hamper the ability to track the achievement of SKN in meeting their goal of 100% electricity generation from renewable energy resources.
	Total Installed Capacity of solar PV	The installed capacity of utility-scale solar PV systems is available from the utilities SKELEC and NEVLEC. The installed distributed solar PV systems are required to be registered with the ministry, which is responsible for energy for grid connection but not for stand-alone systems.	Establish a registration system for residential and commercial distributed PV systems in Nevis.	The lack of data on residential and commercial installations leads to inaccurate measurements of the sector's total capacity and its potential for scaling. Policy gaps may persist as decision-makers do not have a

Sector /Subsector	Indicator	Current Status and Data Gaps	Proposed Methods to address gaps	Impact of Gaps
		There are some data gaps still exists for grid connected installed distributed PV systems		comprehensive understanding of sector performance
	Total Installed Capacity of wind power	Currently, only one utility-scale system has been installed on the island of Nevis. Information about this system is readily available from NEVLEC.	For future systems, a registration system linked with the utilities the Department of Statistics, Energy Division and Climate Action Unit needs to be established	Insufficient data limits feasibility assessments for future projects, which is especially critical in SIDS with constrained resources. This can deter investment and financing for new projects due to a lack of transparent and reliable capacity data.
	Total Installed Capacity of geothermal power	Currently, no geothermal power is installed in SKN. Therefore, no data gap exists.	For future systems, a registration system linked with utilities and the Department of Statistics, Energy Division and Climate Action Unit needs to be established	None Identified
	Total Installed Capacity from renewable sources	This would be the sum of all the installed renewable energy capacity in the Federation.	This data would be accumulated from the systems established for registration.	Can hamper the tracking of NDC if the total installed capacity from renewable sources is unknown or inaccurately reported.
	Annual % transmission & distribution losses	There is no distinction between technical losses and non-technical losses for the transmission and distribution systems for both St. Kitts and Nevis, respectively. It should be noted that improvements in the transmission and distribution systems can only improve technical losses on the system.	Technical losses can be estimated using a top-down approach based on tools that calculate load flow studies. This can be separated from the total losses to create a disaggregation of technical vs non-technical losses. A bottom-up approach is also applicable. It is recommended that utilities implement this.	The reduction of technical losses requires an upgrade of the systems, while non-technical losses are reduced mainly through policy interventions and monitoring. Therefore, a gap in this area can impact on the overall reduction in the losses for transmission and distribution of the networks.

Sector /Subsector	Indicator	Current Status and Data Gaps	Proposed Methods to address gaps	Impact of Gaps
Transport	Number of electric vehicles sold annually	SKN is not a manufacturer of vehicles. Therefore, all vehicles are imported, and importation data is available from the customs department, but that does not necessarily represent the vehicles sold or in operation on the road. Sales data from local car dealers are not actively collected by any ministerial body.	Establish an agreement between local car dealerships and the Climate Action Unit to annually collect and sales data disaggregated by vehicle type	A limited understanding of EV adoption trends affects infrastructure planning, such as charging station deployment. Hinders the policy development to increase EV uptake
	Annual % share of total vehicle sales representing electric vehicles	In addition to the sales data for vehicles not being collected, there is also a direct categorisation of imported vehicles based on fuel type. Therefore, disaggregation of electric, hybrid, gasoline and diesel vehicles are difficult.	Include fuel type in the vehicle database category system to record imported vehicles as "electric", "hybrid", "gasoline, "diesel" or any other relevant category,	This gap affects the ability to assess the actual contribution of the transport sector to emissions reduction goals. This prevents the assessment of SKN's overall progress towards reducing fossil fuel reliance in transportation.
	Annual number of public and private charging stations	There are no public or private charging stations for electric vehicles. However, utility companies will likely collect this data.	Once installed, ensure there is a mechanism in place to track the changes to public infrastructure.	Lack of tracking limits the ability to gauge the sufficiency of charging infrastructure, a key enabler for EV adoption. This can result in uneven access to charging facilities, reducing confidence in EV ownership among residents.

4 Data Protocols

In order to adequately and consistently track the implementation of NDCs over time, it is crucial that SKN develops sound data collection and management strategies which ensure accuracy and transparency in data.

Some key data collection protocols which need to be developed and strengthened to achieve the desired efficiency when tracking indicators are highlighted below:

1. Standardisation of data collection: All data collected are recommended to adhere to standardised formats and methodologies to ensure consistency. These standardised formats are recommended to be developed by SKN to fit into their country's national circumstances.
2. Annual data collection cycle: Data collection is recommended to be done on at least an annual basis. Typically, annual data aggregation is the ideal way to monitor progress against targets.
3. Data verification and quality control: This ensures that the data collected is accurate and up to date. Strategies which involve cross-checking reports from different stakeholders/sources, can be implemented to accomplish this. This is explained in more detail in the **section 4.3.**
4. Reporting and transparency: To increase transparency, SKN can use public reporting strategies such as publishing reports on government websites or open data portals that can be publicly accessed.
5. Training and Capacity Building: It is crucial that there are constant opportunities for training and capacity building being done within the key entities directly involved in data collection, data storage and verification. This will ensure that skills are not lost and standard best practices are updated. This also supports succession planning and helps in preventing potential data loss due to changing staff or mandates.

Sections ***4.1- 4.3*** present a more detailed look at some specific data collection procedures, processing methods, and QA/QC procedures that are recommended for tracking SKN's electricity generation and transport sector indicators. The text is also summarised through the data protocol tables for each indicator (See ***Appendix***)

4.1 Data Collection Procedures

When mapping the data collection procedures, it is important to clearly identify the sources of data for the indicators being tracked, any relevant software tools and hardware infrastructure which can be used, any necessary data collection protocols which should be followed and any other relevant resources. A comprehensive list of the software tools and their licensing/accessibility arrangements can be found in ***Table 12*** in the ***Appendix.*** It is also critical to clearly outline the frequency at which data will be collected to ensure alignment with implementation.

The key data sources for each indicator are outlined in ***Deliverable #H, Output 2.1.1: Report on NDC Tracking Indicators for the Electricity Generation and Transportation Subsectors***. (See **Annexes** for details)

Indicator #1 – Total Annual GHG Emissions

- Tools, Protocols & Resources:
    - Gather activity data
    - Apply emission factors (default or country-specific) based on IPCC Guidelines
    - Use software tools for data entry and calculations. Some commonly used software examples are:
        - IPCC GHG Inventory Software: This web-based application was developed for use in estimating and reporting GHG emissions by sources and removals by sinks. This is an open-source software.
        - Sectoral Activity Data for GHG Emissions (SAGE) tool by GHGMI, is an innovative platform which facilitates activity data collection and management for all IPCC sectors. This tool is not explicitly open source, however, is made available by the UNFCCC Secretariat upon request and approval by your UNFCCC focal point. It is not shared for commercial purposes
        - Customised Excel sheets for GHG Inventory entry
- Frequency & Reporting
    - It is recommended that data be collected on an annual basis. However, given resource constraints, data collection and reporting can be done to align with UNFCCC reporting requirements and data processing techniques can be used to fill gaps.

Indicator 2 - Annual Generation of Renewable Energy from various sources

Renewable energy outputs are typically monitored using local measurements from energy facilities.

- Tools, Protocols & Resources:
    - Annual generation data is recommended to be collected for each renewable energy source. This can also be collected monthly and aggregated.
    - Technical Infrastructure:

        - Devices needed to measure energy generation data. These include smart meters and energy management systems within the local plants.
        - Automated monitoring systems like SCADA (Supervisory Control and Data Acquisition) for RE generation can help in continuous monitoring and reduce the burden of manual data collection.
    - Data Platforms: National data can be aggregated using digital platforms like those supported by the International Renewable Energy Agency (IRENA) or the United Nations Development Programme (UNDP).
    - Training and Capacity Building: It is critical to develop expertise in data management and renewable energy analytics
- Frequency & Reporting
    - Data is recommended to be collected on an annual basis, however, if internally monitored is applied, monthly or quarterly basis is recommended to aid real-time energy management.

Indicator #3 – 6 - Total Installed Capacities for Renewables (Solar PV, Wind, geothermal)

- Tools, Protocols, Resources
    - Record the installed capacity of renewable energy systems
    - Verify data with physical inspections or mapping tools.
    - Technical Infrastructure:
        - SCADA Systems for Real-Time Monitoring: are used to monitor and control the performance of renewable energy installations in real-time. These systems help to track generation performance and the installed capacity of solar PV, wind, and geothermal plants. The data collected can be used to assess the availability and operational efficiency of renewable energy assets in St. Kitts and Nevis.
    - GIS tools like ArcGIS (commercial), QGIS (open source) can facilitate spatial analysis of renewable energy resources
- Frequency and Reporting
    - Data is recommended be collected on an annual basis where possible and reported on a biennial basis to align with the BTR cycles.

Indicator #7 – Annual % transmission & distribution losses

- Tools, Protocols, Resources

    - Measure the difference between energy generated and losses to the system
    - Analyse trends using historical utility data
- Frequency and Reporting
    - Annually or monthly if recorded internally

<u>Indicator #8 – Number of electric vehicles sold annually & #9 - Annual % share of total vehicle sales representing electric vehicles</u>

- Tools, Protocols, Resources
    - Annual sales by vehicle type
    - Cross-validate with government registration data
    - Vehicle Registration Database
        - It is critical to ensure a national database is kept, updated and frequently checked for inaccuracies. Data such as vehicle type, make, model, and year of manufacture should be recorded.
        - To accurately track vehicle sales, ensure all sales (including EVs) are reported to the registration authority within a certain period after the completion of the sale.
    - Dealership Reporting System:
        - Recommend establishing a system with EV dealerships to submit regular (quarterly or annual) reports that detail the number of EVs sold during that period. A standardised reporting template (digital or paper) can be created for car dealerships to report EV sales.
- Frequency and Reporting
    - Annually or quarterly

<u>Indicator #10 – Annual number of public and private charging stations</u>

- Tools, Protocols, Resources
    - Charging Station Database/Registry:
        - A national registry which features both public and private charging stations should be developed and stored within the Ministry with responsibility for Energy.
        - This Ministry should be responsible for tracking the installation of charging infrastructure.
        - GIS can be used to map the charging station locations and their status (active/inactive)

        - To ensure compliance, charging station owners should be required to register their installations with the Ministry with the responsibility of Energy/Transport. This should include regular updates on the status and capacity of the stations.
- Frequency and Reporting
    - Annually or as changes are made

4.2 Data Processing Methods

Data processing involves the conversion of raw data into usable information which can be analysed. Typically, data processing occurs once raw data has been collected and prepped by cleaning and organising it through the removal of duplicate data, error correction, and identification of missing values. Processing involves the preparation of data through several transformations to convert it to a structured format suitable for analysis. This usually involves the use of statistical analysis and aggregation.

Indicator #1 – Total Annual GHG Emissions

- Methodologies for data processing:
    - Use 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Tier 1 or Tier 2 methodology based on the available data. If sector-specific emission factors are unavailable, then the Tier 1 approach should be utilised.
- Data Aggregation:
    - Ensure consistency in unit conversions. Data collected should be converted to common metrics such as CO2 equivalents using global warming potential (GWP). This allows the reader to view and compare emissions across multiple sources and gases.
- Data Analysis Techniques:
    - Linear interpolation can be used for estimations of future emissions and can help project NDC target values when actual values aren't reported.
    - Use software for QA/QC, time-series analysis and consistency checks. Suitable tools are mentioned in ***Section 4.1*** above.

Indicator #2 – Annual Generation of Renewable Energy from various sources

- Methodologies for data processing

  - Use consistent frameworks for calculating renewable energy generation, ensuring units are standardised across each RE source (solar, wind, geothermal) and normalised for variability across sources.
- Data Aggregation
  - Combine output data into an annual total segmented by energy source
  - Consolidate monthly and annual totals into a national renewable energy generation database
- Data Analysis Techniques
  - Evaluate generation trends using time-series analysis
  - Compare annual renewable energy contributions to national targets

Indicator #3 – 6 - Total Installed Capacities for Renewables (Solar PV, Wind, geothermal)

- Methodologies
  - Adhere to technical specifications for capacity data. Use GIS tools to validate the RE installations spatially.
- Data Aggregation
  - Sum total installed capacities of all solar PV, wind and geothermal systems annually.
  - Track commissioning and decommissioning dates for capacity changes.
  - Record expansions or upgrades in annual capacity totals.

- Data Analysis Techniques
  - Conduct analysis to forecast future trends in capacity

Indicator #7 – Annual % transmission & distribution losses

- Methodologies:
  - Use load flow systems calculations to determine technical losses
  - Analyse total losses and use calculations to disaggregate technical and non-technical losses
- Data Aggregation
  - Compile data on energy input and output across transmission & distribution systems
  - Calculate aggregate losses by region and network type

- Data Analysis Techniques

  - Use trend analysis to monitor loss changes over time
  - Conduct correlation studies between loss percentages and infrastructure upgrades

<u>Indicator #8 – Number of electric vehicles sold annually</u>

- Methodologies
  - Use summary statistics and segmentation to process data on EV sales by vehicle type.
- Data Aggregation
  - Consolidate annual sales data into summaries segmented by vehicle category.
  - Perform consistency checks across multiple data sources
- Data Analysis Techniques
  - Calculate annual growth rates
  - Perform trend analysis to forecast future EV adoption

<u>Indicator #9 – Annual % share of total vehicle sales representing electric vehicles</u>

- Methodologies:
  - Calculate market share percentages using formula-based calculations
- Data Aggregation
  - Align EV sales and total vehicle sales data by time period
  - Summarise annual market shares in standardised reports
- Data Analysis Techniques
  - Perform comparative analysis against previous years
  - Visualise market share trends with charts or dashboards

<u>Indicator #10 – Annual number of public and private charging stations</u>

- Methodologies:
  - Use GIS tools to verify charging station locations and categorise by type (public/private)
- Data Aggregation
  - Summarise charging station installations by type annually
  - Create a categorised inventory for public and private stations
- Data Analysis Techniques
  - Conduct density analysis to evaluate the spatial distribution
  - Compare installation trends with EV adoption rates

4.3 Quality Assurance/Quality Control (QA/QC) Procedures

QA/QC procedures should follow IPCC guidelines, which recommend routine checks, such as recalculations and validation against historical trends, to identify anomalies. Typically, some form of third-party verification and review process is done to ensure transparency and accuracy of reported data.

The key aspects which should be outlined when developing sound QA/QC procedures are outlined as follows:

1. Data Validation: Ensure that data is correct, accurate, and falls within expected ranges or values. Validation checks should be performed at each stage of data collection and processing. This can typically be done using databases, automated scripts or Excel features.
2. Consistency Checks: Ensure that the data is consistent across various datasets, time periods, and reporting sources. Any anomalies should be flagged for further investigation. Automated scripts (Python, R) and comparison tools (e.g., Excel, OpenRefine) can be used.
3. Data Audits: Conduct regular data audits to ensure that data collection procedures are followed correctly and that the data is trustworthy. This can be done using audit trails in databases, manual audits and external verification.
4. Data Completeness: Ensure that the data sets are complete, with minimal missing values. Missing data should be identified early and addressed through imputation or data collection improvements.

For each indicator, the following QA/QC procedures are suggested:

Indicator #1 – Total Annual GHG Emissions

Data Validation

- Compare calculated GHG emissions with historical data for consistency
- Validate emissions factors used against internationally recognised standards, such as those provided by the IPCC.
- Perform cross-checks with secondary data sources to ensure accuracy.

Consistency Checks

- Ensure all sectors are consistently included in reporting
- Recheck data from emissions inventories to ensure uniform use of metrics

Data Audits

- Conduct periodic external reviews of emissions inventories by independent third-party auditors
- Establish traceable documentation for every data point (E.g. fuel consumption records, activity data)

Data Completeness

- Verify that all emitting activities within the reporting boundary are accounted for.
- Use gap analysis to identify and document missing data for future inclusion

<u>Indicator #2 – Annual Generation of Renewable Energy from various sources</u>

Data Validation

- Use SCADA systems or energy management software to validate real-time data against manual logs from power plants. IRENA is a good source of useful tools and templates that can be used to validate renewable energy data.
- Compare generation data with modelled outputs or benchmarks from similar regions or installations.

Consistency Checks

- Regularly update and verify data collection methodologies to ensure consistency over time. The same measurement intervals, units and technologies should be used. Protocols from NREL's Best Practices in Renewable Energy Data Management can be used to standardise these practices.
- Separately report each renewable energy source to avoid aggregation errors.
- Compare generation data across months/years for each renewable energy source

Data Audits

- Schedule biannual or annual audits of renewable energy facilities to verify reported generation data against metered readings. Data review frameworks such as those from the IRENA Renewable Energy Statistics Yearbook can be used to aid this process.
- Engage third-party experts to verify system outputs

Data Completeness

- Confirm that generation data includes all operational renewable energy systems within the reporting framework.
- Fill data gaps using modelled estimations based on capacity factors when metered data is unavailable.

Indicator #3 – 6 - Total Installed Capacities for Renewables (Solar PV, Wind, geothermal)

Data Validation

- Cross-check capacity data reported by utility companies or installers against physical inspections and installation records
- Validate reported capacities, procurement records, and equipment specifications

Consistency checks

- Ensure consistent reporting across technologies by using standardised templates and metrics.
- Maintain a uniform update schedule (quarterly or annually) for tracking capacity changes.

Data Audits

- Conduct field inspections of renewable installations to confirm operational status and nameplate capacity
- Periodically engage third-party experts to review and certify the accuracy of installed capacity data

Data Completeness

- Include all operational installations in the total capacity figures, even those not directly connected to the grid (e.g., off-grid solar PV systems)

Indicator #7 – Annual % transmission & distribution losses

Data Validation

- Crosscheck energy generation and energy supply data with SKELEC & NEVLEC's metered records. Validate the consistency with the data and trends from previous years. This would help to identify any potential errors or discrepancies in the metering and recording systems.
- Conduct regular energy audits of transmission and distribution networks to confirm the accuracy of the reported losses.
- Ensure meters at critical points (generation, transmission, distribution) are calibrated correctly. They can be recalibrated on an annual basis.

Consistency checks

- Compare the reported transmission losses against benchmarks for similar small island developing states or national targets set under the NDC framework.

Data Audits

- Conduct periodic audits by external reviewers to confirm the accuracy and integrity of reported figures and verify the methodologies used for calculating losses.
- Maintain detailed logs of standard operating procedures for data collection and processing, to support audits in the identification of potential gaps.

Data Completeness

- Ensure all segments of the transmission and distribution network are included when collecting data.
- Ensure data is reported consistently across all reporting years. This will help in tracking trends accurately.

Indicator #8 – Number of electric vehicles sold annually & #9 - Annual % share of total vehicle sales representing electric vehicles

Data Validation

- Cross-check reported EV sales with vehicle registration data to ensure no discrepancies.
- Validate charging station data to ensure it matches geographical locations and the status of operations.

Consistency checks

- Compare the current year's EV sales data with previous years to identify any significant deviations.

Data Audits

- Perform periodic audits of vehicle sales records from dealerships.

Data Completeness

- Check for missing vehicle registration data.
- Develop a system to fill in gaps where data is incomplete.

Indicator #10 – Annual number of public and private charging stations

Data Validation

- Validate charging station data to ensure it matches geographical locations and the status of operations.

Consistency checks

- Ensure that the reported charging station count matches the actual number of operational stations.

Data Audits

- Conduct on-site checks of a sample of charging stations to confirm reported data.

Data Completeness

- Check for missing charging station data.
- Develop a system to fill in gaps where data is incomplete.

5 Roadmap for Addressing Data Gaps

5.1 Prioritisation of Gaps

As SKN moves toward NDC implementation and formalises its processes to ensure accurate and transparent reporting, it is important that the pre-existing data gaps are addressed, to further improve accuracy for reporting purpose.

When addressing gaps, given the resource and capacity constraints, which are typical for SIDS like SKN, it is important to consider which gaps should be prioritised. In considering how gaps can be prioritised, the following are some key aspects which should be analysed and potential questions which can be asked to help assess priority:

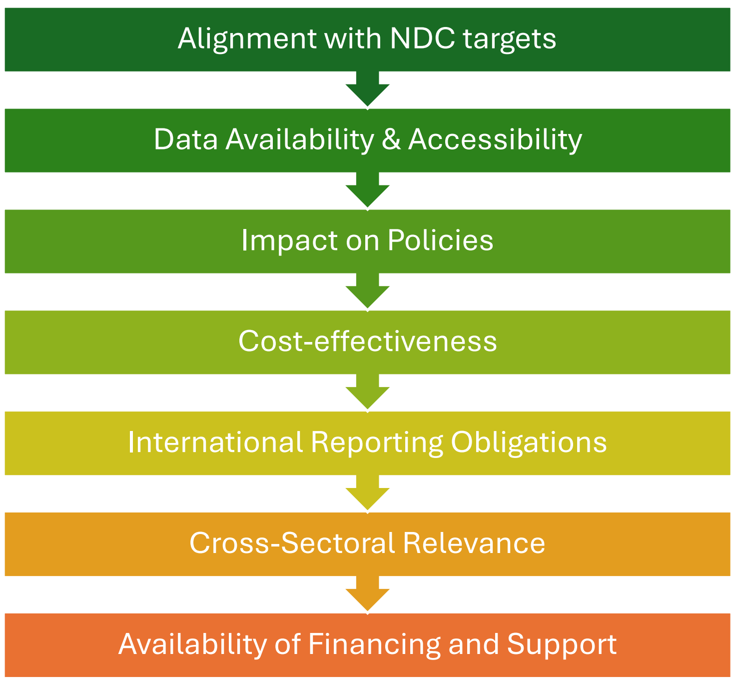

Figure 1: Gap Prioritisation Considerations

1. Alignment with NDC targets and climate goals
   - Is the data aligned with NDC targets and climate goals?
   - Does the gap directly or indirectly affect the overall emissions reductions?
     - If it directly affects reductions, it should be given priority
   - Does the gap directly hinder the ability to track progress toward high-impact targets?
2. Data Availability and Accessibility
   - Is the data readily available or accessible?
   - Are there gaps in existing data systems which prevent the collection of data?

- Priority should be given to filling gaps which can be feasibly collected or estimated, within the current resource constraints.
- Easily accessible data sources should be first (e.g. utility records, vehicle registration forms, import logs)
- Indicators where data is either not being collected regularly or is not available in real-time should be given priority (data on EV charging infrastructure)

3. **Impact on Policy Implementation and Decision-Making**
    - Can filling this gap and improving the quality of data directly inform policy or investment decisions?
        - If yes, focus should be placed on these types of gaps. This can be seen in the following examples:
            - Data on grid stability, intermittency of renewable energy, or storage capacity can directly influence policy on grid modernisation or the scaling of renewable energy.
            - Data on vehicle emissions, fuel consumption, and EV infrastructure can help policymakers design effective policies to reduce transport sector emissions or incentivise EV adoption.
4. **Cost-effectiveness**
    - Is addressing this gap cost-effective?
    - It is important to consider which data gaps, when filled, will provide the most significant impact for the least cost in terms of improving NDC tracking, reporting, and decision-making. Data collection can be resource-intensive, so priority should be given to data which will provide the most actionable insights.
5. **International Reporting Obligations**
    - Does the gap critically affect UNFCCC reporting obligations or other global frameworks?
    - Priority should be given to gaps that affect the ability to adhere to international reporting obligations that are critical for securing climate financing and technical support. In addition, if certain indicators are required for upcoming reporting periods, these data gaps should also be prioritised.
6. **Cross-sectoral Relevance**
    - Is the data gap relevant across multiple sectors?
    - Some data may be used across multiple sectors. Examples include emission factors, data on the interaction between EVs and electric grid, and renewable energy integration.
    - Priority should be given to data gaps, which help identify these cross-sectoral linkages and improve coordination among the sectors. This is especially

relevant as countries, like St. Kitts and Nevis move toward more integrated energy and transportation systems.

7. **Availability of Financing and Support**
   - Is financing or external support available to address the gap?
   - Priority should be given to gaps which align with funding opportunities to ensure access to necessary financial resources for data collection. This may include international funding mechanisms through programs like **Green Climate Fund (GCF)**, or **Global Environment Facility (GEF).**
   - Priority should also be given to gaps where external support is available to provide technical assistance and capacity building, thus bridging the data gaps. Programs from organisations such as the World Bank or UNDP may be useful.

The criterion listed above can be used to assign priority to each gap identified, which would help map the way forward when addressing them. A simple way this can be done is to assign numerical weights (on a scale of 1 – 3) to each gap based on the critical questions highlighted above. If the answer to the question is Yes, then the weight is 3; if the answer is maybe 2, and if no, it is zero. ***Table 3*** shows an example template which can be used for prioritisation.

Table 3: Gap Prioritisation Ranking Table

Criterion	Question	Intensity Weight	Score (Yes = 3; Maybe yes =2, Maybe No=1, No = 0)
Alignment with NDC targets and climate goals	Is the data aligned with NDC targets and climate goals?	0-3	
Data availability and accessibility	Is the data readily available or accessible?	0-3	
Impact on policies	Does this data directly inform policy or investment decisions?	0-3	
Cost-effectiveness	Is addressing this gap cost-effective?	0-3	
International reporting obligations	Does the gap critically affect UNFCCC reporting obligations or other global frameworks?	0-3	
Cross-sectoral relevance	Is the gap relevant across multiple sectors?	0-3	

Availability of financing and support	Is financing or external support available to address the gap?	**0-3**	
Total Score (Level of Priority given to gap)			

This can be used for various gaps. The higher the total score, the higher the priority of the gap.

5.2 Action Plan

Table 4 below is a simplified action plan with recommended interventions by SKN to ensure consistent updates of NDC actions and suggested timelines for completion.

Table 4: Action Plan for Indicators on addressing the data gaps

Subsector	Indicator	Actions	Suggested Timeline
All Sectors	Total Annual GHG Emissions	Establish dedicated GHG inventory system for annual reporting	Short-term: 6-12 months
		Train relevant government agencies on IPCC methodologies	Medium-term: 1-2 years
Electricity Generation	Annual generation of renewable energy from various sources	Establish monitoring system for annual RE generation	Short-term: 6-12 months
	Total Installed Capacity (solar, wind, geothermal, renewables)	Conduct survey on installed RE systems (including commercial and residential)	Short-term: 6 months
		Launch a registration platform for new RE installations in Nevis	Medium-term: 1 year
	Annual % transmission & distribution losses	Establish a system to correctly distinguish between technical and non-technical losses	Medium-term: 1-2 years
Transport	Number of electric vehicles (EVs) sold annually	Collaborate with dealerships to develop EV sales reporting mechanism	Short-term: 3-6 months

		Create a government database for EV imports and sales	Medium-term: 1 year
	Annual % share of EVs in total vehicle sales	Update customs data systems to include fuel categorisation	Short-term: 6 months
		Train customs officials on data systems and fuel categorisation	Medium-term: 1 year
	Annual number of public/private charging stations	Work with utilities to monitor installations of charging stations	Short-term: 6 months
		Implement a permitting system for new charging stations to record their locations	Medium-term: 1 year

In addition to the actions listed above, St. Kitts and Nevis can implement some other key cross-cutting initiatives such as:

- Training Programs: Workshops on emissions reporting, renewable energy tracking and vehicle data systems
- Technology Upgrades: Investments into software and hardware which will help improve data collection and reporting systems should be considered.
- Stakeholder Engagement: Partnerships with utility companies, car dealerships and government agencies need to be built to streamline the flow of data.

6 Conclusion

In alignment with the Paris Agreement, countries, including SKN, have submitted their NDC, which contains mitigation and adaptation targets. It is pertinent that the progress toward achieving these targets is tracked, as it allows for any necessary adjustments to be made as countries move toward achieving their overall climate goals. This tracking can be done using progress indicators, which can be both quantitative and qualitative in nature and provide a comprehensive analysis of progress. This NDC indicator data should be recorded, reported, documented, and archived consistently over time. This data includes data sources, input data, methodologies, assumptions, calculation sheets and the compiled indicator data. Given SKN's heavy focus on its energy sector for mitigation and noting the measures which were identified within the NDC to achieve its overall mitigation target, a total of 10 quantitative indicators within the electricity generation and transport subsectors have been identified to track SKN's NDC progress. Given the data demands for the indicators, an efficient data collection and management system must be established to ensure accuracy, consistency and transparency throughout the NDC tracking process, as highlighted in the document.

7 References

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8 Appendix

Table 5: Data Sources for SKN NDC Tracking Indicators

Subsector	Proposed Indicator	Main Data Sources	Lead Responsible Entity
All Sectors	Total Annual GHG Emissions	GHG Inventory, First Biennial Update Report (BUR1), National Energy Balances	Ministry with responsibility for the Environment (Currently: Ministry of Sustainable Development, Environment, Climate Action and Constituency Empowerment)
Electricity Generation	Annual generation of renewable energy from various sources	Utility company annual reports, National Energy Balances, Energy Unit	Ministry of Public Infrastructure, Energy and Utilities; Domestic Transport; Information, Communication and Technology; and Posts SKELEC and NEVLEC
	Total Installed Capacity of solar PV	First Biennial Update Report (BUR1), Utility company annual reports	
	Total Installed Capacity of wind power		
	Total Installed Capacity of geothermal power		
	Total Installed Capacity from renewable sources		
	Annual % transmission & distribution losses	Utility company annual reports or data	SKELEC and NEVLEC
Transport	Number of electric vehicles sold annually	Datasheets from Customs, Car dealers, Traffic Department and Inland Revenue Department	Ministry of Public Infrastructure, Energy and Utilities; Domestic Transport; Information, Communication and Technology; and Posts Customs and Excise Department Traffic Department Inland Revenue Department
	Annual % share of total vehicle sales representing electric vehicles	Datasheets from Customs, Car dealers, traffic department and inland revenue department	Energy Unit Ministry of the Environment Department of Transport Inland Revenue Department
	Annual number of public and private charging stations	Datasheets or reports from utility companies	SKELEC and NEVLEC

[Source: Deliverable H - Report on NDC Tracking Indicators for the Electricity Generation and Transportation Subsectors]

Table 6: Indicator 1 Data Protocol Table

[Indicator #1] Total Annual GHG Emissions		
Methodology	**Output**	**Unit**
IPCC Tier 1*	Emissions	Gg CO2e
Data Sources/Coordinating Entity		
Primary		**Secondary**
Ministry w.r.f Environment National GHG Inventory Report National Energy Balance		Biennial Update/ Transparency Reports
Data Collection & Analysis Tools		
GHG Inventory Software Sectoral Activity Data for GHG Emissions (SAGE)		

<table>
<tr><th colspan="4">Sampling & Data Collection Procedures</th></tr>
<tr><td>Collection Frequency:</td><td>Annually (Ideally)

Biennially (acceptable)</td><td>Procedures:</td><td>Gather activity data
Apply emission factors based on IPCC Guidelines</td></tr>
<tr><th colspan="4">Data Processing, Aggregation and Analysis</th></tr>
<tr><td colspan="4">Convert data to common metric & document. CO2 equivalents using global warming potential (GWP) should be used.
Linear interpolation can be used to estimate future emissions.</td></tr>
<tr><th colspan="4">QA/QC Measures</th></tr>
<tr><td>Data Validation</td><td>Consistency checks</td><td>Data Audits</td><td>Data Completeness</td></tr>
<tr><td>Compare: Calculated GHG emissions with historical data</td><td>Ensure all sectors are consistently reported</td><td>Conduct periodic external inventory reviews</td><td>Verify all emitting activities are accounted for</td></tr>
<tr><td>Validate emissions factors</td><td>Ensure uniformity of metrics</td><td>Establish traceable documentation for all data</td><td>Conduct gap analysis</td></tr>
<tr><td>Cross check with secondary sources</td><td></td><td></td><td></td></tr>
</table>

Table 7: Indicator 2 data protocol table

[Indicator 2] Annual Generation of Renewable Energy from Various Sources			
Methodology	**Output**	**Unit**	
Direct measurement (metering)	Electricity produced	GWh	
Data Sources/Coordinating Entity			
Primary		**Secondary**	
Ministry of Public Infrastructure, Energy and Utilities et al		Biennial Update/ Transparency Reports	
National Energy Balances			
Utility company annual reports (SKELEC and NEVLEC)			
Data Collection & Analysis Tools			
Smart Meters and Energy Management Systems Geographic Information System (GIS) Supervisory Control and Data Acquisition (SCADA) Systems			
Sampling & Data Collection Procedures			
Collection Frequency:	Annually Monthly/Quarterly (internally monitored)	Procedures:	Collect monthly and annual generation data
Data Processing, Aggregation and Analysis			
Processing/Aggregation		**Analysis**	
Combine output data into annual total segmented by enegry source Consolidate monthly and annual totals into a national RE database		Use time-series analysis to evaluate generation trends Compare annual RE contributions to national targets	
QA/QC Measures			
Data Validation	Consistency checks	Data Audits	Data Completeness
Cross check real-time data with manual power plant logs (Use SCADA system)	Regularly update and verify data colleciton methodologies	Schedule annual or biannual RE facility audits	Ensure generaiton data includes all operational RE systems relevant for reporting

Compare generatoin data with modelled outputs or benchmarks from similar regions	Report each RE source separately	Engage third-party experts to verify system outputs	Fill data gaps using modelled estimations
	Compare generation data across months/years for each RE source		

Table 8: Indicators 3 - 6 data protocol table

[Indicator #3 - 6] Total Installed Capacity of All Renewable Resources (Solar PV, Wind, Geothermal)			
Methodology	**Output**	**Unit**	
Direct measurement	Installed Capacity	MW	
Data Sources/Coordinating Entity			
Primary		**Secondary**	
Ministry of Public Infrastructure, Energy and Utilities; Domestic Transport; Information, Communication and Technology SKELEC and NEVLEC		Biennial Update/ Transparency Reports	
Data Collection & Analysis Tools			
Supervisory Control and Data Acquisition (SCADA) Systems ArcGIS, QGIS Low Emissions Analysis Platform (LEAP) Power BI or Tableau			
Sampling & Data Collection Procedures			
Collection Frequency:	Annually	Procedures:	Record the capacity of commissioned projects Verify data with physical inspections or mapping tools
Data Processing, Aggregation and Analysis			

Processing/Aggregation		Analysis	
Sum total installed capacities of all RE systems annually, per RE type Track commissioning and decommissioning dates Record capacity expansions or upgrades in annual totals		Regression analysis Spatial analysis	
QA/QC Measures			
Data Validation	Consistency checks	Data Audits	Data Completeness
Cross-check capacity data from utilities using physical inspections and installation records	Use standard templates and metrics for reporting	Conduct field inspections of RE installations	Include all operational installtions in total capacity figures
Validate reported capacities, procurement records and equipment specs	Maintain uniform update schedule for tracking capacity changes (quarterly or annually)	Engage third-party experts to review & certify accuracy of installed capacity data	

Table 9: Indicator 7 data protocol table

[Indicator #7] Annual % Transmission and Distribution Losses		
Methodology	**Output**	**Unit**
Formula-based calculations	Percentage losses	%
Data Sources/Coordinating Entity		
Primary		**Secondary**
Utility Company Annual Reports/Databases (SKELEC and NEVLEC)		
Data Collection & Analysis Tools		

SCADA System GIS			
Sampling & Data Collection Procedures			
Collection Frequency:	Annually	Procedures:	Measure the difference between energy supplied and delivered Analyze trends using historical utility data
Data Processing, Aggregation and Analysis			
Processing/Aggregation		**Analysis**	
Compile input and output energy data for T&D systems		Trend Analysis	
Calculate aggregate losses by region and network type		Correlation studies between loss % and infrastructure upgrades	
QA/QC Measures			
Data Validation	Consistency checks	Data Audits	Data Completeness
Crosscheck energy generation and energy supply data with SKELEC & NEVLEC's metered records	Compare reported T&D losses against benchmarks for similar SIDS or national targets	Conduct periodic audits by external reviewers	Enssure all T&D network segments are included in data collection
Conduct regular audits of T&D networks		Maintain detailed logs of standard operating procedures	Ensure consistent reporting of data
Ensure correct calibration of meters			

Table 10: Indicator 8 & 9 data protocol table

[Indicator #8 & 9] Number of Electric Vehicles Sold Annually & Annual % Share of Total Vehicle Sales Representing Evs			
Methodology	**Output**	**Unit**	
Summary statistics & formula-based calculations of market share	Number of electric vehicles sold	vehicles	
Data Sources/Coordinating Entity			
Primary			**Secondary**
Customs, Inland Revenue and Traffic Department, Car Dealerships			
Data Collection & Analysis Tools			
Vehicle registration database Dealership reporting system			
Sampling & Data Collection Procedures			
Collection Frequency:	Annually	Procedures:	Aggregate annual sales by vehicle type Cross check with government registration data Create and maintain national vehicle registration database Implement dealership reporting system
Data Processing, Aggregation and Analysis			
Indicator # 8			
Processing/Aggregation		**Analysis**	

Consolidate annual sales data into summaries segmented by vehicle category	Calculate annual growth rates
Perform consistency checks	Perform trend analysis
Indicator # 9	
Processing/Aggregation	**Analysis**
Align EV sales and total vehicle sales by time period	Perform comparative analysis against previous years
Summarise annual market shares in reports	Use dashboards to visualise market share trends

QA/QC Measures			
Data Validation	Consistency checks	Data Audits	Data Completeness
Crosscheck reported EV sales with vehicle registration data	Compare current year's EV sales data with previous years	Perform periodic audits of vehicle sales records from dealerships	Check for missing vehicle registration data
Ensure charging station data matches geographical locations and status of operations			Develop a system to fill in gaps where data is incomplete.

Table 11: Indicator 10 data protocol tables

[Indicator #10] Annual Number of Operational Public and Private Charging Stations		
Methodology	**Output**	**Unit**
Use GIS to identify charging stations	Total number of charging stations	charging stations
Data Sources/Coordinating Entity		

Primary		Secondary	
Utility company reports (SKELEC and NEVLEC)			
Data Collection & Analysis Tools			
Charging station database/registry			
Sampling & Data Collection Procedures			
Collection Frequency:	Annually	Procedures:	Develop national charging station database Ministry should track installation of charging infrastructure Use GIS to map charging station locations and status Charging station owners should register new installations with Ministry
Data Processing, Aggregation and Analysis			
Processing/Aggregation		**Analysis**	
Summarise charging station installations by type annually		Conduct density analysis to evaluate spatial distribution	
Create a categorised inventory for public and private stations		Compare installation trends with EV adoption rates	
QA/QC Measures			
Validation	Consistency checks	Data Audits	Data Completeness

Ensure charging station data matches geographical locations and status of operations	Ensure that the reported charging station count matches the actual number of operational stations	Conduct on-site checks of a sample of charging stations to confirm reported data	Check for missing charging station data
			Develop a system to fill in gaps where data is incomplete

Table 12: Relevant Software Platforms and their licensing/accessibility arrangements

Software	Licensing/Accessibility Arrangement
SAGE	Commercial - Not open source; provided via the UNFCCC Secretariat to support Enhanced Transparency Framework. Accessible through collaboration with the UNFCCC for member states like St. Kitts and Nevis
LEAP (Low Emissions Analysis Platform)	Free for non-profit, academic, and government use in developing countries; commercial licenses available.
IPCC Inventory Software	Free; open source for GHG inventory processing and reporting.
SCADA (Supervisory Control and Data Acquisition) Systems	Mostly proprietary, but open-source options (e.g., OpenSCADA) are available. Licensing costs for proprietary versions vary by vendor. Open-source versions require technical expertise.
GIS (Geographic Information System)	Proprietary (e.g., ArcGIS) or open-source (e.g., QGIS, GRASS GIS). Open-source GIS tools are highly accessible and widely used for mapping and analysis in SIDS.
Python	Open-source and free to use under the Python Software Foundation License.
R	Open-source and free to use, ideal for statistical analysis and visualisation.
Microsoft Excel	Commercial; requires a Microsoft Office subscription or license. Alternatives like Google Sheets or LibreOffice Calc are free.
OpenRefine	Open-source and free to use; suitable for data cleaning and transformation.
Power BI	Proprietary; requires licenses like Pro or Premium Per User, with costs starting at ~$10-20 USD/user/month. Limited free version available.
Tableau	Proprietary; offers various pricing tiers starting at ~$12 USD/user/month for specific features. Discounts for nonprofits and academia.

9 Annexes

Annex 1 – Related Deliverables

- Deliverable E – Report on data collection, management and data gap assessment for the energy sector
- Deliverable I - Documentation on the NDC tracking tool for the electricity generation and transport subsectors
- Deliverable H - Report on NDC tracking indicators for the Electricity Generation and Transportation Subsectors