ASSESSMENT OF GAPS AND NEEDS IN TONGA'S ENERGY BALANCE: STRENGTHENING MRV AND EMISSION REDUCTION IN LAND, ROAD, MARITIME TRANSPORT AND ELECTRICITY SECTOR.

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.

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CONTENTS

ABBREVIATIONS

Abbreviations	Description
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
NDC	Nationally Determined Contribution
GHG	Greenhouse Gas
PA	Paris Agreement
ETF	Enhanced Transparency Framework
UNOPS	United Nations Office for Project Service
UNEP-CCC	United Nations Environment Programme for Copenhagen Climate Centre
UNFCCC	United Nations Framework Convention on Climate Change
MRV	Measure, Report and Verification
TPL	Tonga Power Limited
TEC	Tonga Electricity Commission
NGO	Non-Government Organizations

1 EXECUTIVE SUMMARY

The Initiative for Climate Action Transparency (ICAT) Project aims to enhance the capacity of Tonga in managing its greenhouse gas (GHG) inventory and tracking progress towards its Nationally Determined Contributions (NDCs) specifically in the sectors of electricity production, maritime transport and road transport. This executive summary outlines the identified gaps and needs that must be addressed to improve Tonga's climate action transparency.

Tonga has made strides in developing its national GHG inventory; however, significant gaps remain. The current inventory lacks comprehensive data collection methodologies, particularly in the areas of electricity generation from renewable sources and emissions from road transport. The absence of robust data hampers accurate reporting and assessment of progress toward NDCs.

The identified Gaps are; Data Collection and Management: There is a need for improved systems to collect, manage, and analyze data related to GHG emissions. Current practices are often inconsistent, leading to unreliable estimates. Capacity Building: Local institutions require training on best practices for GHG accounting and reporting. This includes understanding international standards such as those set by the Intergovernmental Panel on Climate Change (IPCC). Stakeholder Engagement: Effective engagement with stakeholders, including government agencies, private sector actors, and civil society organizations, is lacking. Enhanced collaboration is essential for comprehensive data gathering. Technical Resources: There is a shortage of technical resources and tools necessary for accurate emissions tracking in both electricity production and road transport sectors. Policy Frameworks: Existing policies do not adequately support the systematic monitoring of NDC progress or provide incentives for emission reductions.

To address these gaps, several key needs have been identified: Training Programs: Development of targeted training programs aimed at enhancing skills in GHG inventory management among local officials and stakeholders. Data Infrastructure Improvement: Investment in technology and infrastructure that supports better data collection methods across relevant sectors. Enhanced Reporting Mechanisms: Establishment of standardized reporting frameworks that align with international guidelines to ensure consistency and reliability in emissions reporting. Multi-Stakeholder Platforms: Creation of platforms that facilitate dialogue among various stakeholders involved in climate action initiatives to foster collaboration. Policy Development Support: Assistance in formulating policies that promote sustainable practices within the electricity production and road transport sectors while aligning with global climate commitments.

The successful implementation of capacity-building initiatives under the ICAT Project will significantly enhance Tonga's ability to manage its GHG inventory effectively and track NDC progress accurately. Addressing the identified gaps through targeted interventions will not only improve transparency but also contribute to Tonga's overall climate resilience efforts.

2 INTRODUCTION

2.1 Background

The Paris Agreement (PA) in Article 13 sets out an Enhanced Transparency Framework (ETF) for countries, to build mutual trust and confidence, and to promote effective implementation of the Paris rulebook. To help support countries achieve the goals of the ETF, the Initiative for Climate Action Transparency (ICAT) was created and is managed by the United Nations Office for Project Services (UNOPS). The ICAT is currently working with over 30 countries worldwide, integrating country support, methodological work, and knowledge sharing to strengthen the transparency and effectiveness of climate policy and actions.

Similarly, Tonga has recently been selected to receive ICAT support and is working with the UNEP Copenhagen Climate Centre (UNEP-CCC) as a technical partner to implement the project in Tonga.

The projects ICAT supports relate to: building or enhancing transparency frameworks for mitigation; building a monitoring and evaluation approach for adaptation; building or enhancing frameworks to track progress made in implementing and achieving nationally determined contributions; assessing the impacts of climate policies; estimating or enhancing projections of greenhouse gas; integrating and/or aggregating impact assessment of climate actions at the subnational level and for non-State actors; building a tracking system for a just transition processes; establishing or enhancing a climate data system; and putting in place a framework to track climate finance. ICAT offers a suite of practical, open-source tools and methodologies to provide effective support to the transparency efforts of countries around the world.

2.2 Objectives

To provide technical support to the project encompassing the development of the climate MRV systems for the energy sector that would establish an evidence base for NDC tracking and the future assessment of GHG policy impact on the relevant energy and transport policies.

3 METHODOLOGIES

The following methodological approach will be employed to achieve the desired outputs of the assignment.

3.1. Data Collection

A comprehensive data collection has started being carried out and will continue throughout the assignment. The following key data will be collected and review,

- Vessels Registration
- Amount of Fuel Consumption per year
- Vehicle registration
- Fuel consumption records
- Emission factors
- Total electricity generation data
- Fuel consumption rates, particularly diesel used for power generation

3.2. Identification of Key Stakeholders

- Government Organizations and Non-Government Organizations (NGOs)
- Key stakeholders were identified during the Inception workshop

3.3 Capacity building initiatives

- to ensure sustainability in data collection efforts
- Training workshops

3.4 Monitoring and Evaluation

- Regularly review collected data against national targets for GHG emissions
- Adjust methodologies based on findings from initial assessments to improve accuracy over time

3.5 Reporting mechanisms

- Quarterly reports that will contribute to the annual reporting of the GHG inventory process

- Prepare annual reports summarizing findings from the GHG inventory process
- Share results with stakeholders to promote transparency

4 CURRENT ENERGY OVERVIEW

The following sections are intended to guide practical steps that will improve Tonga's energy balance management, MRV practices and GHG emissions across land transport, maritime and electricity sectors, supporting Tonga's climate goals.

4.1 Current State of Energy Balance in each Sector

This section provides a comprehensive overview of the current energy consumption, fuel sources and emissions levels in Tonga's key sectors, establishing a baseline for identifying gaps and tracking improvements.

4.1.1 Energy Sources Overview

This section provides an overview of the main energy sources in Tonga's key sectors.

4.1.1.1 Land/Road Transport

Land and road transport sector relies heavily on imported fossil fuels, primarily gasoline and diesel. Tonga does not have significant domestic energy production capabilities, which means that its transportation energy needs are met almost entirely through imports.

This dependency on fossil fuels poses challenges for sustainability and energy security. Fossil Fuels are the primary energy source for land transport. Gasoline is used predominantly for private vehicles and light-duty trucks. Diesel is commonly used in heavier vehicles such as buses, trucks, and commercial transport. The available data for the Land transport is the vehicle registrations from the Land Transport Division under the Ministry of Infrastructure.

The reliance on these fuels is due to their availability and the existing infrastructure that supports their use. However, this dependence contributes to greenhouse gas emissions and air pollution, which are critical concerns for environmental health.

4.1.1.2 Maritime Transport

The Tonga Maritime transport sector is doing everything to be the most appropriate and sustainable possible for sailing to again be commonly held knowledge and they rely mostly on fossil fuels, oils and diesels imported from overseas, as their primary source of energy since Tonga does not have significant domestic energy production capabilities. This means that the sector of Maritime transport relies on fossil fuels imported from overseas. Diesel and gasoline are commonly used by Maritime's transports yet this contributes to climate changes due to high emission of greenhouse gas.

4.1.1.3 Electricity Sector

Tonga's energy demand is largely met through the importation of fossil fuels and over 80% of the electricity used in Tonga is generated from imported diesel fuel with Tonga Power Limited (TPL) being the primary consumer, supplying grid electricity across the country. Renewable energy sources, including solar and wind, are gradually contributing to the energy mix, but their impact is limited by challenges in data consistency and measurement standards. Despite recent efforts to incorporate renewables, challenges remain in standardizing and consolidating energy data within the electricity sector.

Diesel and other oil products are measured in liters while renewables are tracked in kilowatt-hours (kw/h), creating inconsistencies that complicate accurate energy tracking and delay the development of a cohesive energy balance. Additionally, the data on electricity production and consumption is not updated on a regular basis, primarily due to inconsistent data sharing between stakeholders and the Department of Energy. This limits the ability to fully access both the supply and demand sides of electricity use, making it difficult to understand consumption patterns, identify areas for emission reduction and inform effective energy planning. With the new Tonga Energy Act coming into place, the Department is looking to improve this by exercising its 'power to obtain information' under the Act.

4.1.2 MRV Processes Overview

Measurement, Reporting, and Verification (MRV) processes are essential for tracking greenhouse gas emissions and ensuring that climate policies are effective.

4.1.2.1 Land Transport

In the context of land transport, MRV processes help assess the impact of transportation on national GHG inventories and inform policy decisions aimed at reducing emissions. Components of MRV Processes in Land Road Transport includes; Measurement: This involves collecting data on fuel consumption, vehicle types, and other relevant parameters that contribute to GHG emissions. For Tonga, this includes fuel sales data from suppliers (aggregated data only).

Second component is reporting: Once data is collected, it will be compiled into a format suitable for analysis and submission to international bodies such as the United Nations Framework Convention on Climate Change (UNFCCC). This requires adherence to specific guidelines that ensure consistency and comparability with other nations' reports.

Last component is verification: Verification involves checking the accuracy of reported data through audits or assessments by independent third parties. This step is vital to

ensure reliability in the reported figures and compliance with international standards. By focusing on these methods, Tonga can improve its GHG inventory process significantly. This will not only aid in meeting international obligations but also support national efforts towards sustainable development.

4.1.2.2 Maritime Transport

The Tonga Maritime transport sector has plans to develop a clear roadmap for rolling out of inclusive low-carbon maritime transport solutions that includes developing an MRV to better monitor and track GHG emissions from the maritime transport sector. Maritime transport's work needs to be planned in conjunction with the stakeholders to share critical data and do workstream focusing on data collection and data analysis.

MRV processes aid in determining the impact of maritime transports on national GHG inventory and provide information for policy decisions on how to reduce emissions.

Measurement is one of the components of MRV processes for Maritime transports and that includes collecting data from relevant ministries such as Fisheries, Tourisms and Luutai Airline. This data collection includes the type of vessels, type of fuels used and the amount of fuel consumption per year.

Reporting is the next element of the MRV processes. After collecting all the data, it will be analyzed and use it to calculate the National Energy Balance which reports the country's energy production and consumption and submit it to the United Nations Framework Convention on Climate Change.

The final step in MRV processes is Verification and this includes confirming the accuracy of the data reported by checking and assessing with the independent third parties. This step is essential to ensure adherence to international standards and confidence in the reported data.

4.1.2.3 Electricity Sector

Implementing MRV processes is critical for monitoring GHG emissions and ensuring transparency and accountability associated with power generation. The measurement phase requires collaboration with TPL and TEC which involves collecting key data such as the quantity of diesel fuel consumed in power generation, the total electricity output in gigawatt-hours (GWh) and the production from renewable energy sources like solar and wind and other renewable sources. It also includes measuring data on system losses and other activity data such as capacity utilization and maintenance schedules of power plants. These measurements provide the initial data needed to evaluate emissions and energy performance.

Next, is the reporting phase where data is collected into accessible formats including GHG inventories that document annual emissions by fuel type, energy balance reports summarizing energy inputs and outputs and also updates on the share of electricity generated from renewable sources. These reports are important for tracking progress toward national targets such as Tonga's commitment to achieving 70% renewable electricity by 2030.

The final phase is verification and this is where we ensure the accuracy and reliability of the reported data. This involves evaluations and audits of GHG emission estimates, fuel consumption and renewable energy contributions. Verifying electricity output and emissions against operational logs and fuel purchase further enhances data integrity. Also, regular performance reviews of power plants and renewable energy systems help identify gaps and improve processes.

4.1.3 Review of GHG Emissions Data

Tonga's GHG emission data is collected through various national reports and inventories submitted to international bodies like UNFCCC.

4.1.3.1 Land/Road Transport

The data collected indicates that road transport contributes significantly to CO2 emissions due to the heav reliance on fossil fuels. The most recent estimates suggest that road transport emitted approximately 30% of the total transport-related GHG emissions.

Recent analyses have shown an upward trend in GHG emissions from road transport due to increasing vehicle ownership and usage. According to the recent data collected, the number of registered vehicles has grown significantly, leading to higher fuel consumption rates. Additionally, a shift towards larger vehicles has been observed, which typically have higher emission rates. A notable finding is that while there has been some investment in public transportation systems aimed at reducing individual car use, these efforts have not yet resulted in a significant decrease in overall transport-related emissions.

4.1.3.2 Maritime Transport

The Tonga Maritime transport sector is one of the primary contributors to GHG emissions as it relies heavily on fuel consumption since 98% of Tonga's primary energy supply comes from petroleum according to the National Shipping Emission Reduction Strategy Report, January 2023.

Recent data collecting shows that the GHG emission's graph is increasing every year due to the increase of vessels which leads to high rates of fuel consumption but the data is still incomplete since some vessels have not yet registered and the amount of their fuel consumptions are not recorded. Tracking of emissions reductions is important for evaluating Tonga's NDC target. For this reason, we need to collect and document precise data so that we can achieve 70% emission reduction from Maritime transport by 2035 and 100% by 2050 according to the National Shipping Emission Reduction Strategy reported in January 2023.

4.1.3.3 Electricity Sector

The electricity sector in Tonga is a primary contributor to GHG emissions, largely due to its reliance on imported diesel fuel for grid electricity generation. However, the accuracy of emissions data from this sector is limited by gaps and inconsistencies in data collection.

Current data-sharing processes between key stakeholders and the Department of Energy are insufficient, often resulting in incomplete emissions data. Without a comprehensive and reliable data set, it is difficult to assess the full impact of fuel

combustion on Tonga's overall GHG emissions. Also, tracking emissions reductions is essential for evaluating progress toward Tonga's NDC targets, such as achieving 70% renewable electricity by 2030.

4.2 Gaps Analysis in Energy Balance and Emissions

This section identifies the key gaps in Tonga's energy balance and emissions data, highlighting challenges in data availability, consistency and accuracy across various energy sectors.

4.2.1 Land/Road Transport

Tonga primarily depends on diesel fuel for its transport system. The energy balance reflects a significant reliance on non-renewable sources, with limited integration of renewable energy technologies such as solar or wind power.

The transport sector accounts for a substantial portion of total energy consumption in Tonga. An analysis of consumption patterns reveals that there is a lack of comprehensive data on vehicle types, fuel usage and travel behavior.

There are notable gaps in data collection methodologies that hinder accurate assessments of energy consumption and emissions. This includes insufficient information on vehicle kilometers traveled (VKT), fuel efficiency standards and the age profile of vehicles.

4.2.2 Maritime Transport

Transport is one of the major fuel users in Tonga and it burns 70+ percent of the imported fuels. Maritime transport is absolutely essential for connectivity within and between island states and it is clear that maritime transport relies significantly on fossil fuel products for its operation. Such dependency will lead to increased GHG emissions and further exacerbate climate change.

The gaps identified in the Tonga Maritime Sector are data collections and management and there is a need for improving in the systems to collect, manage and analyze relevant data that is related to GHG emissions. Some of the small vessels that travel from the main island to the nearby islands, we don't have the records of the amount of fuel consumption of those small vessels every year. This is one of the gaps that the Tonga maritime sector should take into consideration as it is one of the missing data from the data that has been collected every year.

4.2.3 Electricity Sector

In the electricity sector, one significant gap lies in the inconsistency and reliability of data between key stakeholders. As Tonga depends largely on oil products particularly for

power generation, the data on TPL including diesel consumption for electricity generation and power outputs (GWh) is readily available. However, the data provided by TPL often lacks independent verification which raises concerns about its accuracy and reliability. Errors or inaccuracies in TPL's reported data, such as diesel fuel usage or electricity output could result in inconsistent energy balance calculation and falsifications of GHG emissions. On the other hand, data from the TEC is audited, ensuring a higher level of reliability and validation. As the regulatory body, TEC is responsible for calculating electricity tariffs, further highlighting the importance of accurate and robust data management practices within the commission.

The difference in data quality and oversight creates a significant gap in the energy balance of the electricity sector. Reliable data is critical for effective monitoring, reporting and verification (MRV) processes as well as for projecting future energy demands and aligning with national and international emission targets. Moreover, the lack of standardized processes and collaboration between TPL and TEC worsens these issues, limiting the ability to create a complete and accurate energy database.

5 Needs Assessment

This section identifies key requirements to address gaps and improve energy balance monitoring and GHG management in Tonga.

5.1 Sector-Specific Needs

This focuses on the specific needs of each energy sector to enhance data collection, reporting and MRV processes.

5.1.1 Land/Road Transport

In order to enhance data collection, reporting and MRV processes, several specific needs must be addressed. To begin with, there is a critical requirement for standardized data collection methodologies that can capture comprehensive and consistent information on vehicle emissions, fuel consumption and travel patterns. This includes establishing a centralized database that integrates data from various stakeholders such as government organizations, private transport operators and local communities.

Moreover, capacity building is essential, training personnel in data management and analysis will ensure accurate reporting and improve the quality of the data collected. Furthermore, stakeholder engagement is vital to foster collaboration among government entities, NGOs, and the private sector to ensure that all relevant data is shared effectively. Lastly, the aligning of Tonga's national GHG inventory processes with international standards will enhance credibility and facilitate better climate policy assessments. By addressing these needs systematically, Tonga can significantly improve its national GHG inventory process related to the land transport sector.

5.1.2 Maritime Transport

The Tonga maritime transport sector needs a huge improvement in data collection and some specific needs must be addressed in order to enhance the data collection and reporting. To address the gaps mentioned above, it is paramount that we should develop a data management system or conduct a survey in person at each petrol station to collect and record the exact amount of fuel that each small vessel's owners get in every week, month or yearly. Strengthening the MRV process for Tonga Maritime transports needs to be planned and focused on data collection, survey, training and some research.

5.1.3 Electricity Sector

The electricity sector in Tonga requires specific involvement to address its challenges in data management and verification that interfere with accurate energy balance reporting. To address the gaps previously identified, it is important to create a unified data management system where TEC and TPL can collaborate under clearly defined roles and responsibilities. Strengthening verification mechanisms for TPL's data including independent audits or verifications against TEC's records will improve the overall reliability of energy data. Additionally, capacity building within both organizations to stick to standardized international methodologies for energy and emissions reporting is critical.

6 Way Forward

To successfully assess gaps and needs in Tonga's energy balance while strengthening MRV systems and enhancing emission reduction strategies across various sectors, a multi-faceted approach is essential. Establishing a comprehensive baseline of current energy consumption and emissions across land/road, maritime transport, and electricity sectors is crucial. This can be achieved through detailed data collection and analysis to identify key sources of emissions and inefficiencies.

Improving the MRV framework involves integrating advanced technologies such as remote sensing and IoT devices to provide real-time data on energy usage and emissions. Training local personnel in data collection methodologies will ensure sustainability in these efforts. Fostering collaboration among stakeholders—including government agencies, private sector players, and civil society—will facilitate knowledge sharing and resource mobilization for effective implementation of emission reduction initiatives.

Additionally, developing policy frameworks that incentivize renewable energy adoption and energy efficiency measures will create an enabling environment for sustainable practices. Regular reviews of progress against established targets will help identify ongoing gaps and adjust strategies accordingly to ensure continuous improvement in Tonga's energy balance.

7 Conclusion

To sum up this assessment of gaps and needs analysis, each sector has revealed critical insights. The analysis indicates that while Tonga has made strides in developing its

energy infrastructure and policies aimed at sustainability, significantly challenges remain.

The land transport sector requires enhanced data collection methods to accurately monitor emissions and fuel consumption patterns. Implementing strong MRV frameworks will facilitate better policy making and resource allocation. On the other hand, the maritime transport sector is identified as a major contributor to emissions; thus, adopting cleaner technologies and practices is essential for reducing its carbon footprint. This includes transitioning to low emission fuels and improving operational efficiencies. Lastly, the electricity sector must prioritize renewable energy integration to decrease reliance on fossil fuels. Strengthening grid infrastructure and incentivizing investments in renewable sources are vital steps towards achieving a sustainable energy future. Also, by fostering collaboration between TEC and TPL, strengthening data verification mechanisms, Tonga can address challenges such as inconsistencies and gaps in data collection. Such efforts are important not only for improving energy data reliability but also for achieving national and international targets including the transition to 70% renewable electricity by 2030.

Overall, addressing these gaps through targeted interventions will not only contribute to Tonga's national goals for emission reductions but also align with global climate commitments. Collaboration efforts among stakeholders will be crucial in driving these initiatives forward.