Training local experts on the Greenhouse Gas Abatement Cost Model (GACMO) including its use for generating projections and NDCs implementation tracking in Zimbabwe

By

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For:

Government of Zimbabwe

Represented by

Permanent Secretary for Environment, Climate, Tourism and Hospitality Industry

With the support from:

ICAT through UNEP DTU

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This publication has been produced as part of a component of the Initiative for Climate Action Transparency project (ICAT) implemented by UNEP DTU Partnership (UDP). The views expressed in this publication are those of the authors and do not necessarily reflect the views of UDP.

PREPARED UNDER

Initiative for Climate Action Transparency (ICAT) project supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the Children's Investment Fund Foundation (CIFF), the Italian Ministry of Ecological Transition (IMET) and ClimateWorks.

The ICAT project is managed by the United Nations Office for Project Services (UNOPS)

3 September 2021

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Abbreviations and Acronyms

CO2eq	Carbon dioxide equivalent (emissions)
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHGs	Green-house gases
GJ	Gigajoule
GoZ	Government of Zimbabwe
GWh	Gigawatt-hour
kVA	kilovoltampere
kW	kilowatt
KWh	kilowatt-hour
Kt	kilotonne
TJ	Terajoule
toe	tonnes of oil equivalent
t	tonne

Executive summary

Zimbabwe's first economy-wide quantitative assessment of the greenhouse gas (GHG) mitigation potential was conducted in 2020 when the Low Emission Development Strategy (LEDS) was formulated. The assessment was recently improved when the country revised its Nationally Determined Contribution (NDC) to include GHG mitigation targets for non-energy sectors given that other sectors such as agriculture, forestry and other land uses (AFOLU) produces up to 60 % of national GHG emissions in 2017. This emphasizes the need to build the capacity of local experts to revise the national BAU scenario and mitigation targets to include key source sectors to raise the ambition. The United Nations Environment Programme-Technical University of Denmark Partnership (UNEP DTU Partnership) and Italian National Institute for Environmental Protection and Research (ISPRA) responded to the government's request for technical assistance to increase the country's technical capacity for the implementation of the UNFCCC and the PA, as well as related policy impact analysis using the Initiative for Climate Action Transparency (ICAT) Guidelines. This project activity was aimed at building the capacity of local experts in using the GACMO model to provide updated estimates of historical- and baseline- GHG emissions up to 2030, as well as the mitigation potential of implemented and planned conditional actions specified in the current NDC as a means for measuring, reporting and verification (MRV) in tracking the mitigation targets. Through the guidance of international experts, the consultants used a common mitigation assessment framework stipulated in ICAT guidelines to assess the impacts of mitigation policies and actions. Overall, the technical assistance built the local human capacities to enhance transparency in the MRV system for tracking progress of NDC implementation. The trainees used the skills gained to identify opportunities and barriers to the use of GACMO in mitigation planning across economic sectors in Zimbabwe. These outcomes are expected to enable the country to promote efficient, cost-effective policies. At international level, greater transparency, effectiveness, and ambition can be fostered through the enhanced capacity of local experts.

1.0 Introduction

The Enhanced Transparency Framework (ETF), under the Paris Agreement will require developing countries to clearly illustrate their efforts towards meeting their obligations in a manner that is understandable and accepted by other parties to the agreement. Full and effective implementation of the Paris Agreement will require capacity building and skills enhancement of various sector experts in developing countries. Zimbabwe has over the years increased the capacity of its experts on greenhouse gas (GHG) emissions analysis through the National Communications process and other targeted skills development initiatives including UNFCCC and IPCC expert training. In its Third National Communication, Zimbabwe used the Zimbabwe Electricity Load Forecast and Low Emissions Analysis Platform (LEAP) tools to project emissions and estimate mitigation potential of implemented and planned actions. The Greenhouse Gas Abatement Cost Model (GACMO) is one of the tools that the Government of Zimbabwe intend to use to complement the existing tools in mitigation assessment for its Fourth National Communication and in tracking the revised Nationally Determined Contribution (NDC) to complement the existing modelling tools. However, this has not been possible due to inadequate capacity of local experts to use GACMO model and this emphasizes the need to build the capacity of local experts to revise the national BAU scenario and mitigation targets to raise the NDC ambition.

Establishing and enhancing GHG monitoring systems and support mechanisms for GHG mitigation is highlighted as an economy-wide priority in Zimbabwe's revised NDC (2021). The GACMO model is a useful tool for monitoring reporting and verification (MRV) ensuring transparency in climate change mitigation actions. This is not only critical for reporting to the UNFCCC, but also crucial for attracting foreign and domestic finance towards investment areas with the highest sustainability in the evolving global green growth agenda. Capacity building and knowledge sharing among local technical experts is critical in enhancing their use of the tool, both for reporting purposes and other in-country GHG data analysis requirements. This leads to improved quality of mitigation information generated over time. This report outlines the process and activities that were implemented in building the capacity of local experts in using GACMO model. During this process, the experts provided an update of estimates of economy-wide baseline- GHG emissions up to 2030, as well as the mitigation potential of conditional mitigation actions specified in the current NDC. The updated estimates serve as means for tracking implemented and planned mitigation measures to meet emission reduction obligations under the UNFCCC. The report concludes by highlighting priority gaps and barriers that need to be improved in GACMO model to enable its successful use in tracking Zimbabwe's NDCs.

1.1. Objectives of the Technical Assistance

The technical assistance was aimed to build the capacity of local experts to understand how to implement the GACMO tool in the analysis of GHG mitigation options and assessing its potential use in strengthening the national MRV system and for tracking Zimbabwe's economy-wide mitigation target in the revised NDC.

1.2. Planned activities

Working under the supervision of the Climate Change Management Department and UNEP DTU Partnership and ISPRA, the consultants consulted relevant stakeholders to:

a. Develop and deliver training materials for the GACMO training workshop under the guidance of the UNEP DTU expert.
b. Conduct the hands-on training workshop for local sector experts involved in mitigation assessment in using the GACMO, with technical support from UNEP DTU Partnership expert.
c. Craft a report on the opportunities and barriers to the sector-wide implementation of GACMO in Zimbabwe based on the training and consultation with experts

1.3. Outputs

The deliverables for this consultancy are:

a. Inception report and detailed work plan.
b. Facilitation of a hands-on training workshop for local sector experts involved in UNFCCC transparency arrangements in the use of GACMO
c. Documentation of the training & discussion activities, including debrief (report to be delivered by the consultants)
d. The consultants will make available to MECTHI and ICAT and trainees the training materials (including presentations and worksheets).
e. Final report on the opportunities and barriers to the sector wide implementation of GACMO in Zimbabwe

1.4. Expected outputs

After completing the expert training course, participants should:

a. Have a general understanding of the GACMO model and ICAT guidelines for GHG mitigation assessment and NDC tracking.

b. Have an overview of how baseline scenarios for GHG emissions are developed in GACMO for the energy, industry processes and product use, waste, agriculture, and forestry sectors.

c. Be able to participate in compilation of future GHG mitigation reports for BURS, mitigation in NCs and NDCs for the energy, industry processes and product use, waste, agriculture, and forestry sectors.

d. Be able to collect more activity data and emission factors to improve the quality of GHG mitigation assessment across Zimbabwe's economic sectors using GACMO.

2.0 Methodological approach

The approach used to conduct this task began with desktop review of existing national mitigation planning processes and tools that have been used in national mitigation assessments for Zimbabwe, to identify further training needs. These findings were documented in an inception report that the consultants submitted to the Climate Change Management Department (CCMD) and ICAT at the beginning of the project in March 2021. Through this desktop study, the consultants were able to review GACMO model and identified the areas where they needed additional support from international experts. This was followed by 3 train-the-trainer virtual sessions in which the ICAT experts to trained the consultants on the modelling needs identified for GACMO. Then a two-day training workshop was facilitated on 19 and 20 August 2021 by the consultants with virtual support of the international experts to enable trainees to understand GACMO model application. The two main outputs include training course resource materials and this training workshop report that provides a suite of barriers and opportunities to sector-wide use of GACMO in Zimbabwe, indicates the implications for mitigation planning, NDC tracking and achievement of emission reduction targets.

2.1 Identification of training needs for mitigation assessment tools

The Consultants carried out the training needs analysis to compare GACMO with the performance of the other tools to identify further training needs for mitigation assessment. The Consultants reviewed at all tools used to estimate Zimbabwe's historical emissions, project emissions into the future, carry out mitigation assessments and economic analysis, and track implementation of mitigation measures. The following tools or models were looked at:

- 2006 IPCCC Guidelines
- 2006 IPCC Software
- LEAP, and
- GACMO

The 2006 IPCC guidelines give guidance on the estimation of historical emissions, including on gathering and use of activity data and emission factors. The IPCC software helps calculate the historical emissions by sector and category as per 2006 guidelines. The software has some default emission factors for the Tier 1. Zimbabwe has used the 2006 IPCC software in estimating emissions for some of the sectors (Energy and Agriculture) in its Third National Communication (TNC) and for all sectors in its Fourth National Communication (NC4) and First Biennial Report (BUR1). However, the software does not do projections and mitigation assessment of future projects or measures. The use of the software in NCs and BURs may give an indication of the mitigation efforts being taken by a country but does not give the impact of specific projects or measures. Accessing and installing the software is easy and free.

The LEAP tool has the capacity to generate historical trends of emissions, produce projections, carry out mitigation assessments, do economic analysis and produce marginal abatement cost curves, and finally carry out the monitoring, verification and reporting functions. However, intensive training is required to master the tool and the licence fees required to access the tool are barriers to its widespread use.

2.2 GACMO model review

The GACMO was looked at closely i.e. the way it is structured and how it performs the following functions:

- Historical emissions trending
- Baseline Projection Scenarios
- Technical mitigation assessment
- Economic analysis, and

- MRV

The two trainers identified areas where they needed further training from the UNEP DTU experts and these areas included:

- Determination and entering growth rates of emissions or drivers of emissions by sector and category
- The use of the case study mitigation projects in calculating units penetrating, investment costs and emissions reductions
- The interpretation of the Marginal Abatement Revenue Curve results

The two local trainers requested for three Training of trainers (ToT) sessions from the UNEP DTU experts which were held on 27 May, 8 June and 10 June 2021. After the ToT sessions, the local trainers recommended some changes to the international experts on the GACMO to suit local needs. These recommendations were considered and modified in the model including:

- Combining the Country information and Assumptions sheets
- Inclusion of another MRV sheet for emissions

2.3 Development of training material and training programme

To ensure that the participants understand how the GACMO works training material was prepared on the following topics (See also Annex I):

- Objectives of the Workshop
- Introduction to the Greenhouse Gas Abatement Cost Model (GACMO)
- GACMO sector coverage & components (sheets)
- Guidance of how GACMO works
- Country information and Assumptions
- Start Year (Base year) Balance
- Physical and Energy units
- Growth rates and projections
- Establishment of mitigation scenario
- Energy sector- Mitigation Projects
- IPPU sector- Mitigation Projects
- AFOLU sector- Mitigation Projects
- Waste sector- Mitigation Projects
- The main results - emissions mitigation graph
- Investment costs and implementation costs
- Marginal abatement revenue curve
- Use of GACMO for MRV
- Comparison with LEAP

The CCMD officials and UNEP DTU experts were consulted in the development of the training topics and the content. The training workshop programme is in the Annex.

2.4 Training workshop on GACMO tool for local experts

The workshop was held at Montclair Hotel where the Covid -19 rules were observed both in terms of the maximum number of participants, physical distancing, mask wearing, sanitizer usage, and body temperature monitoring. Mr Tendayi Marowa and Dr Walter Svinurai delivered most of the training while the UNEP DTU experts Jingjing Gao and Joergen Villy Fenhann gave,

virtually, an overview of the support UNEP DTU provided and presented on the use of GACMO in the region and on marginal abatement revenue curve.

The two-day training workshop was attended by local experts working on the NCs, BUR, NDC and ICAT Technical Assistance programme and CCMD officials (see Annex II). The names, titles and organisations of the participants are in Table x in the Annex. The consultant working on the ICAT components focusing on NDC implementation tracking tool and on the assessment of the greenhouse gas emission reduction and sustainable development potential of the National Renewable Energy Policy and the National Biofuels Policy attended the training.

3.0 Outcomes of the local experts' training workshop

The suitability of the GACMO as a tracking tool for Zimbabwe's NDC implementation was discussed by the workshop participants sector by sector. The comments are given in the subsequent sections.

Table 1.1: Gaps and barriers and related opportunities for using GACMO in NDC tracking for Zimbabwe

Mitigation Assessment component	Gaps & Barriers in using GACMO	Opportunities for using GACMO
Historical emissions trending	Energy sector: • GACMO does not calculate non-CO2 emissions, but imports them from other tools • It does not give a trend of historical emissions as it caters for one year (Start Year) IPPU • GACMO does not calculate emissions but imports them in GgCO2eq r AFOLU • Forestry emissions, like IPPU, are imported to GACMO as totals, and not disaggregated according to IPCC sub categories Waste • GACMO does not calculate emissions from the waste sector but imports emissions from liquid and solid waste for the Start Year, while the Waste sector categories are Solid Waste Disposal, Biological Treatment of solid waste, Incineration and open burning of waste, and Wastewater Treatment and Discharge.	Energy sector: • GACMO uses the Energy balance and follows the 2006 IPCC guidelines to estimate CO2 emissions from combustion for the Start Year, and these CO2 emissions can be compared with the Reference Approach emissions of the BUR and with those of the IEA. AFOLU • Emissions from Agriculture and Forestry are imported to the Start Year by category • Overall emissions are calculated with and without forestry, in line with the national GHG inventory
Baseline Projection Scenarios	Energy sector: • GACMO is not flexible enough to give project BAU emissions and mitigation potential on an annual basis (gives emissions every five years, up to 2030) • The GACMO generates, with the aid of growth rates, Base Line or BAU emissions for the years 2020, 2025, 2030 and 2050. IPPU • GACMO does not disaggregate emissions by category, making projections inaccurate because of the use of a single growth rate to represent all emissions from the various categories AFOLU	Energy sector: • The tool allows importing of historical emissions (though for one year -the Start Year) and Base Line or BAU emissions for the years 2020, 2025, 2030 and 2050. Most countries give their emissions reduction targets for the years 2025 and 2030. • Economic growth rates are applied to activity data instead of emissions, making it relatively more accurate that methods based on emissions. AFOLU • A growth rate is used to project emissions into the future for each category Waste

	• A single growth rate is used to project emissions from the FOLU into the future are not also applied by category; a single growth rate is used	• GACMO produces BAU projections for the years 2020, 2025, 2030 and 2050 by applying growth rates on imported liquid and solid waste emissions for the Start Year.
Technical mitigation assessment	•	Energy sector: • GACMO gives cumulative emissions reductions, as a percentage, for each reported year AFOLU • The GACMO has some mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement costs Waste • The GACMO has some mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement costs
Economic analysis	s	Energy sector: • The GACMO has numerous mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement costs. • GACMO gives the results of an economic analysis in both graphical (Marginal Abatement Revenue Curve) and tabular formats, and gives flexibility to exclude some projects from the graph •
MRV	Energy sector: • On tracking implementation of mitigation measures the GACMO MRV tracks only units penetrating; it does not track the emissions per se. AFOLU	Energy sector: • GACMO keeps track of what has been planned (in units penetrating) and has provision for recording actual units penetrating per year. Comparing the actual units penetrating against the planned units is actually performance tracking.

4.0 Recommendations

The analysis in chapter 5 shows that GACMO has positive and negative attributes (in the four sectors Energy, IPPU, AFOLU and Waste) that can be considered when investigating the suitability of the tool in tracking the NDC implementation in Zimbabwe. It is recommended to address the negative attributes if GACMO is to be chosen as the country's NDC implementation tracking tool.

4.1 Energy sector

- Add another MRV sheet that tracks emissions

4.2 IPPU

- The IPPU sector need to be replaced with categories (2A-Mineral Industry, 2B- Chemical Industry, 2C-Metal Industry, 2D- Non-Energy Products from Fuels and Solvent Use, 2E-Electronic Industry, 2F- Product Uses as Substitutes for Ozone Depleting Substances, 2G- Other Product Manufacture and Use, and 2H- Other) in the Start Year and all the BAU projection sheets (2020, 2025, 2030 and 2050)

4.3 AFOLU

- Emissions from AFOLU should be recorded in the Start Year sheet and the Baseline sheets as per the IPCC source categories:

4.4 Waste

- Emissions from the Waste sector should be recorded in the Start Year sheet and the Baseline sheets as per the categories:
    - 4A -Solid Waste Disposal
    - 4B - Biological Treatment of solid waste
    - 4C -Incineration and open burning of waste
    - 4D- Wastewater Treatment and Discharge

5. Conclusions

The local experts training on GACMO model brought a lot of experience on the assessment of the economic potential of mitigation actions, an area that has not received much attention in Zimbabwe. Based on the consultative process with local experts for mitigation and MRV, GACMO can be used as a tool for assessing the economic potential of mitigation actions in complement to detailed models for technical mitigation potential such as LEAP. Given that only a limited number of local experts were consulted about the suitability of using GACMO in NDC tracking for Zimbabwe due to Covid19 regulations at the present time, further consultations with more experts and stakeholders are required to ascertain the model use.