Workshop to Validate Biomass Electricity Policy Options and their Potential Climate and Sustainable Development Impacts in Eswatini

ICAT Initiative for Climate Action Transparency

Initiative for Climate Action Transparency – ICAT

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May 2022

PREPARED UNDER

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

Federal Ministry for the Environment, Nature and Nuclear Safety

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

MINISTERO DELLA TRANSIZIONE ECOLOGICA

climateworks FOUNDATION

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

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ABBREVIATIONS

CSO	Central Statistics Office
CBIT	Capacity Building Initiative for Transparency
CSER	Centre for Sustainable Energy Research
EEA	Eswatini Environmental Authority
EEC	Eswatini Electricity Company
ESA	Eswatini Sugar Association
ESERA	Eswatini Energy Regulatory Authority
ETF	Enhanced Transparency Framework
GHG	Greenhouse Gas
GHGMI	Greenhouse Gas Management Institute
GoE	Government of Eswatini
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
MNRE	Ministry of Natural Resources and Energy
MoU	Memorandum of Understanding
MRV	Measurement, Reporting and Verification
MTEA	Ministry of Tourism and Environmental Affairs
NC	National Communication
NDC	Nationally Determined Contributions
NEP	National Energy Policy
NIR	National Inventory Report
QA	Quality Assurance
RE	Renewable Energy
SRA	Eswatini Revenue Authority
UNESWA	University of Eswatini
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services

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1. Introduction

1.1. Background

The Government of Eswatini has prioritized enhancing national capacities to meet its reporting obligations under the enhanced transparency framework (ETF) of the Paris Agreement under the UNFCCC. The Ministry of Tourism and Environmental Affairs (MTEA) has received support from the Initiative for Climate Action Transparency (ICAT) to improve institutional arrangements and data collection processes to assist Eswatini to meet the accelerated reporting requirements under its Nationally Determined Contributions (NDC) under the Paris Agreement.

The University of Eswatini's (UNESWA's) Centre for Sustainable Energy Research (CSER) was hired by ICAT (through UNOPS) to complete the ICAT Eswatini Project which includes the following main activities:

- **Activity 1**: Adaptation scoping and gap analysis for the health and water sector.
- **Activity 2**: Energy sector GHG inventory institutional arrangements and data collection roadmap.
- **Activity 3:** Agriculture sector GHG inventory institutional arrangements and data collection roadmap.
- **Activity 4:** Incorporation of timber and sugarcane plantation data into the LULUCFsector GHG inventory.
- **Activity 5:** Renewable electricity policy scenario assessment and impact modelling with recommendations for implementing NDC targets

1.2. Objectives of the Workshop

The main aim of Activity 5 was to quantify, under various policy and institutional scenarios, the amount of biomass renewable electricity that could be generated in Eswatini and to examine associated climate and sustainable development impacts with recommendations for implementing NDC targets. In the workshop held at the Hilton Garden Inn Hotel, Mbabane, by Activity 5 in Mbabane, on the 24th of May 2022, various pathways for the development of biomass electricity and possible policy frameworks were discussed government, corporate, and sugar and timber out-grower representatives. The workshop was to validate the outputs of the work carried out by activity 5 on the impacts assessment of biomass electricity in Eswatini.

The workshop's specific objectives were to:

1. Present assumptions in the modelling and climate impacts of different biomass electricity scenarios.
2. Present sustainable development impacts of the different biomass electricity scenarios.
3. Provide recommendations on policy options for investing in biomass electricity generation in Eswatini.

2. Format and Participation

The workshop was conducted over 1 day – May 24, 2022. The morning session was used for remarks by the Ministry of Tourism and Environmental Affairs (MTEA), remarks by the Ministry of Natural Resources and Energy (MNRE) as well as presentation by the activity 5 team on stakeholder engagement. The mid-morning session was used to present impacts of various scenarios and policy options for biomass electricity. The afternoon session was initially planned for breakout group discussions and reporting back to plenary but ended up being a lively plenary discussion.

2.1. Participation

The workshop had 33 physical participants, six of whom were from UNESWA. They included representatives from the Ministry of Tourism and Environment Affairs (MTEA), which includes the Department of Forestry and the Department of Meteorology, with its Climate Change Unit (CCU), and government personnel from respective project thematic areas including Ministry of Agriculture (MOA), Ministry of Natural Resources and Energy (MNRE), with its Department of Energy, Ministry of Finance (MOF), sugar companies, timber companies and both sugar and timber out-growers and their association representatives (namely the Eswatini Sugar Association/ESA and the Eswatini Cane Growers Association/ECGA). In addition, the state-owned electricity utility, Eswatini Electricity Company (EEC) and the Eswatini Energy Regulatory Authority (ESERA) also participated.

The Ministry of Economic Planning and Development (MEPD) and Shiselweni/Peak Timbers were the only two invited organisations that could not attend the workshop. There were 5 online participants from project counterparts GHGMI and ICAT, as well as from RES (Royal Eswatini Sugar Corporation) and ESERA. The Principal Secretary (PS) of MTEA was among the 33 physical participants while the PS of MNRE sent a representative to give remarks on her behalf. It is worth noting that ESERA participated online at first but eventually joined the meeting physically. It is also worth noting that out of 33 physical participants only 13 were female and the rest were male. The list of physical workshop participants is in Annex 2 and group picture of participants is in Figure 1, below.

Figure 1: Workshop participants.

3. Workshop outcomes

The workshop produced the following outcomes:

- Validated climate and sustainable development impacts;
- Policy options for biomass electricity options for Eswatini; and,
- Recommendations for next steps in biomass electricity in Eswatini.

4. Proceedings of the workshop

4.1. Early Morning Session Presentations

The workshop was opened by Ms. Khetsiwe Khumalo, the government officer responsible for co-ordinating the Climate Change Unit (CCU) at the Ministry of Tourism and Environmental Affairs (MTEA). Ms. Khumalo highlighted the importance of the project in ensuring that the country can track its progress in climate change issues and in looking at impacts that each electricity production option could have. She further said the relationship between climate change and sustainable development cannot be ignored. Therefore, it is important as a country to explore renewable energy options for biomass electricity, particularly, due to the extensive engagement of smallholder farmers as out-growers in the sugar growing sector, as well, to a lesser extent, in the timber growing sector.

Dr. Mathunjwa (Head of CSER/UNESWA) then introduced the workshop (figure 2). He indicated the workshop was intended to validate the Biomass Electricity Policy Options identified by the Activity 5 Team under this ICAT Project, and the potential climate and sustainable development impacts that developing biomass electricity options and policies could have on the provision of electricity, the climate change benefits of such, and the socio-economic impacts of such renewable electricity generation could have in Eswatini. He pointed out that Eswatini's resources are not an infinite reservoir. He highlighted that Eswatini must limit the negative impacts of electricity generation on the environment. He further noted that, though Eswatini is a small country, and its GHG emissions are relatively small, it is still crucial to examine options and policies that would reduce emissions in the electricity generation sector, so that Eswatini can attract climate change-related funds and skills to mitigate and adapt to climate change.

Dr Mathunjwa elaborated further that the UNFCCC's Paris Agreement requires transparency on what Eswatini is doing to tackle climate change. This ICAT Eswatini project has helped to study intensively how five specific activities under the project can address the climate change issues, both adaptation and mitigation, through 5 main activities:

- **Activity 1:** Adaptation scoping and gap analysis for the health and water sector.
- **Activity 2:** Energy sector GHG inventory institutional arrangements and data collection roadmap.
- **Activity 3:** Agriculture sector GHG inventory institutional arrangements and data collection roadmap.
- **Activity 4:** Incorporation of timber and sugarcane plantation data into the LULUCF sector GHG inventory.
- **Activity 5:** Renewable electricity policy scenario assessment and impact modelling with recommendations for implementing NDC targets.

In concluding his remarks, Dr Mathunjwa pointed out that the country is considering other renewable electricity sources such as solar and wind, not just biomass, that will help to limit and reduce greenhouse gas emissions. Eswatini emits less greenhouse gases (GHG) compared to developed countries but has an obligation to limit its emissions as set out in the Paris Agreement and its most recent Nationally Determined Contributions (NDC) that the Government of Eswatini submitted to the UNFCCC in October 2021. This will assist in sourcing climate finance to boost projects on mitigation and adaptation. Eswatini made a commitment to the UNFCCC in its latest NDC, that 50 % of electricity production will be generated from renewable energy with 95 MW biomass by 2030. There is also exploration of wind power solar energy and solar water heater technologies to help achieve these goals and commitments.

Figure 2: Dr Mathunjwa introducing the workshop

Ms Khangeziwe Mabuza (PS - MTEA) spoke about Eswatini's GHG inventory compilation and mitigation commitments through the NDC (figure 3). She was happy to be part of such important work under ICAT, and urged all parties involved to make biomass electricity generation possible (government and private sector) to engage intensively so that this does not end up as just a report. She asked both academia and the private sector to submit quality reports with quality data and quality analysis. The ICAT Project's sustainable energy framework should enable Government to encourage the investment needed for sustainable energy transitions, including the policy frameworks necessary to achieve these transitions. The Ministry is grateful to partners who supported this project i.e. ICAT, GHGMI and others. The Ministry is willing to support the recommendations of this ICAT-supported project as much as possible.

Figure 3 : Ms. Khangeziwe Mabuza, Principal Secretary/PS MTEA making her remarks

Ms. Mabuza also spoke about government's plans for the power sector. She said it was pleasure to be part of this work, ensuring that the country has options for clean electricity production. The country imports about 80% of its electricity from South Africa. Developing Eswatini's own indigenous biomass electricity will help to secure the country's own production.

Through ESERA Government has started with an auction for 40MW of biomass electricity which is part of an auction for 80MW renewable energy, the other 40MW being solar PV (photovoltaics). Solar will meet many of Eswatini's clean electricity needs. However, it is not available all hours of the day, and that is why only 40MW was planned for. She said that, with improved technology (e.g. battery storage), this might be increased in the future.

She stated that the delay in contracting the 40MW biomass electricity was due to lack of information on the availability of biomass resources. The MTEA calls upon stakeholders to avail information on available biomass resource so that plans to increase biomass electricity production can be made. This work being undertaken by ICAT is a major step in that direction.

Ms. Mabuza noted that the PS for MNRE (Ministry of Natural Resources and Energy), Ms. Dorcas Dlamini, was presently in another meeting, but would join the workshop later during discussions on biomass electricity for Eswatini.

Figure 4: Ms. Xolile Nxumalo, PS MNRE Representative making her remarks

After the remarks by PS-MTEA, Dr. Thembelihle Dlamini (UNESWA/CSER) gave a summary of stakeholder engagement including meetings, interviews, field visits and the 1st Workshop held on the 7th and 8th April 2021. In the presentation, the disagreements between sugar millers and growers regarding ownership of the bagasse were noted. Considering the issue of bagasse ownership, the farmers requested that a policy for sharing the revenues associated with using bagasse to generate electricity be crafted, noting that the Sugar Act of 2007 set out the principle for such sharing.

As for transporting the cane and the cost for water pumping, sugar out-growers stated that both costs are fully carried by them. Thus, the motivation for generating electricity using biomass was primarily supported by the sugar factories, but that this could be addressed in discussions with sugar out-growers and the sugar mills.

Montigny Timber is the largest timber concern in Eswatini and was represented at the workshop. They started an innovative programme for black wattle (***acacia mearnsii***) in 2014, where the local community members are assisted towards growing wattle trees for sale to Montigny's mills.

Both timber companies (Shiselweni Forest/Peak Timber and Montigny), expressed strong interest in venturing into biomass electricity generation using their wood waste/residue materials. As noted by the PS for MTEA, Ms. Mabuza, ESERA has issued calls for a 40 MW biomass plant, and through the MoF (Ministry of Finance, represented at this workshop), ESERA has presented Investment incentives that are available to investors which are known as Development Approval Orders (DAO) and the Special Economic Zones (SEZs). Overall, stakeholders are interested in biomass power plants, as well as government, if there are clear policies or guidelines that will motivate local companies to participate.

The choice of inter-annual intervals was determined by imagery availability, particularly before 2000, and coincided with years where good quality remote sensing imageries with less cloud effect have now been prepared under this ICAT Eswatini Project and are now available for the entire country from 1990 to 2020. These have further provided input into Eswatini's updated IPCC Tier 2 mapping and data for the Forestry and Land Use (specifically sugar). This was supplemented by other ancillary spatial datasets such as high-resolution aerial imagery. This approach is expected to provide data with greater certainty and linked to biomass and carbon dynamics for Eswatini National Inventory reporting. This includes GIS-based combinations of land cover/forest types with connections to soil properties, integrating several types of monitoring and data (1990 to 2020).

Figure 5: Dr Thembelihle Dlamini, giving a presentation on stakeholder engagement.

Mr Jele (Forestry Department, MTEA) said the Department has data on wattle forests (about 35 670 hectors) divided into 2: the wattle stands (controlled) and the wattle jungle (still trying to control). The "wattle jungles" are individually- owned wattle stands (about 18 000 hectares total in the country) that are not controlled by any company around Nhlangano and Ntondozi. The Forestry Department has data on private small companies that own forests and is still in the process of collecting more data.

Some farmers have embarked on macadamia farming which can also contributes to potential biomass supply for energy. Dr. Nkambule (ECGA) commented that water is another limiting factor, perhaps, more than land when it comes to expansion of sugar cane plantations. Mr. Vilakati (MNRE) asked which policies do sugar growers require to produce enough bagasse and waste to expand electricity generation. .

Ms Mabuza (PS MTEA) said there are already too many committees that have been formed to look at renewable energy. She suggested that those already existing should be engaged to look into the biomass electricity generation matter, as has been set out in Activity 5's work with all key stakeholder groups.

Dr Mavimbela said for now the biomass resources that have been considered are forest waste and bagasse, but others like bamboo, sandanezwe, etc. have been mentioned. Dr Mavimbela discussed the Mauritius biomass project case; they had a high-level committee led by their minister of finance back in the mid-1990s, working with the Global Environment Facility (GEF) to start and craft a sugar biomass electricity policy using renewable electricity feed-in-tariffs (REFITs) when they began to promote sugar bagasse electricity at the beginning of their efforts. They use of a complementary fuel (coal) during the sugar off-crop season to meet about 20% of their energy resource for generating electricity. However, Dr. Mavimbela stated that the work that his team (Activity 5) had carried out with all the stakeholders mentions during this workshop, demonstrated that there was sufficient biomass, if the right policy, institutional and financial framework were set up, to generated sufficient electricity from biomass only for the entire year.

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Mr. Vilakati (MNRE) asked if there are any indications on available biomass resources and

capacities of power plants. Dr Wisdom Dlamini said the biomass resources are available, but there is a need to consider their calorific values.

4.2. Mid-morning Session Presentations

Dr. Mavimbela (UNESWA/CSER) gave a presentation on the modelling of biomass electricity scenarios. He highlighted that the tool used for the modelling was LEAP-Low Emissions Analysis Platform (figure 5). The presentation was followed by a discussion.

Mr. Olaff Marais (RES/Royal Eswatini Sugar's Director of Operations) commented on the calorific values and moisture contents of woodchips and wood residues, citing that 17% is too much for woodchips and suggested a value of 12%, and 13% for sugar cane as it takes a long time to dry. A study by the European Union showed that RES uses all its bagasse to produce electricity to sustain its operations, there is no available bagasse to generate extra electricity to feed it to the grid. However, additional electricity can be produced through improving the combined heat and power (CHP) technology that both RES's two factories (Mhlume and Simunye) and Illovo (Ubombo estate) which, in turn, will increase the efficiency of the boilers. The challenge is that the necessary upgrades are expensive.

Ms. Xolile Nxumalo, who was representing the Principal Secretary for the MNRE, asked if it is possible to use maize as feedstock for biomass electricity generation? Dr Mavimbela said it is possible, but the feedstock density of maize plants is lower than that of sugar cane in the same area of field. Also, using maize plants as a feedstock will threaten food security in the country.

Figure 6: Dr Mavimbela giving his presentation

Dr. Mavimbela (UNESWA/CSER) then gave a presentation of two Proposed Biomass Electricity Policy Options and their implications (investment, stakeholder engagement, policy implications). The two options were a feed-in-tariff option and an auction option. Advantages and disadvantages of the options were presented. In addition, the impact of tax incentives during the development of power plants was presented as a possible way of enhancing either option. The presentation was followed by discussion:

Ms. Xolile Nxumaloi (representing PS MNRE), asked the option that Mauritius used for purchasing biomass electricity. Dr Mavimbela said they used feed-in-tariff at the beginning but not sure what they use now. Mr Sonkhe Dlamini (ESERA) said as an organisation they looked at both the feed-in-tariffs and auction and considered technological advances of biomass production, and eventually settled on the bidding (auctioning) option. Dr. Nkambule (ECGA) suggested that considerations should be directed towards decreasing base load by decreasing demand through electricity generation for own use by individuals. Mr Joseph Ncwane (EEC) commented that this might introduce uncertainties in the demand projections. There will be a study by World Bank for off-grid electricity options. To decrease demand EEC is also promoting the efficient use of electricity e.g., household appliances and street lighting.

Mr. Fakudze, of the Ministry of Finance (MOF) stated that competitive bidding might be better and tax incentives do exist to make the investments more attractive to investors. Ms. Ginindza, (ILLOVO/Ubombo) indicated that when electricity is a secondary product for the company, it might not be able to access such tax and investment incentives.

Mr Ncwane (EEC) further commented that the high electricity prices are forcing people to look for alternative energy resources. There is an ongoing study that EEC is embarked on which is financed by the World Bank. This study focusses on looking at feasibility of alternative energy options. There is need to finance another study to look at solar energy for domestic use. He stressed that EEC promotes efficient use of electricity and does this sometimes by running campaigns around the country.

4.3. Afternoon Session Discussions

The afternoon session was originally planned to be for breakout group discussions that was to be followed by a plenary discussion but as stakeholders began to settle discussions erupted among all the participants and it was thought best to continue the discussions in plenary. Mr Vilakati (MNRE) said information on the capacity of available biomass should be sourced from stakeholders' engagement and the resources potential to produce biomass electricity sustainably before the government can make a policy for biomass electricity. Dr Mavimbela's response was that an upgrade of the current technology is a necessity. It is important think about the energy produced than the biomass capacities.

Mr. Ndzinisa (MNRE) suggested to consider waiting for the results of the current biomass electricity bidding process proceeds in order to see how low the tariff can go. The World Bank will fund a study to determine how much biomass is available in the country. Mr Ndzinisa also asked about the actual quantity of biomass resource available for electricity generation and what challenges exist with sourcing for efficient boilers. This information will be very beneficial to EEC in terms of their planning and how the potential amount of biomass electricity that will be injected of the main electricity.

Mr Oloff Marais (RES) said considerable money will be needed to buy the boilers. He emphasized on the need for full buy-in from government and relevant stakeholders such as ESERA and support from government. Government and ESERA should produce a request for information (RFI). The cost of mechanical harvesting which can be used to increase more feedstock is high. This type of harvesting would also be beneficial to RES as it allows green production of sugar.

Further, he supported the competitive bidding option for purchasing biomass electricity as feed-in-tariffs option has many inherent issues. Bidding will allow buy-in from all stakeholders from all levels in the country. There is also a good relationship between the sugar and the timber

industries. The timber industry supplies the sugar industry with wood chips when their bagasse is inefficient.

Mr Vilakati said it was the government policy decision to procure power competitively in line with the prevailing legislation for procuring new power generation capacity. ESERA is currently developing a framework that will address the issue of feed-in-tariff for start-ups IPPs who will be able to send excess power to net metering. Mr Oloff said large biomass companies are willing to sit in discussions for the proposed framework by ESERA.

Dr Mathunjwa stated that there can be consideration for tax exemption for some specific investments, including imported machinery, that is required by the country. Biomass generation is part of the renewable energy that the country has committed to the UNFCC. Dr. Mathunjwa (UNESWA) further commented on the bidding process saying it prevents biomass industry from meeting, this process will can take about 6 months.
Mr Cunningham, Montigny Timber, stated that they know how much biomass there is. They have done a full study of the resource. So, doing another study would not benefit them.

Dr Mathunjwa applauded the sugar and timber industries for coming together in their planning to inform government about the right information they need to guide the biomass electricity generation. Mr Ncwane (EEC) requested MNRE to organise a meeting with the key biomass stakeholders and industry experts to gather information informed by scientific study on the biomass electricity issue.

5. Summary, conclusions and recommendations

The workshop was a success, as can be seen from the discussions. In the discussions, most assumptions in the modelling were found to be within expected values with the only exception being some of the calorific values. However, the discussions have shown that while the stakeholders have been able to get together through this project there is still need for further engagement among them. Some of the issues that remain contentious among stakeholders are:

- The bagasse question between millers and out-growers. Out-growers believe they ought to be paid for their bagasse when it is used to generate electricity that is sold, noting the Sugar Act of 1967.[1]
- Recommending the auction option. Some stakeholders believe they still need to engage in the modalities of procuring biomass. One of the issues is that sugar millers buy some of the biomass resource (wood chips) from timber companies which they will have to compete with in an auction.

The following recommendations were drawn from among the stakeholders:

- It was recommended that some of the calorific values in the modelling assumptions be revised downward.
- It was recommended that further engagement on biomass by the key stakeholders be pursued.
- Increasing the wattle 'jungles' rehabilitation program be explored. It was noted that there are vast wattle 'jungles' in the south as well as other independent timber farmers that had not been reached by

[1] Sugar Act, 1967, Chapter VII, "By Products", pp. 31-32

the project.

In a private discussion with the private sector stakeholders (both timber and sugar) after the workshop, the team learnt that a Biomass Group was established in 2014 to foster cooperation among the industry stakeholders but the group eventually became inactive. The team believes that the revival of the Biomass Group with government leading it can be instrumental in country's transition to greater energy security through biomass.

6. Closing remarks

Ms. Khetsiwe Khumalo, in her closing remarks, appreciated ICAT for providing a platform for these discussions and studies on biomass electricity. The recommendations from the project will be used to inform and guide the next steps that the country will take towards biomass electricity generation. A successful implementation of the recommendations will ensure success in NDC implementation. It is important to explore opportunities like carbon markets through the international Green Climate Fund (GCF).

Annexures

Annex 1: Workshop Agenda; 24 May 2022 Hilton Garden Inn Mbabane

Time	Activity	Responsibility
0830 - 0900	Arrival and Registration	All Participants
0900 – 0915	Welcome Remarks	MTEA-CCU
0915 - 0930	Introduction of All Workshop Participants	All Participants
0930 – 0945	Introduction of the Workshop and its objectives including brief introduction of the ICAT Project and summary of Activity 5 – Biomass Electricity Options & Policies	UNESWA
0945 – 1010	Eswatini's GHG Inventory Compilation & Mitigation commitments through the NDC	MTEA
1010 – 1030	Government's plan for the power sector	MNRE
1030 - 1100	Summary of Stakeholder Engagement including meetings, interviews, field visits & 1st Workshop 7th & 8th April 2021	UNESWA (Activity 5)
1100 – 1120	**Tea Break**	**All Participants**
1120 –1200	Development of policy scenarios and tools for biomass electricity using the LEAP Model, stakeholder discussions & information	UNESWA (Activity 5)
1200 -- 1230	Presentation of 3 Proposed Biomass Electricity Options and their implications (investment, stakeholder engagement, policy implications)	UNESWA (Activity 5)
1230 – 1300	Brief discussion of Proposed Biomass Electricity Options and assigning of each participant to 1 of 3 break-out groups	All
1300 – 1400	**Lunch Break**	**All Participants**
1400 – 1500	Break-out group discussions (9-10 members to each break out group)	All
1500 -- 1530	Rapporteurs of each break out group present to plenary session	Group reps
1530 – 1615	Moderated open discussion of pros & cons of each of 3 options	UNESWA
1600 – 1630	Summary, conclusions and recommendations on biomass electricity policy options	UNESWA