



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

**Report of the
mid-term review of the UNIDO project
Promotion of waste-to-energy applications in agro-industries of Tanzania**

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Contents

Glossary of mid-term review related terms	i
Abbreviations and acronyms	iii
Project factsheet	iv
UNIDO staff responsible for the project	v
I. EXECUTIVE SUMMARY	1
II. COUNTRY AND PROJECT BACKGROUND AND CONTEX	2
III. MID-TERM REVIEW OBJECTIVES, METHODOLOGY AND PROCESS	3
IV. PROJECT ASSESSMENT	3
IV.1 Findings on project specific questions	3
IV.2 Findings on standardized review issues and questions	5
A. Project design assessment	5
1. Project design	5
B. Project performance and progress towards results	7
1. Relevance	9
2. Effectiveness and progress towards expected results	10
C. Project implementation management	15
1. Project management	15
2. Results-based work planning, monitoring and evaluation, reporting	16
3. Financial management and co-finance	16
4. Stakeholder engagement and communication	18
D. Sustainability	18
E. Gender mainstreaming	19
F. Performance of Partners	19
G. Remaining barriers to achieving the project expected results	21
IV. 3 Risk assessment	21
V. CONCLUSIONS, RECOMMENDATIONS AND FOLLOW-UP PLAN	25
VI. ANNEXES	26

Glossary of mid-term review related terms

Term	Definition
Results-Based Management (RBM)	A management strategy focusing on performance and achievement of outputs, outcomes and impacts.
Monitoring	A continuing function that uses a systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds.
Review	An assessment of the performance of an intervention, periodically or on an ad hoc basis. Note: Frequently “evaluation” is used for a more comprehensive and/or more in-depth assessment than “review”. Reviews tend to emphasize operational aspects. Sometimes the terms “review” and “evaluation” are used as synonyms.
External evaluation/review	The evaluation/review of a development intervention conducted by entities and/or individuals outside the donor and implementing organizations.
Formative evaluation/review	Evaluation/review intended to improve performance, most often conducted during the implementation phase of projects or programs.
Relevance	The extent to which the objectives of a development intervention are consistent with beneficiaries’ requirements, country needs, global priorities and partners’ and donors’ policies. Note: Retrospectively, the question of relevance often becomes a question as to whether the objectives of an intervention or its design are still appropriate given changed circumstances.
Effectiveness	The extent to which the development intervention’s objectives were achieved, or are expected to be achieved, taking into account their relative importance.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Sustainability	The continuation of benefits from a development intervention after major development assistance has been completed. The probability of continued long term benefits. The resilience to risk of the net benefit flows over time.
Institutional development impact	The extent to which an intervention improves or weakens the ability of a country or region to make more efficient, equitable, and sustainable use of its human, financial, and natural resources, for example through: (a) better definition, stability, transparency, enforceability and predictability of institutional arrangements and/or (b) better alignment of the mission and capacity of an organization with its mandate, which derives from these institutional arrangements. Such impacts can include the intended and unintended effects of an action.
Log frame	A management tool used to improve the design of interventions, most often at the project level. It involves identifying strategic elements (inputs, outputs, outcomes, impact) and their causal relationships, indicators, and the assumptions or risks that may influence success and failure. It thus facilitates planning, execution, monitoring and evaluation of a development intervention.
Results	The output, outcome or impact (intended or unintended, positive and/or negative) of a development intervention.
Impacts	Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.
Outcome	The likely or achieved short-term and medium-term effects of an intervention’s outputs.
Outputs	The products, capital goods and services which result from a development intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Indicator	Quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect the changes connected to an intervention, or to help assess the performance of a development actor. Means by which a change will be measured. Example: Total wastewater in t/yr.

Term	Definition
Target	Definite ends to be achieved. Specifies a particular value that an indicator should reach by a specific date in the future. Example: Reduce by 50% the amount of wastewater in t/yr, between 2015 and 2020.
Milestones	Interim targets; points in the lifetime of a project by which certain progress should have been made. They provide an early warning system and are the basis for monitoring the trajectory of change during the lifetime of the project.
Baseline	The situation prior to a development intervention against which progress can be assessed or comparisons made.
Assumptions	Hypotheses about factors or risks which could affect the progress or success of a development intervention. Necessary conditions for the achievement of results at different levels. These are conditions that must exist if the project is to succeed but which are outside the direct control of the project management. This is called the external logic of the project because these conditions lie outside the project's accountability and can be related to laws, political commitments, political situation, financing, etc.
Theory of change	Theory of change or programme theory is similar to a logic model, but includes key assumptions behind the causal relationships and sometimes the major factors (internal and external to the intervention) likely to influence the outcomes.
Conclusions	Conclusions point out the factors of success and failure of the evaluated intervention, with special attention paid to the intended and unintended results and impacts, and more generally to any other strength or weakness. A conclusion draws on data collection and analyses undertaken, through a transparent chain of arguments.
Lessons learned	Generalizations based on evaluation experiences with projects, programs, or policies that abstract from the specific circumstances to broader situations. Frequently, lessons highlight strengths or weaknesses in preparation, design, and implementation that affect performance, outcome, and impact.
Recommendations	Proposals aimed at enhancing the effectiveness, quality, or efficiency of a development intervention; at redesigning the objectives; and/or at the reallocation of resources. Recommendations should be linked to conclusions.
Gender mainstreaming	The process of assessing the implications for women and men of any planned action, including legislation, policies or programs, in all areas and at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programs in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality

For more related terms and definitions see also:

OECD-DAC Glossary of Key Terms in Evaluation and Results Based Management (2010); <http://www.oecd.org/development/peer-reviews/2754804.pdf>.

UNDG Results-based management handbook; <https://undg.org/wp-content/uploads/2015/01/UNDG-RBM-Handbook-2012.pdf>.

UNIDO e-learning course on: Results-based Management and the Logical Framework Approach; <http://intranet.unido.org/training/rbm/#home>

Abbreviations and Acronyms

TANESCO	Tanzania Electricity Supply Company Limited
MoE	Ministry of Energy
REA	Rural Energy Agency
UNIDO	United Nations Industrial Development Organization
EWURA	Energy and Water Utilities Regulatory Authority
SIDA	Swedish International Development Cooperation Agency
DIT	Dar es Salaam Institute of Technology
REDCOT	Renewable Energy Development Company (T) Limited
UNESCO	United Nations Educational, Scientific and Cultural Organization
GDP	Gross Domestic Product
MW	Mega Watt
kWH	kilowatt Hour
GWh	Giger Watt Hour
GEF	Global Environment Facility
WtE	Waste to Energy
WPP	Wananchi Power Providers
R&D	Research and Development
GoT	Government of Tanzania
UNEP	United Nations Environment Program
I&LC	Information and Learning Centre
EIA	Environmental Impact Assessment
MTE	Mid-Term Evaluation
MeTL	Mohammed Enterprises Tanzania Limited
GHG	Green House Gases
MoF	Ministry of Finance
EoI	Expression of Interest
UNDP	United Nation Development Program
IRENA	International Renewable Energy Agency

Project factsheet

Project Title	Promotion of waste-to-energy (WtE) applications in agro-industries
UNIDO ERP ID and/or project No.	140077
GEF project ID	4873
Region	Sub-Saharan Africa
Country	Tanzania
GEF focal area and operational programme	Climate Change CCM-3
GEF implementing agency(ies)	UNIDO
GEF executing partner(s)	Ministry of Energy, Rural Electrification Agency
Project size (FSP, MSP, EA)	FSP
Project CEO endorsement / Approval date	17 December 2014
Project implementation start date (first PAD issuance date)	<u>10 February 2015</u>
Expected implementation end date (indicated in CEO endorsement/Approval document)	48 Months
Revised expected implementation end date	MTE recommends a 1-year extension
Actual implementation end date	
GEF project grant (excluding PPG, in USD)	5,277,000
GEF PPG (in USD)	50,000
UNIDO co-financing (in USD)	150,000
Total co-financing at GEF CEO endorsement (in USD)	26,750,000
Expected materialized co-financing at project completion (in USD)	16,000,000 to 22,000,000
Materialized co-financing at mid-term review completion (in USD)	14,330,000
Total project cost (excluding PPG and agency support cost, in USD; i.e., GEF project grant + total co-financing at CEO endorsement)	32,027,000
Mid-term review date	May 2019
Planned terminal evaluation date	

(Source: Project document)

UNIDO staff responsible for the project

<i>Position</i>	<i>Current</i>	<i>At approval</i>
Project Manager(s):	Jossy Thomas	Jossy Thomas
National Project Coordinator/s:	Robert Washija	Original NPC left UNIDO
Others involved in the project management in the HQ:	Kolade ESAN, Project Administrator	Project Associate

I. Executive summary

The **Promotion of waste-to-energy applications in agro-industries of Tanzania** project has increased installation of WtE plants for energy use in agroindustries and emission reduction. Tanzania has a large agriculture sector and has need of further electrification and power generation. Agro-waste has good energy content and is otherwise a disposal problem. The project is highly relevant to the national development context and offers good greenhouse gas emission reductions potentials.

The project was designed with four components comprised of an Information & Learning Centre, Demonstrations and Financial instruments as well as a Monitoring and Evaluation component. The design was comprehensive and appropriate to the goal na objectives.

The changes in government, changes in the selection of a national Information and Learning Centre (ILC) and change in the National Project Coordinator have contributed to delays on several key components.

The I&LC is critical to sustainability and capacity building. This MoU needs to be signed as soon as possible. Should the terms not be agreed, the Rural Energy Agency seems to be performing this function already through the SIDA funded program. UNIDO could donate the grant funds to this program at REA emphasizing the Agro WtE technology.

Workshops should prepare developers for project implementation thus they are needed early in a project.

Workshops with policymakers should be presented and executed as consultatory processes tackling current issues on distributed generation and electrification as well as WtE benefits. Other donors should be invited to join these workshops as the issues are more general in nature.

Demonstrations have encountered technology risk with biomass gasification. Failures have a very powerful negative impact n technologies in the market. Eligibility of biomass gasification to internal combustion engines technology should be suspended. The REDCoT and WPP plants need to be remediated and functioning before any further biomass gasification projects are supported. Biogas digesters, bagasse cogeneration and simple combustion boiler technologies are all working fine and should remain eligible.

Otherwise, the Agro-waste to Energy technologies including biogas digesters to methane, and boilers are relatively risk-free and proceeding well. Of the 6.8 MW target, 3.26 MW have been installed and if they are made fully operational will result in the electricity and greenhouse gas emissions reductions nearing half the overall target. The third Expression of Interest will probably bring forward sufficient potential projects to reach the target.

The grant modality will be used to support the demonstration sites, however, in future UNIDO/GEF should invest in guidelines for revolving funds that are less disruptive to the marketplace, more sustainable long term and achieve about 4 times more post-project direct impact with co-finance.

The project should be extended by a year and priority put onto getting the Information & Learning Centre up and running.

Demonstrations of biomass gasification to producer gas for combustion in Internal Combustion spark engines need remediation in order to make them successful. Otherwise other technologies appear to have low risks and it is expected that the project could nominally achieve the MW targets and Greenhouse Gas emission reductions targets by project completion.

Policy support as part of the finance component should be used to address potential political risk and TANESCO offtaker risks.

II. Country and project background and context

Tanzania country situation and background/context have not changed dramatically. Since the project was developed GDP growth has been 7% (2017) and continues. Electrification reached 32.8% in 2016 leaving a strong need for electricity especially in rural areas and farming districts. In 2018 the president signed a deal for construction of a large hydro dam that could double the available electricity generation. This is causing some perturbation in policies and donor programs that were focussed on mini grid electrification. Environmentalists are fighting the dam construction as it will flood 463 sq km including a UNESCO Heritage site and game reserve.

In addition, there have been some difficulties for Small Power Producers getting paid by TANESCO for electricity at the rates approved by the regulatory agency.

From the Project Brief:

“According to the International Energy Agency (IEA), Tanzania consumed a total of 20.8 Mtoe in 2011, of which, net imports were 1.6 Mtoe. Energy imports form about USD 1.5 billion per annum which is about 23% of the total imports and almost all of them are petroleum products. In 2009, out of the total energy consumed in Tanzania, biomass represented 88.6% of the total energy consumption, petroleum products 9.2% and electricity 1.8%. Other energy sources, such as coal, natural gas and solar represented a negligibly small percentage.

Biomass is the single biggest source of energy in the country. According to the estimates made by REA, about 15 million tons per year of agricultural, livestock and forestry residues are annually generated. These include sugar bagasse (1.5 million tons per year (mtpy), sisal (0.2 mtpy), coffee husk (0.1 mtpy), rice husk (0.2 mtpy), municipal solid waste (4.7 mtpy), forest residue (1.1 mtpy)) with the balance from other crop wastes and livestock. Further supplies are obtained through sustainably harvested fuelwood from fast-growing trees plantations. However, only a very small percentage of these wastes are used for energy generation. On the other hand, biomass is the main domestic energy source. More than 80% of the Tanzanians depend upon biomass as their major energy source with very less usage efficiency. As a result, in the overall country energy mix, biomass represents the major share.

Tanzania's per capita electricity consumption is around 78 kWh¹² per annum, which is very low compared to that of the world's average per capita consumption (2,000 kWh) and developing countries in Sub-Saharan Africa (552 kWh).

Tanzania's installed electricity generation capacity in March 2013 was 1,564 MW, of which around 1,438 MW was available in the main grid and the balance of 126 MW was from the small power producers (SPPs), mini-grids and imports. Out of this, 32% of the electricity comes from natural gas, 29% from oil, 35% from large hydropower and the remaining percentage from small renewable energy power and imports¹³. Electricity generation mix in Tanzania for the year 2012, with an overall production of 5,740 GWh¹⁴, is shown in figure 2. In addition, there are around 300 MW of private diesel

generation systems not connected to Tanzania Electric Supply Company Limited (TANESCO) grid.

Electricity demand in the country is increasing rapidly mainly due to the accelerated productive investments, increasing population and increasing demand for energy services. The Power System Master Plan (2010 – 2035) anticipates that Tanzania will increase its electrification status from 18.4% to at least 75% by 2035. In addition, the demand from the connected customers will also increase significantly, as Tanzania becomes a middle-income country as stipulated in Tanzania Vision 2025. The peak demand is projected to rapidly increase from about 1,000 MW in 2010 to about 4,700 MW by 2025 and 7,400 MW by 2035”.

The context for the project remains valid for this technology and while some risks will need to be addressed, the project should proceed.

III. Mid-term review objectives, methodology and process

The Mid-Term Review is an opportunity to have an independent opinion on the progress on outputs and the probability of achieving outcomes. From the GEF Monitoring and Evaluation Policy 2010:

a. Relevance—the extent to which the activity is suited to local and national environmental priorities and policies and to global environmental benefits to which the GEF is dedicated; this analysis includes an assessment of changes in relevance over time.

b. Effectiveness—the extent to which an objective has been achieved or how likely it is to be achieved.

c. Efficiency—the extent to which results have been delivered with the least costly resources possible.

d. Results—in GEF terms, results include direct project outputs, short- to- medium-term outcomes, and progress toward longer-term impact including global environmental benefits, replication effects, and other local effects.

e. Sustainability—the likely ability of an intervention to continue to deliver benefits for an extended period of time after completion; projects need to be environmentally as well as financially and socially sustainable.

Documents reviewed include the Project Identification Form, Project Document – especially the Results Framework, and the Project progress reports as well as the Project Implementation Reviews. The project outputs were also reviewed including assessments of industrial plants, public awareness materials.

The review was done following the Results Framework component by component with a concentration on outcomes, sustainability and as to whether outputs were supporting broader market transformation.

IV. Project assessment

IV.1 Findings on project specific questions

A project-specific issue with technology is worth highlighting. Biomass gasification has been a choice of several developers. Pyrolysis of rice husk, maize cobs, sawdust or

other woody biomass gives producer gas, a mixture of unburnt hydrocarbons that can be used either with 20% diesel in a compression ignition engine or as a straight input to a spark (gasoline) engine.

Two WtE project developers chose this technology, importing it from India through Husk Power.

From the site visits and a meeting with Husk Power, it was ascertained that there were at least seven facilities of this type of their design and some of TERI India in Tanzania without any record of production. The spark engines are susceptible to tar fouling. None of them are producing any significant power although they can run. The highly fluctuating loads in mini-grids seem to be a problem getting to steady state. The following is recommended to address this issue:

Form a group DIT, REDCoT, Husk Power, WPP, and UNIDO to perform R&D.

DIT researchers will be given a genuine issue of importance to explore and generate learning from as jointly private/public sector funded issue.

UNIDO and GoT should transfer the TERI 32 kW gasifier/engine previously donated to Small Industries Development Organisation (GoT) to DIT. It was never installed or used. This is the same technology as the Husk units and could serve as a testbed or different fuel stocks and techniques. TERI in proposals to UNIDO has identified advanced technologies including electrostatic precipitation and a gas chiller which may resolve the tar fouling issue.

Additional training could ensure mixed fuel - maize cobs or small chunk woody biomass is mixed in the gasifier bed with sawdust or rice husk to avoid caking. Use adequate filtration material and the system is cleaned regularly.

Test biomass gasifier to a boiler/steam turbine, thus avoiding all combustion as quality issues. The outputs are briquettes and electricity. The efficiency could be enhanced by a lake water steam condenser on the turbine at WPP site.

The project should seek agricultural development investment from TIB Development Bank or SIDA/REA for maize grinding, rice milling, sawmills, and water pumping at the generation sites.

In the case of Mtwara, pumped energy storage in a water distribution system storage tank at 200 m height turbines in low altitude distribution system points for WPP Nyasha. These would provide adequate loads for extended steady-state operation of gasifiers thus. Reducing fouling problems and providing productive uses of electricity. For the REDCOT application, grid connection is planned so the plant could run at full output. A co-located sawmill could provide the sawdust and wood offcuts.

The MTE consultant contacted the Cuban Ministry of Energy and was able to learn that the biomass gasifier installed under the UNIDO/UNEP project there (circa 2005) was still working. It takes time to clean the system but saves on fuel.

Other project Specific questions on Agro-waste to Energy technologies are integrated with the standardized questions through the Logical Framework structure.

IV.2 Findings on standardized review issues and questions

A. Project design assessment

1. Project design

The objective of the project is to promote investments in waste-to-energy (WtE) technologies for electricity generation in agro-industries. This was later expanded to biofuels and electricity. The project design could have allowed for equivalency between electricity and biofuels but at this time there seems no harm in accepting biofuel provided they achieve the Greenhouse Gas emissions reductions and development goals.

The Global Environment Facility's Climate Change Mitigation focal area objective 3 is to Promote investment in Renewable Energy (RE) technologies.

Outcomes were stated as "Investment in RE technologies increased". Outputs were projected as Renewable Energy capacity installed.

Given the shifts in government priorities to grid extension and central power generation, policy frameworks as a GEF priority could have been given more emphasis. The issue is included as an activity under finance.

Energy efficiency in agro-industrial processes and mini-grids could have been included to avoid the situation where low-efficiency equipment is used with RE.

Also, a reduction of deforestation impact may result from briquettes from waste and could go along with biomass resource assessment.

Development Goals call for productive uses driven by the WtE processes and this was included in the Expressions of Interest for projects. Since productive uses were not eligible for GEF support, they are in some cases not being pursued. The project design could have included associated co-finance from development finance for the agro-processing facilities.

2. Project results from framework/log frame

Component 1: Capacity development and Knowledge management. Improved awareness, knowledge and capacity on WtE

Expected Outputs

1.1 An information and learning centre (I&LC) established for WtE at the University of Dar es Salaam (UDSM) [changed to Dar es Salaam Institute of Technology (DIT).]

The shift in institutions apparently resulted in miss-matched expectations from both parties and lead to no agreement being reached. Project design and management trade-off between overfunding from grant versus building on baseline sustainable activity tended toward the latter and not spending GEF funds to kickstart activity. Consequently, some of the foundational building blocks were missing for early training, demonstrations and finance. One of the developers did not realize he needed an Environmental Impact Assessment as TANESCO advised him. On review, since the developer had lumped together two sites, the EIA could have been avoided by presenting as they are in fact separate sites under the threshold for EIA requirement. Alternatively, a workshop on WtE project development could have illuminated the necessary steps. It is appropriate to fund such training initially from GEF and donor co-finance shifting to baseline support as the project volume and training demand increases.

Agreement between DIT and UNIDO was yet to be reached at the time of the mission but appeared to be positive.

Marginally Unsatisfactory – Late

1.2. Capacity developed for at least 50 policy makers.

This aspect was presented as a capacity building but (as mentioned by TIB Development Bank on another matter) it should be policy support and consultation processes leading to conducive policies and merged with Component 3.1 on policy gaps. This engenders a more positive engagement and outcomes beyond training in the form of policy improvements. The government has decided to build a large hydro dam in the World Heritage Selous game reserve for central power generation despite objections from environmental groups. Recommended actions are to jointly fund in-depth studies of the advantages of diversified energy sources and distributed generation. In particular, the El Nino and La Nina oscillations have resulted in multi-year droughts and floods in the last decade due to climate change. Hydro dams in Africa are often heavily silted due to deforestation and in Kenya and Ghana have fallen below operating level due to lack of water and adequate storage. Diversification is therefore important. Also, mini-grids can be an advance distribution electrification network that can later be connected to the main grid and voltage support provided by distributed generation especially during peak demand.

Marginally Unsatisfactory. No progress so far despite the political risk.

1.3 Technical capacities developed for relevant RE institutions, agro-industries and project developers (target at least 50 numbers each).

This activity has had no apparent progress despite the issuance of three Expressions of Interest and award of several grant investments. Some of the developers could definitely have benefited from workshops on project development. The guidance was needed on Environmental Assessment requirements and Biomass resource availability as well as technology operations. Training is now being organised for biomass gasification technology.

During the Mid-Term Review, one of the original developers Mohamed enterprises Tanzania Ltd was interviewed to understand why they had not gone ahead with a WtE project. They withdrew over concerns that TANESCO was not a reliable off-taker. Workshops would be a way to bring these issues out in public and have them addressed by the government and the utility.
Little progress.

Marginally Unsatisfactory so far

Component 2. Demonstration of WtE technologies

2.1 Detailed plant designs prepared for demonstration projects

2.2 WtE power plants established for 6.8 MW cumulative capacity

2.3 WtE transferred to agro-industries.

The initial project proponents (MeTL, Masasi foods, Zanzibar Sugar, National Ranching Co were not moving so UNIDO issued an Expression of Interest (EoI) to attract developers. Although the originating project proponents could have received a waiver from the competition. MeTL went as far as to prepare a proposal for the EoI but did not submit due to TANESCO off-taker risk. Zanzibar Sugar has come in on the third EoI. It is recommended that the original project proponents be re-engaged both for additional outputs but as well learning on what stalled their projects.

Outgrowers – cashew apples to ethanol and cashew shells to bio-oil and briquettes. The 2.9 MW equivalence was reviewed and will achieve an equivalent GHG reduction.

Wananchi PP – rice husk and maize cobs to producer gas to electricity and briquettes – tar issues in spark engines partly due to low intermittent loads

Renewable Energy Development Co of Tanzania (REDCoT) – sawdust and maize cobs to producer gas and briquettes – tar issues expected.

It is recommended that no new biomass gasification systems be funded until the existing ones are working successfully.

Satisfactory with remedial action required on biomass gasification systems.

Component 3: Creation of favourable investment environment components and systems

3.1. Gap analysis on policy requirements conducted

This should be a priority. With the change in government 2015-16 and seemingly little public or partner consultation, the policy direction has shifted to large hydro and grid extension. Policy support in the form of a study examining to understand how mini-grids and distributed generation can complement central power production. Distributed generation has much less transmission loss. Voltage and frequency can be improved near to the loads. Biomass is dispatchable so could be used for peak power production. On the large hydro-dam side evaluation of interannual rainfall patterns and drought, cycles would show that large hydro is in fact not as reliable as one might hope. Therefore diversification is needed.

The issue needs to be tackled in consort with SIDA, IRENA and other like-minded donors. From discussion during the MTE mission with the Ministry of Energy, they would be interested.

No apparent progress.

Marginally Unsatisfactory – to be resolved now the risk is identified

3.2. Incentive and soft loan facilities designed.

UNIDO has had difficulty designing and implementing revolving soft loans. The Solar Heating for Industrial Processes in Egypt revolving fund was not being implemented mainly due unwillingness of UNIDO procurement officers to share risk and accept that the revolving fund should take the risk and accept potential losses. This is the role of GEF funding in stimulating markets. However, the grant modality was selected and subsidizes RE at 400 USD/kW installed capacity. Unfortunately, subsidies can give the impression that technologies are not cost effective. Soft finance, on the other hand, can be integrated with mechanisms at REA and TIB Development Bank that can continue post project.

Grants have been successful in lowering finance needs as the developer can offer UNIDO/GEF grant as equivalent to equity and meted out by capacity installed (kW) and facility milestones. There is no apparent sustainability or exit strategy (could have used declining grant rate for each EoI from 400 \$/kW to zero). Grants may cause inflated costing (\$/kW are high, co-finance uncertain).

A revolving fund at REA was identified in the Project Brief to GEF. The impact of is several times larger than grant (could revolve 4 times as post-project direct emissions reduction). WtE is cost-effective, therefore UNIDO/GEF should share investment risk as to the first loss (since it is a grant anyway) or share risk *pari passu*¹ by the revolving fund and other financiers

UNIDO could have continued to engage REA/TIB Development Bank in agreement that provides a tranche of a grant, verifies the first revolution loans contain repayment to REA/TIB Development Bank then releases the balance of grant to REA. The revolving fund has its own oversight committee (MoE, REA, TIB Development Bank, MoF) UNIDO monitors activity to end of the project. UNIDO has no further fund responsibility past first investment commitments. The first commitments are demonstrations that have high due diligence.

The revolving fund should take the risk and not be fully commercially viable to justify GEF use of grant funds. It is probably too late for Tanzania WtE project, but this should be addressed by establishing guidelines for revolving funds by UNIDO (similar to UNEP and UNDP) for future GEF projects.

Satisfactory, but with recommendations for grants to revolving funds recommended in future projects

3.3 Incentive scheme established under REA for investors of WtE projects.

Little engagement by the project has been made on this topic with REA – the agency that could provide soft finance post project.

SIDA is funding a grant-based technical assistance facility for rural electrification.

Procuring each demonstration project directly from headquarters will result in weaker sustained market thrust and the soft co-finance REA has could have expanded the demonstrations and replication effectively.

Satisfactory

3.4. Soft loan facility established under REA for investors in WtE projects

TIB Development Bank – is a national development bank and uses revolving funds for some sectors. UNIDO did not engage on this due to UNIDO procurement due diligence issues. Revolving funds are eligible grant recipients for UN funds from GEF but this needs a set of guidelines developed at UNIDO.

Unsatisfactory but too late for this project to address

4. Monitoring and Evaluation (M&E).

The Project Implementation Reviews

2016: All Highly Satisfactory or Satisfactory rated, risks all rated low to moderate
“The assessment of the project on the achievement of its Global Environment Objectives/Development Objectives is rated as Highly Satisfactory.
This global objective is related to direct emission reduction which is in line with the goal of the project to reduce carbon emission in the agro-industrial sector of Tanzania. The project has implemented significant activities towards achieving its goal and

¹ **Pari-passu** is a latin term that means "at an equal rate or pace." It is often used in finance.

global environment objectives. The following activities were implemented during the FY 2016:

- i) Identification of an institution to host the I&LC;
- ii) Techno-economic assessment of the demonstration site; and
- iii) Design of incentive scheme for WtE plant investors/ developers.

These activities will result in the project progressing towards achieving its goal and global environment objectives”.

This rating was optimistic but at that stage, things appeared to be on track.

2017: Highly Satisfactory on Global Objective, Satisfactory on Components, Low to Moderate Risk

“The overall rating of this project with respect to the achievement of its GEOs/DOs is assessed as Highly Satisfactory. This global objective is related to the direct emission reductions which will result from the operation of the three WtE power plant under construction with a cumulative capacity of 4.1 MW. These three sites are expected to result in avoidance of around 12, 929 t COe annually and 193,935 tCOe for 15 years plant lifetime”.

In fact, 2 of the 3 sites went ahead, Outgrowers is in production, Wanachi Power Producers has capacity installed but insufficient off-takers and plant problems, and REDCoT is in early construction and testing mode in May 2019.

The PIR does not highlight risks that the Info & Learning Centre was not in place or that the policy gaps work had not been done.

HS and S were too optimistic.

2018: Highly Satisfactory on Global Objective, Satisfactory on Components, Low to Moderate Risk [Too optimistic in hindsight]

“The following activities have been completed/initiated:

- The framework for establishing the proposed information and learning centre for WtE (I&LC WtE) is submitted to HQ for final review and the official launching of the I&LC WtE is scheduled for January 2019;
- Published the 2nd call for expression of interest to solicit investments in developing WtE power plant resulting in four more additional contracts;
- Seven WtE power plants with a cumulative capacity of 6.523 MW is under development;”

As at May 2019, investment demonstrations had stalled and project risks were manifesting (High Risk) and should have attracted remedial effort. The project management recognizing the risk went to the third Expression of Interest.

In general, project management could have recognized risks earlier and deployed resources to counter the risks. The Policy Gaps 3.1 activity could have been useful. Partnering with TIB Development Bank and REA on projects could have helped. Small contracts for training could have been executed so that Component 1 functions were not missing.

B. Project performance and progress towards results

1. Relevance

Agriculture is a very important sector of the Tanzanian economy. The government identified Cashews as a strategic product for further development and export. In the past

Cashew, trading was not transparent and almost all of the raw product was exported to India for processing. The OutGrowers demonstration project keeps the processing in the country and takes the waste apples and shells turning them into value added in the form of energy. Similarly, the other Waste to Energy projects takes sisal waste, rice husk or sawdust waste that is otherwise a disposal problem and turns it into energy which in rural areas is not otherwise available or has to be imported as diesel. So, the target group needs and the focus on agro-WtE was entirely appropriate and remain so.

The energy in Tanzania is restricting rural economic growth and prosperity. The recent change in government has resulted in a shift in priorities from mini-grid electrification to a large hydro-dam with grid extension. This reviewer, based on discussions with stakeholders and a review of the facts sees distributed generation and mini-grid pre-electrification as an important strategy and that grid extension on its own has risks and development delays that will take years. Ministry of Energy Principal Energy Officer was receptive to policy support to explore this issue.

UNIDO has a history in industrial applications of waste to energy and is best placed among UN/GEF agencies to support this technology. UNIDO needs capacity building to manage financial instruments such as providing grants to revolving funds that take on technology and market risk.

2. Effectiveness and progress towards expected results

Table 1: Progress towards expected results (based on the log frame)

Expected results	Indicator	Baseline	Mid-term	End-of-project target	Achievement rating	Justification for rating
			Actual			
Goal: Increased installation of WtE plants for energy use in agroindustries and emission reduction	1. MWs of WtE plants installed in agro-industries 2. tCO ₂ emission reduced	1. MWs of WtE plants installed in agro-industries 2. tCO ₂ emission reduced	Target Not Specified. As at 2019 2.9 MW, 0.2 MW, & 0.16 MW from 3 investors going ahead, others stalled, 3 rd EoI launched	At least 4 investors invest in WtE plants for a cumulative 6.8 MW capacity 2. Replication plants for at least 15 MW capacity 3. Achieve 328,877 tCO _{2e} of emission reduction directly (through demonstration plants) 4. Achieve 725,464 tCO _{2e} of emission reduction indirectly	<i>On track to be achieved</i>	1. Three sites visited, one with WtE in production 2.9 MW, one with WtE some capacity installed but not fulfilling production yet, One with capacity under test and plant in construction . Proposals under review for third EoI. 2. Rural Energy Agency and Tanzania Investment Bank have programs for which WtE is eligible.

Objective: To promote investments in WtE technologies for energy generation in agro-processing industries	USD investment in WtE technologies	Low level of investments in WtE technologies	2.93 M\$ including 1.63 M\$ co-finance	At least approximately USD 14.1 million investment in 6.8 MW WtE projects	Slow but on track if the EoI 3 is successful	Results to date as well as an interview with prospective developer Mohamed enterprises and early results from EoI3 including bagasse to electricity plant on Zanzibar and others still in the process
Outcome 1: Improved awareness, knowledge and capacity on WtE technologies	Indicator 1: Creation and operation of the special centre for improving the human and institutional capacity	Insufficient human and institutional capacity to develop WtE projects	No MoU, still in discussion as at May 2019	1. Establish the I&LC within the first six months from the start of the GEF project 2. Undertake capacity building activities to at least 50 beneficiaries from each group 3. To target at least 10 Women participation in each group	This will likely be achieved but very late Red/Yellow	Meeting with DIT and UNIDO was positive but output level is not on track
	Indicator 2: Number of trained personnel by the centre 3. Number of women trained		No Training			
Output 1.1: An information and learning centre (I&LC) established for WtE	Indicators: 1. Business plan and annual work plans created 2. Creation and operation of the centre	Lack of one-stop technical centre on WtE	So far the only discussion	1. Business plan and annual work plan creation within first 3 months of the GEF project start	No MoU	

				2. Creation and operation of the centre within 6 months of the GEF project start		
Output 1.2: Capacity developed for at least 50 policy makers	1. Number of training organized 2. No. of key policy makers trained 3. Number of women trained	Inadequate capacity among the key policy makers	So far the only discussion	1. Conduct at least 2 training 2. Educate and train at least 50 policymakers on WtE potential, technology and project development 3. Include at least 10 women policymakers in the training		
Output 1.3: Technical capacities developed for relevant RE institutions, agro-industries and project developers	Indicators: 1. Number of training organized for different target groups 2. No. of persons trained 3. Number of women trained	Insufficient local capacity to develop, support, operate & maintain WtE plants	So far the only discussion	1. Conduct at least 2 trainings 2. Train at least 50 personnel from each of the target groups 3. Include at least 10 women for each target group	No Training reports	
Outcome 2 Increased use of WtE technologies in agro-industries	Indicators: MWh of electricity from WtE technologies	Developers do not trust WtE projects due to lack knowledge and the risks perceived.	3 investors going ahead, others stalled, 3 rd EoI launched	41,446 MWh generated electricity from WtE plants are used in the agro-industries		
Output 2.1: Detailed plant designs prepared for participating demonstration projects	Indicator: Project progress status	Lack of plant design reports for further project development	Designs for the 3 plants are in place	Detailed plant design reports for the demonstration projects		

Output 2.2: WtE power plants established for 6.8 MW cumulative capacity	Indicator: MW of installed capacity	Lack of demonstrable commercial WtE plants Agro-industries depend on diesel or grid (fossil-fuel dominated based) electricity	3.26 MW installed or in preparation for installation	6.8 MW WtE plants supplying electricity to agro-industries	On track	Physical site verifications were done on the three sites
Output 2.3: WtE technologies transferred to agroindustries	Indicators: 1. No. of technology know-how workshops conducted 2. No. of field visits to WtE plants	Agro-industries have inadequate knowledge on WtE technologies and it is potential	No progress	1. Conduct at least 2 technology knowhow workshops 2. Conduct at least 2 field visits and hands-on training at WtE plants		
Outcome 3: Increased involvement of private investors in WtE projects	No. of project developers developing WtE projects	Low interest from private investors to engage in WtE plants development	Expressions of Interest have brought forward 11 developers in Eol 1 and 2.	1. Involve at least 4 project developers in demonstration projects 2. Install at least 9 demonstration projects for a cumulative capacity of 6.8 MW 3. Install at least 5 replication projects for a cumulative capacity of 15 MW		The assumed "Support of REA and interest of private investors along with the TIB Development Bank" for this component needs strengthening. Meetings showed interest on their part but closer integration is needed.
Output 3.1: Gap analysis on policy requirements conducted	Gap-analysis report	Existence of a few policies to promote Renewable Energy. On the other	No progress although needs are demonstrated	One detailed gap analysis report within the first year of the GEF		Major gaps are appearing including questionable support for mini-grids and

		hand, there is a lack of motivation among private investors				small power producer contributions to electrification
Output 3.2: Incentive and soft loan facilities designed	1. Number of incentive schemes designed 2. Number of the soft loan facility designed	Inadequate financing facilities to attract investments in WtE projects	Grant scheme implemented Soft loan scheme abandoned	1. At least one incentive scheme designed 2. At least one soft loan facility designed		
Output 3.3: Incentive scheme established under REA for investors of WtE projects	USD incentives based on incremental cost principle to WtE projects	Inadequate financing facilities to attract investments in WtE projects	Grants being disbursed. No sustained financing is foreseen.	Establish incentive scheme with USD 3.4 million GEF grant for the demonstration and replication projects		
Output 3.4 Soft loan facility established under REA for investors of WtE projects	1. USD soft loan 2. No. of private companies benefitted through the soft loan facility	Inadequate financing facilities to attract investments in WtE projects	No longer being developed. Too late.	1. USD 9.6 million soft loan established 2. At least 5 private sector initiatives benefitted under the soft loan scheme		May as well be deleted from the work plan at this late date. UNIDO should build the capacity to implement these mechanisms in future projects as they are far superior to grants.

Traffic-light assessment:

Green = Achieved Yellow = On track to be achieved Red = Not on target to be achieved

3. Efficiency

Efficiency is focussed on the cost of the project to the GEF in proportion to the global benefits anticipated \$GEF/tCO₂e.

Component 1 has been significantly delayed in part because the UNIDO management did not want to advance grant funds without significant commitments from the institution itself or from the government that would ensure co-finance of activities and long term sustainability. Since UNIDO was switching from the University of Dar es Salam to the Dar es Salam Institute of Technology and the National Project Coordinator left the project, other factors were also at play. The Ministry of Energy nominated the Dar es

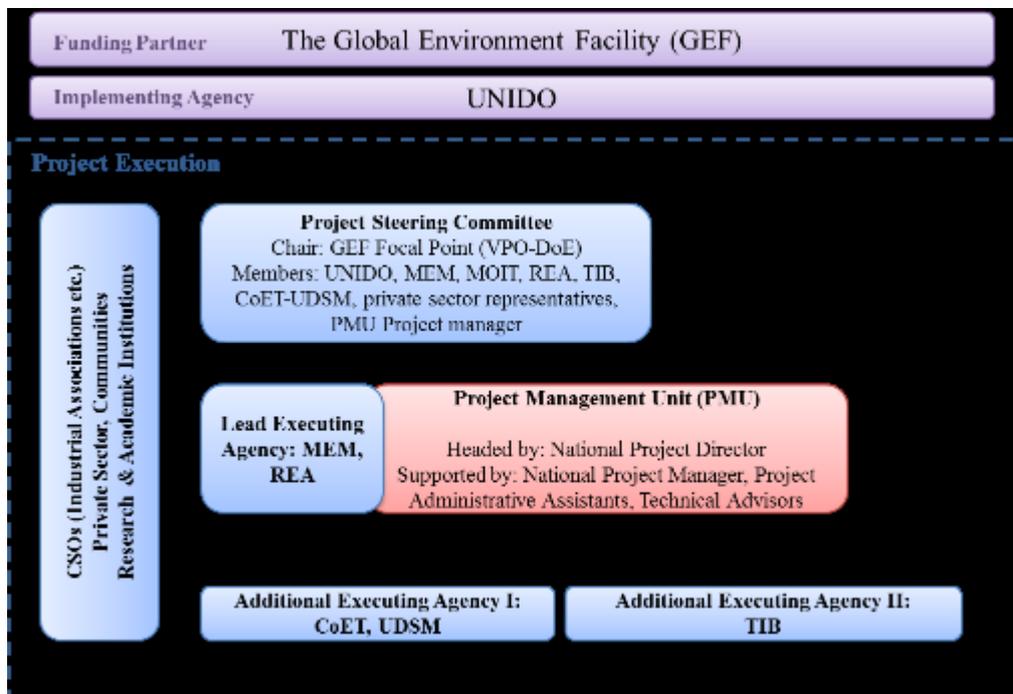
Salam Institute of Technology to compete in the selection of the East African Centre of Excellence for Renewable Energy and Energy Efficiency. The award went to Makerere University in Uganda but DIT will remain in the network. So DIT appears a good choice and receives some support from government and donors other than the GEF WtE project. The project could have benefitted from early grant-based activities to get workshops and training initiated.

Component 2 The original co-financiers from private sector did not proceed at the project stage. The project moved to 3 Expressions of Interest to get competitive bids for demonstration projects. This could bring competitiveness into play to improve efficiency, however, grant-based assistance did not include cost/tCO₂ or cost/MWh competition. This may not have been appropriate even that much of the beneficiary targets were rural and remote where willingness to pay more was evident.

Component 3. The Gap analysis on policy requirements should have assisted moving into the new policy regime of the new government and could have smoothed the transition to a central generation/grid expansion policy thrust. The grant mechanism is the least cost-efficient means of supporting projects from a market and sustainability perspective. Ironically, the procurement process at UNIDO headquarters is a major impediment to cost efficiency in finance of renewable energy. A similar experience occurred with the Solar Heating for Industrial Processes in Egypt. It is recommended that guidelines be established for revolving and risk sharing funds at UNIDO so as to be capable of implementing grants to financial mechanisms that can sustain several times the impact of straight grants to projects. A revolving fund mechanism that assumes first or *pari passu* risk would be about 4 times more efficient than straight grants and would not disturb the market-place as the transition to conventional finance would be likely. Overall efficiency at project approval is based on estimated 328,877 tCO₂e for 5,277,000 USD GEF or 16 US/tCO₂e and with the estimated replication bringing the total to 725,464 tCO₂e resulting in 7.3 \$US/tCO₂e. This reviewer is of the opinion the replication potential is there and that if barrier removal is effective it will be fulfilled.

C. Project implementation management

1. Project management



The project has an appropriate steering committee arrangement while UNIDO headquarters retains approval of demonstration sites, procurement and overseeing the monitoring and reporting.

If feasible, the Project Steering could be given more responsibility as a transition to sustained activity after the GEF project.

2. Results-based work planning, monitoring and evaluation, reporting

Results-Based work planning

The National Project Coordinator left UNIDO as the project was starting up. This caused a loss of momentum and the project took some time to recover. In addition, Component 1 was seriously delayed by a decision to shift from the University of Dar es Salaam to the Dar es Salaam Institute of Technology (DIT). Management could have gone ahead with joint workshops with the Rural Energy Agency (REA) as a stop-gap until DIT came on board. On the Demonstrations and Finance components, management appropriately initiated Expressions of Interest and selected a grant modality as a way of expediting key outputs in terms of MW installed and GhG abatement.

Biannual work plan reviews are called for in the project document. There are occasionally Project Steering Committee meeting delays because government offices were moved to a town, Dodoma, some hours drive from Dar es Salaam. Nevertheless, management is functioning.

Results-based monitoring and evaluation

A monitoring and evaluation system is in place. The National Project Coordinator performs the main functions on the ground with visits by the Project Adviser and Project Manager from UNIDO headquarters for Steering Committee meetings and other milestones. The Project Progress Reports and Project Implementation Reviews are regular. The reports follow the Log Frame as far as Outputs and Activities. The action of issuing Expression of Interest rounds demonstrates the attention to results level outcomes. In hindsight, the PIR ratings were optimistic given that some of the demonstrations are not yet producing energy. The Mid-Term Review consultant and Project Advisor recognized this problem during the MTE and appropriate actions are being undertaken to rectify biomass gasification/ spark engine technical problems.

Results-based reporting

In efforts to achieve results beyond outputs, several changes were made. The University of Dar es Salaam was dropped in favour of the Dar es Salaam Institute of Technology(DIT). The DIT was nominated by GoT for the East African CREEE so would seem to be an agreed change.

The revolving fund idea was dropped in favour of single demonstration grants. Least Developed Countries always prefer grants so this would not be a hard sell. The grant modality was probably selected to avoid lengthy negotiations on revolving funds. The decision to go for Expressions of Interest for the demonstration sites was taken with a view to achieving results within the project timeframe.

3. Financial management and co-finance

At CEO endoresment the confirmed sources of cofinancing were listed as follows:

Rural Energy Agency (REA) Grant	6,500,000
TIB Development Bank) Grant	3,500,000
TIB Development Bank) In-kind	2,550,000
The National Ranching Company (NARCO) Investment	2,600,000
Private Sector (MeTL) Investment	3,000,000
Private Sector Zanzibar Sugar Factory Ltd Investment	8,000,000

Private Sector Masasi Food Industries Company Limited Investment	450,000
GEF Agency UNIDO Grant	60,000
GEF Agency UNIDO In-kind	90,000
 Total Co-financing	 26,750,000

Meetings with REA and TIB Development Bank confirmed that they are both active in renewable energy investments however, it is the reviewer's opinion that the relationship could be strengthened as they are the most likely sustained successor to the WtE project. If closer ties are established and WtE enhanced in their technical assistance and investment pipeline with the Rural Energy Agency Swedish International Development Agency, part of 38 M\$ under execution could be considered co-finance covering 6.5 M\$ pledged. REA holds workshops on Renewable Energy and provides technical assistance to developers. These activities could have been a partial substitute or DIT during the delayed initiation of the Information and Learning Centre.

Also the World Bank line of credit to Tanzania Investment Bank engagement in the project could be enhanced so as to enrich their support of the Agro-Waste to Energy activities and that part of their 42 M\$ programs could be considered co-finance covering 6.05 M\$ pledged. As important would be their engagement in agro-processing industries. Productive uses are recognised in the Expression of Interest processes by the UNIDO WtE but finance of those activities is sometimes lacking such as in the Wananchi Power Producers project. Rice husking and maize milling are the perfect co-investments that generate business that consumes the power and provides the waste biomass. Lack of reliable offtakers is part of the Wananchi Power Producers project problems as they cannot serve small intermittent loads with biomass gasification due to tar fouling problems.

The UNIDO WtE Expressions of Interest awarded projects show co-finance of 1.63 M\$

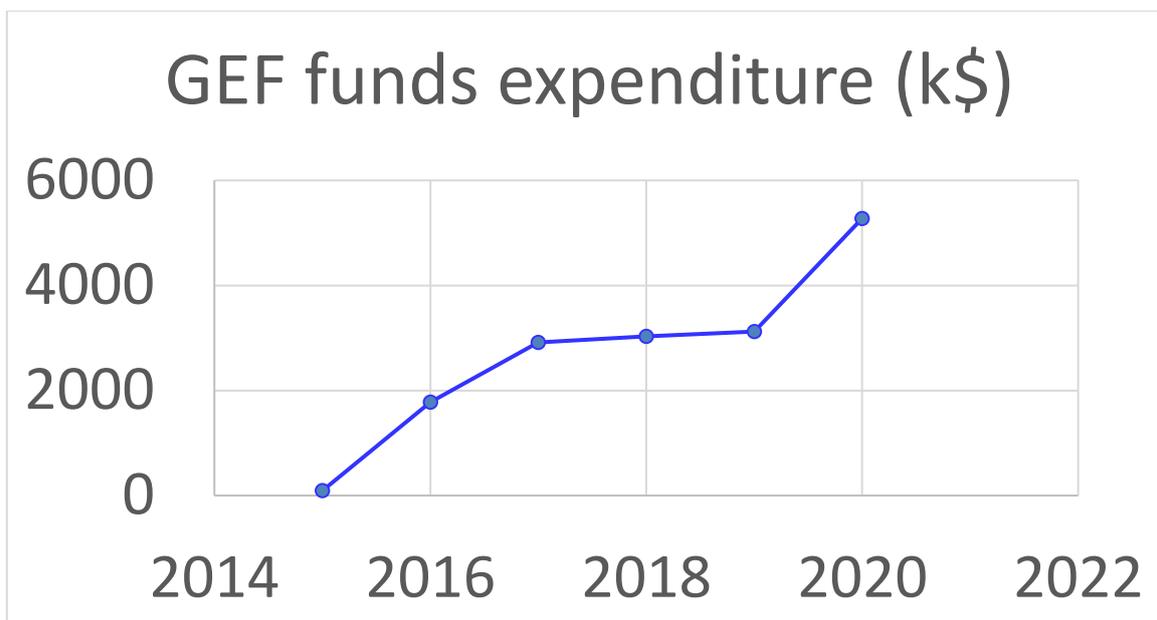
The Outgrowers (1.16 M\$) includes Swedish foundations contributing to the sustainable energy and sustainable agriculture aspects at a 1:1 ratio. The project produces biodiesel from cashew shells and ethanol from cashew apples.

Wanachi Power Producers (0.28 M\$) includes WB grant 4.4:1

- ✓ REDCoT (0.19 M\$) 2.4:1
- ✓ EoI 3
 - Balance of Grants at 1:1, 2M\$
 - Balance of Grants at 4:1, 8 M\$

- UNIDO Grant and In-kind under execution 0.15 M\$
- Estimated total 16.33M\$ to 22.33 M\$ (depends on leverage on remaining funds) against the target of 26.75

Satisfactory



4. Stakeholder engagement and communication

Stakeholder engagement

The main stakeholders are engaged through the Steering Committee. Engagement of the private sector is evident in the project preparations and seems to have been successful at that stage. On project approval, the change of government was followed by a period on no communication by the government as they redesigned policies and programs. Component 1 and component 3.1 have not proceeded so should be used to engage stakeholders in a more meaningful way.

Communication

The move of Government offices to Dodoma makes some communication difficulties. During the MTE mission, the Project Steering Committee meeting was postponed due to conflicts. UNIDO for their part is communicating regularly and status reports are issued.

The requests for Expression of Interest for WtE demonstrations were effective attracting interest broadly from investors.

The establishment of the Information and Learning Centre would greatly enhance the visibility of WtE in Tanzania.

D. Sustainability

Agro-Industrial Waste to Energy should be a highly sustainable technology in Tanzania with benefits to the farmers and the economy. While it seems there is plenty of waste material, an assessment would be beneficial.

While EWURA has provided Small Power Producer guidelines, there is a perception in the industry that TANESCO is not a reliable off-taker in terms of timely payment. Component 3.1 should try to address this risk.

The policy direction toward large hydro and grid extension is understandable given that many developed countries took that route and are successful. There is risk associated with drought, climate change, deforestation/silting of reservoirs that can partly be addressed by having diversified energy sources. The socio-political risk to WtE could also be addressed through analysis for policy support.

Finance for replication is available from the Rural Energy Agency, Tanzania Investment Bank and the private sector, among others.

E. Gender mainstreaming

UNIDO commissioned the Gender Baseline Situation and Action Plan for the Waste to Energy project. The results of a survey of 5 facilities showed weak representation in management by women and recommend strong measures to enhance gender equality.

“Based on the results of this mainstreaming process including gender analysis and baseline survey, it is obvious that the gender equality and/or women empowerment goals would be at threat without UNIDO support to mainstream gender in this project. The gender gaps that exist at national and local context of the WtE project among others, including few female students in SET, stereotypes about women in the technical work, gender imbalances in the demonstration projects, many cultural and socio-economic barriers, lack of power to make decision, time constraints due to household chores could be important hindrances to gender equality. It is therefore important to note that while Tanzania has been at the forefront of creating positive legal and political frameworks for promoting gender equality, this will not change the lives of women without deliberate actions and efforts to address the existing gender gaps. Implementation of the proposed action plans is an important step towards contributing to close the existing gender gaps within the framework of WtE project”.

Once the Info & Learning Centre is launched, they will be tracking training participants.

F. Performance of Partners

Project partner	Key questions for assessing the performance of partners	Strength	Areas for further strengthening
UNIDO			
1. The project team in the field	<ul style="list-style-type: none"> • <i>Has the project team discharged it is project implementation and management functions adequately (in terms of work planning and executing, monitoring and reviewing performance, allocating funds, and following up agreed/corrective actions)?</i> • <i>Has an effective M&E system been put in place, was it closely link with the log frame, does it generate information on performance and results which is useful for project managers and PSC to make critical decisions?</i> • <i>Has the management of the flow of funds and procurement been suitable for ensuring timely implementation?</i> • <i>How proactive and prompt the project team was to ensure timely implementation of recommendations from experts of support missions and HQ-based project managers?</i> 	<p>Strength is Good</p> <p>M&E is in place</p> <p>Component 1 is behind, otherwise OK</p>	Accelerate progress on late components

<p>2. UNIDO HQ-based management</p>	<ul style="list-style-type: none"> • <i>How well did UNIDO design the project?</i> • <i>How adequate were project management arrangements and counterpart resources (funding, staff, and facilities) in place at project start-up? Were the roles and responsibilities of partners clarified?</i> • <i>Did UNIDO take the initiative to modify project design and log frame (if required) during implementation in response to any major changes in the context?</i> • <i>How proactive and prompt UNIDO HQ-based project managers are in providing implementation support, supervision, and ensure timely implementations of recommendations from experts; in undertaking necessary follow-up to resolve any implementation bottlenecks?</i> • <i>How active have UNIDO HQ-based managers been in managing the project based on results (ensuring the using of log frame in work-plan, M&E and reporting, asking for information related to performance and results, and use them to make decisions)?</i> 	<p>Design was good</p> <p>The switch to Expression of Interest has kept the project on track for outputs</p>	<p>Component 1 delay is causing problems with sustainability</p> <p>UNIDO procurement needs improvement on practices for giving grants to financial mechanisms</p>
<p>Government</p>			
<p>1.</p>	<ul style="list-style-type: none"> • <i>Do local and national government stakeholders support the objectives of the project? Do they continue to have an active role in project decision-making that supports efficient and effective project implementation?</i> • <i>Has the government assumed ownership and fulfilled responsibility for the project?</i> • <i>Were counterpart resources (funds and staffing) provided as planned in the project design?</i> • <i>Did the government ensure suitable coordination of the various departments involved in the project implementation?</i> 	<p>The working level of representatives of the government was all supportive of the project.</p>	<p>Policy direction is shifting emphasis to central hydropower and grid extension. Policy support is needed to identify the benefits of parallel effort on mini-grids and distributed generation.</p>
<p>Donors</p>			
	<ul style="list-style-type: none"> • <i>How active has the donor been in reviewing the project performance and implementation?</i> • <i>How proactive and prompt has the donor been in providing the necessary support to the project implementation (in terms of decisions on fund instalment, approval/rejection of request from project team...)?</i> • <i>Does the donor ask for information related to project performance and results?</i> • <i>To what extent does the donor make decisions based on performance and results in information?</i> 		<p>Strengthened collaboration with the Swedish International Development Agency and World Bank could benefit the sustainability of the WtE market</p>

G. Remaining barriers to achieving the project expected results

What are the key constraints to achieve expected results	How to resolve them?	Who can do it?
Institutionalized knowledge and training.	Finalize arrangement with DIT	UNIDO NPC and PM
Sustained finance for WtE	Strengthen relations with REA/TIB Development Bank	UNIDO/TIB Development Bank/REA/SIDA

IV. 3 Risk assessment

Risk (as at CEO approval/endorsement)	Risk level (at CEO endorsement)	Mitigation Measure (as at CEO approval/endorsement)	Progress to date at PIR 2018	Mid-Term Review
WtE technologies are relatively new in the country and there is a lack of technical expertise for development and implementation of such projects.	Moderate	Detailed techno-economic feasibility studies will be carried out. The technical personnel in the industries will be trained on the deployment of RE in industrial settings. The capacity of government officials and relevant institutions will be built.	Technical assessment of the demonstration sites have been carried out	The biomass gasification systems need to be proven operable. Wananchi Power Producers and REDCoT have facilities that need to be operated according to manufacturer guidelines with sufficient load.
No off-takers for the generated electricity	Low	The demand-supply gap is very high in rural Tanzania.	Load survey has been conducted, less than 10% of the produced electricity will be consumed at the demonstration sites. The rest of the produced electricity is fed into TANESCO national grid of Tanzania using the Standardized Small	Hold a consultation with Small Power Producer stake-holders to establish a more firm context for developers to invest in WtE. (TanESCO, MoE, REA,

			Power Projects Tariff for Biomass power plants 200 kW – 1 MW	TIB Development Bank, UNIDO, Energy and Water Regulatory Authority)
The general perception that investments in WtE technology based plants do not provide enough (high) returns and hence the investors are not willing to invest	Low	The revolving fund will be established at REA for supporting WtE financing investments. Partnerships will be developed among commercial banks, investors and financial institutions.	Incentive scheme based on incremental cost principle has been introduced to incentivise investors to develop WtE power plant	Projects are going ahead so this risk is managed but could have been more influential as a revolving finance and risk sharing mechanism
Application of WtE technologies in agro-industries might be halted by the shortage of inputs	Low	The installations will be done only after a proper resource assessment study is done in order to ensure the supply of wastes from agro-industries	Technical assessment of the demonstration sites have been carried out and recommendations to ensure the sustainability of the WtE have been proposed	Partner with IRENA to get biomass resource assessments confirmed
Lack of human capacity to operate the demonstration projects	Low	All the demonstration projects O&M staffs will be trained by the respective suppliers. Moreover, under the project, there will be several pieces of training on successful operation and maintenance of biomass and biogas projects. In addition to this, an information/learning centre will be established for continuous capacity building activities. All these would sustain the objectives of the proposed project	No progress to date	Training needed

Demonstration plants face operational problem due to lack of training to the operators.	Low	Capacity building at all levels is included in the project which will mitigate this risk.	No progress to date	Risk manifesting as poor operating records for biomass gasification projects, training and co-finance for productive uses at generation sites would assist.
Co-financing not being committed by the co-financiers	Moderate	Letter of commitment will be obtained from the co-financiers to ensure their financing for the project	Stakeholders have been engaged to assist in mobilizing investment fund for developing the demonstration sites	
Tanzania's electricity mix greatly depends on hydropower (presently 35%, down from over 50%). Due to the changing weather patterns which significantly affect the energy sector, hydropower is highly vulnerable to weather conditions and climate changes.	Low	Utilization of wastes for electricity generation will reduce the dependency on hydropower	Technical assessment of the demonstration sites have been carried out to determine the generating capacity of the demonstration sites	Hydro reliability risk can be partially countered by WtE generation.

Table. Risk identification and assessment

Categories	Criteria	At Risk (Risk Rating 1-3)	Not at Risk/ (Risk Rating 4-6)	Description						
B. Project performance and progress towards results	1. Relevance		6							
	2. Effectiveness and progress towards results		4							
	3. Efficiency		4							
C. Project implementation management	1. Project management		5							
	2. Results-based work planning, monitoring and evaluation systems, reporting		5							
	3. Financial management and co-finance		4							
	4. Stakeholder engagement and communication	3		Info & Learning Centre is off track						
D.	Sustainability									
E.	Gender mainstreaming		4							
F.	Performance of Partners		4							
G.	Remaining barriers to achieving the project expected results		4							
	Overall Project Risk Rating 	Overall Project Rating at MTE– based on a number of identified project risks								
	Summary:	<table border="1"> <tr> <td>0-1</td> <td>L</td> </tr> <tr> <td>2-3</td> <td>M</td> </tr> <tr> <td>>3</td> <td>H</td> </tr> </table>			0-1	L	2-3	M	>3	H
0-1	L									
2-3	M									
>3	H									

V. Conclusions, recommendations and follow-up plan

The changes in government, changes in the selection of a national Information and Learning Centre (ILC) and change in the National Project Coordinator have contributed to delays on several key components.

The I&LC is critical to sustainability and capacity building. This MoU needs to be signed as soon as possible. Should the terms not be agreed, the Rural Energy Agency seems to be performing this function already through the SIDA funded program. UNIDO could donate the grant funds to this program at REA emphasizing the Agro WtE technology.

Workshops should prepare developers for project implementation thus they are needed early in a project.

Workshops with policymakers should be presented and executed as consultatory processes tackling current issues on distributed generation and electrification as well as WtE benefits. Other donors should be invited to join these workshops as the issues are more general in nature.

Demonstrations have encountered technology risk with biomass gasification. Failures have a very powerful negative impact on technologies in the market. Eligibility of biomass gasification to internal combustion engines technology should be suspended. The REDCoT and WPP plants need to be remediated and functioning before any further biomass gasification projects are supported. Biogas digesters, bagasse cogeneration and simple combustion boiler technologies are all working fine and should remain eligible.

Otherwise, the Agro-waste to Energy technologies including biogas digesters to methane, and boilers are relatively risk-free and proceeding well.

The grant modality will be used to get the demonstration sites, however, in future UNIDO/GEF should invest in guidelines for revolving funds that are less disruptive to the marketplace, more sustainable long term and achieve about 4 times more post-project direct impact with co-finance.

Project component/result	Recommendation	Agreed action	Responsibility	Priority & agreed date
1.Information & Learning Centre	Close the MoU	Verbal agreement of UNIDO and DIT was apparent in the interview	UNIDO & DIT	2019
2. Demonstrations	Remediate the biomass gasification demonstrations	Training planned, Research project needed	UNIDO, DIT, Husk, WPP, REDCOT	2019
3.1 Policy Gaps	Engage with other donors and government on electrification strategies			
3.3 Finance	Establish guidelines for risk sharing revolving funds		UNIDO management	

VI. Annexes

Interviewees

1. Kolade Esan, Project Administrator, UNIDO headquarters (accompanied on the whole mission)
2. Robert Washija, National Project Coordinator, UNIDO FO Dar es Salaam (accompanied on whole Tanzanian mission)
3. Renewable Energy Development Company of Tanzania Ltd (met at Mfundi project site under construction)
4. Wananchi Power Producers (met at project site Mbaha)
5. Karsten Solaas Outgrowers (met at facility site in Tanga)
6. Dr John A. Msumba, Dar es Salaam Institute of Technology (met at DIT)
7. Deusededit Malulu, Rural Energy Agency (met at REA)
8. Emilian Nyanda, Principal Energy Officer, Ministry of Energy
9. Denis Deogratias and Joseph Chilambo, Tanzania Investment Bank (at TIB Development Bank)
10. Guillem Gomis, Husk Power Systems, (at their offices)
11. Samuel Kessy, TANESCO (at their offices)
12. Jossy Thomas, Project Manager (met in Vienna)
13. Alois Posekufa Mhlanga, Industrial Development Officer, UNIDO (met in Vienna)

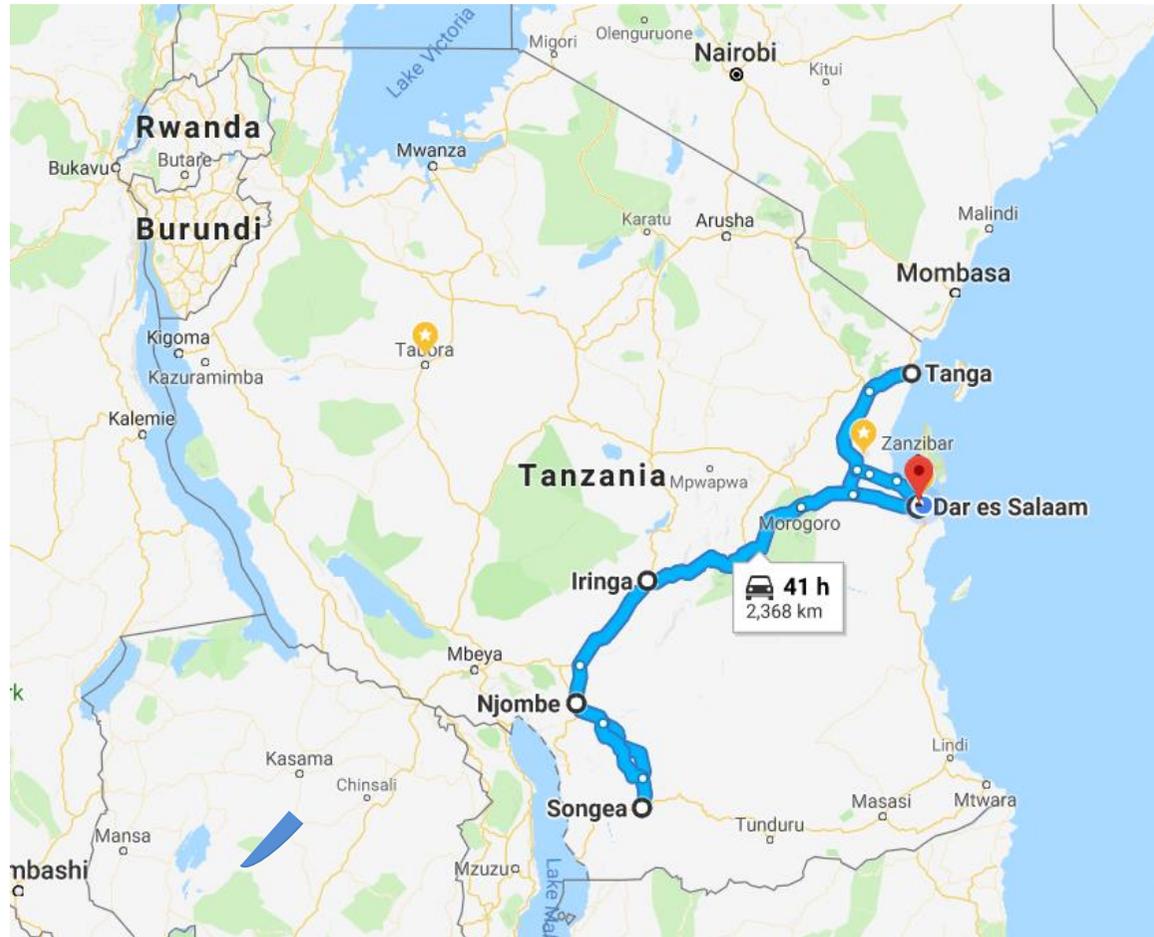
Independent Mid-Term Evaluation of UNIDO Project:

Promotion of Waste to Energy Applications in Agro-Industries of Tanzania

***Draft Plan for Evaluators Site and Project Stakeholders Interview
March/April 2019***

Date		Day#	Activity	Destination Location	Additional Info's
01-Apr-19	Monday	Day 1	Travel to Iringa	Iringa	10 hrs drive (Min)
02-Apr-19	Tuesday	Day 2	Visit REDCOT site at Mufindi		3 hrs drive (Min)
02-Apr-19	Tuesday	Day 2	Travel to Njombe	Njombe	6 hrs drive (Min)
03-Apr-19	Wednesday	Day 3	Travel to Songea	Songea	7 hrs drive (Min)
04-Apr-19	Thursday	Day 4	Visit MPP Ltd site at Mbaha		8 hrs drive (Min)
05-Apr-19	Friday	Day 5	Travel to Iringa	Iringa	10 hrs drive (Min)
06-Apr-19	Saturday	Day 6	Travel to Tanga	Tanga	12 hrs drive (Min)
07-Apr-19	Sunday	Day 7	Visit Out-Growers site		0.5 hrs drive (Min)
07-Apr-19	Sunday	Day 7	Travel to Dar es Salaam	Dar es Salaam	8 hrs drive (Min)
08-Apr-19	Monday	Day 8	Evaluators interview with the project stakeholders	Dar es Salaam	
09-Apr-19	Tuesday	Day 9	4th GEF5 PSC	Dar es Salaam	

NB: This is a very tight schedule base on mileage to be covered per location and time set



Separate documents of reference are:
TOR_MTE GEF-5 TZ WtE_Revised.pdf
12-17-2014_Council_document2_0.pdf

