



Project Implementation Report

(1 July 2021 – 30 June 2022)

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| Project Title: | <i>Sustainable conversion of waste to clean energy for greenhouse gas (GHG) emission reduction</i> |
| GEF ID: | <i>5154</i> |
| UNIDO ID: | <i>120568</i> |
| GEF Replenishment Cycle: | <i>GEF-5</i> |
| Country(ies): | <i>Kenya</i> |
| Region: | <i>AFR</i> |
| GEF Focal Area: | <i>Climate Change Mitigation (CCM)</i> |
| Integrated Approach Pilot (IAP) Programs¹: | <i>N/A</i> |
| Stand-alone / Child Project: | <i>Stand-alone</i> |
| Implementing Department/Division: | <i>EAE/ENE/CTI</i> |
| Co-Implementing Agency: | <i>N/A</i> |
| Executing Agency(ies): | <i>N/A</i> |
| Project Type: | <i>MSP</i> |
| Project Duration: | <i>48</i> |
| Extension(s): | <i>2</i> |
| GEF Project Financing: | <i>USD 1,999,998</i> |
| Agency Fee: | <i>USD 190,000</i> |
| Co-financing Amount: | <i>USD 9,824,718</i> |
| Date of CEO Endorsement/Approval: | <i>9/2/2015</i> |
| UNIDO Approval Date: | <i>10/9/2015</i> |
| Actual Implementation Start: | <i>11/2/2015</i> |
| Cumulative disbursement as of 30 June 2022: | <i>USD 1,869,907</i> |
| Mid-term Review (MTR) Date: | <i>N.A.</i> |
| Original Project Completion Date: | <i>10/15/2019</i> |

¹ Only for GEF-6 projects, if applicable

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| Project Completion Date as reported in FY21: | 10/31/2022 |
| Current SAP Completion Date: | 10/31/2022 |
| Expected Project Completion Date: | 10/31/2022 |
| Expected Terminal Evaluation (TE) Date: | 10/31/2022 |
| Expected Financial Closure Date: | 2/28/2023 |
| UNIDO Project Manager²: | <i>Mr. Naoki Torii</i> |

I. Brief description of project and status overview

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| Project Objective |
| <i>The project aims at promoting the conversion of waste to clean energy as an alternative source of electricity generation. The main objective is to promote investments in waste-to-energy (WTE) technologies to increase the electrification rate as well as to reduce greenhouse gases (GHG) emissions in the country. The most promising waste sectors for electricity generation from the conversion of WTE are the municipal waste and agro industrial residues. Due to the advantages of agro-industrial residue over municipal waste, the agro-industrial sector has been selected for demonstrating WTE (biogas) power plants while at the same time enhancing the processing of agro-produce to be more efficient and sustainable.</i> |

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| Baseline |
| <i>In Kenya, agro-industrial wastes are generally underutilized and in most cases disposed of by burning, dumping or unplanned landfilling. Dumping and unplanned landfilling results in methane generation and its subsequent release into the atmosphere. Methane is a stronger GHG than carbon dioxide. Hence, the avoidance of its release to the atmosphere or its utilization holds great environmental benefits in terms of mitigating GHG emissions and adapting to climate change. It has been estimated that industrial-scale power/co-generation using biogas produced from agricultural residue could abate 1.6 million CO2 per year.</i> |

| Overall Ratings³ | FY22 | FY21 |
|--|-------------------------|-------------------------------------|
| Global Environmental Objectives (GEOs) / Development Objectives (DOs) Rating | <i>Satisfactory (S)</i> | <i>Moderately Satisfactory (MS)</i> |
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² Person responsible for report content

³ Please refer to the explanatory note at the end of the document and assure that the indicated ratings correspond to the narrative of the report

With the extension of the project duration, it was observed that the project was back on track and was expected to achieve most of its major global environmental objectives, and yields satisfactory global environmental benefits, with only minor shortcomings.

Implementation Progress (IP) Rating

Satisfactory (S)

Moderately Satisfactory (MS)

With the extension of the project duration, it was observed that the project was back on track and all remaining project activities made progresses to reach the end of project targets.

Overall Risk Rating

Low Risk (L)

Moderate Risk (M)

The overall risk rating was downgraded to Low Risk, since all remaining project activities are on track and with prospects for achieving the project objectives until project closure.

II. Targeted results and progress to-date

Please describe the progress made in achieving the outputs against key performance indicator's targets in the project's **M&E Plan/Log-Frame at the time of CEO Endorsement/Approval**. Please expand the table as needed.

| Project Strategy | KPIs/Indicators | Baseline | Target level | Progress in FY22 |
|---|--|--|---|---|
| Component 1 – Capacity development and knowledge management | | | | |
| Outcome 1.1: Improved awareness, knowledge sharing on best practices and capacity building on WTE in the Country | | | | |
| Output 1.1.1: Information and best practices platform (IBPP) for WTE technologies established at KIRDI | 1. Business plan and annual work plans created. 2. Creation and operation of the centre | Lack of one-stop technical centre on biogas | 1. Business plan and annual work plan creation with first 3 months of the GEF project start. 2. Creation and operation of the center within 6 months of the GEF project start. | <ul style="list-style-type: none"> • Testing of Biogas laboratory equipment completed. • Creation and operationalization of IBPP Website, filtered with information and details, is under development. • Development of a database for promoting biogas (compilation of existing biogas systems and national stakeholders engaged in WtE sector) for the IBPP website. This activity is still on going with a field evaluation of existing biogas plants and feedstock systems already conducted in March 2022 and data collection tools still under development. • A Sustainability strategy of the IBPP process is under preparation. |
| Output 1.1.2: : Development of human capacities in WTE for policy makers (at least 50 policy makers), project developers, agro-industries, and other stakeholders (at least 50 persons) | 1. Number of trainings organized for policy makers 2. Number of trainings organized for different target groups 3. Number of key policy makers | Inadequate capacity among the key policy makers & project developers | 1. Conduct at least 2 trainings for policy makers 2. Conduct at least 2 trainings for other target groups 3. Educate and train at least 50 policy makers on WTE | <ul style="list-style-type: none"> • Networking activities within Biogas Sector. Conferences and Workshops are scheduled from July 2002 onwards. Preparation of brochures and leaflets for dissemination are under development. |

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| | <p>trained (% of female/male participants)</p> <p>4. Number of persons (from other target groups) trained (% of female/male participants)</p> <p>5. Number of female trainers</p> | | <p>potential, technology and project development</p> <p>4. Train at least 50 personnel from each of the target groups</p> <p>5. Include at least 20% (of the total participants) women in each training</p> | |
| <p>Output 1.1.3: Development and strengthening of institutional capacities in the area of WTE among technical institutions and financial institutions (at least 50 persons from each group)</p> | <p>1. Number of trainings organized</p> <p>2. Number of persons trained (% of female/ male participants)</p> <p>3. Number of female trainers</p> | <p>Insufficient local capacity to develop, support, operate & maintain WTE plants</p> | <p>1. Conduct at least 2 trainings</p> <p>2. Train at least 50 personnel from different target groups</p> <p>3. Include at least 20% (of the total participants) women in each training</p> | <ul style="list-style-type: none"> Establishment of a training team within the IBPP and conduct train-the-trainer programme for KIRDI staff, in two phases: <ul style="list-style-type: none"> 1) 13 KIRDI staff (6 men and 7 women) were trained in a 6 day online Biogas Foundation Course (covering Biogas Basics (Main design characteristics and parameters of biogas plants, Feedstocks for biogas production, Digestate as Fertilizer, Biogas plant planning and feasibility, Construction Operation Maintenance, Safety on biogas plants, Biogas Policy, Financial aspects of biogas plants, developing bankable proposals for biogas projects, Assessment of biogas proposals for funding, Sustainability of Biogas). 2a) 3 KIRDI staff (2 men and 1 woman) trained in Advanced course on Biogas topics in Germany (Biogas basics, Biogas parameters (lab monitoring and analysis of biogas plants), Feedstocks, Biowaste to Biogas (waste management from agroindustry's/farms and municipal waste), Digestate (bio slurry) as fertilizer, Technology, Construction, operation and maintenance (biogas plant design and installations), Biogas Sustainability, Biogas plant planning and feasibility (technical assessment, feasibility studies and audit of biogas systems), Financial aspects, Assessment for funding, Safety of biogas plants and Biogas policy). 2b) Visit of 4 Biogas plants in Germany. The Advanced Course (for 3 KIRDI staff) included the visit of 4 biogas sites (1 plant about agricultural, flower and organic residues, 1 treatment plant of regional biowastes, 1 dry digestion plant using biomethane for transportation, 1 agricultural biogas plant using slurry). |
| Component 2 – Establishment of agro-industrial WTE plants | | | | |
| Outcome 2.1: Increased use of biogas for energy generation | | | | |
| <p>2.1.1 Establishment of standards for medium and large scale biogas power plants.</p> | <p>Number of standards</p> | <p>Back in 2015, at the project inception phase, no standards existed for biogas power plants.</p> <p>KEBS & ERC were the responsible entities for the design and enforcement of</p> | <p>Early enforcement of the proposed standard</p> | <ul style="list-style-type: none"> Development of draft Standards for farm and industrial scale systems including revisions of international expert opinions by the German Biogas Association (GBA) completed. Three Biogas Technical Committee (TC)⁴ meetings under KEBS held to refine the Standards for farm and industrial scale systems. |

⁴ The TC includes members from Ministry of Energy, Ministry of Agriculture, KIRDI, private sector companies, universities and other technical institutions.

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| | | the biogas standard. | | <ul style="list-style-type: none"> • Biogas Standards approved by the Standards Council and Gazette in April 2022. • Standard Launching and Information Sharing Event in cooperation with KEBS and ERC was held on 4 July 2022. |
| Output 2.1.2: Detailed plant design prepared for WTE plants | Project progress status | Lack of plant design reports for further project development. | Detailed plant design reports for the demonstration projects | Nothing to report for FY22. |
| Output 2.1.3.: WTE plants established for a cumulative capacity of around 1,856 kWe and 1,397 kWth | MW of installed capacity | <ol style="list-style-type: none"> 1. Inadequate commercial WTE plants 2. Agro-industries depend on (fossil-fuel dominated based) electricity and fossil fuel such as fuel oil for thermal energy needs. | 1,856 kWe and 1,397 kWth plants supplying electricity and thermal energy respectively | <ul style="list-style-type: none"> • Olivado completed the installation of the Avocado fruit/waste biogas plant with the total installed capacity of 470 kWe plus 422 kWth from the heat recovery system. • Tropical Power completed the installation of the rose waste processing plant and realized the total achieved installed capacity of electricity is 670 kWe. • Timber Treatment International completed the installation of steam plants in Dandora, Nyahururu and Sotik KCC plants with a total cumulative capacity is 16,302 kWth. • Consequently, in total the project reached the total installed capacity of 1,140 kWe and 16,724 kWth. |
| Component 3 – Scaling up investment in WTE plants | | | | |
| Outcome 3.1: Establishment and implementation of incentive systems for WTE technologies | | | | |
| Output 3.1.1: Establishment and implementation of incentive systems for WTE technologies | <ol style="list-style-type: none"> 1. USD incentives based on incremental cost principle to WTE projects 2. Number of project developers benefitted through the incentive facility | Inadequate financing facilities to attract investments in WTE projects | <ol style="list-style-type: none"> 1. USD 4 million incentive facility established 2. At least 15 replication project benefitted under the facility | Nothing to report for FY22. |

III. Project Risk Management

1. Please indicate the overall project-level risks and the related risk management measures: (i) as identified in the CEO Endorsement document, and (ii) progress to-date. Please expand the table as needed.

Describe in tabular form the risks observed and priority mitigation activities undertaken during the reporting period in line with the project document. Note that risks, risk level and mitigations measures should be consistent with the ones identified in the CEO Endorsement/Approval document. Please also consider the project's ability to adopt the adaptive management approach in remediating any of the risks that had been sub-optimally rated (H, S) in the previous reporting cycle.

| | (i) Risks at CEO stage | (i) Risk level FY 21 | (i) Risk level FY 22 | (i) Mitigation measures | (ii) Progress to-date | New defined risk ⁵ |
|--|------------------------|----------------------|----------------------|-------------------------|-----------------------|-------------------------------|
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⁵ New risk added in reporting period. Check only if applicable.

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|---|--|--------------|--------------|--|--|--------------------------|
| 1 | Lack of human and institutional capacity impedes large scale penetration of WTE technology | Low Risk (L) | Low Risk (L) | The training was conducted for the experts, operators, government agencies, etc. Capacity building and transfer of technology will mitigate the technical risk. As Kenya already has the technology for domestic biogas plants, further development on commercial biogas plants can be achieved with lesser difficulty. | <ul style="list-style-type: none"> • 40 County staff (33 men and 7 women) trained to prepare country level energy planning (12 energy plans were prepared). • Decentralized Energy Planning Manual developed and shared with the counties. • 11 KIRDI staff (6 men and 5 women) trained on biogas technology. | <input type="checkbox"/> |
| 2 | General perception that WTE investments yield low returns, hence the investors are not willing to invest. | Low Risk (L) | Low Risk (L) | Detailed techno-economic feasibility studies were carried out to establish the financial viability of the demonstration projects. Moreover, financial incentives are in place to attract investments in WTE. Increased awareness, knowledge and experiences created by the successful operation of the demonstration plants are expected to enhance the stakeholders' participation. | <ul style="list-style-type: none"> • Pre-Feasibility study reports prepared for eight (8) sites. • Full feasibility and designs done for the Dagoretti biogas plant. • Incentive scheme based on incremental cost principle to the tune of USD 700,000 finalized to incentivize project developers and investors. | <input type="checkbox"/> |
| 3 | No off-takers for the generated electricity | Low Risk (L) | Low Risk (L) | The demand-supply gap is very high in Kenya and hence, there is no market risk. Off-takers for each plant will be decided during the feasibility study. | Feasibility study identified off-takers for the generated energy. | <input type="checkbox"/> |
| 4 | Application of WTE technology might be in halt by the shortage of inputs | Low Risk (L) | Low Risk (L) | Installations were only done after the conducting of proper resource assessment to ensure the supply of wastes from industries. | The assessment of the availability of the feedstock was done during the pre-feasibility study. | <input type="checkbox"/> |
| 5 | Inadequate availability of trained plant operators. | Low Risk (L) | Low Risk (L) | The O&M staff will be trained at the information and best practices platform (IBPP) and will undergo on-the-job training in an existing biogas plant. Moreover, designated O&M staff at the demonstration projects will be trained by the respective suppliers. Additionally, local engineering and O&M companies will be trained in O&M of WTE plants. | <ul style="list-style-type: none"> • The legal framework for establishing the IBPP at KIRDI was finalized and approved. • Biogas lab installed equipment including IT. • 14 KIRDI staff (9 men and 5 women) were trained on operation of IBPP and biogas laboratory technology in China as well as Kenya. • Training materials on biogas technology were developed. <p>Train-the-Trainer course on Biogas topics is about to be completed.</p> | <input type="checkbox"/> |
| 6 | Floods | Low Risk (L) | Low Risk (L) | Biogas plant buildings and site offices will be located on elevated areas to prevent flooding. All buildings and structures will be designed and built appropriately to avoid flooding. | Two companies (Olivado and Tropical power) developed their plant layout to prevent flooding with a well-designed drainage system to accommodate heavy rainfall. | <input type="checkbox"/> |
| 7 | Kenya's electricity mix greatly depends on hydropower (presently 50%). Due to the changing weather patterns which significantly affect the energy sector, hydropower is highly vulnerable to weather conditions and climate changes. | Low Risk (L) | Low Risk (L) | Utilization of wastes for electricity generation will reduce the dependency on hydropower. | <ul style="list-style-type: none"> • Tropical Power completed the plant installation processing rose waste and achieved an installed capacity of electricity of 670 kWe. • Olivado completed the plant installation utilizing Avocado fruit/waste with a total achieved installed capacity of 470 kWe. | <input type="checkbox"/> |

2. If the project received a [sub-optimal risk rating \(H, S\)](#) in the previous reporting period, please state the [actions taken](#) since then to mitigate the relevant risks and improve the related risk rating. Please also elaborate

on reasons that may have impeded any of the sub-optimal risk ratings from improving in the current reporting cycle; please indicate actions planned for the next reporting cycle to remediate this.

N/A

3. Please indicate any implication of the **COVID-19** pandemic on the progress of the project.

During the reporting period, Kenya experienced two peaks of Covid-19 infections, with one being in August 2021 with over 1975 (daily) new infections registered, followed by a flattening of the curve until reaching an all-time high COVID-19 infection rate Mid December 2021, with 3749 (daily) positive results which corresponds to nearly a third of conducted tests. Scientists believed the surge was fueled by the highly transmissible omicron variant of the coronavirus. Nevertheless, Kenya was also seeing a low rate of hospitalizations and deaths⁶.

As of 30 June 2022, there were 333,952 infections and 5,653 coronavirus-related deaths reported in the country since the pandemic began. Kenya's vaccination campaign began in March 2021, prioritizing health workers, teachers, security personnel, and people aged over 58 years⁷. Accordingly, as of 02 July 2022, Kenya administered at least 27,087,910 doses of COVID vaccines so far, which corresponds to about 31.8% of the country's population fully vaccinated⁸.

The Government of Kenya announced various measures to prevent the further spread of Coronavirus and equally during this reporting period, the development of the COVID-19 pandemic was carefully monitored and measures to utilize remote communications were utilized as applicable and necessary during the implementation. The main challenges were related to capacity building activities, monitoring, and site visits as well as stakeholder engagement activities. Since face-to-face communication continued restricted, interim solutions such as teleconferencing and planning for online courses were put in place.

However, due to the pandemic and related restrictions some remaining project activities experienced some delays and re-scheduling which resulted in the no-cost extension of the project period until October 2022 for its successful conclusion, while taking into account the health and safety of staff, consultants, stakeholders, beneficiaries, and partners involved.

4. Please clarify if the project is facing delays and is expected to request an **extension**.

N/A.

5. Please provide the **main findings and recommendations of completed MTR**, and elaborate on any actions taken towards the recommendations included in the report.

In early 2021, considering the remaining project period and changing circumstances affected by COVID-19, the project team initiated the mid-term monitoring and evaluation of the project progresses by engaging a local expert and prepared a report. As the main findings of the report, it was observed that the project demonstrated good progress towards the delivery of all key outputs and that tangible results can already be observed. The activities supported by the project would deliver on their objectives and outcomes satisfactorily by project closure. The report further highlighted that all the major activities were already completed but identified following items which need attentions in project execution: (i) the Information and best practices platform (IBPP) for WTE technologies, which was in its final stages of being established at KIRDI, and (ii) the development of industrial biogas standards requires a multi-stakeholder review of the draft report and the convening of a workshop to come up with a final standards document. These two pending activities experienced delay due to the prevalence of the COVID-19 pandemic (and its confinement measures) since they require in-person engagement.

⁶ Voices of America (VOA) Article (2021) Record High COVID-19 Infection Rate Hits Kenya, available at <https://www.voanews.com/a/record-high-covid-19-infection-rate-hits-kenya/6363405.html>

⁷ Information retrieved from Reuter's Corona Virus Tracker, available at <https://graphics.reuters.com/world-coronavirus-tracker-and-maps/countries-and-territories/kenya/>

⁸ Data retrieved from Kenya's Ministry of Health Portal, available at <https://www.health.go.ke/>

As the main conclusions of the report in terms of relevance, it was verified that the project design and implementation were relevant and aligned with the national policies for the promotion of renewable energies, the priority areas for UNDAF and it equally responded satisfactorily to the national and beneficiary WTE related needs in the areas of training, institutional strengthening, awareness and regulatory environment. In terms of effectiveness, the implementation of project activities and products obtained generated positive effects that contribute to enhancing investments in WTE technologies. In terms of efficiency, the report concluded that the organizational structure and available resources were adequate to implement the necessary activities, however noted the experienced delays⁹ in the technical implementation. Moreover, in terms of normative values, a gender perspective was included and activities specifically aimed at meeting the differential needs and interests of women. In terms of sustainability, the report concluded that the benefits derived from the project would highly likely be maintained after the possible after the conclusion of the project.

As a recommendation, the report underscored the relevance of the positive externalities of WTE generation which should be made more explicit, particularly in comparison with other renewable energies. The report proposed that it could positively facilitate the diversification of energy resources which may improve access to finance for similar initiatives.

IV. Environmental and Social Safeguards (ESS)

1. As part of the requirements for **projects from GEF-6 onwards**, and based on the screening as per the UNIDO Environmental and Social Safeguards Policies and Procedures (ESSPP), which category is the project?

- Category A project
- Category B project
- Category C project

(By selecting Category C, I confirm that the E&S risks of the project have not escalated to Category A or B).

Notes on new risks:

- *If new risks have been identified during implementation due to changes in, i.e. project design or context, these should also be listed in (ii) below.*
- *If these new/additional risks are related to Operational Safeguards #2, 3, 5, 6, or 8, please consult with UNIDO GEF Coordination to discuss next steps.*
- *Please refer to the UNIDO [Environmental and Social Safeguards Policies and Procedures \(ESSPP\)](#) on how to report on E&S issues.*

Please expand the table as needed.

| | E&S risk | Mitigation measures undertaken during the reporting period | Monitoring methods and procedures used in the reporting period |
|---|--|--|--|
| (i) Risks identified in ESMP at time of CEO Endorsement | Not Applicable as this project is under GEF-5 cycle. | - | - |

⁹ As detailed in the other relevant report sections regarding the delays due to the Covid-19 pandemic, import issues of plant materials and political constraints of land leasing agreements.

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| (ii) New risks identified during project implementation (if not applicable, please insert 'NA' in each box) | Not Applicable as this project is under GEF-5 cycle. | - | - |
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V. Stakeholder Engagement

1. Using the previous reporting period as a basis, please provide information on **progress, challenges and outcomes** regarding engagement of stakeholders in the project (based on the Stakeholder Engagement Plan or equivalent document submitted at CEO Endorsement/Approval).

The main project stakeholders and executing partners, as outlined in the Stakeholder Section of the CEO document, include the Ministry of Energy (MoE), the Ministry of Environment and Forestry, the Ministry of Industry, Trade, and Cooperatives (MoITC)¹⁰ and the Ministry of Agriculture, Livestock and Fishery (MoALF) along with the Kenya Industrial Research and Development Institute (KIRDI), the Kenya Bureau of Standards (KEBS) and the Cooperative Bank of Kenya. Moreover, the Kenya Biogas Stakeholder Network (BIO-NET), the Dagoretti Environment Management Association (DEMA) as well as the Council of Governors are also major stakeholders in the project.

To ensure proper oversight and Government and institutional ownership of the Project, a Project Steering Committee (PSC) was established under the Chairmanship of the Ministry of Environment and Forestry/with Co-Chairs by MoE and the Industrialization, Trade and Enterprise Development. The other above mentioned representatives involved in the different project components are equal members of the PSC. The PSC is setup to provide advisory inputs for the project, make decisions on the budget and annual work plan and conduct monitoring activities.

Progress, challenges and outcomes regarding engagement of stakeholders in the project:

1) *The uptake of the waste to energy technologies requires a solid and predictable regulatory environment that provide security and incentive for private sector entities, agro-processing plants in particular, to invest in the responsible waste management and consequently reduce the GHG emissions. At the project inception phase in 2015, there were no existing industrial biogas standards in Kenya.*

In response, the project worked with KEBS, along with Kenya's Energy Regulatory Commission (ERC) and the German Biogas Association, to develop national standards addressing this gap. The new national standard, labelled "Code of practice for farm and industrial scale biogas systems" were officially endorsed in April 2022 and is one of the key outcome of this project. The new standards provide a clear, harmonized, agreed and documented guidance on the planning, design, construction, operation, and maintenance of farm and industrial scale anaerobic biogas systems.

2) *There is little awareness among the managers in the relevant industries about waste to energy technology and its positive impact on the GHG emissions, energy savings and the waste management.*

In response to this challenge, the project is currently studying potential GHG savings in the Dagoretti slaughterhouse area in order to enhance understanding and awareness of the stakeholders on the matter.

3) *The project stakeholders also include wider renewable energy/technical institutions, financing institutions as recipients of training on WTE technologies to facilitate development of biogas projects. This may also include civil Society Organizations (CSOs) and Non-Governmental Organizations (NGOs) comprising those focusing on gender equality issues and advocating women's empowerment. As identified as a challenge, by the mid-term monitoring and evaluation of the project, consideration of measures to further incorporate gender and local/vulnerable communities' dimensions in the formulation and implementation activities of future projects designs, was noted and be included in project design.*

4) *The recommendation given by the mid-term monitoring and evaluation report included also the creation of more communication and awareness materials e.g. infographics, audiovisual material, didactic material for children and teachers to raise awareness and bring knowledge about WTE technologies.*

In response, the communication materials to be developed under this project, will incorporate this

¹⁰ Former Ministry of Industrialization and Enterprise Development.

recommendation and create adequate knowledge materials catering for children and teachers to further disseminate WtE technologies through their networks and channels.

2. Please provide any feedback submitted by national counterparts, GEF OFP, co-financiers, and other partners/stakeholders of the project (e.g. private sector, CSOs, NGOs, etc.).

Feedback from the Project Steering Committee (PSC) :

During the reporting period, as part of the monitoring function, the PSC visited the Tropical Power Biogas plant at Naivasha as well as the Timber Treatment International Biomass Plants in Dandora, Nyahuru and Sotik. Since the PSC visited back in 2019 the Information and Best Practice Platform at KIRDI as well as the Olivado biogas plant, this visit was to complement the implementation progress monitoring of the main project sites. In conjunction with the project activity to support the establishment of industrial biogas standards in liaison with KEBS, a technical committee equally visited the sites. The visits resulted in engaging with the project partners and familiarizing officials and stakeholders on the technologies applied at the sites and mechanism of waste to energy.

The PSC concluded after the visit that the significant progress achieved by the project and were content to note the extent to which the activities relate and demonstrate the concept of waste to energy as an example of a circular economy model.

Regarding the remaining work plan until project closure, it was agreed to hold a project closure PSC meeting to report on the outstanding activities. In addition, it was proposed to hold an information sharing workshop for the stakeholders to allow for interaction and exchange among project partners and related biogas stakeholders.

Feedback form the Operational Focal Point in the Ministry of Environment and Forestry:

The OFP in the Ministry of Environment and Forestry carried out a monitoring visit to all the ongoing project plants and recommended that the data generated from these green innovations should be documented to contribute to the country's obligations on climate change and that these green energy solutions should equally be shared to benefit other local industries and help the country adopt energy efficiency practices. It was further reported that the project plants would serve as case studies for the relevant ministries as the policies on waste management and circular economy were recently developed.

Feedback from the Ministry of Energy:

One of the main project counterparts, Paul Mbuti, the Kenyan Minister of Energy, highlighted that when looking at the impact on what has been supported by UNIDO in the Agro-processing, the benefit associated with the reduction of greenhouse gases, such as CO₂ and carbon dioxide which contributes to the NDC objectives, has helped Kenya respond to mitigation aspects required within the framework of the Paris Agreement.

Feedback from the Council of governors:

The Council of governors will take up the projects acquired knowledge and share it with county governments to be a learning tool in the design of industrial parks.

Feedback from the KEBS Technical Committee members:

The site visits conducted in conjunction with the project activities to support the establishment of industrial biogas standards in liaison with KEBS was informative for the members. Some members commented that the applied technologies vary in their origin (Germany, India and Finland) and relied on different standards available of each originating supplier country. In this sense, the successfully endorsed new national standard labelled "Code of practice for farm and industrial scale biogas systems" in April 2022 was considered to be a real game changer since it would provide a clear, harmonized, agreed and documented guidance on the planning, design, construction, operation, and maintenance of farm and industrial scale anaerobic biogas systems. The standard was needed not only for the regulatory body e.g. for licensing the biogas provider and setting a price of the biogas as a commodity but also for plant owners, to purchase certified equipment.

Feedback from the private sector:

Kenya's Cooperative Bank:

Through the project activities, the Cooperative Bank staff gained the capacity to evaluate similar types of projects. In addition, the Bank will continue to liaise with the project plant of TTI and KCC to identify further areas that require funding for expansion.

The German Biogas Association (GBA):

GBA provided international expert opinions and revisions during the standards development and concluded that with the growing development of biogas plants, it would become increasingly important to establish technical standards to support the overall development. The now published standards in Kenya would help to ensure technically reliable, safe and environmentally friendly biogas installations.

The Kenya Industrial Research and Development Institute (KIRDI):

KIRDI emphasized that through the project they were provided with the necessary tools, equipment and facilitations which has enabled them to move a step further in realizing the goal of having WtE technologies in the country and being successful.

Feedback from the project plants:

- Tropical power

1. *Benefits of the Project:* The project improved the biogas plant's capacity to process and use rose waste from flower farms as an additional supplementary feedstock. The additional feedstock increased productivity at the plant, with run tests showing that an additional capacity of 500kW would be achievable.

2. *Highlights of the Project:* In as much as most of the equipment was sourced from outside the county, the decision to source "plug and play" solutions was of great benefit to the project. It reduced the installation and commissioning duration to about 3-4 weeks.

3. *Challenges Encountered:* Raising the upfront cost of the project (i.e. about US\$285,370), was the biggest challenge. Other challenges involved acclimatization of the new feedstock into the process. However, co-digestion was found to aid acclimatization.

4. *Difficulties & Potential Improvement:* Compaction and collection of rose waste from farms further than 5km from the plant has proved to be difficult due to the bulky nature of the waste. There is a need to therefore improve the supply chain by processing the waste at the collection point, compacting and transporting to the biogas plant.

5. *Perspectives and Opportunities:* Tropical power perceives waste to energy technology as a pragmatic feasible solution that is yet to be fully harnessed. Specifically, Tropical power is of the opinion that rose waste from flower farms in Naivasha, Nanyuki and other areas in Kenya has great energy potential in WtE applications within the agriculture space. The waste has potential to provide low carbon footprint energy and soil amelioration solutions. For example, the rose waste can yield energy if used in biomass boilers, briquetting and pyrolysis. A by-product from pyrolysis, biochar, has additional use in carbon sequestration and soil improvement.

- Timber Treatment International

1. *Benefits of the project:* The applied Business model between Timber Treatment International and Kenya Cooperative Creameries is the perfect demonstration of a circular economy, with waste from one industry being used as a resource for another production process.

2. *Highlights of the Project:* The plant managed to replace around 2,5 million liters of furnace oil (fossil fuel) with biomass fuel (generated from waste), which is carbon neutral, and an estimated CO₂ offset per year of 7,303,386 Kg enabling the use of renewable energy. The overall purpose, to convert waste to clean energy, is accomplished and expected to run for the next 8/9 years, thus actively contributing to Kenya's GHG emission reduction.

3. *Challenges encountered:* All conducted activities were not being able to be delivered on time due to an unexpected delay, including penalties to the shipping company, in the customs clearing process at the Kenyan port. In addition, the activities equally encountered delays due to unfavorable weather conditions during the construction phase. In the project site of Dandora, some additional last minute changes in the civil design needed to be accommodated, due to adverse soil conditions on site. Lastly, the activities equally experienced disruptions because of the COVID-19 pandemic.

4. *Difficulties & Potential Improvement:* One encountered difficulty is the noise level of the boilers in Nyahururu and Sotik, which potentially could be improved with the installation of silencers. Additionally, the current storage of biomass offcuts in the open does not reduce the moisture content to the desired percentage, leading to boiler operational inefficiencies. This could be addressed through the construction of proper biomass storage shades with suitable wood stag in order to help reduce moisture content to the desired level. Moreover, during the PSC visit, TTI was recommended to improve the site layout of their energy plants including the floors to assure proper application of occupational health and safety standards, including firefighting equipment and fencing of the premises.

5. *Perspectives on WtE in Kenya:* The country has huge potential for biomass as well as enormous potential

for carbon neutral energy, particularly in comparison to fossil fuel. The switch to biomass in the TTI plants enabled the KCC management to reduce its energy costs by 30-35%. Additionally, around 15 green jobs were created at each of the TTI plants and local farmers have been contracted to supply biomass off cuts/briquettes. Moreover, a switch from the use of ammonia cooling to the use of absorption chillers reduced further the energy consumption approximately from 250 KW to about 10 KW. With regards to access to financial support, sustainable renewable energy projects should be considered for soft loans, with the equipment itself, serving as its collateral. TTI is of the opinion that the decision makers in the biogas industry need to be given more knowledge on Waste to Energy and related GHG emission effects and its importance on reducing it. Accordingly, private sector stakeholders are keen to invest in projects based on economic incentives, however the government seems reluctant to change, unless there is clear policy to use biomass for energy.

- Olivado

1. *Benefits of the project:* The Olivado plant uses anaerobic digestion for treating the organic waste from the factory whilst at the same time offering a renewable substitute to costly, not always reliable grid electricity and environmentally damaging vehicle fuel. An additional beneficial is the by-product from this process which comes in the form of a bio-fertilizer from the digester effluent, adding further value to this treatment process.

2. *Highlights of the Project:* The plant managed to substitute 412,121 kWh/y of grid electricity, 152,507 liters of petrol and 7,600 tons of waste disposal and handling, amounting to a total savings potential of 477,805 USD¹¹.

3. *Challenges encountered:* One of the main challenges was the non-availability of construction materials, encountered during the construction phase and when damaged caused to plant by an unfortunate combination of material failure and extreme weather, unexpected delays were accrued. The other major challenges was the access to local financing, where on a number of occasions agreed terms were continuously changed and final agreements kept being pushed forward, often without any valid reasons provided. It was only through the SUNREF programme that Olivado finally managed to get some local banks interested. The banks however pulled out 9 months after essentially committing to a loan. Another challenge was the COVID-19 pandemic, its confinements and illness of the generator supplier unable to return to site for commissioning of the system.

4. *Difficulties & Potential Improvement:* Every project comes with some difficulties which are often beyond control. In Olivado's case, difficulties observed in the annual fluctuation in avocado processing quantities, mainly relating to rainfall and natural fruit bearing cycles. In addition, the already detailed delays and financial difficulties came with significant costs. Potential improvements acknowledged for future plant projects relate to firstly having funds secured and secondly having a clear picture of which materials can be sourced locally and which have to be imported.

5. *Perspectives on WTE in Kenya:* Apart from the benefits that this biogas plant brings to the Olivado factory, the project's business model has very real potential for duplication, to further contribute to Kenya's goals in GHG emissions reduction.

3. Please provide any **relevant stakeholder consultation** documents.

5154_6th Project Steering Committee Meeting Minutes (May 2022)

5154_Report of PSC Visit to WTE project sites (23-27 August 2021)

VI. Gender Mainstreaming

1. Using the previous reporting period as a basis, please report on the **progress achieved on implementing gender-responsive measures and using gender-sensitive indicators**, as documented at CEO Endorsement/Approval (in the project results framework, gender action plan or equivalent),.

¹¹ Excluding the sale of the fertilizer by-product, which an estimated value of the fertilizer upwards from USD 500,000 per year.

Although this is a GEF 5 project, and according to the UNIDO Gender Categorization Tool¹² the project's intervention was categorized as having "limited gender dimensions", some notable achievements were made in this area. A Gender Analysis provided relevant information to respond to possible inequities within the institutions that were part of the project as beneficiaries. Furthermore, a Gender Mainstreaming Report was prepared during the project inception phase and guided the overall gender mainstreaming of the project intervention.

During project implementation, the following activities were incorporated:

- Gender-sensitive recruitment was practiced for staff and consultants while the existing project staff were trained on gender issues.
- Gender dimensions were considered in all decision-making processes. The PSC members recruitment emphasized on inclusion of women from the stakeholders.
- The participation of women in training activities (as participants and trainers) was deliberately emphasized through proactive mechanism such as the nomination of women by participating institutions when sending out invitation letters. encouraged by putting emphasis on the nomination of women by participating institutions when sending out invitation letters. For the institutions who were part of capacity building efforts of the project, gender was a significant consideration and women were intentionally selected and well represented in the training activities.
- Gender dimensions were considered in data collection and assessments.

VII. Knowledge Management

1. Using the previous reporting period as a basis, please elaborate on any **knowledge management activities / products**, as documented at CEO Endorsement / Approval.

The project incorporates knowledge management under its component 4. Accordingly, the following knowledge activities were conducted and the associated products were developed or are currently under development:

4.1.1 Terminal Evaluation Project Report

- Terminal Evaluation Project Report under preparation (Evaluator recruitment currently ongoing with start of evaluation in August 2022).

4.1.2 Lessons learning and information dissemination workshops

- Information sharing and dissemination event of the National Standards on farm and industrial biogas systems conducted on 4 July 2022 in Nairobi.
- Biogas stakeholder information sharing Workshop in Nairobi is planned for August 2022.

4.1.3 Publications and websites

FY22

- National Standards labelled " Code of practice for farm and industrial scale biogas systems", were developed and officially endorsed.
- A news article was prepared and published on the UNIDO Website featuring the information sharing and dissemination event of the National Standards on farm and industrial biogas systems.
- A video clip detailing the project activities and including interviews with main project counterparts was prepared and uploaded to the UNIDO open data website, the UNIDO Youtube Videos page and disseminated by the UNIDO Kenya Field Office via Twitter and on the UN Kenya Flickr Homepage.
- Creation and operationalization of IBPP Website, is under development.
- A Sustainability strategy of the IBPP process is under preparation.

¹² UNIDO Gender Categorization Tool, available at https://www.unido.org/sites/default/files/2015-09/GENDER_CATEGORIZATION_TOOL_FINAL_0.pdf.

Previous FYs

- A Business plan (including a legal framework) of IBPP operationalization was developed.
- A Decentralized Energy Planning Manual was developed and disseminated.
- A Gender Analysis and mainstreaming plan for potential WTE projects was prepared and disseminated.
- Pre-Feasibility study reports were prepared for eight 8 potential project sites.
- Full feasibility study and designs were prepared for the Dagoretti biogas plant.
- Creation and operationalization of IBPP Website, is under development.
- A Sustainability strategy of the IBPP process is under preparation.
- A Biogas guidebook was developed.
- Training Materials (PPP and Videos) on biogas technology were developed (11 topics including Introduction of biogas Basics, Biogas Parameters, Biogas Feed stocks, Biogas Plant Planning & Feasibility, Construction, Operation, Maintenance, Safety of Biogas Plants, Digestate as Fertilizer, Biogas Policy, financial Aspects, Assessment for funding, Biogas Sustainability).
- A Mid-term project Monitoring and Evaluation report was prepared.

2. Please list any **relevant knowledge management mechanisms / tools** that the project has generated.

5154_TC Final Draft Standards (KS 2951-2022)

5154_News article about National Standards information sharing and dissemination event

5154_Videoclip about the Project

VIII. Implementation progress

1. Using the previous reporting period as a basis, please provide information on **progress, challenges and outcomes achieved/observed** with regards to project implementation.

Component 1 – Capacity development and knowledge management

During the reporting period, considerable progress was achieved with regards to the activities of the Information Best Practice Platform (IBPP) on Waste-to-Energy Technologies. The development of the IBPP website, as well as the compilation of a database of existing biogas systems and national stakeholders to be featured on the IBPP website is underway. The sustainability strategy of the IBPP upon project closure is equally under preparation.

Moreover, within the second half of 2022 several Biogas/Waste to Energy associated networking activities, including conferences and workshops are currently planned, with the accompanying communication materials such as brochures or leaflets presently in preparation. Additionally, with respect to the components of institutional strengthening and capacity building activities, during the reporting period a train-the-trainer team within KIRDI was established and their two-phased training courses in biogas technologies would be successfully completed by the beginning of July 2022.

While there was no substantive challenges in implementing these activities, some challenges were observed in administrative procedures e.g. requirement of VISA for KIRDI staff to travel to Germany for the purpose of attending advanced course as well as the COVID-19 related restrictions.

The other outcomes equally achieved under this component are as follows:

- *Business plan of IBPP operationalization developed.*
- *The legal framework for establishing the IBPP at KIRDI finalized and approved.*
- *A Capacity assessment of KIRDI was conducted, including recommendations for the IBPP requirements.*

- *Biogas lab installed equipment including ICT ((computers, projector, screen, work station).*
- *2 trainings conducted, involving 14 KIRDI staff (9 men and 5 women) were trained on operation of IBPP and biogas laboratory technology in China as well as in Kenya.*
- *Testing of Biogas laboratory equipment completed.*
- *A series of technical training materials on biogas technology (11 topics including Introduction of biogas Basics, Biogas Parameters, Biogas Feed stocks, Biogas Plant Planning & Feasibility, Construction, Operation, Maintenance, Safety of Biogas Plants, Digestate as Fertilizer, Biogas Policy, financial Aspects, Assessment for funding, Biogas Sustainability) were developed.*
- *Training videos on Biogas technology focusing on train-the-trainer content were developed.*
- *A Biogas guidebook was developed.*
- *2 Trainings, involving 40 personnel (33 men and 7 women) from the county offices were trained on how to elaborate county level energy plans.*
- *12 County level Energy plans were prepared.*
- *A Decentralized Energy Planning Manual developed and disseminated within counties.*
- *56 policy makers (45 men and 11 women) were trained and shared knowledge on waste to energy solutions.*
- *16 personnel (13 men and 3 women) of the office of the Principle Secretary in the Ministry of Environment conducted a knowledge sharing and monitoring site visit.*
- *A Gender analysis was carried out for potential WTE projects.*
- *48 persons (37 men and 11 women) trained for development and strengthening of institutional capacities in WTE.*

Component 2 – Establishment of agro-industrial WTE plants

During the reporting period, the development of draft Standards for farm and industrial scale biogas systems was completed. The process included several rounds of revisions by the Technical Committee (TC) with support of international expert opinions by the German Biogas Association (GBA). The new national standards were officially endorsed in April 2022. An official launch and Information Sharing Event about the new standards, in cooperation with KEBS and ERC held on 4 July 2022 engaging stakeholders on these newly approved standards and kept the public abreast with current developments in the standardization field. Moreover, all three project plants successfully commissioned their systems and submitted their final reports. The challenges herewith encountered have been reflected in Section V.2 of this report, featuring the feedback from all the plant owners.

The other outcomes equally achieved under this component are as follows:

- *Assessment of the international standards completed and shared with stakeholders including line ministries.*
- *Roadmap for the development of the standards agreed upon in close consultation with the stakeholders including line ministries.*
- *Three Biogas Technical Committee (TC) meetings under KEBS held to refine the Standards for farm and industrial scale systems.*
- *A pre-feasibility study was conducted for the eight potential project sites (Kilifi plantations, Olivado EPZ, Kisumu, Municipal wastes, Homabay Slaughterhouse, Dagoretti Slaughterhouse, Farmers' choice, Taita Estates, Agro-Chemicals and Food Company (ACFC).*
- *Detailed feasibility studies and designs were finalized for the Dagoretti biogas plant.*
- *The Tropical Power Plant completed the installation of the rose waste processing plant and realized a capacity of 670 kWe.*
- *The Olivado plant completed the installation of the Avocado fruit/waste biogas plant with a capacity of 470 kWe and 422 kWth from the heat recovery system.*
- *Timber Treatment International completed the installation of steam plants in Dandora, Nyahururu and Sotik KCC plants with a cumulative capacity of 16,302 kWth.*

Component 3 – Scaling up investment in WTE plants

Since the Component has already been completed, no further progress reported.

The outcomes achieved under this component are as follows:

- Incentive scheme based on incremental cost principle to the tune of USD 700,000 finalized to incentivize project developers and investors.
- 3 private sector companies benefited from the incentive scheme (Tropical Power, Olivado, Timber Treatment International)
- The project has established an incentive at a rate of USD 300 for every kilowatt installed.
- A Linkage was formed with the FASEP programme to support feasibility studies for biogas sites.

2. Please briefly elaborate on any **minor amendments**¹³ to the approved project that may have been introduced during the implementation period or indicate as not applicable (NA).

Please tick each category for which a change has occurred and provide a description of the change in the related textbox. You may attach supporting documentation, as appropriate.

| | | |
|--------------------------|---|------|
| <input type="checkbox"/> | Results Framework | N.A. |
| <input type="checkbox"/> | Components and Cost | N.A. |
| <input type="checkbox"/> | Institutional and Implementation Arrangements | N.A. |
| <input type="checkbox"/> | Financial Management | N.A. |
| <input type="checkbox"/> | Implementation Schedule | N.A. |
| <input type="checkbox"/> | Executing Entity | N.A. |
| <input type="checkbox"/> | Executing Entity Category | N.A. |
| <input type="checkbox"/> | Minor Project Objective Change | N.A. |
| <input type="checkbox"/> | Safeguards | N.A. |
| <input type="checkbox"/> | Risk Analysis | N.A. |
| <input type="checkbox"/> | Increase of GEF Project Financing Up to 5% | N.A. |
| <input type="checkbox"/> | Co-Financing | N.A. |
| <input type="checkbox"/> | Location of Project Activities | N.A. |
| <input type="checkbox"/> | Others | N.A. |

3. Please provide progress related to the **financial implementation** of the project.

¹³ As described in Annex 9 of the *GEF Project and Program Cycle Policy Guidelines*, **minor amendments** are changes to the project design or implementation that do not have significant impact on the project objectives or scope, or an increase of the GEF project financing up to 5%.



GRANT DELIVERY REPORT

| | | | | | |
|------------------|--|---------------|------------------------|-------------------|-------------------------|
| Grant: | 200003217 | Grant Status: | Authority to implement | Grant Validity: | 02.11.2015 - 31.10.2022 |
| Sponsor: | 400150 - GEF - Global Environment Facility | Currency: | USD | Reporting Period: | 02.11.2015 - 30.06.2022 |
| Other Reference: | 5154-U3-PJ-MS-GR-01 | Fund: | GF | Prepared on: | 05.07.2022 |

| Project | Project Description | Country | Region | Project Manager | Project Validity |
|---------|--|---------|--------|-----------------|-------------------------|
| 120568 | SUSTAINABLE CONVERSION OF WASTE INTO CLEAN ENERGY TO REDUCE GHG EMISSIONS IN KENYA | Kenya | Africa | Naoki Torii | 12.11.2015 - 31.10.2022 |

| | Description | Released Budget Current Year (a) | Obligations Current Year (b) | Disbursements Current Year (c) | Expenditures Current Year (d=b+c) | Total Agreement Budget (e) | Released Budget (f) | Obligations + Disbursements (g) | Funds Available* (h=f-g) | Support Cost (i) | Total Expenditures (j=g+i) |
|----------------|------------------------------------|----------------------------------|------------------------------|--------------------------------|-----------------------------------|----------------------------|---------------------|---------------------------------|--------------------------|------------------|----------------------------|
| 120568 | | USD | USD | USD | USD | USD | USD | USD | USD | USD | USD |
| 120568-1-02-01 | OP 1: Capacity Building on WTE | | | | | | | | | | |
| 1100 | Staff & Intern Consultants | 0.00 | 0.00 | 0.00 | 0.00 | 48,217.80 | 48,217.80 | 48,217.80 | 0.00 | 0.00 | 48,217.80 |
| 1500 | Local travel | 1,873.32 | 0.00 | 0.00 | 0.00 | 17,067.76 | 17,067.76 | 15,194.44 | 1,873.32 | 0.00 | 15,194.44 |
| 1700 | Nat.Consult./Staff | 0.00 | 0.00 | 0.00 | 0.00 | 97,457.09 | 97,457.09 | 97,457.09 | 0.00 | 0.00 | 97,457.09 |
| 2100 | Contractual Services | (2.46) | (13,336.90) | 12,063.82 | (373.08) | 40,061.65 | 40,061.65 | 39,691.06 | 370.59 | 0.00 | 39,691.06 |
| 3000 | Train/Fellowship/Study | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3500 | International Meetings | 0.00 | 0.00 | 0.00 | 0.00 | 26,054.82 | 26,054.82 | 26,054.82 | 0.00 | 0.00 | 26,054.82 |
| 4500 | Equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5100 | Other Direct Costs | 0.00 | 0.00 | 0.00 | 0.00 | 10,240.88 | 10,240.88 | 10,240.88 | 0.00 | 0.00 | 10,240.88 |
| 9300 | Support Cost IDC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 22,626.03 | 22,626.03 |
| 120568-1-02-01 | Total | 1,870.83 | (13,336.90) | 12,963.82 | (373.08) | 240,000.00 | 240,000.00 | 237,756.09 | 2,243.91 | 22,626.03 | 260,382.12 |
| 120568-1-03-01 | OP 2: Biogas for Energy Generation | USD | USD | USD | USD | USD | USD | USD | USD | USD | USD |
| 1100 | Staff & Intern Consultants | 0.00 | 0.00 | 0.00 | 0.00 | 117,097.29 | 117,097.29 | 117,097.29 | 0.00 | 0.00 | 117,097.29 |
| 1500 | Local travel | 0.00 | 0.00 | 0.00 | 0.00 | 41,218.82 | 41,218.82 | 41,218.82 | 0.00 | 0.00 | 41,218.82 |
| 1700 | Nat.Consult./Staff | 47,141.42 | 17,994.91 | 27,731.42 | 45,726.33 | 208,184.40 | 208,184.40 | 207,769.31 | 1,415.09 | 0.00 | 207,769.31 |
| 2100 | Contractual Services | (6.45) | (59,346.54) | 58,089.73 | (1,256.81) | 254,098.87 | 254,098.87 | 252,848.51 | 1,250.36 | 0.00 | 252,848.51 |
| 3000 | Train/Fellowship/Study | 0.00 | 0.00 | 0.00 | 0.00 | 44,057.91 | 44,057.91 | 44,057.91 | 0.00 | 0.00 | 44,057.91 |
| 3500 | International Meetings | 0.00 | 0.00 | 0.00 | 0.00 | 13,277.63 | 13,277.63 | 13,277.63 | 0.00 | 0.00 | 13,277.63 |
| 4300 | Premises | 0.00 | 0.00 | 0.00 | 0.00 | 208.38 | 208.38 | 208.38 | 0.00 | 0.00 | 208.38 |
| 4500 | Equipment | 0.00 | 0.00 | 28.42 | 28.42 | 10,203.57 | 10,203.57 | 10,229.99 | (26.42) | 0.00 | 10,229.99 |
| 5100 | Other Direct Costs | 584.93 | 0.00 | 541.73 | 541.73 | 21,570.51 | 21,570.51 | 21,527.31 | 43.20 | 0.00 | 21,527.31 |
| 9300 | Support Cost IDC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 67,451.57 | 67,451.57 |
| 120568-1-03-01 | Total | 47,134.97 | (41,351.63) | 86,389.30 | 45,037.67 | 710,915.38 | 710,915.38 | 706,233.15 | 2,682.23 | 67,451.57 | 775,684.75 |

* Does not include Unapproved Obligations




GRANT DELIVERY REPORT

| | | | | | |
|------------------|--|---------------|------------------------|-------------------|-------------------------|
| Grant: | 200003217 | Grant Status: | Authority to implement | Grant Validity: | 02.11.2015 - 31.10.2022 |
| Sponsor: | 400150 - GEF - Global Environment Facility | Currency: | USD | Reporting Period: | 02.11.2015 - 30.06.2022 |
| Other Reference: | 5154-U3-PJ-MS-GR-01 | Fund: | GF | Prepared on: | 05.07.2022 |

| Project | Project Description | Country | Region | Project Manager | Project Validity |
|---------|--|---------|--------|-----------------|-------------------------|
| 120568 | SUSTAINABLE CONVERSION OF WASTE INTO CLEAN ENERGY TO REDUCE GHG EMISSIONS IN KENYA | Kenya | Africa | Naoki Torii | 12.11.2015 - 31.10.2022 |

| | Description | Released Budget Current Year (a) | Obligations Current Year (b) | Disbursements Current Year (c) | Expenditures Current Year (d=b+c) | Total Agreement Budget (e) | Released Budget (f) | Obligations + Disbursements (g) | Funds Available* (h=f-g) | Support Cost (i) | Total Expenditures (j=g+i) |
|----------------|--|----------------------------------|------------------------------|--------------------------------|-----------------------------------|----------------------------|---------------------|---------------------------------|--------------------------|------------------|----------------------------|
| 120568-1-04-01 | OP 3: Establishment of incentive systems | USD | USD | USD | USD | USD | USD | USD | USD | USD | USD |
| 1100 | Staff & Intern Consultants | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1500 | Local travel | 5,000.00 | 0.00 | 1,234.50 | 1,234.50 | 10,274.68 | 10,274.68 | 6,509.18 | 3,765.50 | 0.00 | 6,509.18 |
| 1700 | Nat.Consult./Staff | 21,045.46 | 2,813.03 | 18,278.02 | 21,091.05 | 68,934.68 | 68,934.68 | 68,980.27 | (45.59) | 0.00 | 68,980.27 |
| 2100 | Contractual Services | 54,393.14 | (29,197.85) | 76,157.93 | 46,960.08 | 594,694.17 | 594,694.17 | 587,261.11 | 7,433.06 | 0.00 | 587,261.11 |
| 3000 | Train/Fellowship/Study | 0.00 | 0.00 | 32.11 | 32.11 | 22,469.49 | 22,469.49 | 22,501.60 | (32.11) | 0.00 | 22,501.60 |
| 3500 | International Meetings | 0.00 | 0.00 | 0.00 | 0.00 | 765.00 | 765.00 | 765.00 | 0.00 | 0.00 | 765.00 |
| 4500 | Equipment | 0.00 | 0.00 | 6.60 | 6.60 | 1,590.43 | 1,590.43 | 1,597.03 | (6.60) | 0.00 | 1,597.03 |
| 5100 | Other Direct Costs | 128.16 | 0.00 | 841.13 | 841.13 | 6,049.22 | 6,049.22 | 6,763.19 | (714.97) | 0.00 | 6,763.19 |
| 9300 | Support Cost IDC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 66,298.37 | 66,298.37 |
| 120568-1-04-01 | Total | 80,564.76 | (26,384.82) | 96,550.29 | 70,165.47 | 704,776.67 | 704,776.67 | 694,377.38 | 10,399.29 | 66,298.37 | 760,675.74 |
| 120568-1-05-01 | Project Management Cost | USD | USD | USD | USD | USD | USD | USD | USD | USD | USD |
| 1100 | Staff & Intern Consultants | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1500 | Local travel | 56,756.43 | 3,205.91 | 4,596.38 | 7,802.29 | 60,770.92 | 60,770.92 | 11,816.78 | 48,954.14 | 0.00 | 11,816.78 |
| 1700 | Nat.Consult./Staff | 36,213.66 | 7,233.86 | 4,482.86 | 11,716.72 | 127,548.68 | 127,548.68 | 103,049.74 | 24,498.94 | 0.00 | 103,049.74 |
| 2100 | Contractual Services | 0.00 | 605.01 | 0.00 | 605.01 | 441.66 | 441.66 | 1,046.67 | (605.01) | 0.00 | 1,046.67 |
| 3500 | International Meetings | 0.00 | 0.00 | 0.00 | 0.00 | 4,147.64 | 4,147.64 | 4,147.64 | 0.00 | 0.00 | 4,147.64 |
| 4500 | Equipment | 0.00 | 0.00 | 19.83 | 19.83 | 1,613.23 | 1,613.23 | 1,633.06 | (19.83) | 0.00 | 1,633.06 |
| 5100 | Other Direct Costs | 2,077.17 | 525.90 | 12.17 | 538.07 | 2,936.71 | 2,936.71 | 1,397.61 | 1,539.10 | 0.00 | 1,397.61 |
| 9300 | Support Cost IDC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11,700.13 | 11,700.13 |
| 120568-1-05-01 | Total | 95,047.26 | 11,570.68 | 9,111.24 | 20,681.92 | 197,456.84 | 197,456.84 | 123,091.50 | 74,365.34 | 11,700.13 | 134,791.67 |

* Does not include Unapproved Obligations

| | | | | | | | |
|--|--|------------------|--|------------------------|------------------------|-------------------------|-------------------------|
|  GRANT DELIVERY REPORT | | Grant: | 200003217 | Grant Status: | Authority to implement | Grant Validity: | 02.11.2015 - 31.10.2022 |
| | | Sponsor: | 400160 - GEF - Global Environment Facility | Currency: | USD | Reporting Period: | 02.11.2015 - 30.06.2022 |
| | | Other Reference: | 5154-U3-PJ-MS-GR-01 | Fund: | GF | Prepared on: | 05.07.2022 |
| Project | Project Description | Country | Region | Project Manager | | Project Validity | |
| 120568 | SUSTAINABLE CONVERSION OF WASTE INTO CLEAN ENERGY TO REDUCE GHG EMISSIONS IN KENYA | Kenya | Africa | Naaki Tori | | 12.11.2015 - 31.10.2022 | |

| | Description | Released Budget Current Year (a) USD | Obligations Current Year (b) USD | Disbursements Current Year (c) USD | Expenditures Current Year (d=b+c) USD | Total Agreement Budget (e) USD | Released Budget (f) USD | Obligations + Disbursements (g) USD | Funds Available* (h=f-g) USD | Support Cost (i) USD | Total Expenditures (j=g+i) USD |
|----------------|---------------------------------|---|-------------------------------------|---------------------------------------|--|-----------------------------------|----------------------------|--|---------------------------------|-------------------------|-----------------------------------|
| 120568-1-51-01 | Effective Assessment of Outputs | | | | | | | | | | |
| 1100 | Staff & Intern Consultants | 40,383.09 | 0.00 | 0.00 | 0.00 | 40,402.27 | 40,402.27 | 19.18 | 40,383.09 | 0.00 | 19.18 |
| 1500 | Local travel | 0.00 | 0.00 | 0.00 | 0.00 | 6,743.57 | 6,743.57 | 6,743.57 | 0.00 | 0.00 | 6,743.57 |
| 1700 | Nat.Consult./Staff | 17.52 | 0.00 | 0.00 | 0.00 | 95,052.58 | 95,052.58 | 95,035.04 | 17.52 | 0.00 | 95,035.04 |
| 2100 | Contractual Services | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3000 | Train/Fellowship/Study | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5100 | Other Direct Costs | 0.00 | 0.00 | 0.00 | 0.00 | 4,850.71 | 4,850.71 | 4,850.71 | 0.00 | 0.00 | 4,850.71 |
| 9300 | Support Cost IDC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10,112.48 | 10,112.48 |
| 120568-1-51-01 | Total | 40,400.61 | 0.00 | 0.00 | 0.00 | 146,849.11 | 146,849.11 | 106,448.50 | 40,400.61 | 10,112.48 | 116,560.99 |
| 120568 | Total | 265,603.36 | (69,502.67) | 205,014.65 | 135,511.98 | 1,999,998.00 | 1,999,998.00 | 1,869,906.62 | 130,091.38 | 178,188.58 | 2,048,095.22 |
| 200003217 | USD Total | 265,603.36 | (69,502.67) | 205,014.65 | 135,511.98 | 1,999,998.00 | 1,999,998.00 | 1,869,906.62 | 130,091.38 | 178,188.58 | 2,048,095.22 |

* Does not include Unapproved Obligations

IX. Work Plan and Budget

1. Please provide **an updated project work plan and budget** for the remaining duration of the project, as per last approved project extension. Please expand/modify the table as needed.

Please fill in the below table or make a reference to a file, in case it is submitted as an annex to the report.

| Outputs by Project Component | 2022 | | | | GEF Grant Budget Available (US\$) |
|--|------|----|----|----|-----------------------------------|
| | Q1 | Q2 | Q3 | Q4 | |
| Component 1 - Capacity development and knowledge management | | | | | |
| Outcome 1.1: Improved awareness, knowledge sharing on best practices and capacity building on WTE in the country | | | | | |
| Output 1.1.1: Information and best practices platform (IBPP) for WTE technologies established at KIRDI | - | - | X | X | 0 |
| Output 1.1.2.: Development of human capacities in WTE for policy makers (at least 50 policy makers), project developers, agro-industries, and other stakeholders (at least 50 persons) | - | - | X | | 1,000 |
| Output 1.1.3: Development and strengthening of institutional capacities in the area of WTE among technical institutions and financial institutions (at least 50 persons from each group) | - | - | X | | 1,243.91 |
| Component 2 – Establishment of agro-industrial WTE plants | | | | | |
| Outcome 2.1: Increased use of biogas for energy generation | | | | | |
| Output 2.1.1 Establishment of standards for medium and large scale biogas power plants. | - | - | X | | 2,682.23 |
| Output 2.1.2: Detailed plant design prepared for WTE plants | - | - | | | 0 |
| Output 2.1.3.: WTE plants established for a cumulative capacity of around 1,856 kWe and 1,397 kWth | - | - | | | 0 |
| Component 3 – Scaling up investment in WTE plants | | | | | |
| Outcome 3.1: Establishment and implementation of incentive systems for WTE technologies | | | | | |

| | | | | | |
|--|---|---|---|---|-----------|
| Output 3.1.1: Establishment and implementation of incentive systems for WTE technologies | - | - | X | | 10,399.29 |
| Component 4 – Monitoring and Evaluation (M&E) | | | | | |
| Outcome 4.1: Effectiveness of the outputs assessed, corrective actions taken and experience documented | | | | | |
| Output 4.1.1: Mid-term M & E report prepared | - | - | | | 0 |
| Output 4.1.2: End of project M & E report prepared | - | - | X | X | 30,000 |
| Output 4.1.3: Lessons learning and information dissemination workshops | - | - | X | | 5,000 |
| Output 4.1.4: Publications and websites | - | - | X | X | 5400,61 |
| Project Management | | | | | |
| Project management cost | - | - | X | X | 74,365.34 |

X. Synergies

1. Synergies achieved:

The project partnered with the FACEP project financed by the government of France and implemented by Naskeo Environment¹⁴, an independent French engineering company and constructor of biogas plants, that installed equipment for the biogas laboratory at KIRDI.

In addition, in the area of sustainable waste, a national sustainable waste management policy (in 2020)¹⁵ and a sustainable waste management Bill (in 2021)¹⁶ were adopted, which will further delineate strong government support for sustainable waste management including waste to energy and most certainly will create potential synergies for further promote waste to energy technologies in the country moving ahead.

3. Stories to be shared (Optional)

Since the project entered its final Implementation weeks the following overall progresses, challenges, outcomes and key lessons learned can already be drawn:

- This Waste to Energy project demonstrated new approaches to managing organic waste by converting it to renewable energy.*
- The energy generated is used by the companies themselves, which reduces overall energy costs but also created a new income stream by selling the surplus energy and the by-products, such as bio fertilizers.*
- Trainings of biogas practitioners reduced the skills gap in the biogas and waste to the energy sector.*
- The biogas laboratory at KIRDI provides a new testing facility in the east and central Africa region. It reduces the cost of doing analytical tests overseas and creates new job opportunities and acts as a training and knowledge hub.*
- The uptake of the waste to energy technologies requires a solid and predictable regulatory environment that provides security and incentives for private sector entities.*
- Lack of land lease arrangements led to delays in setting up a biogas plant.*

¹⁴ NASKEO, available at <https://naskeo.com/en/>

¹⁵ National Sustainable Waste Management Policy, available at <http://www.environment.go.ke/wp-content/uploads/2021/03/FINAL-National-Waste-Policy-March-2020.pdf>

¹⁶ The Sustainable Waste Management Bill 2021, available at

http://kenyalaw.org/kl/fileadmin/pdfdownloads/bills/2021/TheSustainableWasteManagementBill_2021.pdf

- *The initial cost of investment is high, while few institutions offering appropriate financing for biogas projects.*
- *The private sector partners experienced difficulties in accessing loans.*
- *There were significant (and unexpected) delays with customs clearance of imported materials and parts.*
- *The feed-in-tariffs for feeding the power to the grid are relatively low to the cost of production, which very often limits investment of larger-scale biogas plants.*

EXPLANATORY NOTE

1. **Timing & duration:** Each report covers a twelve-month period, i.e. 1 July 2021 – 30 June 2022.
2. **Responsibility:** The responsibility for preparing the report lies with the project manager in consultation with the Division Chief and Director.
3. **Evaluation:** For the report to be used effectively as a tool for annual self-evaluation, project counterparts need to be fully involved. The (main) counterpart can provide any additional information considered essential, including a simple rating of project progress.
4. **Results-based management:** The annual project/programme progress reports are required by the RBM programme component focal points to obtain information on outcomes observed.

| Global Environmental Objectives (GEOs) / Development Objectives (DOs) ratings | |
|---|---|
| Highly Satisfactory (HS) | Project is expected to achieve or exceed <u>all</u> its major global environmental objectives, and yield substantial global environmental benefits, without major shortcomings. The project can be presented as “good practice”. |
| Satisfactory (S) | Project is expected to <u>achieve most</u> of its <u>major</u> global environmental objectives, and yields satisfactory global environmental benefits, with only minor shortcomings. |
| Moderately Satisfactory (MS) | Project is expected to <u>achieve most</u> of its major <u>relevant</u> objectives but with either significant shortcomings or modes overall relevance. Project is expected not to achieve some of its major global environmental objectives or yield some of the expected global environmental benefits. |
| Moderately Unsatisfactory (MU) | Project is expected to achieve <u>some</u> of its major global environmental objectives with major shortcomings or is expected to <u>achieve only some</u> of its major global environmental objectives. |
| Unsatisfactory (U) | Project is expected <u>not</u> to achieve <u>most</u> of its major global environmental objectives or to yield any satisfactory global environmental benefits. |
| Highly Unsatisfactory (HU) | The project has failed to achieve, and is not expected to achieve, <u>any</u> of its major global environmental objectives with no worthwhile benefits. |

| Implementation Progress (IP) | |
|---------------------------------------|---|
| Highly Satisfactory (HS) | Implementation of <u>all</u> components is in substantial compliance with the original/formally revised implementation plan for the project. The project can be presented as “good practice”. |
| Satisfactory (S) | Implementation of <u>most</u> components is in substantial compliance with the original/formally revised plan except for only few that are subject to remedial action. |
| Moderately Satisfactory (MS) | Implementation of <u>some</u> components is in substantial compliance with the original/formally revised plan with some components requiring remedial action. |
| Moderately Unsatisfactory (MU) | Implementation of <u>some</u> components is <u>not</u> in substantial compliance with the original/formally revised plan with most components requiring remedial action. |
| Unsatisfactory (U) | Implementation of <u>most</u> components is <u>not</u> in substantial compliance with the original/formally revised plan. |
| Highly Unsatisfactory (HU) | Implementation of <u>none</u> of the components is in substantial compliance with the original/formally revised plan. |

| Risk ratings | |
|--|---|
| Risk ratings will assess the overall risk of factors internal or external to the project which may affect implementation or prospects for achieving project objectives. Risk of projects should be rated on the following scale: | |
| High Risk (H) | There is a probability of greater than 75% that assumptions may fail to hold or materialize, and/or the project may face high risks. |
| Substantial Risk (S) | There is a probability of between 51% and 75% that assumptions may fail to hold or materialize, and/or the project may face substantial risks. |
| Moderate Risk (M) | There is a probability of between 26% and 50% that assumptions may fail to hold or materialize, and/or the project may face only moderate risk. |
| Low Risk (L) | There is a probability of up to 25% that assumptions may fail to hold or materialize, and/or the project may face only low risks. |