Guidelines:

- This Request Submission Form should be completed by the organisation requesting technical assistance from the Climate Technology Centre & Network (CTCN) in collaboration with the National Designated Entity (NDE) of the country in question
- The Form must be signed by the NDE. Please see updated contact list of NDEs here: http://unfccc.int/ttclear/support/national-designated-entity.html
- The Form can be submitted as a Word file containing a digital signature or as a signed and scanned PDF file in combination with an un-signed Word file
- For requests submitted by multiple countries, all the NDEs of the respective countries shall sign identical Forms before official submission to the CTCN
- NDEs have the opportunity to submit CTCN requests in collaboration with National Designated Authorities (NDAs) for the Green Climate Fund (GCF) if targeting the GCF Readiness Programme.

Requesting country or countries:	KENYA
Request title:	TITLE: **Assessing the Feasibility of Producing Dimethyl Ether (DME) from Plastic and Organic Waste as a Clean Household Cooking Fuel in Kenya.** OBJECTIVES 1. To assess the technical and environmental feasibility of producing DME from plastic and organic waste streams in Kenya. 2. To evaluate the techno-economic viability and greenhouse gas mitigation potential of waste-to-DME systems for household cooking applications. 3. To assess policy, institutional, market, and infrastructure requirements for integration of DME within Kenya's clean cooking transition. 4. To strengthen local technical capacity, technology transfer, and stakeholder collaboration for future pilot implementation and scale-up. 5. To develop a pilot implementation roadmap and investment-oriented scale-up strategy for waste-to-DME deployment in Kenya.
NDE	Carolyne Njuguna Kenya Industrial Research and Development Institute (KIRDI) Research Scientist carolynekol@gmail.com or carolyne.njuguna@kirdi.go.ke P.o Box 30650-00100

	NAIROBI
Request Applicant:	Margaret Wangari Taita Taveta National polytechnic, Senior Technical Trainer Agriculture and Environmental Department-HOD Wangarimargaret4@gmail.com/wangarimwangi@ttnp.ac.ke .

Climate objective:

- ☐ Adaptation to climate change
- ☒ Mitigation of climate change
- ☐ Combination of adaptation and mitigation of climate change

Geographical scope:

- ☐ Community level
- ☐ Sub-national
- ☒ National
- ☐ Multi-country

If the request is at a sub-national or multi-country level, please describe specific geographical areas (provinces, states, countries, regions, etc.).

Problem statement related to climate change

Kenya faces a growing concern of the accumulation of both organic and inorganic waste in major cities such as Nairobi, Mombasa, and Nakuru. This challenge is largely driven by improper waste handling, inadequate segregation at source, and inefficient disposal systems. As a result, large volumes of waste end up in open dumpsites and landfills, contributing significantly to environmental degradation and public health risks. Urban centres are the largest contributors to this crisis. Nairobi alone generates approximately 2,400–2,500 tonnes of solid waste per day**,** amounting to **over** 2.3 million tonnes annually, yet less than half of this waste is effectively collected or treated (World Bank, 2018; Africa Check, 2024). Mombasa generates an estimated 2,000 tonnes of waste per day**,** while Nakuru produces about 500–513 tonnes daily**,** with a significant proportion being biodegradable (about 80%). Despite these high volumes, only about 60–70% of waste is collected**,** and less than 20% is recycled, leaving the majority to accumulate in the environment.

The accumulation of waste contributes to air pollution through open burning and releases harmful greenhouse gases such as methane, a potent contributor to climate change. Poor waste management also leads to blockage of drainage systems, increasing the risk of urban flooding, and has been associated with outbreaks of diseases in densely populated areas (World Bank, 2018). At the same time, access to reliable and affordable energy remains a pressing challenge in Kenya. Approximately 70–82% of households rely on biomass fuels such as firewood and charcoal for cooking**,** contributing to deforestation, indoor air pollution, and greenhouse gas emissions. Household cooking alone contributes significantly to national

carbon emissions, further exacerbating climate change.

Despite the scale of these interconnected challenges, there is limited adoption of innovative solutions that can simultaneously address waste management and energy access. Therefore, there is an urgent need to explore sustainable and integrated solutions that not only reduce the growing burden of waste accumulation in landfills but also provide clean, reliable, and affordable energy for household use, as well as reduce carbon emissions and overall carbon footprint Preliminary assessments indicate strong potential for converting municipal plastic and organic waste into Dimethyl Ether (DME) for household cooking applications in Kenya. Studies from waste-to-fuel systems show that approximately 1 tonne of mixed municipal waste can generate between 80–150 kg of DME depending on feedstock composition and conversion efficiency. Considering that Nairobi generates over 2,400 tonnes of waste daily, even recovering 30% of suitable waste streams could potentially produce 57–108 tonnes of DME per day. This quantity could support approximately 28,000–54,000 households daily, assuming an average household DME cooking consumption of 2 kg/day. In addition, diversion of waste from landfills and replacement of charcoal and firewood could significantly reduce greenhouse gas emissions, methane release, and deforestation pressure.

Past and on-going efforts to address the problem

Kenya has made several efforts to address challenges related to waste management, clean energy access, and climate change mitigation through policy, institutional frameworks, and pilot projects. At the national level, the government has developed key strategies such as the National Sustainable Waste Management Policy (2021) and the National Solid Waste Management Strategy, which promote a circular economy approach based on waste reduction, recycling, and resource recovery. These frameworks align with Kenya's Vision 2030, which prioritizes sustainable waste management systems and the transformation of dumpsites into environmentally sound facilities.

In addition, Kenya has implemented the Bioenergy Strategy (2020) to promote the use of organic waste, agricultural residues, and other biomass resources for energy generation, including biogas and biofuels, as part of efforts to expand clean energy access and reduce reliance on traditional biomass.

At the project level, several waste-to-energy (WTE) initiatives have been proposed and are under development. Notably, the Nairobi Waste-to-Energy project at the Dandora dumpsite aims to convert municipal waste into electricity while reducing environmental pollution. Other emerging initiatives focus on converting waste into energy and agricultural inputs, signalling a gradual shift toward resource recovery and circular economy practices.

However, despite these efforts, implementation remains limited due to technical, financial, and institutional barriers. Most initiatives are still at pilot or planning stages, with a primary focus on electricity generation rather than clean cooking solutions. There is also limited integration of plastic and organic waste streams into advanced fuel production systems, and insufficient technical capacity to deploy innovative technologies such as Dimethyl Ether (DME).

Specific technology[1] barriers

These challenges highlight the absence of scalable, integrated waste-to-energy solutions that simultaneously address waste management, clean household cooking energy, and climate mitigation. In particular, there is a lack of feasibility studies and technical assessments to evaluate the viability of converting mixed plastic and organic waste into clean fuels such as DME within the Kenyan context. From a technological perspective, several key barriers persist:

- Lack of advanced waste segregation and pre-treatment systems, resulting in heterogeneous waste streams that are unsuitable for efficient fuel conversion.
- Limited access to proven gasification and catalytic conversion technologies required for transforming mixed plastic and organic waste into Dimethyl Ether (DME).
- Insufficient local technical expertise and operational capacity to design, operate, and maintain waste-to-fuel plants.
- High capital and operational costs of DME production infrastructure, including reactors, gas cleaning units, and synthesis systems.
- Limited infrastructure for DME storage, distribution, and end-use (e.g., compatible cooking technologies).

This proposal directly responds to these gaps by undertaking a comprehensive feasibility study for the establishment of a waste-to-DME production plant in Kenya. It will assess technological options, evaluate system design requirements, and identify appropriate conversion pathways while analysing economic, environmental, and institutional feasibility. The project aims to provide a clear roadmap for deploying DME technology as a sustainable solution for waste management, clean household cooking energy, and reduction of carbon emissions and overall carbon footprint.

Sectors:

Please indicate the main sectors related to the request:

☐ Coastal zones	☒ Early Warning and Environmental Assessment	☐ Human Health	☒ Infrastructure and Urban planning
☐ Marine and Fisheries	☐ Water	☐ Agriculture	☒ Carbon fixation
☒ Energy	☐ Forestry	☐ Industry	☒ Renewable

[1] *"**any equipment, techniques, practical knowledge and skills** needed for reducing greenhouse gas emissions and adapting to climate change" (Special Report on Technology Transfer, IPCC, 2000)*

Efficiency energy

☐ Transport ☒ Waste management

Please add other relevant sectors:

Cross-sectoral enablers and approaches:

Please indicate the main cross-sectoral enablers and approaches

☒ Communication and awareness ☒ Economics and financial decision-making ☒ Governance and planning ☒ Community based

☒ Disaster risk reduction ☒ Ecosystems and biodiversity ☒ Gender

Technical assistance requested (up to one page):

Overall objective

To provide technical assistance for assessing and enabling the feasibility and deployment of waste-to-Dimethyl Ether (DME) technology in Kenya by addressing key technological, institutional, and capacity barriers. The assistance will support the development of an integrated waste-to-energy solution that contributes to climate change mitigation through reduced greenhouse gas emissions, improved waste management, and provision of clean household cooking energy**.**

Anticipated groups of activities to be performed by the technical assistance

Activity 1: Evaluate existing waste Collection strategies.

- Annalyse channels used in waste collection from the source to the end user
- Identify gaps in waste collection and recommend improvement strategies

Activity 2: Technical Feasibility Assessment

- Assess technology options appropriate for mixed plastic and organic waste streams.
- Assess Technology Readiness Levels (TRLs) of selected waste-to-DME conversion technologies and evaluate their suitability for deployment under Kenyan conditions.
- Evaluate alternative process pathways including gasification, syngas cleaning, methanol synthesis, and DME catalytic dehydration systems.
- Identify technical risks associated with feedstock variability, catalyst performance, emissions control, operational safety, and infrastructure compatibility.
- Develop a Life Cycle Assessment (LCA) framework to evaluate environmental impacts and carbon emissions across the waste collection, transportation, processing, DME

production, distribution, and end-use cooking stages.

Activity 3: Feedstock and Supply Chain Analysis

- Analyze availability, composition, and logistics of waste feedstock in target cities.
- Identify requirements for waste segregation, collection, and pre-treatment systems.

Activity 4: Techno-Economic and Financial Analysis

- Estimate capital and operational costs of DME production systems.
- Assess financial viability and potential investment models.

Activity 5: Environmental and Climate Impact Assessment

- Quantify greenhouse gas emission reduction potential.
- Evaluate environmental and health co-benefits (e.g., reduced air pollution, waste diversion).
- Develop preliminary greenhouse gas reduction scenarios comparing current waste disposal and charcoal-based cooking systems with proposed waste-to-DME systems using IPCC emission factors and baseline methodologies.

Activity 6: Institutional and Capacity Needs Assessment

- Identify gaps in technical expertise, regulatory frameworks, and institutional coordination.
- Propose capacity-building programs and policy recommendations.
- Promote collaboration with Kenyan universities, TVET institutions, local fabricators, and engineering firms to support domestic innovation and adaptation of waste-to-DME technologies
- Review international standards and safety protocols for DME-LPG blending and assess applicability of standards such as IS 18698:2024 to the Kenyan context.

Activity 7: Technology Transfer and Local Capacity Development

• Develop a technology transfer framework for adaptation and localization of waste-to-DME systems in Kenya.

• Facilitate collaboration between international technology providers, Kenyan universities, TVET institutions, research centers, and local engineering firms.

• Support knowledge transfer in gasification technologies, catalyst systems, reactor operations, emissions monitoring, and DME storage and handling systems.

• Promote local participation in engineering design, fabrication, installation, operation, and maintenance of pilot waste-to-DME facilities.

• Develop technical training modules and certification programs for engineers, technicians,

researchers, and waste management practitioners.

• Identify opportunities for local manufacturing and assembly of selected plant components to strengthen domestic technical capacity and industrial development

Activity 8: Market and End-Use Assessment

- Evaluate demand and adoption potential of DME for household cooking.
- Assess infrastructure needs for storage, distribution, and utilization.
- Assess phased integration pathways for DME within Kenya's LPG market, including low-percentage DME-LPG blending scenarios and infrastructure compatibility assessments. (Evaluate phased DME-LPG blending scenarios (8%–20%) to enable gradual market introduction without requiring immediate modification of existing LPG cooking appliances).
- Assess opportunities for development and deployment of specialized low-cost burners and porous medium combustion systems optimized for higher DME concentrations in rural and off-grid applications.

Activity 9: Implementation and Scale-Up Planning

- Develop a pilot plant concept and implementation roadmap.
- Recommend strategies for scaling up and replication at national level.
- Identify and assess suitable pilot demonstration sites, including Dandora dumpsite (Nairobi), Mwakirunge dumpsite (Mombasa), and Gioto waste management site (Nakuru), based on waste availability, infrastructure access, and implementation feasibility.
- The technical assistance will engage early-stage industry partners and identify pilot implementation pathways to ensure that the feasibility assessment supports practical deployment and future investment readiness rather than remaining solely academic. Collaboration with waste management companies, clean cooking enterprises, engineering institutions, and fuel distribution stakeholders will help strengthen implementation potential, commercialization pathways, and future scale-up opportunities for waste-to-DME systems in Kenya.

Anticipated products to be delivered by the technical assistance.

- Comprehensive feasibility study report (technical, economic, environmental, institutional).
- Technology assessment report identifying suitable waste-to-DME conversion pathways.
- Feedstock assessment and supply chain analysis report.
- Greenhouse gas emission reduction and environmental impact report.
- Policy and regulatory recommendations brief.
- Capacity building and training plan for stakeholders.
- Market assessment report for DME as a household cooking fuel.
- Pilot project concept design and implementation roadmap.

- Preliminary Life Cycle Assessment (LCA) and greenhouse gas emissions baseline report for waste-to-DME production systems.

Expected timeframe:

Phase 1: Inception and Planning (Month 1–2)

- Stakeholder consultations and project kick-off
- Refinement of scope and methodology
- Development of detailed workplan and data collection framework

Phase 2: Data Collection and Assessments (Month 3–6)

- Feedstock assessment (waste quantity, composition, supply chains)
- Technology assessment (waste-to-DME conversion options)
- Market and clean cooking demand analysis
- Institutional and policy review

Phase 3: Analysis and Feasibility Studies (Month 7–9)

- Techno-economic analysis (CAPEX, OPEX, financial viability)
- Environmental and climate impact assessment (GHG reduction potential)
- Identification of technological and capacity gaps

Phase 4: Strategy Development and Validation (Month 10–11)

- Development of pilot plant concept design
- Preparation of implementation roadmap and scale-up strategy
- Stakeholder validation workshops and feedback integration
- Development of Monitoring, Evaluation, and reporting indicators for pilot implementation and scale-up.

Phase 5: Final Reporting and Dissemination (Month 12)

- Submission of final feasibility study and technical reports
- Policy recommendations and capacity-building plan
- Dissemination of results to stakeholders and potential investors

Anticipated gender and other co-benefits from the technical assistance:

- **Stakeholder Engagement and Consultations**
  - Ensure **active participation of women, youth, and vulnerable groups** in consultations and decision-making processes.
  - Incorporate gender perspectives in identifying energy needs and waste

management practices.

- **Capacity Building and Training**
  - Develop targeted training programs to enhance **women's technical skills and participation** in waste management and clean energy value chains.
  - Promote women's inclusion in technical, entrepreneurial, and leadership roles.
- **Market and End-Use Assessment**
  - Assess **women's preferences, affordability constraints, and adoption barriers** related to DME as a clean cooking fuel.
  - Promote gender-sensitive design of distribution and utilization systems.
- **Policy and Institutional Analysis**
  - Integrate gender considerations into policy recommendations and regulatory frameworks.
  - Support gender-responsive planning in energy and waste sectors.
  - Recommend fiscal incentives, subsidies, and policy mechanisms to support local DME production, reduce dependence on imported LPG, and encourage private-sector investment.

Anticipated Gender Benefits

- **Reduced health risks** due to decreased exposure to indoor air pollution from traditional cooking fuels
- **Time savings** for women and girls by reducing fuel collection burdens
- **Economic empowerment** through job creation and participation in waste-to-energy value chains
- **Improved energy access and affordability** for households

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Other Co-Benefits

Environmental and Biodiversity Benefits

- Reduced deforestation and land degradation through decreased reliance on firewood and charcoal
- Lower pollution from unmanaged waste, supporting ecosystem health and biodiversity conservation

Climate Benefits (Mitigation)

- Contribution to Kenya's **Nationally Determined Contributions (NDCs)**
- Preliminary estimates suggest that diversion of organic waste from landfills combined with substitution of charcoal and firewood by DME could reduce greenhouse gas emissions by thousands of tonnes of CO_2-equivalent annually depending on plant scale and household adoption rates. Additional mitigation benefits include reduced methane emissions from decomposing waste and reduced black carbon emissions from biomass combustion.

Economic Benefits

- Creation of **green jobs** in waste collection, processing, and energy production
- Attraction of investment in waste-to-energy infrastructure
- Reduced household expenditure on cooking fuels

Social Benefits

- Improved public health outcomes due to reduced air pollution
- Enhanced urban sanitation and living conditions
- Increased access to reliable and modern energy services

Cultural Benefits

- Promotion of cleaner cooking practices aligned with evolving lifestyles
- Reduction in traditional practices that contribute to environmental degradation

By integrating gender-responsive approaches and delivering multiple environmental, social, and economic co-benefits, the proposed technical assistance ensures a holistic and inclusive pathway toward climate mitigation and sustainable development in Kenya.

Key stakeholders:

Please list the stakeholders who will be involved in the implementation of the requested CTCN technical assistance and describe their role during the implementation (for example, government agencies and ministries, academic institutions and universities, private sector, community organizations, civil society, etc.).

Stakeholders	**Role to support the implementation of the technical assistance**
National Designated Entity	Ensures alignment with national climate priorities and policies; supports coordination among government agencies and stakeholders. Linkage between the government and CTCN
Request Applicant – Taita Taveta National Polytechnic	Preparation and submission of the technical assistance request; coordinates project activities; liaises with stakeholders; provides local, ensures implementation aligns with project objectives. Coordinate project implementation, stakeholder engagement, technical training, and local capacity-building activities.

Ministry of Environment and Climate Change	Provides policy guidance on climate change and environmental management; supports integration with national climate strategies and NDCs.
Ministry of Energy and Petroleum	Facilitates integration of DME into clean cooking and energy systems.
Private Sector (Waste Management & Energy Companies)	Provide technical expertise, investment insights, and potential partnerships for waste-to-DME technology deployment.
Community-Based Organizations (CBOs) and NGOs	Support community engagement, awareness creation, and inclusion of vulnerable groups, including women and youth.
Development Partners / Donors	Provide technical expertise, funding support (outside CTCN scope), and knowledge sharing for scaling up implementation.
Research Institutions and Universities	Conduct technical analysis, feasibility studies, and provide research support on waste-to-energy technologies.
University of Nairobi	Research collaboration on waste characterization, gasification systems, catalyst studies, and environmental assessments
Jomo Kenyatta University of Agriculture and Technology	Support engineering design, pilot system development, process optimization, and technical research.
Kenya Industrial Research and Development Institute	Support industrial research, catalyst testing, technology adaptation, and process validation for local conditions.
Kenya Climate Innovation Centre	Facilitate innovation support, incubation, entrepreneurship development, and private-sector partnerships.
National Environment Management Authority	provide environmental regulatory guidance, permitting support, and environmental impact compliance
International Technology Partners (e.g., South Korean institutions and waste-to-energy companies)	Facilitate technology transfer, engineering expertise, catalyst system knowledge sharing, and advanced waste-to-DME technical support.
County Governments of Nairobi, Mombasa, and Nakuru	Support waste collection coordination, feedstock supply systems, pilot implementation, and community engagement.
Stakeholder(early stage)	Role in Supporting Implementation
Kenya Pipeline Company	Explore potential storage and fuel distribution infrastructure compatibility for DME systems

National Oil Corporation of Kenya	Support clean fuel commercialization pathways and market integration discussions
TakaTaka Solutions	Support waste collection logistics, feedstock aggregation, and circular economy integration
BasiGo	Potential collaboration on clean energy innovation and low-carbon fuel ecosystem development
Private LPG distributors and clean cooking enterprises	Assess DME blending, cylinder compatibility, cookstove adaptation, and market deployment opportunities
Waste recycling and plastic recovery companies	Support segregation, feedstock recovery, and waste supply chain development

Alignment with national priorities (up to 2000 characters including spaces):

1. Introduction

My proposed technical assistance in *"Assessing the Feasibility of Producing Dimethyl Ether (DME) from Plastic and Organic Waste as a Clean Household Cooking Fuel in Kenya for Climate Mitigation"* is closely aligned with Kenya's national climate commitments, development strategies, and sectoral policies. Kenya faces dual challenges of **inefficient waste management** and **heavy reliance on traditional biomass fuels** such as firewood and charcoal for household cooking. These challenges contribute significantly to greenhouse gas (GHG) emissions, deforestation, environmental degradation, and adverse public health outcomes due to indoor air pollution.This project addresses these interconnected challenges by exploring the conversion of plastic and organic waste into Dimethyl Ether (DME), a clean-burning alternative fuel. By integrating waste management and clean energy production, the proposed technical assistance contributes to Kenya's transition toward a **low-carbon, climate-resilient, and circular economy**. This section outlines how the project aligns with key national frameworks, including climate policies, development plans, and technology strategies.

2. Alignment with the Nationally Determined Contribution (NDC)

Kenya's Nationally Determined Contribution (NDC) Kenya commits the country to reducing greenhouse gas emissions by **32% by 2030** relative to the business-as-usual scenario. The NDC identifies priority sectors for mitigation, including energy, waste, and forestry, all of which are directly addressed by this project.

The proposed DME production system contributes to emissions reduction in several ways. First, by converting plastic and organic waste into fuel, the project reduces methane emissions that would otherwise arise from unmanaged waste decomposition in landfills. Methane is a potent greenhouse gas, and improved waste management is a key mitigation strategy under Kenya's NDC. Second, the use of DME as a household cooking fuel replaces traditional biomass such as charcoal and firewood, which are associated with high carbon emissions and deforestation. By reducing reliance on biomass, the project contributes to forest conservation

and enhances carbon sinks.

Furthermore, the project supports cross-sectoral mitigation by linking waste management and energy production. This integrated approach aligns with Kenya's NDC emphasis on **synergistic solutions** that address multiple emission sources simultaneously. Therefore, the technical assistance directly contributes to achieving Kenya's climate targets while promoting sustainable development.

3. Alignment with Kenya Vision 2030 and National Development Plans

The Kenya Vision 2030 serves as the country's long-term development strategy, aiming to transform Kenya into a newly industrializing, middle-income country. Vision 2030 is anchored on three pillars: economic, social, and political development, with strong emphasis on environmental sustainability and access to modern energy.

The proposed DME project aligns with the economic pillar by promoting **green industrialization** through the establishment of waste-to-fuel conversion systems. Such systems can stimulate local industries, create employment opportunities, and enhance value addition in the waste management sector. By converting waste into a valuable energy resource, the project contributes to resource efficiency and economic diversification.

Under the social pillar, the project supports improved quality of life by promoting access to clean cooking fuels. Indoor air pollution from biomass use is a major health concern in Kenya, particularly among women and children. The adoption of DME can significantly reduce exposure to harmful pollutants, thereby improving public health outcomes.

The environmental pillar of Vision 2030 emphasizes sustainable natural resource management and environmental conservation. The project contributes to this goal by reducing waste pollution, minimizing deforestation, and lowering greenhouse gas emissions. Additionally, the project aligns with the Medium-Term Plans (MTPs) under Vision 2030, which prioritize energy access, environmental sustainability, and climate change mitigation. The proposed waste-to-DME initiative also aligns with Kenya's Bottom-Up Economic Transformation Agenda (BETA), particularly under the sectors of climate action, manufacturing, housing and settlement, energy access, and environmental sustainability. By promoting circular economy practices, green industrialization, waste valorization, and job creation, the project supports BETA objectives related to inclusive economic growth, green employment opportunities, and sustainable urban development.

4. Alignment with Poverty Reduction and Social Development Strategies

Poverty reduction remains a central objective of Kenya's national development agenda. Limited access to affordable and clean energy disproportionately affects low-income households, forcing them to rely on traditional fuels that are both inefficient and harmful to

health.

The proposed DME initiative supports poverty reduction in several ways. First, it has the potential to lower long-term household energy costs by providing an alternative to expensive or inefficient fuels. Second, the project creates opportunities for **green job creation** along the value chain, including waste collection, sorting, processing, and fuel distribution. These activities can provide income-generating opportunities, particularly in urban and peri-urban areas where waste accumulation is significant.

Moreover, improved waste management systems can enhance living conditions in low-income communities by reducing environmental pollution and associated health risks. The project also supports inclusive development by integrating informal waste collectors into formal waste management systems, thereby improving their livelihoods and working conditions.

5. Alignment with Technology Needs Assessment (TNA)

Kenya's Technology Needs Assessment (TNA) Kenya identifies priority technologies required to support climate change mitigation and adaptation. Among the key priorities are **waste-to-energy technologies**, **clean cooking solutions**, and **low-carbon industrial processes**.

The proposed technical assistance directly addresses these priorities by evaluating the feasibility of producing DME from waste. This approach represents an innovative application of waste-to-energy technology, transforming waste into a clean and useful fuel. By focusing on DME, the project also contributes to the development and deployment of clean cooking technologies, which are essential for reducing emissions and improving public health.

Additionally, the project promotes technology transfer and capacity building by leveraging international best practices, particularly from countries such as South Korea, which have successfully implemented waste-to-energy systems. This knowledge transfer can enhance local technical capacity and support the adoption of advanced technologies in Kenya.The technical assistance will establish baseline waste-to-DME conversion ratios, household energy substitution potential, and full Life Cycle Assessment (LCA)-based greenhouse gas mitigation scenarios for Kenya."

6. Alignment with Low Emission Development Strategies (LEDS)

Kenya's Low Emission Development Strategies (LEDS) provide a framework for transitioning to a low-carbon economy while achieving sustainable development goals. Key priorities include reducing reliance on biomass energy, promoting renewable energy, and improving waste management systems.

The proposed DME project supports these priorities by offering a **low-carbon alternative to traditional cooking fuels**. By replacing charcoal and firewood with DME, the project reduces carbon emissions and supports the decarbonization of the household energy sector. Furthermore, the integration of waste-to-energy systems promotes a circular economy, where

waste is treated as a resource rather than a liability.

The project also enhances energy security by diversifying the energy mix and reducing dependence on imported fuels. This aligns with LEDS objectives of promoting sustainable and resilient energy systems.

7. Alignment with Nationally Appropriate Mitigation Actions (NAMAs)

Nationally Appropriate Mitigation Actions (NAMAs) are voluntary initiatives undertaken by developing countries to reduce emissions in line with their development priorities. Kenya has identified several mitigation actions in the energy and waste sectors, including the promotion of clean cooking technologies and improved waste management.

The proposed DME initiative qualifies as a potential NAMA by providing a scalable solution that reduces emissions from both waste and energy sectors. The project's integrated approach aligns with the principles of NAMAs, which emphasize cost-effective, sustainable, and nationally appropriate solutions.

Furthermore, the project has potential to attract international climate finance, as NAMAs are often supported by global funding mechanisms. By demonstrating feasibility, the technical assistance can pave the way for larger-scale implementation and investment.

8. Alignment with Technology Action Plans (TAPs)

Technology Action Plans (TAPs) focus on the implementation of priority technologies identified in the TNA. They aim to facilitate technology transfer, capacity building, and scaling up of climate-friendly technologies.

The proposed project contributes to TAPs by:

- Promoting the adoption of waste-to-energy technologies
- Supporting capacity building in gasification and fuel synthesis
- Encouraging innovation in waste valorization

By assessing feasibility, the project provides critical information needed to guide investment and policy decisions. It also supports the development of enabling environments for technology deployment, including regulatory frameworks and institutional capacity.

9. Alignment with the National Adaptation Plan (NAP)

Kenya's National Adaptation Plan (NAP) Kenya focuses on enhancing resilience to climate change impacts across various sectors. While the proposed project is primarily mitigation-oriented, it also provides important adaptation co-benefits.

For instance, reducing deforestation through decreased reliance on charcoal enhances ecosystem resilience and protects watersheds. Improved waste management reduces

vulnerability to climate-related health risks, particularly in urban areas prone to flooding and pollution. Additionally, diversifying energy sources enhances resilience to supply disruptions caused by climate variability.

10. Alignment with Sectoral Policies and Strategies

Energy Sector

The project aligns with Kenya's energy policies that promote clean cooking solutions and energy diversification. By introducing DME as an alternative fuel, the project supports the transition to modern energy systems.

C**omparative Positioning of DME within Kenya's Clean Cooking Strategy**

Kenya's clean cooking strategy promotes alternatives such as LPG, biogas, ethanol, electricity, and improved cookstoves to reduce dependence on traditional biomass fuels. However, each option faces challenges related to cost, infrastructure, feedstock availability, or scalability. Unlike LPG, which is largely imported, DME can potentially be produced locally from municipal plastic and organic waste, improving energy security while supporting circular economy goals. Compared to biogas and ethanol, DME is more suitable for large-scale urban applications because it utilizes existing municipal waste streams without competing for agricultural resources. While electric cooking offers long-term decarbonization potential, affordability and electricity access remain barriers for many households. DME therefore presents a complementary clean cooking solution that can reduce greenhouse gas emissions, indoor air pollution, waste accumulation, and dependence on charcoal and firewood, while supporting Kenya's climate mitigation and sustainable development objectives.

Waste Management Sector

The project supports sustainable solid waste management strategies by promoting waste reduction, recycling, and resource recovery. It aligns with circular economy principles and helps address challenges of waste accumulation in urban areas.

Climate Policy Framework

The project is consistent with the Climate Change Act (Kenya), which provides a legal framework for climate action in Kenya. The Act emphasizes low-carbon development, climate resilience, and sustainable resource use, all of which are supported by the proposed initiative.

11. Conclusion

The proposed technical assistance is highly consistent with Kenya's national climate and development priorities. It addresses critical challenges in waste management and household energy use while contributing to climate mitigation, economic development, and social well-being. By aligning with key frameworks such as the NDC, Vision 2030, TNA, LEDS, NAMAs,

TAPs, and NAP, the project demonstrates strong strategic relevance and potential for impact.

Importantly, the project offers a **practical and scalable pathway** for achieving multiple national objectives simultaneously. It supports the transition to a low-carbon economy, promotes sustainable resource use, and enhances resilience to climate change. The technical assistance will establish baseline waste-to-DME conversion ratios, household energy substitution potential, and full Life Cycle Assessment (LCA)-based greenhouse gas mitigation scenarios for Kenya." With appropriate policy support, financing mechanisms, and stakeholder engagement, the proposed DME initiative can play a significant role in advancing Kenya's sustainable development agenda. The proposed technical assistance is designed not only as a feasibility assessment, but also as a strategic foundation for future pilot implementation, technology localization, industry participation, and long-term integration of waste-derived DME within Kenya's clean cooking transition and circular economy agenda.

Reference document (please include date of document)	**Extract** (please include chapter, page number, etc.).
Nationally Determined Contribution (NDC)	Government of Kenya. (2020). *Kenya's Updated Nationally Determined Contribution (NDC)*. Nairobi: Ministry of Environment and Forestry- Section: Mitigation Contribution.pg 8-15
Technology Needs Assessment	Government of Kenya. (2013). *Technology Needs Assessment Report*. Nairobi: Ministry of Environment and Mineral Resources. Chapter 2 & 4 pg. 25-60
National Adaptation Plans	Government of Kenya. (2015). *National Adaptation Plan 2015–2030*. Nairobi: Ministry of Environment and Natural Resources. Chapter 4 & 6, pg. 50-110
Nationally Appropriate Mitigation Actions	Ministry of Environment and Natural Resources. (2015). *Kenya's Nationally Appropriate Mitigation Actions (NAMAs)*. Section-energy and waste mitigation Action-pg. 18-40
Low Emission and Mitigation Strategies	Government of Kenya. (2016). *Kenya Climate Change Framework Policy*. Nairobi. Chapter 3 pg.30-55
Technology Action Plan (TAP)	Government of Kenya. (2013). *Technology Action Plans for Climate Change Mitigation*. Nairobi. Section: Waste Management Technologies Pgs.: pp. 40–75
Supporting International and Comparative References	(2021). *Waste-to-Energy in Korea: Policy and Technology Review*. Paris: International Energy Agency. Chapter 2: Waste-to-Energy Technologies (2022). Pgs35-70

Clean Cooking and Energy Access	*Africa Energy Outlook*. Paris: International Energy Agency. Chapter: Clean Cooking in Africa, Pages**:** pp. 120–150

Development of the request (up to 2000 characters including spaces):

Please describe how the request was developed at the national level and the process used by the NDE to approve the request before submitting it (who initiated the process, who were the stakeholders involved and what were their roles?) and describe any consultations or other meetings that took place to develop and select this request, etc.

Background documents and other information relevant for the request:

- Please list all relevant documents that will help the CTCN analyse the context of the request and national priorities. Please note that all documents listed/provided should be mentioned in this request in the relevant section(s), and that their linkages with the request should be clearly indicated. For each document, please provide web-links (if available) or attach to the submission form. Please add any other relevant information as required.
- Please indicate if this request has been developed with the support of the CTCN Request Incubator.

OPTIONAL: Linkages to Green Climate Fund Readiness and Preparatory Support

The CTCN is collaborating with the GCF in order to facilitate access to environmentally sound technologies that address climate change and its effects, including through the provision of readiness and preparatory support delivered directly to countries through their GCF NDA. These actions are in line with the guidance of the GCF Board (Decision B.14/02) and the UNFCCC, particularly paragraphs 4 and 7 of 14/CP.22 that addresses Linkages between the Technology and the Financial Mechanisms[2].

The CTCN is therefore implementing some of its technical assistance using GCF readiness funds accessed via the country's NDA. Any application for GCF support, including the amount of support provided, is subject to the terms and conditions of the GCF and should be developed in conjunction with the NDA.

Please indicate whether this request has been identified as preliminarily eligible by the NDA to be considered for readiness support from the GCF.

☐ Initial engagement: The GCF NDA of the requesting country has been engaged in the design of this request and the NDA will be involved in the further process leading to an official agreement for accessing GCF readiness support.

☐ Advanced engagement (preferred): The GCF NDA of the requesting country has been

[2] Please see: https://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/auv_cop22_i8b_tm_fm.pdf

directly involved in the design of this request and is a co-signer of this request, the signature indicating provisional agreement to use readiness national funds to support the implementation of the technical assistance.

NDA name:

Date:

Signature:

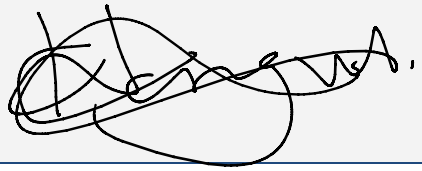
Monitoring and impact of the assistance:

By signing this request, I affirm that processes are in place in the country to monitor and evaluate the technical assistance provided by the CTCN. I understand that these processes will be explicitly identified in the CTCN Response Plan and that they will be used in the country to monitor the implementation of the technical assistance following standard CTCN procedures.
I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Monitoring & Evaluation Indicators

Objective Area	SMART Indicator	Baseline	Target
Waste Assessment	Quantity of waste streams assessed (tonnes/day)	Limited data	Waste characterization completed in Nairobi, Mombasa, and Nakuru
Technology Assessment	Number of waste-to-DME technology pathways evaluated	0	Minimum 3 conversion pathways assessed
GHG Mitigation	Estimated greenhouse gas reduction potential (tCO_2e/year)	Not established	Preliminary GHG reduction scenarios developed
Waste Diversion	Potential waste diverted from landfill (tonnes/year)	Low recovery rates	Feasibility scenarios established
Clean Cooking Transition	Estimated households potentially served by DME fuel	0	Preliminary adoption scenarios developed
Capacity Building	Number of engineers, researchers, and technicians trained	Limited expertise	At least 50 stakeholders trained
Institutional Strengthening	Number of institutions actively participating	Limited coordination	Minimum 10 institutions engaged
Technology	Technology transfer	None	1 framework completed

Transfer	framework developed		
Policy Support	Policy and regulatory recommendations developed	Fragmented policies	Comprehensive policy brief completed
Investment Readiness	Pilot project concept and implementation roadmap developed	None	1 pilot roadmap completed
Gender Inclusion	Percentage of women participating in consultations/training	Not systematically tracked	Minimum 40% participation
Knowledge Dissemination	Number of stakeholder validation workshops conducted	0	Minimum 3 workshops completed

Signature:	
NDE name:	Carolyne Njuguna
Date:	26/05/26
Signature:	

THE COMPLETED FORM SHALL BE SENT TO THE CTCN@UNEP.ORG

The CTCN is available to answer all questions and provide guidance on the application process.