



MECS-TRIID Final Project Report (Public Version)

Approach to Designing Delivery Models of Modern Energy Cooking Services in Tanzania (ADD-MECS-Ta)

TaTEDO- Centre for Sustainable Energy Services



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Produced by: TaTEDO
For: DFID and Loughborough University

Date: 28 February 2020

Document Control Sheet

Issue Status	Author(s)	Reviewed By	Loughborough University Approved By	Issue Date
Draft version	Jensen Shuma	Estomih N. Sawe		
Final version	Jensen Shuma	Estomih N. Sawe	Simon Batchelor/Jane Spencer	07/05/2020

Executive Summary

The MECS TRIID research project aimed at assessing and understanding the entire market systems of modern energy cooking appliances (specifically electric pressure cookers) in order to propose an approach for designing sustainable delivery/business models for scaling up their uptake in Tanzania. The project has been implemented in urban and peri-urban areas of Dar es Salaam Region (Ubungo and Kinondoni districts) and a rural area of Gairo District in Morogoro Region where PowerGen Company is currently operating a Solar PV Mini-Grid power plant.

The methodology of the research project was performed through sampling of participants, data collection and analytical assessment of information on modern energy cooking services. Sampling of the users of the Modern Energy Cooking Services for this research was performed by selecting households from segments of low, medium and high incomes and suppliers along the market chains. The research data were collected from both secondary and primary sources for use in different analytical assessment tools. The analytical assessment was conducted to understand the entire market systems of Electric Pressure Cookers (EPCs).

The following activities were performed by the project in order to achieve the research objectives:

- Undertake project preparatory activities which include application of research permit, introduction of project to Local Government Authorities (LGAs) in the selected areas and preparation of the inception report,
- Review literature and collect secondary data and information from different sources,
- Identify and assess demand of highly efficient electric pressure cookers,
- Undertake market analysis of the highly efficient electric pressure cookers,
- Assess the enabling environment for MECS in Tanzania
- Assess and understand the required support services

The research findings from the project indicate that the target markets for EPCs are households and small food business enterprises in both rural and urban areas. The aggregate demand of EPCs is still very low in Tanzania. The factors which were observed and considered to influence the demand of EPCs are awareness of appliance, price of appliance, seasonality of income, availability and quality of the appliance and income level of customers which determines affordability and prices of substitutes/compliments.

Based on the findings of the project, there are six potential chains for marketing EPCs to the end-users. These are market chains from manufacturers through importers to:

- i) supermarkets to urban end-users,
- ii) urban end-users
- iii) distributors to urban end-users
- iv) distributors to rural end-users
- v) distributors, retailers to urban end-users,
- vi) distributors, retailers to rural end-users.

Most of retailers are at the moment, mini-grid owners who supply EPCs to rural end-users.

The end users of electric pressure cookers who will benefit from modern energy cooking services are categorized into various groups based on their income. These are 1) Low Income Customers, 2) Medium Income Customers and 3) High Income Customers. The most potential customers for electric pressure cookers are type 2 and 3 customers (high and medium income segments) and 40% of the type 1 (low income customers) especially business persons and individual households with regular monthly income.

There are market barriers observed during implementation of the project. These are low awareness, low affordability due to limited financing for end-users, limited capitals for suppliers, availability of appliances, technical gaps such as after sale services, knowledge to use and cultural barriers related to tastes, perception, preferences and deep fraying.

The support services required for facilitating access of EPCs to end-users include: awareness campaign and promotion of EPCs, capacity building trainings for use, financial support to enhance affordability for end users and investment and working capital for importers, distributors and retailers and after sale services of electric cooking appliances.

The enabling environment is brought about by supportive policies of energy, trade, SMEs, micro-finance, feed-in-tariffs, fiscal and monetary issues and related strategies, programmes and institutional and legal frameworks. These documents among others support the delivery of modern energy cooking services in Tanzania.

According to this research study, it has been observed that the approach for designing the delivery model for modern energy cooking services will be undertaken through the following steps: 1) Entry Point and Assessment of Potentials, 2) Actors Assessment 3) Identify Potential Customers, Demand and Value Proposition 4) Assess and decide on the Supply Chain (market actors and barriers) 5) Study the Enablers and Determine Support Services to Actors, 6) Design and Test MECS Delivery Model, 7) Optimize, Review and Retest the Delivery Model, 8) Plan and Operationalize Implementation of MECS Delivery Model and 9) Select Implementers.

The specific focus of this research is an approach for designing Modern Energy Cooking Service Delivery model, which was assessed through analytical framework. The approach is supported by two components: 1) Mapping the Modern Energy Cooking Delivery System and 2) Tools Required for Designing MECS Model. The tools for MECS models include Delivery Model Map, Business Model Canvas, Stakeholder Mapping Tool, Need Assessment Tool and Risk Assessment Tool.

The case studies highlighted for sustainable delivery models were developed according to information and analysis which was obtained from participatory meetings in rural setting with mini-grid electricity users and urban setting with national grid electricity users.

The next steps will build on the implementation of the findings and recommendations of this research project and widen focus of this innovation to other areas. The MECS team at TaTEDO in collaboration with different partners will continue with the efforts of addressing the identified barriers along the market chain and within the enabling environment in order to contribute to the efforts of developing a market of EPCs in Tanzania.

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1.0 Introduction

The Approach to Designing Delivery Models of MECS in Tanzania (ADD-MECS-Ta) is a research project with purpose to study the entire market systems of the modern energy cooking appliances in order to identify, assess and understand market actors, barriers, enablers and drivers in order to propose for an approach that will improve the delivery of modern energy cooking appliances in Tanzania. The modern energy cooking services (MECS) researched through this project are geared towards improving market of modern energy cooking appliances specifically the high efficient Electric Pressure Cookers (EPCs) which are cleaner cooking appliances that have low or zero emissions of harmful fumes. The time scale of the project was six months (19 Aug 2018 -28 Feb 2020)

The project was implemented in urban and peri-urban areas of Dar es Salaam Region (Ubungo and Kinondoni Districts) and rural areas of Gairo District in Morogoro Region where PowerGen Company is currently operating a Solar PV Mini-Grid power plant.

1.1. Aims of the project

The project aim was to assess and understand the entire market systems of highly efficient electric cooking appliances (specifically EPCs) in order to propose an approach for designing sustainable delivery/business models for scaling up their uptake in Tanzania.

1.2 Objectives of the Project

The project intended to assess and understand the following attributes:

- Market chain from suppliers/importers, distributors, retailers to the customers/end-users of the modern cooking energy appliances and services,
- Socio-economic and cultural context of potential end-users or end users of the MECS in the project areas,
- Required support services (awareness, grants, micro-finance, capacity building, etc)
- Enabling environment (policies, strategies, legislation, etc).

1.3 Structure of the Report

The final research report presents the methodology and findings of the study from the project areas on the Approach to Designing MECS Delivery Models in Tanzania. The report starts chapter 1 on introduction which provides background, aim and objectives of the project. This is followed by the second chapter on methodologies for sampling, data collection and analytical assessment. The third chapter consists of work conducted in the field which is followed by findings of the research. The findings have four sections. The section 4.1 presents findings from the study on the MECS market system. These findings were used to develop an approach for designing MECS delivery models (Section 4.2). Section 4.3 describes the supporting tools that are part of this approach (the full tools are attached as appendices). Section 4.4 presents case studies of MECS Delivery Models developed by using the proposed approach. The report at the end explains where research findings will be applied, next steps, dissemination plan and conclusion.

2.0 Methodology

The methodology of the research project was performed through participant sampling, data collection and analytical assessment of information on highly efficient electric pressure cookers.

2.1 Sampling and Sample Size

Sampling of participants of the MECS research project was performed by selecting end-users from segments of low, medium and high incomes in order to identify and assess their market characteristics i.e. the end-users perceptions, preferences, understanding, barriers, levels of awareness, gaps and proposes interventions and options to increase access to EPCs. Sampling was also used to identify suppliers/importers, dealers and sales agents who are key actors in the marketing of EPCs.

Focus groups discussions were used for sampled out categories of district staff, women, importers, distributors, retailers and leaders at the local and national levels.

During the field work study, the project team selected 30 households for assessing among others, socio-economic and cultural issues including the end-users perception and demand of efficient electric cooking appliances. The information was captured from potential end users on different ways of scaling up the uptake of high efficient Electric Pressure Cookers (EPCs).

2.2 Data Collection

The research data were collected from both secondary and primary sources and were used in different analytical assessment tools. Secondary data were collected from published sources. The methodologies used for primary data collection were divided into five parts.

- The first part was to use tools of the Participatory Rural Appraisal (PRA) in villages where PowerGen mini grid are located to collect primary socio-economic, cultural information, needs and wants from rural based end-users with potentials of using EPCs.
- The second part was conducted through household survey and participatory meetings to collect primary information from urban and peri-urban end-users who are grid connected customers.
- The third part was conducted through survey of other market actors such as importers, distributors and retailers.
- The fourth part was to undertake meetings with development partners and financial institutions to find out the possibility of getting more information on knowledge and financial resource support, donor policies on clean cooking, investment opportunities for EPCs and any other interventions or plans for similar initiatives.
- The fifth part was on the enabling environment whereby meetings with staff from relevant ministries and government agencies were conducted to find out and discuss policies, acts, strategies and similar initiatives which may affect or influence the adoption of modern energy cooking services in Tanzania. This also included assessment of fiscal and monetary policies and their effects to the delivery of MECS in Tanzania.

2.3 Analytical Assessment

The analytical assessment was conducted to market systems of EPCs in order to propose an approach and interventions required for designing their delivery/business models in urban, peri-urban and rural areas of Tanzania. The research through analytical assessment was categorised into three levels of the market system which include: market chain, support services and the enabling environment.

2.3.1 Market Chain

The project assessed the market chains of the EPCs in order to identify the market actors and the demand from end-users for EPCs, as well as competitors (LPG, Kerosene, briquettes, charcoal and firewood stoves) and their distribution networks.

The project managed to undertake the following functions:

- Analyse and understand market chains of efficient Electric Pressure Cookers (EPCs).
 - Assess and understand market actors along the market chains (end-users, retailers, distributors, suppliers/importers and producers)
 - Analyse and understand barriers, enablers and drivers of delivery of EPCs,
 - Evaluate the end users behaviours and their appeal to market of EPCs by considering
 - How they prefer to buy EPCs
 - Whether they need personalized education and training
 - Whether they need additional products or services to be used along with appliances
 - Find out after sale services are required for appliances and who will provide them
 - Their willingness and ability to pay for EPCs
- Find out how to reduce market margins for affordability improvement towards fast marketing and delivery of EPCs for different segments of end-users
- Explore possibilities of micro-financing to provide affordable financing to end-users, distributors and retailers
- Find different ways of distributing EPCs to the end-users.

2.3.2 Support Services

The assessment was also conducted to determine kind of support services required for urban, peri-urban and rural areas. This includes to:

- Identify barriers and gaps of support services from different actors along the market chain.
- Find out different ways for granting access to micro-credits for low income end users so that they can pay for cooking appliances on flexible terms.
- Assess capacity along the market chain and possibility of developing it for actor's capacity and skills base, as well as that of other actors (e.g. local government or private sector),
- Find out and assess possible methods of increasing awareness of EPCs in the market i.e. radio, prints, TV, social media, live demonstration in national events/public areas, eCook Book, etc.

2.3.3 Enabling Environment

The enabling environment was also assessed as key and principal enabler for facilitating the widespread and uptake of modern energy cooking services. The assessment considered the following areas:

- Discuss with policy makers, credit providers, decision makers (national and local levels), etc. on enabling environment required for MECS
- Opportunities for fostering the enabling environment required for the delivery of highly efficient cooking energy appliances,
- The governmental structures, regulations, policies and incentives that support or can impede the delivery of cooking energy appliances and services.
- Identify areas for advocacy to the government and other influential actors (development partners) such as on tax reforms, incentives, financial institutions services and other reforms necessary for improving the enabling environment.

Market mapping was used to show the actors, barriers, enablers and drivers within the market system of EPCs including the required enabling environment and supporting services.

3.0 Implementation

3.1 The Work Conducted

The following activities were performed by the project in order to achieve the research objectives:

3.1.1 Undertake project preparatory activities which included application of research permits, introduction of project to Local Government Authorities (LGAs) in the selected areas and preparation of inception report

The initial procedure required for implementing the project and doing research in Tanzania is to seek permission from the relevant government authorities. The permit was requested and obtained from the President's Office-Regional Administration and Local Governments (PO-RALG). The permit was submitted to the Local Government Authorities (LGAs) to introduce the MECS TRIID project and requested the district support during project implementation. The inception report and research tools were as well prepared. The inception report was prepared to present preliminary key elaboration of the research project for data collection and analysis from the fieldwork. The research tools for data collection focused on the components of market systems which include market chains, additional support services required and the necessary enabling environment. The tools were questionnaires for household surveys and checklists for PRA and focus groups discussions. Checklists in urban areas were used for data collection from the development partners, market actors, micro financial institutions and relevant sectoral ministries. PRA tools were used for collecting data from stakeholders in rural areas.

3.1.2 Review literature and collect secondary data and information from different sources,

The review of literature was undertaken from published documents on the subject matter of the modern energy cooking services. The sources for the secondary data were from previous studies conducted on eCook and clean cooking in Tanzania and literatures on Modern Energy Cooking Services, energy delivery/business models, gender mainstreaming in energy cooking services, etc. Some of the sources of secondary information are records, reports, policies, strategies, newspapers, newsletters, internet, articles and journals.

3.1.3 Primary Information Collection

The primary data was collected from the field to assess the modern energy cooking context and identify the end users' needs and wants. The type of information gathered from three project districts varied depending on the levels of income, location, cultural issues and types of food cooked by end-users. The following approaches and methods were used for primary information collection:

- Undertake PRA for data collection and socio-cultural information at Songambele and Kitaita Villages in Gairo District,
- Distribute highly efficient electric pressure cookers to selected households (high, medium and low income) to test acceptability, willingness to pay and uptake of appliances and collect data from end users.
- Undertake interviews and participatory focus group discussions with high, medium and low-income customer segments in the community while ensuring gender consideration,

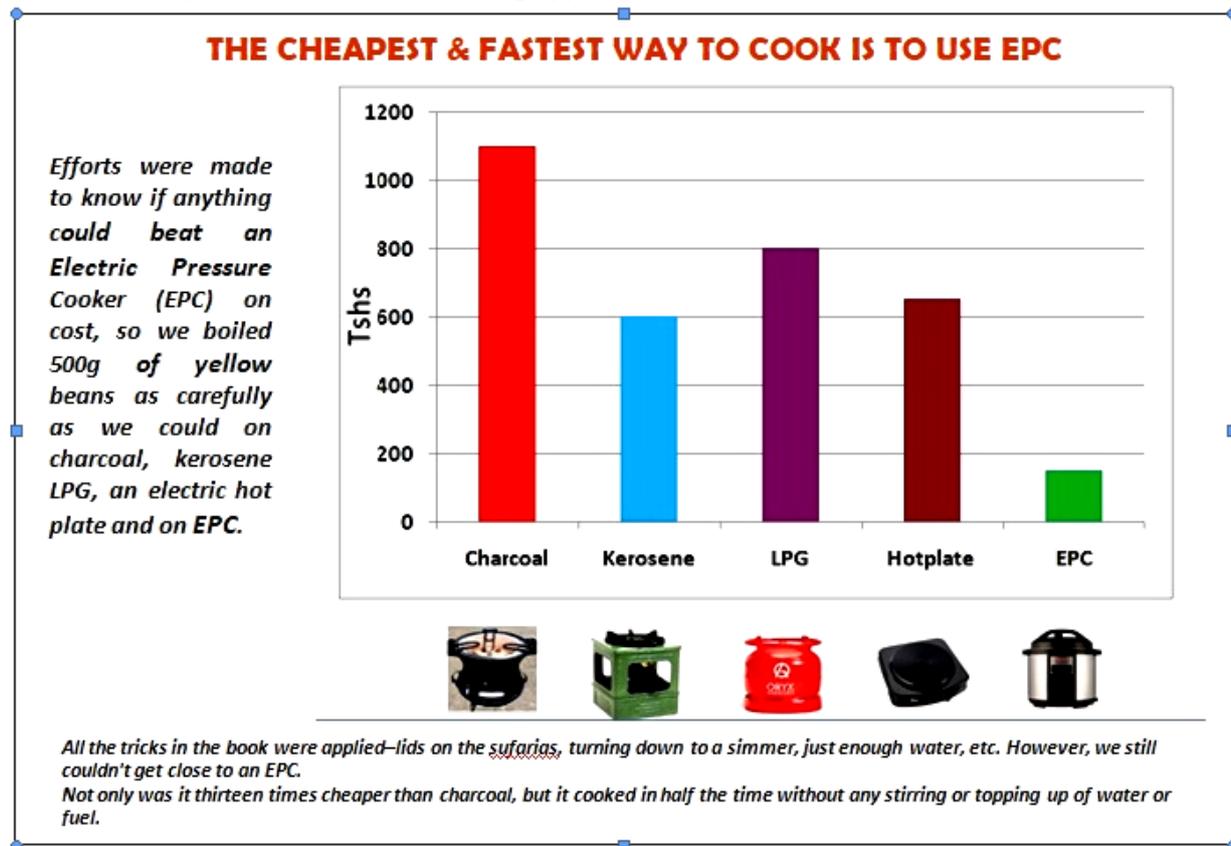
- Conduct household survey for the end users in Kinondoni and Ubungu Districts,
- Undertake meetings with the Development Partners in Dar es Salaam Region,
- Conduct meetings with Financial Institutions in Dar es Salaam Region,
- Undertake meeting with relevant ministries and Government Institutions in Dodoma as the Capital City of Tanzania.
- Identify and conduct survey of entrepreneurs along the market chains in all project districts

The information collected was used to identify and assess demand and supply, analyse market, assess required support services and determine the enabling environment. The analytical assessment was performed to get aggregated information of developing an approach and delivery/business models for scaling up delivery of MECS activities in Tanzania.

3.1.4 Identify and Assess Demand of Highly Efficient Electric Pressure Cookers

The aim of the demand identification was to assess the value proposition from both end-users and other stakeholders. The first step for demand assessment was to create awareness on how efficient electric pressure cookers work and their multiple benefits to end-users. It also included description and awareness raising of the values which the customers or end-users may receive by accepting to use electric pressure cookers for their daily cooking. The graphic illustration hereunder (chart 1) from eCook Project was used to create awareness on cooking energy budget comparison for a customer who is intending to switch to highly efficient Electric Pressure Cookers (EPCs)

Chart 1: Cost Comparison for Different Cooking Appliances



i). Intervention Context

The project is intending to serve end-users who are potential customers of EPCs in urban, peri-urban and rural areas. The selection of end users was determined by income levels and source of electricity. The end-users for rural areas were selected from smallholder farmers who are depending on income from agricultural products at Kitaita and Songambebe in Gairo District. The end-users for urban and peri-urban areas were selected from high, medium and low-income households of Kinondoni and Ubungu Districts in Dar es Salaam Region. The research also considered users versus energy infrastructure such as users of the national electric grid and local mini-grids. All these target groups were intervened to assess potential demand of EPCs and were used as an entry point of designing delivery model of modern energy cooking appliances and services.

ii). Actors Engagement and Mapping

Different actors were involved in assessing delivery of highly efficient electric cooking appliances and services. These included smallholder farmers, LGA staff, government staff, people in urban households, community groups at ward levels, end-users of micro-financial institutions, staff in the private sector, etc. The participatory approaches were used to map and engage end-users and other actors in rural, urban and peri-urban areas. These approaches were also used to collect data to identify demand by mapping out perceptions, preferences, drivers and interests of using EPCs.

iii). Needs and Wants

End-users needs during undertaking of this research focused on possibility of acquiring appliances which are affordable, clean, efficient, safe, energy/budget saving and do not require close care and attention when a user is cooking. The drivers for engaging users in the process of demanding EPCs were also identified and this led to the identification of users for testing EPCs adoption. A total of 22 end users who showed interest of participating in the research procured EPCs through direct payments and local credit mechanisms. These credit mechanisms in Kitaita and Songambebe were in the form of selling EPCs through village leaders as guarantors who will make close follow up to the end-users. In Kinondoni and Ubungo, some high-income segments paid cash but middle and low income paid through MFIs (SACCOS and VICOBA). The EPCs were used for testing their needs, wants and perceptions on the use of new appliances and changes in the cooking behaviours.

iv). Gaps and Barriers of Delivering Modern Energy Cooking Services

The process also assessed potential gaps and barriers of delivering EPCs to end-users. The different stakeholders helped to identify gaps/barriers and potential ways of filling those gaps. This was followed by the prioritisation of solutions in order to effectively remove gaps or barriers in the market system of modern energy cooking services.

v). Potential Interventions and Objectives

The research analysis also identified potential solutions that could be used for coming up with priority needs from end-users so that the existing barriers could be addressed. At the end, the users proposed some interventions as possible solutions and objectives which helped to develop approach and ultimately delivery/business models for supporting MECS at the community level.

3.1.5 Undertake Market Analysis of the Electric Pressure Cookers

The project at this stage, managed to undertake analysis of the potential value propositions and determine which market chain options are available for dissemination of EPCs. On the basis of the characteristics of the socio-economic and cultural context and the existing enabling environment, market analysis involved combination of resources, people and processes that are aimed to improve delivery of modern energy cooking services in a sustainable way to the end-users. The process involves EPC promotion or awareness creation, understand customer satisfaction, understand customer needs, identify segments of EPC interested customers, market testing and assess willingness and ability to pay from customers.

The market chains and associated actors who are expected to supply EPCs to the end-users were identified. The next stage was to find out how to ensure that proposed values will be delivered to end-users through market chains. The last step is to ensure sustainability and determine benefits of social-cultural and environment attributes required in each market chain.

3.1.6 Assess and Understand the Required Support Services

The support services are required to mitigate risks and improve delivery of modern energy cooking services to end users and market actors. The research team in some areas of Gairo, Ubungo and Kinondoni districts observed areas with lack of market for EPCs and tried to find out gaps or barriers which have caused this situation. This led to the identification of type of additional support required to design and deliver EPCs to the end users. The main gaps/barriers which were assessed during the undertaking of the research activities include; level of awareness, capacity and skills of market actors, financial support available for end users and other market actors, availability, after sale services and quality of EPCs.

3.1.7 Assess the Enabling Environment for MECS in Tanzania

The research assessed governmental policies, structures, regulations, and incentives that support or impede the delivery of modern energy cooking services. The enabling environment information was gathered through the following procedures:

- Discuss with staff from relevant ministries, government institutions and local government staff to get their perception on modern energy cooking services,

- Review existing policies, strategies, regulations plans, programmes and other government documents to identify the policies which support or impede modern energy cooking services.
- The assessment was also made to find out those policy areas which could be barriers for the market of EPCs in Tanzania.
- Determine government regulations, structures and policies that support business and marketing of similar goods and services in the country

Although many of the enabling environment attributes are beyond the direct control of the market actors and end-users, assessment of these attributes was considered important for designing measures for developing sustainable delivery/business models.

3.2 How the Idea was Generated.

The idea of developing an Approach for Designing a Delivery Model for Modern Energy Cooking Services originated from the perceived problems and difficulties of disseminating and scaling up the efficient electric cooking appliances to end-users. The problem was experienced immediately after the eCook Study which was carried out by TaTEDO, GAMOS, University of Surrey and Loughborough University in 2018. Electricity was observed to be the cleanest and cheapest means of cooking food and if it is used in efficient appliances will be affordable by most of the people, especially the poor segments in the community. The challenge was low awareness and appropriate means of obtaining and supplying EPCs to the end-users. Inefficient and low quality appliances were also noted to be a major barrier. These were among the barriers for efficient cooking and appropriate delivery to potential end-users in the country.

3.3 Challenges Faced and their Resolution/Mitigation

The main challenge faced during the implementation of the research project is rescheduling of the planned activities due to the delays of processing permits and introduction of the project to local authorities in the project areas. The reason for this change is due to the fact that the permit process and project introduction coincided with a period of local election registration, campaigning and election of new leaders of the local governments. The MECS team had to wait for new local regime in the local government to be in place. This challenge was mitigated by rescheduling the work-plan and moved forward activities of the project research permit and introduction of the project at the districts and wards levels.

3.4 Gender Mainstreaming in the MECS Activities

During the project implementation, MECS team managed to develop links between women's cooking activities and possible clean energy solutions. The project has studied factors that influence adoption of clean cooking solutions and use by women and girls. These include type of cooking appliance and socio-cultural factors, such as how time saved from use of clean and efficient electric cooking appliance is spent. The data and analytical assessment from this project are expected to benefit women and girls through the development of sustainable delivery models for cooking appliances related to gender and women's empowerment. Women also participated in different parts of the project implementation to provide information for scaling uptake and improving market of modern energy cooking services. The research also assessed how MECS delivery model can be used to facilitate the uptake of EPCs by end users who to the large extent are women and girls. During analytical assessment, the project strived to find out the needs and preferences of women and girls which would be used to inspire men so that they could help more women to procure EPCs.

4.0 The Research Findings

4.1 Situation of Modern Cooking Energy Delivery System

4.1.1 Electricity as Energy for Modern Cooking Services

Electricity in Tanzania is generated from different sources such as hydro, natural gas, solar, small hydro and thermal diesel and biomass generation. Although, electricity is used for lighting, ironing and phone charging in residential sector, it is exclusively used as energy for cooking by few high income households. According to NBS/REA, of 2016 only 32.8 per cent of households were connected to the national grid in Tanzania but households which are using electricity for cooking is only 0.3 percent. The cost of electricity for this customer category including tax, and other levies is TZS 355 (GBP 0.13) per kWh. If a household will use hotplate, two units of electricity per meal cooked, or six units per day at TZS 2,130 (GBP 0.76), monthly consumption of electricity for cooking would approximate TZS 63,900 (GBP 22.8), currently more expensive than charcoal.

Frequent power cuts also frustrate households that cook with electricity, often requiring a back-up supply of household fuel often charcoal and LPG. Very few Tanzanians think that they will ever have the opportunity to cook using electricity. Access, reliability and affordability seem to be barriers to the promotion of electricity as an alternative to biomass (firewood and charcoal); therefore, it has been difficult for many people to imagine electricity as a realistic alternative energy in the foreseeable future.

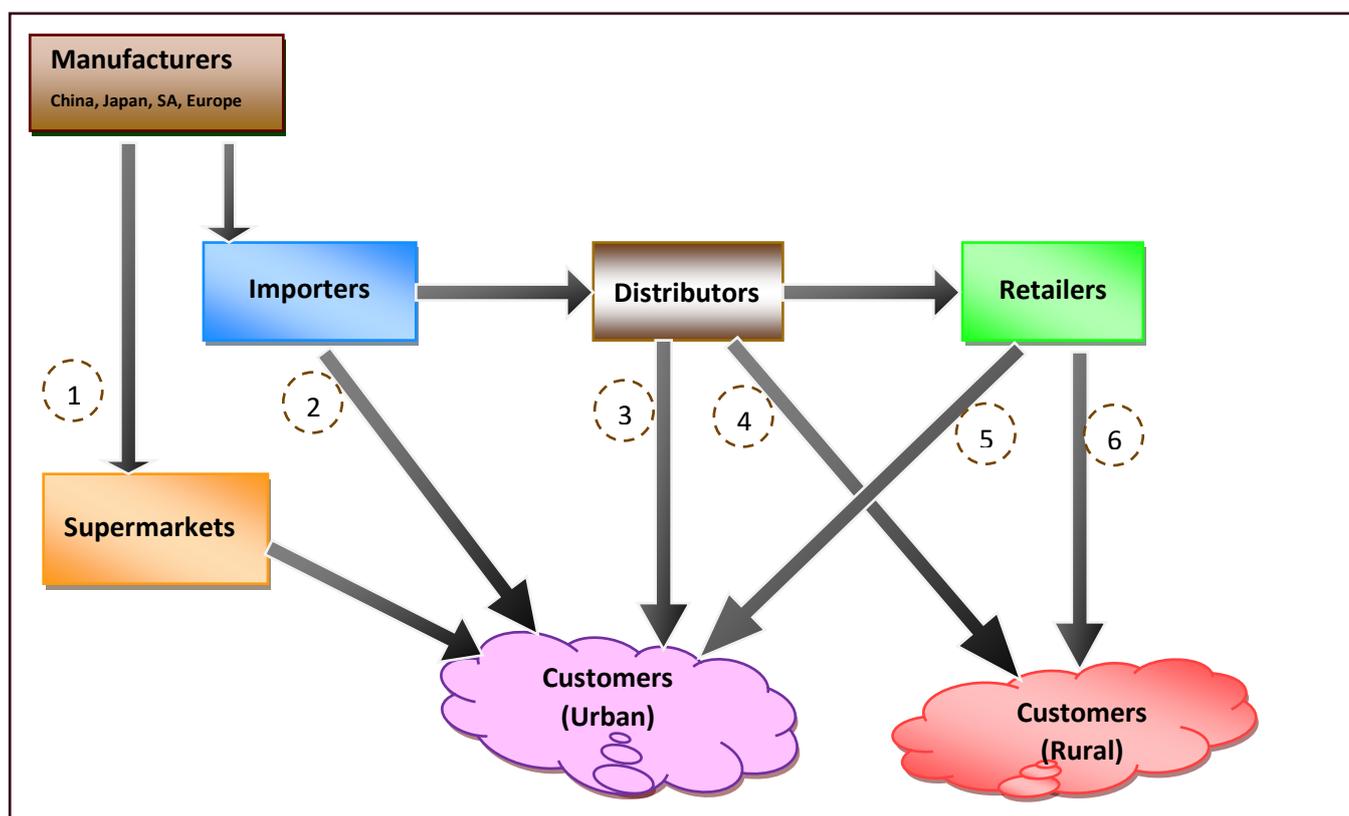
4.1.2 Market Chains for Electric Cooking Appliances (EPCs)

Market Chains according to this research, are channels that take electric cooking appliances from manufacturers to end users, are currently of different depending on type and number of actors. The main electric cooking appliance researched for marketing through this project is Electric Pressure Cooker (EPC). The target markets are households and small business enterprises in both rural and urban areas. There are six chains for marketing EPCs to the end-users.

- i) The market chain from manufacturers through supermarkets to end-users,
- ii) The market chain from manufacturers through importers to urban end-users
- iii) The market chain from manufacturers through importers, distributors to urban end-users
- iv) The market chain from manufacturers through importers, distributors to rural end-users
- v) The market chain from manufacturers through importers, distributors, retailers to urban end-users,
- vi) The market chain from manufacturers through importers, distributors, retailers to rural end-users.

The following chart shows marketing chains through which end-users may obtain electric cooking appliances.

Chart 2: Marketing Chains for EPCs



The EPCs are manufactured in different countries (China, Japan, South Africa, Europe, etc.) and are imported by local importers or owners of supermarkets to Tanzania. Several of these supermarkets are in urban areas. The EPCs which are vended through supermarkets are bought directly by urban end-users. The local dealers may either supply EPCs to urban end-users who will go to their stores or shops or supply them through distributors who have been selling them to retailers. The retailers may either transport them to the remote areas of mainland towns or rural areas connected with electricity. Many of these retailers are mini-grid developers who intend to introduce new electric appliances to the mini-grid customers. The important market chain for rural end-users is the one starting from manufacturers through local importers, distributors, retailers to rural end-users. The important market chain for urban end-users is the one starting from manufacturers through local dealers, distributors to urban end-users. These chains are important because

services of awareness, promotion, capacity building coupled with reasonable prices provided to the end-users. The longer the market chain, the lower the share of revenue which is generated by EPCs as the work, reward and transport costs are spread out among many business enterprises. This may also end up with high retail price of EPCs to the end-users. This information was obtained from pricing structure which was assessed from suppliers of EPCs along the market chain.

i) Gross Margin Analysis of EPC

The gross margin analysis was determined to not only to manage the profit of the businesses along the market chain but also to weigh how much taxes are involved in the process of supplying EPCs to the end users in Tanzania.

Table 1: Gross Margin or Pricing Structure Analysis

	Items	TZS	GBP	GM/Tax
1	Average Retail Price (retailers)	210,000	75.0	
	Transport (from distributor)	1,000	0.4	
	Tax	17,600	6.3	8.38%
	Training	5,200	1.9	
	Retailer Gross Margin	6,200	2.2	2.95%
2	Distributor Price	180,000	64.3	
	Transport to retailer	1,250	0.4	
	Transport from Importer	1,000	0.4	
	Promotion	3,250	1.2	
	Training	10,500	3.8	
	VAT (18%)	32,400	11.6	18.00%
	Distributor Gross Margin	10,400	3.7	5.78%
3	Importer Price	125,000	44.6	
	Transport from entry points	1,000	0.4	
	Importation costs	5,200	1.9	
	VAT (18%)	22,500	8.0	18.00%
	Import Duty (10%)	8,800	3.1	7.04%
	Importer Gross Margin	10,000	3.6	8.00%
4	Producer Price	77,500	27.7	

The total gross margin for different actors along the market chain is 16.73%. The total tax (including VAT, Import duties and others) which is deducted from the sales of EPCs along the market chain is 51.42%. This implies that exemption of EPC from tax payment will reduce the price of EPC by more than 50% in the market. If some distributors decided to import directly from manufacturers this would also reduce price by 8%. The gross margins for actors are generally low because business for EPCs is at the early growth stages in Tanzania and it requires some effort to develop marketing efficiencies.

4.1.3 Customer (End-Users) Segments

The end users or customers of EPCs who will benefit from saving and reduced costs of modern energy cooking services are categorized into various segments based on their income, availability of electricity and other preferences such as sizes of the appliances. The information was obtained during household surveys, focus group discussions for urban end-users and PRA for rural end users. The category percentage was also determined from the NBS Household Budget Surveys (2017). The customers of EPCs can be splinted in the following categories:

Type 1 – Low Income Customers

About 53% of people fall into this sub-categories:

- Smallholder farmers with average earning of 2-2.5 £ per day
- Business persons - earning between 2-5 £ per day.
- Individual households with regular monthly incomes (rural medical officer, rural school teachers, etc.) – earning between 4-7 £ per day.

Type 2 – Medium Income Customers

About 32% of people belong to the following sub-categories

- Medium scale farmers and enterprises – earning between 8-10£ per day
- Individual households – earning average income of about 10£ per day.
- Small enterprises such as food kiosks, food vendors, etc with 8 – 15£ per day
- Faith Based organization offices like churches and mosques with 8-10£ per day

Type 3- High Income Customers

About 15% of people with the following sub-categories

- Large farmers earning income of more than 40 £ per day
- Employed Individual households earning income of more than 35 £ per day
- People with Business Activities earning income of more than 55 £ per day

The most important customers for EPCs are types 2 and 3 (high and medium-income customers) and 40% of the type 1 (low-income customers), which encompasses business persons and individual households with regular monthly income. The criteria used for selecting who would be a likely and important customer include their income or purchasing power and connection to electricity (solar, mini-grid and national grid). The smallholder farmers require special arrangements of flexible payments such as credit financing because their income is seasonal. The supplier who will target this market must access it during crop harvesting when farmers have high income. The end-users in urban areas are households and small SMEs which require modern energy cooking appliances and services for meal preparation. Most of the distributors and retailers are supposed to target these customers. The future efforts will strive to have an active promotion and marketing strategy to cater for the above categories. Most efforts will be directed towards clients and areas which will have a high demand for EPCs.

4.1.4 Value Proposition

The main value proposition which is expected by end-users is household energy cost reduction, time saving and clean energy cooking services. Value proposed for **suppliers** will be profit obtained from sales of EPCs. Other proposed values for **end-users** include reduced in-door air pollution, safety of appliance, quality, quicker cooking services, efficiency and energy saving and reduced labour required for collection of fuels (Table 1). More than 90% of Tanzanian population is using biomass fuels on inefficient cookstoves. For most end-users, these EPCs will be new appliance for cooking since some of them are using inefficient cookstoves. Therefore, introduction of MECS is expected to solve the end-users' problems of inefficient technologies, implying reduced wasteful consumption of energy and high cost to the meal preparation.

Table 2: Value Proposed by Users Received EPCs

S. No	Places	EPCs Supplied	More Required EPCs at the time of the study	Type of Sale	Value Proposed
1	Kitaita/Songambebe (Gairo)	6	10	Credits through Village Leaders	Reducing time and labour for collecting cooking fuels, quick cooking services
2	Kimara (Ubungo)	2	13	Cash and Credits through VICOBA	Reduced household energy budgets, time for cooking, in-door air pollution
3	Sinza (Ubungo)	3	14	Cash	Reduced household energy budgets, time for cooking, safety, reduced labour for cooking
4	Goba (Ubungo)	2	10	Credits through VICOBA	Reduced household energy budgets, labour for cooking, in-door air pollution, appliance safety
5	Mwananyamala (Kinondoni)	2	8	Credits through *VICOBA	Reduced household energy budgets, time for cooking, use appliance in food vending enterprise
6	Mbezi (Kinondoni)	4	15	Cash	Reduced household energy budgets, quicker cooking services, efficiency and energy saving
7	Kawe (Kinondoni)	3	12	Cash and Credit through **SACCOS	Reduced household energy budget, reduced time and labour for cooking, cleaner kitchen environment

* VICOBA means Village Community Bank

** SACCOS means Savings and Credits Cooperative Society

4.1.5 Demand of the Modern Energy Cooking Appliances

The aggregate demand of EPCs is still very low in Tanzania. The factors which were observed and considered to influence the demand of EPCs are price of appliance, awareness, purchasing power of end-users, seasonality of income, prices of substitutes/compliments and quality of the product.

- a) Price of the Appliance: The retail price to end-users of the EPCs ranges from TZS 180,000 (GBP 65) to TZS 250,000 (GBP 90) depending on a point along the chain the appliances are procured by an end-user. The EPCs have high price elasticity of supply; therefore increase in price due to associated market costs may make some low income customers withdraw from buying the product.
- b) Awareness: The EPCs as observed in rural and urban areas is a new product in the market. Several end users in households, government departments, local governments, financial institutions and donors are not aware of benefits of EPCs on energy and budget saving in their households.
- c) Ability to Pay by Customers: The research was conducted in high, medium and low income clusters of different end-users. High income end-users have ability to pay for EPCs easily. The medium income end-users have shown ability to buy the appliance through credit facilities. The low income end-users will buy the EPC whenever is subsidized through specific market schemes or affordable credit mechanisms.
- d) Seasonality of Income: The factor was observed for rural customers in which there is time in the year, people have relatively high income (boom) and the time when people have low income (recession) in rural areas. This is attributed to seasonality of income from agriculture.
- e) Prices of Substitutes and Complements: The substitutes of EPCs are LPG stoves, normal pressure cookers, charcoal stoves, firewood stoves, etc. The complementary service of EPCs is electricity. If the tariffs of electricity are higher than prices of alternative energy sources, customers may weigh prices from alternative fuels and costs incurred by using electricity for cooking and based on this factor some customers may switch to substitutes.
- f) Quality of the Appliance: There are several types of EPCs. The assessment of quality of the EPCs, showed that some EPCs are not well insulated and some parts are hot when a user is cooking, such that quality varies according to brand and makes in the market. This factor may also make customers demand the high quality electric pressure cookers.

Demand of modern energy cooking services by end users may also be influenced by other needs such as sizes of EPCs, ability to use and fears of new technology. It was realized that demand of EPCs requires promotion and training on how to use the appliances. These functions will enlighten end users on demand attributes above.

4.1.6 Support Services for Modern Energy Cooking Appliances and Services

There are three categories of local actors of modern energy cooking services which require support services namely importers, distributors, retailers and end-users. Modern energy cooking appliances and services are new innovations in the community; that is why its market is still underdeveloped. The strategy for scaling up its market is important and this requires support services for customers in order to promote sales and achieve customer satisfaction.

The support services required for EPCs to customers are as follows:

- Awareness campaign and promotion of EPCs,
- Capacity building trainings for different groups of end-users
- Financial support to suppliers and end-users
- After sale services for highly efficient electric cooking appliances
- Advocacy for supportive policies, strategies, regulations, tax exemptions etc.

These support services are required for facilitating the scaling up market of modern energy cooking appliances. These services may dramatically increase customer trust and loyalty since potential customers may see how EPC is working and demand it for cooking in their households. These factors were identified through stakeholders' interviews during household surveys and focus group discussions.

4.1.7 Capacity Needs along the Market Chains

The capacity of actors along the market chains is important attribute to ensure marketing of EPCs. The analysis of the capacity for market actors were undertaken in order to facilitate scaling up of market of EPCs to customers. The capacity needs of actors along the market chains are as shown hereunder:

Table 3 Capacity Required for Different Actors in the Market System

S. No.	Actor	Required Capacity/Support
1	Importer	Reduced import duties, business capitals, knowledge on standards and quality, EDS training, financing to enhance investment and working capitals.
2	Distributors	business and market networks, knowledge of after sale services, marketing techniques, knowledge of the EPC, business capitals
3	Retailers	awareness, knowledge of the EPC, business capital, network of customers, repairing skills, transport
4	End-Users	awareness, EPC operating ability, problem fixing, cleaning and maintenance,

The main capacities required by all suppliers are investment and working capitals for expanding their business activities, knowledge and specifications of the EPCs and business and market skills. The capacities required by end users are awareness, operating ability for EPCs and after sales services. The awareness in rural areas can be raised by brochures, leaflets, posters, radio and live demonstration while in urban areas may be raised by prints, radio, TVs, social media and trade fairs.

4.1.8 Enabling Environment for Modern Energy Cooking Services

The enabling environment in this case refers to the formal policies, strategies, public infrastructure, institutional and legal frameworks that support the delivery of modern energy cooking appliances and services in the market. The following policies, strategies, legal documents and infrastructure are supporting modern energy cooking services.

Table 4: Enabling Environment (Policies, Strategies and Legal Documents)

Policies	Strategies/Programmes	Legal Documents
National Energy Policy (2015)	SE4ALL Action Agenda (2015)	Electricity Act of 2008
Tanzania Trade Policy (2017)	Power System Master Plan (2016)	Rural Energy Act of 2005
Tanzania Monetary Policy (2018)	Rural Electrification Master Plan	Energy and Water Utility Regulatory Authority Act (2006)
Tanzania Fiscal Policy (2017)	Biomass Energy Strategy for Tanzania (BEST)(2014)	Business Registration Act
National SMEs Policy (2003)	Standardized Power Purchase Agreement & Tariffs (2008)	Tanzania Trade Development Authority Act (2009)
National Micro-Finance Policy (2017)	Tanzania Investment Prospectus (SE4All) (2015)	Environmental Management Act 2004
Energy Subsidy Policy (2013)	National Public Private Partnership Implementation Strategy	
Feed-in tariff policy (2004)		

The National Energy Policy (2015) focuses on market mechanisms and means to reach the objective, and achieve an efficient energy sector with a balance between national and business interests. The policy stipulates measures for affordable and reliable energy supplies in country. It takes into account energy related environmental considerations and increase energy efficiency. The SMEs Policy (2003) stipulates possibility to promote business services, by using affordable and efficient energy services. Some of the key regulations governing Tanzania's energy and renewable energy sectors are stipulated in the Energy and Water Utilities Authority (EWURA) Act (2006). Some functions which are conducted by EWURA are to protect consumer interests; and protect the financial viability of efficient suppliers. Micro finance Policy (2017) creates an enabling environment for efficient and effective microfinance sub-sector in the country that serves the needs of the low-income individuals, households and enterprises.

The fiscal policy in relation to MECS includes import duties, taxes, exemptions, subsidies and energy bills. The energy bills depend on three attributes tax rate, level of consumption and unit price. The higher cooking energy consumption by end-users can be caused by inefficiency of cooking appliances and low consumer awareness. The attributes have effects to the consumer purchasing power and household welfare.

Most of these policies and regulations are supporting and creating enabling environment for activities of the proposed business. However, the MECS market environment can be improved by reducing tax and providing incentives in order to increase affordability of EPCs to low income end-users.

4.1.9 Barriers for Delivering Highly Efficient Electric Pressure Cookers

The research project assessed barriers of supplying EPCs from different end-users. The following are barriers assessed and identified during implementation of research activities:

i) Awareness Barriers

The main barrier observed from end-users at all levels was low awareness of using EPCs. Efficient cooking by using EPCs is a new practice to many end-users. The MECS also requires to be introduced in the country education system. The lack of awareness was also observed for development partners, government staff, local leaders and end users in the community. The low awareness if is not resolved will become barrier for demand, support services and commercialization of electric cooking appliances and services. MECS knowledge and skills are also supposed to be introduced in education system of Tanzania.

ii) Financial Barriers

The financial barriers, according to this project can be divided into low affordability by end-users and limited access to capitals for suppliers. The low affordability was observed to be a gap for medium and low-income segments of end-users in both urban and rural communities. This is attributed to seasonality of income for rural end-users and priority put on cooking appliances, lack of adequate income and gender income allocation decisions in the households for urban end-users. The financial barrier for suppliers is limited access to capital for business development (such as credit, loans etc.).

iii) Technical Barriers

The technical barriers identified through this project are size of appliances, quality, knowledge on how to use appliance and after sale services. The size of many appliances promoted and sold through different stores and supermarkets are of six litres. This seems to be inadequate size for a large family of more than eight people. Cooking with efficient electric appliances requires changes in normal practices and behaviours of preparing meals in the households. The qualities of EPCs in the market are different caused by efficiency, operability and limited functions of the appliances. This requires new knowledge on how to use appliance. Any person who will buy EPC will also require assurance of after sale services such as repairs and spare parts. Others will also prefer to have two pots per EPC instead of one.

iv) Cultural Barriers

The cultural barriers assessed from end users especially in rural areas, are related to heating and warming up the house, drying crops and frying some food stuff. The traditional cookstoves are used for cooking and cater for above functions, the electric pressure cooker is only used for cooking. Therefore, the family in cool areas is supposed to find other means of warming up, drying crops and frying food. There are also considerable suspicions surrounding the introduction of EPCs as new products to end -users. Some end-users would prefer for someone else to use and carry the process of appliance familiarity before they buy.

v) Appliance Availability Barriers

The high efficient electric cooking appliances (especially EPCs) are not easily available in the market at the moment. If awareness creation and promotion is undertaken for EPCs, there are high chances that there will be scarcity of those appliances in the market. There is a need for bulky supply of EPCs in the country in while exploring possibility of establishing factory for EPCs in Tanzania for enhancing supply of EPCs as demand is strengthened

4.2 Approach for Designing the MECS Delivery Model

A MECS delivery model is a combination of the appliance, support services, management activities, enabling environment and relationship types required to supply efficient cooking energy appliances to end users. This research has resulted in an approach for developing delivery models for EPCs, which consists of the following steps:

Table 5: Steps in the Approach for Designing the Delivery Model for EPCs

S. No.	Step	Description
1	Starting Point and Assessment of Potentials	The starting points are different depending on challenges along the market system. According to the research, the starting point was the problems of low awareness, unavailability and difficulty of supplying EPCs to the end-users. This is followed by choosing appliance for cooking, initial MECS modelling functions and involved actors and geographical areas. The potential of uptake of the EPCs is also required to be assessed from all actors and from selected areas.
2	Actors Analysis	The actors' analysis should be undertaken for high, medium and low income segments in the market chain in considered geographical areas. The analysis also involve social-cultural assessment of each segment and their affordability of appliances and services
3	Identify Potential Customers, Drivers, Demand and Value Proposition	The potential customers of efficient cooking appliances need to be identified at this stage and drivers for adopting the cooking appliances. This is followed by determination of potential demand of highly efficient cooking appliances through assessing intervention context, how customers will be engaged, socio-economic and cultural issues, needs and wants, gaps and barriers and potential interventions/objectives. The value proposition of both end-users and suppliers will also be identified as drivers for demanding appliances.
4	Assess and decide on the Supply Chain(market actors)	The step needs to assess the supply chains of EPCs in the market and determine the important supply chain for a particular area. The important supply chain should be able to reach most customers and provide the reasonable market margin. All associated market services and market actors need to be assessed to remove any anomalies along the market chain.
5	Study the Enablers and Determine Support Services	The enabling environment in terms of policy, strategies, legal and regulatory frameworks through which the model will operate need to be assessed. The support services for end-users and suppliers will also be determined to find out kind of support should be provided to market actors.
6	Design and Test Delivery Model	At this stage, different tools and charts will be used to build the delivery model which will deliver appliances to the end-users in the community. This stage will go concurrently with division of responsibilities and understand the various outputs and interventions needed. The approach is followed by testing the model on proposed values and interventions through different assumptions and gathering more information and lessons.
7	Optimize, Review and Retest the Delivery Model	The approach at this stage should be optimized by assessing risks (market, financial and social risks) and provide mitigation measures. Review the model by ensuring all sustainability requirements and supporting services are in place. This will be followed by retesting and finalizing the delivery model.
8	Plan and Operationalize Implementation of Delivery Model	The approach at this stage will develop an implementation work-plan and an M&E plan to make the delivery model operational. The implementation should start with pilot and scale up with time after getting encouraging outcomes provided that financial resources and other support are in place.
9	Select Implementers	The team of professionals and support staff has to be selected to ensure barriers along the market chain are addressed and operations in the model are delivered according to the requirements and conditions in the appliance market.

The delivery model will be implemented in a situation where market is absent, fragile or thriving in Tanzania. The approach should be able to identify drivers which will attract customers to buy appliances. This situation requires support services for scaling up the market. The support could be in the form of economic, both monetary and in-kind (e.g. government subsidies or incentives and donor funding), and could also include capacity building and advocacy to influence public energy related policies, strategies, initiatives, etc.

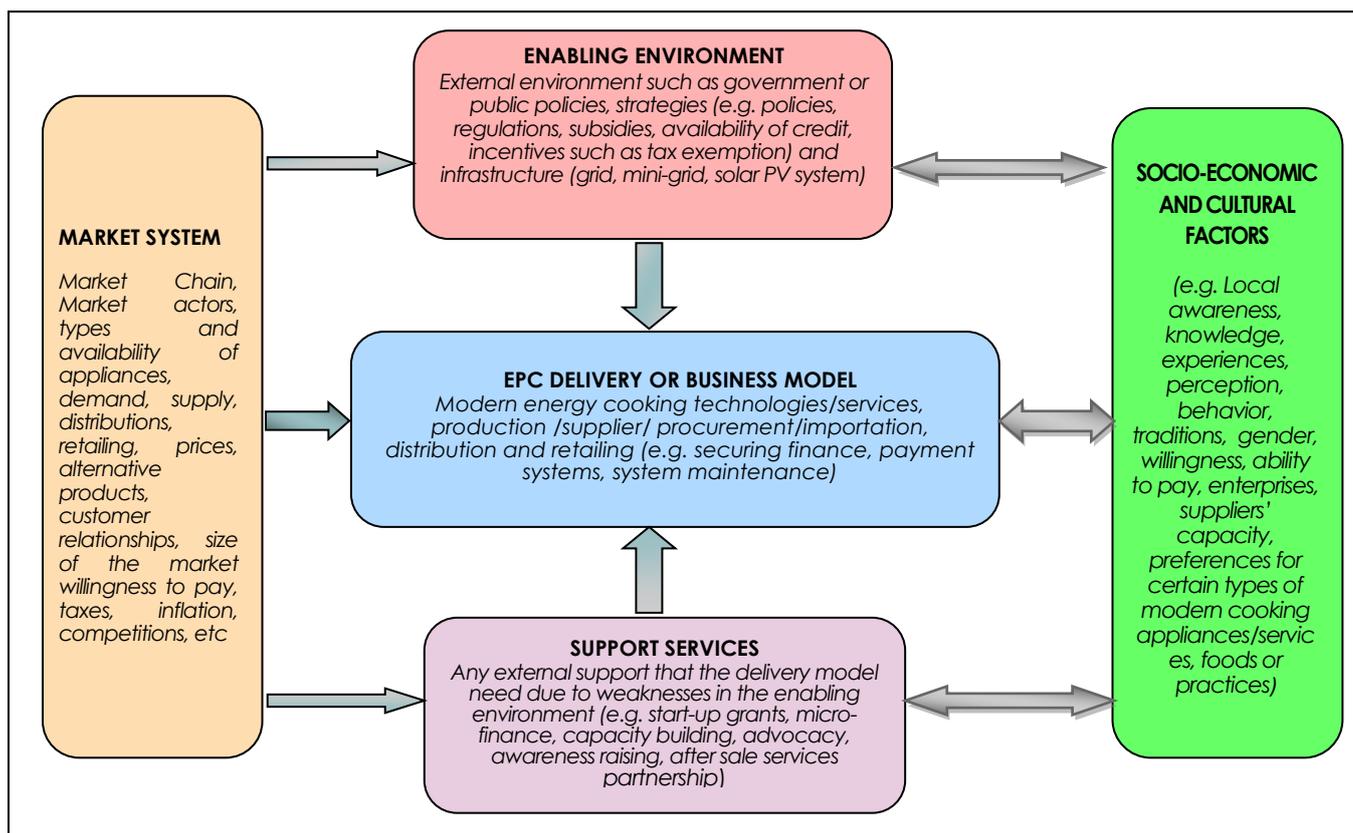
4.3 Mapping and Tools for Supporting Approach for Designing EPC Delivery Model

The approach above is further illustrated through EPC delivery system and supporting tools. The delivery model is integrated in the system. The EPC delivery system enables developer to identify key components of the approach that supports the delivery of modern energy cooking appliances and services to high, medium and low income clusters of people in the community. The delivery model is supported by two components:

4.3.1. Mapping Modern Energy Cooking Delivery System

The mapping of delivery system is made up of five key building blocks for ensuring sustainable supply of cooking energy appliances and services to the customers.

Chart 3: Map of EPC/Modern Energy Cooking Delivery System



Mapping of MECS/EPC delivery system, according to chart 3 above, involves assessment of socio-economic and cultural factors of customers and the market system. These will enable to design delivery model required in a specific areas and environment. According to barriers and gaps which will be observed in the market systems together with socio-economic and cultural factors, the support services are identified and interventions developed for supporting actors in the market. The system allows also to identify type of enabling environment required for MECS activities.

4.3.2. Tools Required for Designing EPC Delivery Model

The tools which may support MECS delivery model and that are required for analysis of information to the delivery model are:

i. EPC Delivery Model Map

The tool is an expansion of the EPC delivery model framework and details some of the key factors for analysis. These are adapted from the ‘business model canvas’ framework. The EPC Delivery Model Map also integrate the building blocks for the ‘enabling environment’, ‘socio-cultural context’ and ‘supporting services’ with a set of factors which are illustrations of what issues to consider when designing the EPC delivery model. The delivery model map is attached as Appendix B.

ii. Business Model Canvas Framework

The business model canvas as a tool which is used in businesses services was also used to support EPC delivery model. It was used as a framework to guide decision making in the EPC delivery model’s value added; the types of relationships it creates with partners (everyone who takes part in the delivery model) and end users (customers); and the resources and activities required to implement it. A specific ‘socio-environmental benefits’ element has also been added in the ‘accounting’ building block for the measurement of non-monetary targets. However, elements have been added so that the socio-cultural context and enabling environment can be taken into consideration. The business model canvas is attached as appendix A

iii. Actors Mapping Tool

The tool is used to assess the actors and their relationship to the EPC delivery system. All actors in the market system including market functionaries, support services and enabling environment are supposed to be mapped by this tool. Actors with closer relationship are located near to the centre which means are near to the EPC delivery system. Other actors will be located in the tool depending on their influence to the delivery system. The actors near to delivery system have high possibility of becoming potential partners or customers in the EPC delivery model. These could either be categorised into suppliers, end-users or MECS international and local supporting partners. The actors analysis tool is attached as annex C.

iv. Need Assessment Tool

The participatory tools are required in order to assess needs EPC end users in rural, peri-urban and urban areas. The tools which were used for this research to identify and assess needs of actors in rural area were Participatory Rural Appraisal (PRA) tools. The PRA tools and approaches incorporated the normative knowledge and opinions of rural customers in the identification of socio-economic, cultural issues and planning and management of modern cooking energy services. Different participatory approaches including focus groups discussions, household surveys were used to get needs of potential end-users.

v. Risk Assessment Tool

The risk assessment tool is based on the principle that a risk has two primary dimensions. These are probability of occurrence and size of impact. The tool allows user to rate potential risks on these two dimensions. The probability that a risk will occur is represented on one axis of the chart and the impact of the risk. Those two dimensions are plotted for a particular risk on the tool. This gives a quick, clear view of the priority that is needed by each risk and will lead to decision on what resources are required to manage that particular risk. The table is used to present assessment from this tool showing type of risk, its impact, priority, mitigation measures, etc. The risks assessment results are used to optimise EPC delivery model. The tool for assessing risks in the delivery system is attached as appendix D. The table below shows risks assessed through this research study:

Table 6: Risks Assessment in the EPC Delivery System (originated from appendix D)

S. No.	Risks	Level of Occurrence	Impact	Mitigation Measures
1	High demand compared to supply of EPCs	High	High	Ensure bulky importation of EPCs
2	Low affordability of low income customers	High	Medium	Linked with MFIs and include in the credits in the bills
3	EPC technical defaults	Medium	Medium	Provision of after sale services, spares and capacity building of local technicians
4	Fluctuation of Foreign Currency	Medium	High	Maintain foreign currency bank account
5	Fluctuation of EPC production in the country of origin	Low	Medium	Import bulky, store and explore more sources in the long term produce locally.

4.4 Case Studies for Sustainable Delivery Models for Rural and Urban Areas

The case studies presented in this section are using/piloting approach developed by this research project for delivering EPCs to end-users in urban, peri-urban and rural communities. These cases show how these models have been adjusted to support delivery of EPCs to end-users. These models are as described hereunder:

4.4.1 Delivery Model for Rural Settings with Mini-Grids

i). Project Description

The model for delivering EPCs in rural settings with mini-grids was developed according to the information collected at Kitaita and Songambebe Villages at Gairo District, Morogoro Region. These are villages with access to solar mini-grid electricity operated by Power Gen Company. The technology is based on a centralised solar PV-battery system with electricity distribution grid connecting households in two villages. Customers have ability to pre-pay on a Pay as You Go (PAYG) basis for clean, round-the-clock AC power using their mobile phones through modular micro-grid systems.

ii). Methodology

The information was collected through Participatory Rural Appraisal (PRA), households' surveys, focus group discussions and demonstrations of how to use EPCs. Issues covered during data collection were assessment of rural socio-economic and cultural factors, market actors, barriers, enablers, drivers, demand, supply, affordability, willingness to pay, alternatives, wealth ranking, income variation, gender, attitudes on new products, social cohesion, leadership, market and context, preferences, perception and customary practices.

The team explored credit services in two villages and three types of micro financial services exist in the project area. These are credits through PowerGen, credits through village leaders and credits through Village Community Bank (VICOBA). The team decided to leave a few EPCs (6) in the village (with upfront payments of 20% of EPC price and signing of contract) to test market while collecting information on response of villagers to the purchase of the EPC appliances. The repayment of EPCs will be paid through mobile payment system in four instalments for a period of how many months.

iii). Drivers

The main driver for adoption of EPCs is availability of mini-grid and scarcity of fuel for cooking. The main fuels used for cooking at the villages are firewood and charcoal which are used in traditional stoves of metal charcoal stoves and three stone fire-places. The villagers (women and girls) take about 7 to 8 hours to travel to another region (Manyara Region) where natural woodland forests are available for firewood collection. A bundle of firewood is used for three days before they go back to the forest to recollect firewood.

iv). Socio-Economic and Cultural Context

Some of the socio-economic and cultural factors observed in Kitaita and Songambele are low awareness of cooking with electricity, low capacity of using EPCs, seasonality of income, low affordability, type of food, local cooking practices, low willingness to pay, high electricity tariffs, etc. Reduced time for fuel collection and maintaining the taste of food by new appliance (EPCs) in rural settings are important factors for rural end-users. The barriers for most of end-users are income which is seasonal which created fear of paying EPCs and electricity in rural areas.

v). Enabling Environment

All energy related existing policies, strategies and programmes are supporting the use of wood alternatives as energy for cooking. The support to end users for buying appliances through credit services or external supports from individuals, donors or government are specifically critical in enabling efficient electric pressure cookers to be adopted by low income rural end-users. The government willingness to use subsidies or reform taxes of EPCs will stimulate early adoption of EPCs in rural areas.

vi). Support Services

The support services required in rural areas such as Kitaita and Songambele are: awareness creation, promotion of EPCs, availability of EPCs, capacity building trainings, credit services, lowering of electric tariffs, repair and maintenance of appliances. .

vii). Delivery Model

There is high potential of adopting EPCs in rural settings (like Kitaita and Songambele) due to scarcity of fuels for cooking, although income for villagers is seasonal because it is based on agricultural crop harvesting period. Therefore, any EPCs which will be delivered to end-users during off-season will be supplied through credit services. There are high chances that the end users will be willing to pay and afford EPCs during harvesting time. The appropriate market chain to rural settings is to get supplier at the district capital that will retail EPCs to the rural and urban areas with both national and mini-grids during harvesting time

The model must involve importation of EPCs from external markets (mostly from China), through a domestic appliance dealer in the main commercial capital city of Dar es Salaam. There is a possibility of selecting potential suppliers at district level who will be a distributor of EPCs in the district especially areas with mini-grids. The supplier at district centre may retail those appliances in rural areas during harvesting time or through credit services. The value proposition, customer relations, cost structure and revenue streams were determined through PRA and capacity building was conducted by TaTEDO. The model also requires trained technicians at the district centre who will provide EPC after sales services.

viii). Suggestions

The market for EPCs is likely to be financially successfully if will start with high and middle income households in the rural areas. It will be easier to reach poor segments once market is already established when trust of the EPCs use is high in the community. Low income (affordability) is not the only socio-cultural factor that affect uptake but also less willingness to pay for clean cooking technologies to some people in rural areas which are non-smoke as they are used to deter insects and preserve crops.

4.4.2 Delivery Model for Urban Setting with the National Grid

i). Overview

The EPCS delivery model for urban areas was developed from research activities conducted in urban areas of Kinondoni and Ubungo Districts in Dar es Salaam Region. Dar es Salaam Region has the highest percentage (73.5 percent) of households using charcoal for cooking (NBS, 2017). Although, the whole urban area of Dar es Salaam region is electrified, only 7.2% of households are using electricity for cooking. The natural forests in Tanzania are excessively encroached for charcoal production caused by increased demand crucially in Dar es Salaam which consumes more than 50 percent of all the charcoal produced in the country. Introduction of EPCS in Dar es Salaam Region will cut down a large proportion of charcoal consumption, if modern energy cooking services will be adopted by a large number of the households.

ii). Methodology

The information was collected through household surveys and focus group discussions from Kinondoni and Ubungo Districts. The information collected from end-users is related to demand and use of the modern cooking energy appliances and services. The information includes socio-economic and cultural issues such as cooking behaviours, frequencies of cooking, time used for cooking, processes used for cooking, appliances preferred by users, etc. Other information are the potential market actors in their areas, awareness, capacity of using EPCS, willingness to pay, credit facilities, prices of appliances, barriers and drivers of acquiring the electric cooking energy appliances and services.

iii). Drivers

The high cost of energy for cooking is the main driver of adoption of modern energy cooking services in the urban areas of Dar es Salaam Region. Several households in the city are practising energy stacking in their household to reduce household energy budgets. Introduction of EPCS in urban areas will enable people to cut down household energy budget used for cooking.

iv). Socio-Economic and Cultural Context

The urban setting surveyed for this research has a large proportion of high income households. Many of them have tried to use electricity for cooking by using electric hotplate cookers, microwaves and hot water kettles but it was expensive and they ended up with high energy bills and use of sub-standard electric appliances. Some households have ability to buy Electric Pressure Cookers (EPCs) in cash or through credit services. There are high chances that households which will acquire appliances on credit basis in urban settings will have high recovery rate of their credits. However, several people in urban households are not aware of EPCs. Several households in urban settings are occupied by staff from different government and private sector firms. Cooking in several households is performed by housekeepers (who are not decision makers in the households). The most likely places where someone could meet many of people for appliances delivery is at their workplaces. The barrier which was observed for urban settings was size of electric pressure cookers. Some of the households were interested in EPCs of large sizes (more than 6 litres) than those which are in the market and probably two pots.

v). Enabling Environment

All energy related existing policies, strategies and programmes are supporting the use of wood alternatives and clean energy for cooking. The standards and quality of appliances were the main concerns of people in the high income households. The use of electricity is associated with high energy budgets. The complains of people in many households were high tariffs from the national electric utility (TANESCO) and power blackouts or power cuts which necessitates end users to apply fuel stacking. They need to be ensured of reliability of electricity from the national grids all the time and the situation could be mitigated by power utility.

vi). Support Services

The support services required in urban areas such as Kinondoni District include awareness raising, promotion of EPCs, availability of EPCs, capacity building trainings, credit services, repair and maintenance of appliances. Awareness and promotion could be undertaken through local TVs, radio, social media and video documentary. All these activities should be availed to end users in order to speed up scaling up of modern energy cooking services in Tanzania.

vii). Delivery Model

There is high potential of adopting EPCs and other modern energy cooking appliances in similar urban settings due to high household cooking budgets and a long time used for meal preparation in households. Several market chains can be used in the urban areas which include acquiring EPCs from supermarkets, dealers, distributors and retailers, etc. The supply of EPCs at the moment is very low and is growing according to the emergent demand in the market.

The EPCs manufacturers are companies which are outside the country mostly in China, Japan and South Africa. The EPCs which are in the local markets are imported from external markets, through local importers in the main commercial capital city of Dar es Salaam. There are different domestic appliances dealers in the urban areas and increased demand of EPCs will pass signal to the market and there is high chances of immediate response to the market demand.

However, there is possibility of selecting dealers with appropriate appliances that will be used to distribute EPCs to the end-users in the urban areas. Product promotion and capacity building are important support services for scaling up delivery of EPCs in urban areas. The value proposition, customer relations, cost structure and revenue streams will be determined through capacity building training which may be availed by NGOs or trained LGA staff (community development officers). There is a need for trained technicians in urban areas to provide after sales services.

viii). Suggestions

At the moment, EPCs are imported by importers, dealers who could supply EPCs according to available amount of their financial capitals. The need for developing short market chain in order to increase the market margin and reduce prices for the end-users should be emphasized. The distributor who is dealing directly with end-users could import directly from external markets. There is a need for after sales services for EPCs otherwise lack of those services will reduce uptake of these appliances.

5.0 Limitations of the Innovation/Approach/Design/System

The approach for designing delivery models of the Modern Energy Cooking Services is limited to the EPCs and not to other cooking energy appliances and services. However, the approach could be slightly adjusted and adapted for other cooking energy appliances and services. The approach will also focus and associated with use of electricity for cooking. The research is focusing on the electric pressure cookers which at the moment in Tanzania are used by end users at household level and not by SMEs and Institutions.

These limitations can be overcome by modifying the approach for other energy services. The use of electric pressure cookers in SMEs and institutions will require larger size appliances which require production of those appliances by manufacturers.

6.0 Practical Applications of the Concept to the National Cooking Energy System

The project focus is to facilitate interested stakeholders to adopt a delivery/business model of supplying appliances which will support increased and efficient use of electricity for cooking. Clean and efficient cooking energy services are issues which are stipulated in the national energy policy (2015) and SE4All Action Agenda of Tanzania. The practical application of this concept to the national efforts will improve the energy cooking sector through different delivery models for different market segments. Some of these delivery models include: Delivery/business models of modern cooking services for: Mini-Grid Systems, On-Grid Rural Areas, On Grid Urban and Peri-Urban Areas and stand-alone solar PV systems.

The approach may also be applied for solar power banks in urban, peri-urban and rural areas. Area specific socio-economic and cultural context may determine the delivery/business models to be adopted. However, the practical application will also be to implement the models and recommendations from this study to develop a thriving market of EPCs in Tanzania.

7.0 Next Steps

7.1 Next Intervention Include the Costs, Time and Resources Required for Next Steps of Development /Implementation

The next steps will build on efforts to implement the findings and recommendations of this research project and widen focus of this innovation to other areas. The MECS team at TaTEDO in collaboration with different partners will continue with the efforts of addressing the barriers identified along the EPCs market chain in order to contribute to the efforts of developing market of EPCs in Tanzania. This will be performed through implementation of a sustainable modern energy cooking delivery/business models in urban and rural settings. Efforts will be made to collaboratively address market barriers, foster an enabling environment and provide support services. The efforts will also contribute to enhance the EPCs demand and strengthen supply. The resources required for the next steps of the implementation include human resources, supporting facilities such as stationeries and transport, bulky acquisition of efficient electric cooking appliances such as electric pressure cookers, and battery supported eCook systems and credit facilities. There will be activities for piloting approach for designing EPC Delivery Models in rural, peri-urban and urban areas by providing support

services to support actors along market chains and advocacy and piloting different delivery/business models in urban and rural settings.

The future prospects of the research on Approach to Designing Delivery Models for MECS has goal of transforming the cooking sector in Tanzania by ensuring end-users in the community are using efficient cooking appliances. The following are selected interventions which will perpetuate MECS efforts in Tanzania:

- Scale up Market of Efficient Modern Cooking Appliances in Tanzania
- Invest in Efficient Electric Cooking Appliances Manufacturing in Tanzania
- Develop Education Curriculum for MECS in Tanzania
- Transforming Tanzania Cooking Sector through Scale up of Modern Energy cooking Services
- Advocacy for MECS Policy Recommendations
 - Encouraging suppliers to import quality and efficient electric cooking appliances,
 - Incentivised local manufacturers once market has developed
 - Support establishment of service networks (spare parts, expertise for repair, etc)
 - Support consumers to repay high initial costs through micro-financing
 - Support consumers to understand the benefits and lower behavioural change barriers

The work-plan with interventions, components, geographical focus and budgets are attached as appendix E.

7.2 Funding Planning to Apply for the Next Steps such as EU, DFID

The funding will be solicited from different sources willing to support the idea of enhancing markets of efficient and clean modern energy cooking services. The EU and DFID through MECs Programme will be important sources of the funding through the MECS programme and other initiatives.

7.3 Partnership Developments and New Investors Engagement.

The next steps will also focus to develop partnership with different actors along the market chain including; local partners from the Government, Local Government, Private Sector and Community. Other institutions and organisations to provide financial support will be approached from the development partners and investors who will be interested to develop business enterprises and partnerships for modern energy cooking appliances and services market development.

8.0 Dissemination Plan

The dissemination of the final research report can be broken down into four segments of interested stakeholders at local, national, regional and international levels. The dissemination will be undertaken through meetings, workshops, seminars, symposiums, newsletters, newspapers, social media, emails and websites. The dissemination will be geared towards awareness creation, learning and business development. The findings of the project as compiled in the report will be disseminated to different stakeholders and partners as shown hereunder:

- The local partners who are expecting to use the report include community, LGAs, Vocational Institutes, local energy NGOs, CBOs and Private Sector Companies. The information in the report will help them to adopt modern energy cooking services and apply resources for developing their projects, conduct trainings and planning MECS activities at local levels.
- National partners who will use the report for different purposes including relevant ministries, government institutions/agencies, academic Institutions, national networks/alliances and financial institutions. The information will be used to provide inputs during policy reviews and cooking energy decision making in the government institutions, education, project development, trainings and awareness on the types of business which could emanate from MECS technologies.
- The regional partners who are expected to use the report are regional networks/alliances, research and academic institutions, energy departments of regional bodies (EAC and SADC) and organisations both private and state owned. The information will be used more for learning purposes, project development and sharing experience on different strategies and solutions towards increasing access to modern energy cooking technologies through viable business delivery models.
- Different International partners who are expected to use findings from the report for different purposes. The international partners expected to get the report through online communication media such as emails and websites. The expected international partners include bilateral and multilateral organisations interested to clean cooking services such as foundations, research institutions, academic institutions and international based organisations. The information will help to understand the modern energy cooking situation in Tanzania, the barriers and the supports required in the local context and can be a useful tool to make informed decision. The information may also be used as basis of mobilizing more financial resources for new and on-going initiatives towards achieving the universal access to cooking energy services.

Dissemination of similar MECS outcomes has been done through different projects. MECS dissemination has been carried out through various meetings, capacity building trainings, trade fairs, workshops, seminars, symposiums and websites. For the past one year, TaTEDO has managed to disseminate more than 200 EPCs to end-users. The information about MECS has been shared with the government officials (at both national and district levels) and end-users in urban and rural areas. The main focus during the dissemination was to create awareness and train to use EPCs and existence of the modern cooking energy solutions, the associated benefits in terms of health, cost saving and time saved compared to other solutions. Feedbacks from the end-users have been regularly received and most of them have been requesting for more information on highly efficient electric cooking appliances, their operations and how to acquire them. The response and purchase of appliances from different clients and customers is indication that modern energy cooking appliances and services has huge potential market in Tanzania. . The EPCs end-users feedback was performed during and after capacity building trainings. The participants who received capacity building and demonstration are coming back with more end-users who are looking for similar trainings and modern energy cooking appliances. Other feedbacks include the need for larger size of the EPCs, Multi-functional EPCs (such as deep frying, roasting, etc), after sale services provisions, etc.

9.0 Conclusion

The MECS TRIID research project implemented in urban, peri-urban and rural areas has generated a number of findings and lessons that can lead into other research, development support and target investments. The project has developed an approach for designing and developing delivery models for modern energy cooking services. The future prospects of this approach are based on the ability of using the approach for supporting development of MECS delivery models in other areas.

The approach is a tool for supporting the transition to modern, efficient and clean cooking services that contributes to fundamental development benefits, including improving people's health, reducing air pollution, and enabling mothers to spend more time with their families and pursue economic opportunities.

The focus of this efforts now on scaling up supply and demand of modern energy cooking appliances and services through innovative market-based approaches and mobilize financing in order to apply delivery/business models from approach researched through this project to real lives of people in the community.

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Appendixes

Appendix A: EPC Business Model Canvas Framework

<p>Key Partners</p> <ul style="list-style-type: none"> Who are MECS Key Partners? Who are MECS key suppliers? Which Key Resources are MECS acquiring from partners? Which Key Activities do partners perform? <p>Optimization and economy Reduction of risk and uncertainty Acquisition of particular resources and activities</p>	<p>Key Activities</p> <ul style="list-style-type: none"> What Key Activities do EPC Value Propositions require for Supply Chains, customer relationships and revenue streams? <p>Categories</p> <ul style="list-style-type: none"> Marketing Problem Solving Platform/Network 	<p>Value Proposition</p> <ul style="list-style-type: none"> What value does EPC deliver to the customer? Which customer's problems are we helping to solve? What bundles of MECS appliances and services are we offering to each Customer Segment? Which customer needs are we satisfying? <p>These are activities for market actors and end users</p> <p>Characteristics</p> <ul style="list-style-type: none"> Newness Performance Customization "Getting the Job Done" Design Brand/Status Price Cost Reduction Risk Reduction Accessibility Convenience/Usability 	<p>End-User Relationships</p> <ul style="list-style-type: none"> What type of relationship does each of Customer Segments expect us to establish and maintain with them? Which ones have been established? How are they integrated with the rest of our business model? How costly are they? <p>Examples</p> <p>Personal assistance Dedicated Personal Assistance Self-Service Automated Services Communities Co-creation</p>	<p>End-User Segments</p> <ul style="list-style-type: none"> For who are the value is created? Who are the most important customers? <p>Types of Segment</p> <p>Mass Market Niche Market Segmented Diversified Multi-sided Platform</p>															
<p>Cost Structures</p> <ul style="list-style-type: none"> What are the most important costs inherent in the EPC delivery model? Which Key Resources are most expensive? Which Key Activities are most expensive? <p>Cost Driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing) Value Driven (focused on value creation, premium value proposition) sample characteristics: Fixed Costs (salaries, rents, utilities) Variable costs Economies of scale Economies of scope</p>	<p>Key Resources</p> <ul style="list-style-type: none"> What Key Resources do EPC Value Propositions require? Resources for supply chains? Resources for Customer Relationships? Resource size for achieving Revenue Streams? <p>Types of Resources</p> <ul style="list-style-type: none"> Physical Intellectual (brand) Financial 		<p>Market Chains</p> <ul style="list-style-type: none"> Through which Market Chains do EPC Customer Segments want to be reached? How are we reaching them now? How are EPC supply chains integrated? Which ones work best? Which ones are most cost-efficient? How those chains are integrated with customer routines? <p>Chain phases:</p> <ol style="list-style-type: none"> Awareness: How do we raise awareness about EPC and services? Evaluation: How do we help customers evaluate suppliers' value proposition? Purchase: How do we allow customers to purchase specific appliances and services? Delivery: How do we deliver a Value Proposition to customers? After sales: How do we provide post-purchase customer support? 	<p>Revenue Streams</p> <ul style="list-style-type: none"> For what value are customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues? <p>Revenue types</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Fixed Pricing</th> <th>Dynamic Pricing</th> </tr> </thead> <tbody> <tr> <td>Product sale</td> <td>List Price</td> <td>Negotiation(bargaining)</td> </tr> <tr> <td>Usage fee</td> <td>Product feature dependent</td> <td>Yield Management</td> </tr> <tr> <td>Subscription Fees</td> <td>Customer segment dependent</td> <td>Real-time-Market</td> </tr> <tr> <td></td> <td>Volume dependent</td> <td></td> </tr> </tbody> </table>	Type	Fixed Pricing	Dynamic Pricing	Product sale	List Price	Negotiation(bargaining)	Usage fee	Product feature dependent	Yield Management	Subscription Fees	Customer segment dependent	Real-time-Market		Volume dependent	
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	Volume dependent																		

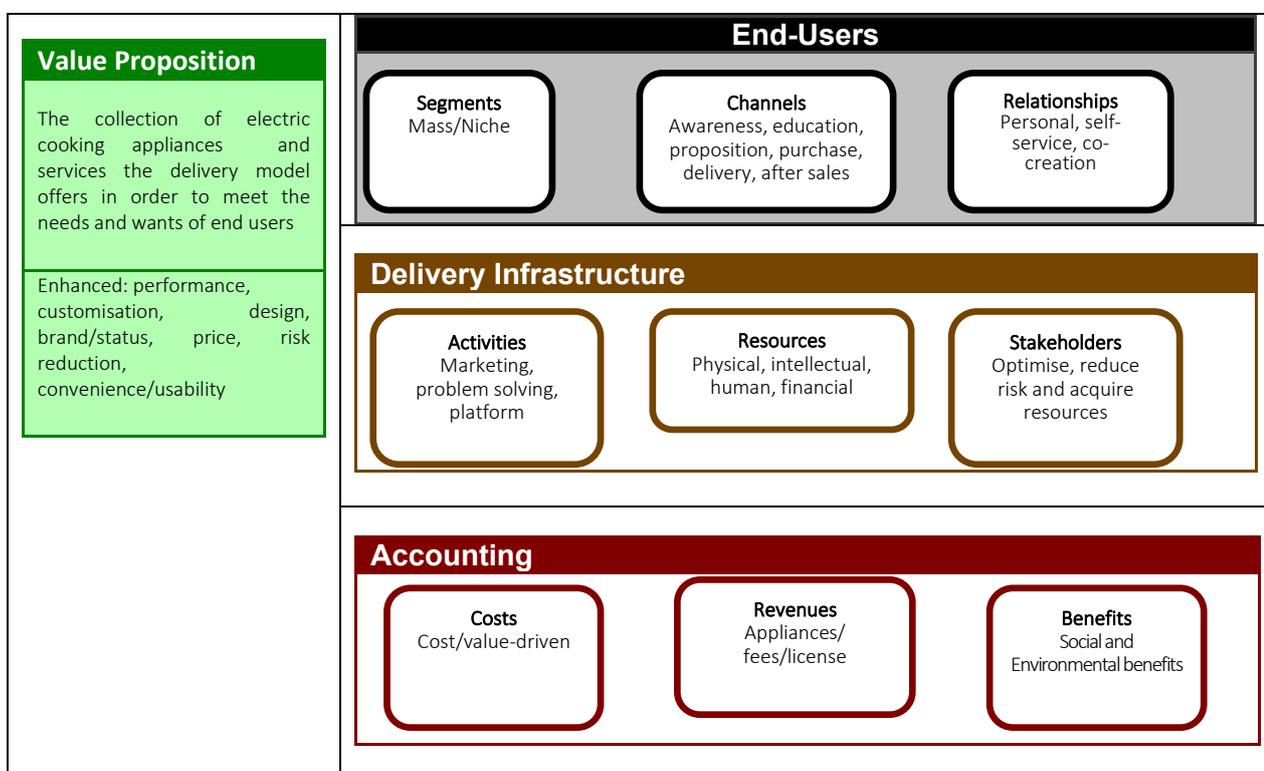
Appendix B: The EPC Delivery Model Map

Socio –Economic and Cultural Context

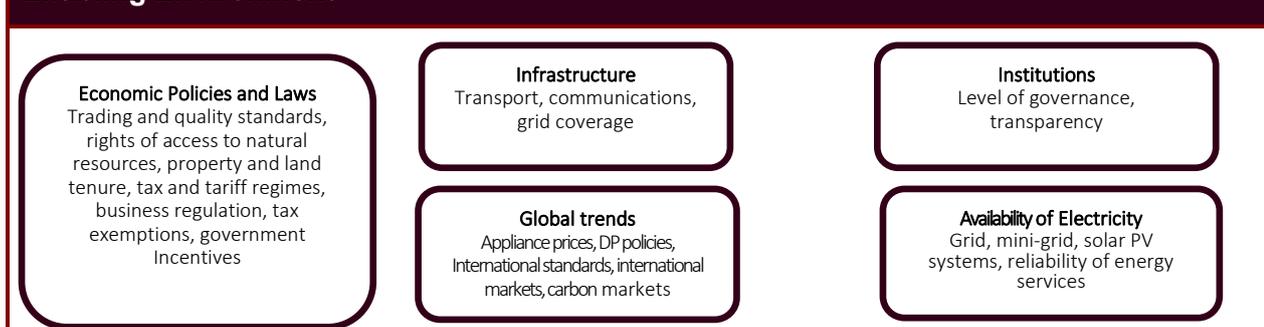
Local awareness, skills and capacity	End-user food preferences and perception	Service modalities (e.g. cash, credit, use of mobile banking; Enterprises, supplier capacity	Attitudes toward Introduction of new technologies	Willingness and ability to pay
End-user knowledge, average income, income variation etc	Gender Relationships		Social cohesion /traditions / Conflict	Preferences towards appliances/services

Support Services

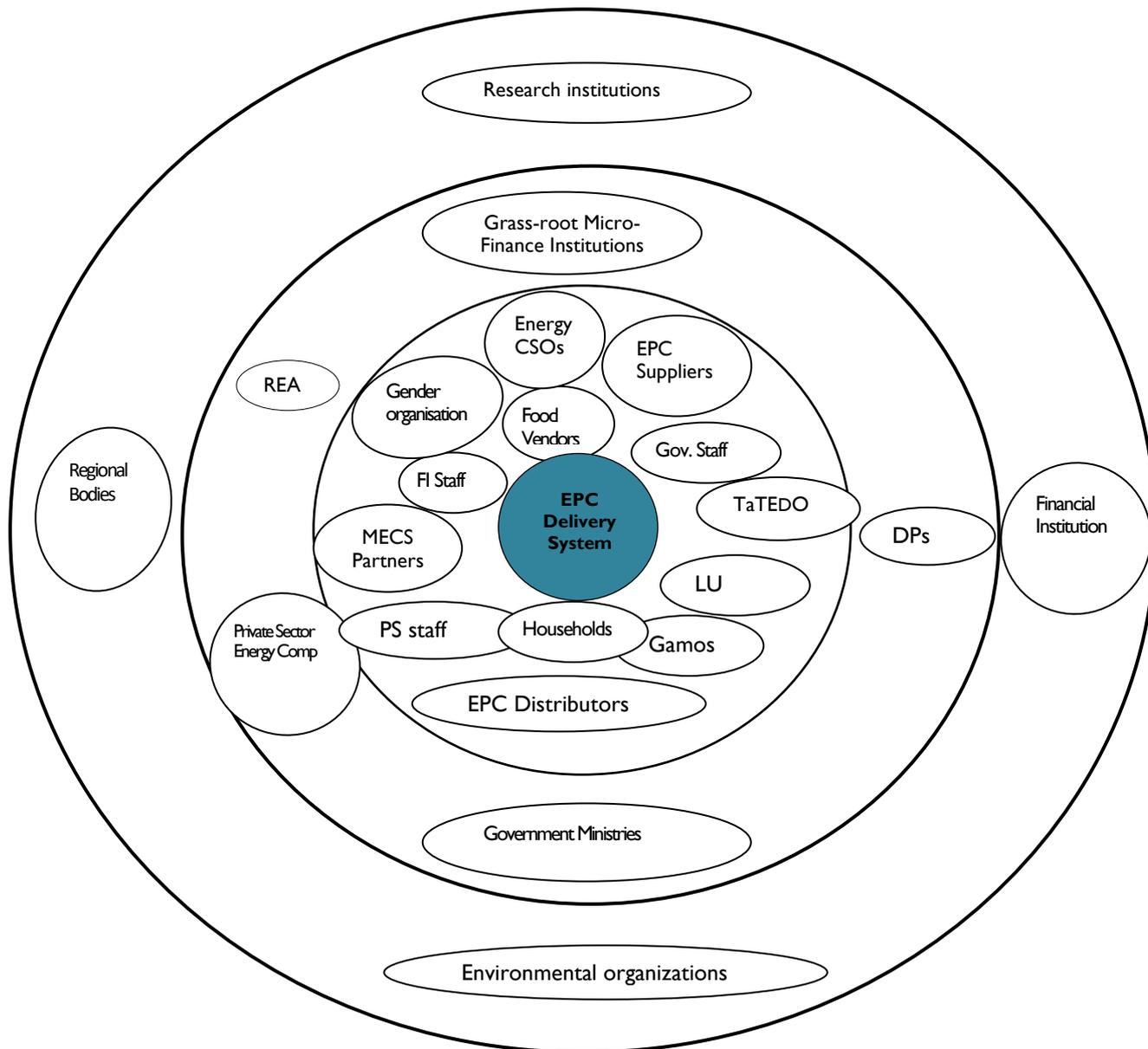
Micro-finance /Credit Services	Capacity Building	Start-up Grants	Awareness Creation	Advocacy
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Enabling Environment

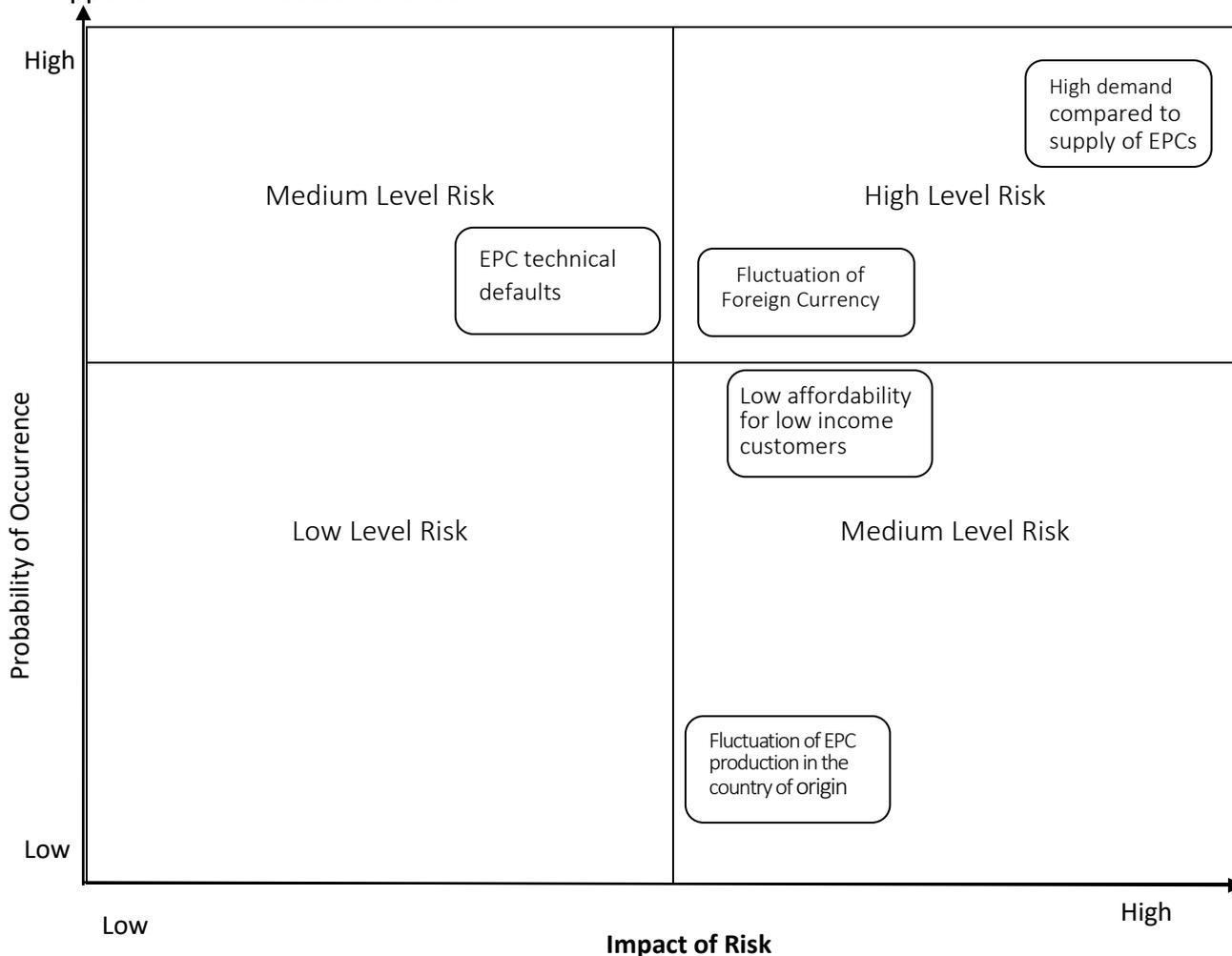


Appendix C: Actors Analysis Tool



The tool could be used to identify partners and customers of EPCs in specific geographic areas. The relationship of partners and customers to EPC delivery system is represented pictorially by this tool. The stakeholders with close relationship are near to the centre. The weak relationship is indicated by distance of the stakeholders from the centre to the periphery. The stakeholders are separated and illustrated in a tabular form to separate partners and customers, including their preferences, roles and needs.

Appendix D: Risk Assessment Tool



The Risk Assessment Tool (RAT) is used to show the impact and probability of occurrence of the risks. The procedures of using this tool start with identification of risks, which is followed by assessing them in terms of their occurrence and impact. The risks will fall in low, medium and high risks. The table should be used to present assessment from this tool showing type of risk, its impact, priority, mitigation measures, etc. The risk of high impact should be given high priority, followed by medium risks and low risks. Interventions should be considered to mitigate these risks.

The risks could be identified by using business risks identification framework. There are different risks which could be assessed by using this tool as listed hereunder:

- Changing customer behaviour and expectations.
- Actual value proposition delivered declines leading to loss of customers or inability to attract new customers.
- Service provision issues (Quality Control).
- Diminish the effectiveness of market chains due to changing behavioural patterns.
- Unexpected Cost increases in supporting the customer relationship.
- Reducing market share and/or suppressing margins.

The risk assessment tool is supposed to support the whole risk management capability, namely identification of key risks, quantification and finally management of those risks. The motivation to develop delivery model risk management comes from diverse spheres of economic activity as business models are central in most enterprises.

Appendix E: Future Interventions Expected from MECS TRIID Project

S. No.	Interventions	Geographical Focus	Costs (GBP)
1	Scale up Market of Efficient Modern Cooking Appliances in Tanzania	Lake and Southern Highlands	300,000
	<ul style="list-style-type: none"> Promote Electric Cooking Appliances in the Project Areas Capacity Building Trainings of Efficient Electric Cooking Develop Market Chains for Supplying Electric Cooking Appliances Advocacy of subsidies and tax exemption for EPCs Facilitate Supply of Electric Cooking Appliances through Developed Market Chains to End-Users 		
2	Invest in Efficient Electric Cooking Appliances Manufacturing in Tanzania	Dar es Salaam for East Africa Market	1,200,000
	<ul style="list-style-type: none"> Preliminary and Legal Aspects of EPC Investment in Tanzania Set-up a Mutually Beneficial Partnership Between Internal and External Investor Construct Factory Infrastructure and Facilities Procure and Install Machines for Appliance Production Manage and Develop Production of MECS Appliances 		
3	Develop Education Curriculum for MECS in Tanzania	High learning institutions	150,000
	<ul style="list-style-type: none"> Undertake MECS study for Education Curriculum and Involved Stakeholders Develop and Refine the Syllabus for MECS for High Leading Institutions Undertake Technical Meeting to Refine MECS Curriculum Pilot Curriculum in Selected MECS Courses 		
4	Transforming Tanzania Cooking Sector through Scale up Modern Energy Services	The Whole Country	1,200,000
	<ul style="list-style-type: none"> Conduct Awareness campaign of EPCs in Tanzania Undertake Technical and Business Capacity Building Actors Along Market Chains Develop Strategy for MECS in Tanzania Facilitate Supply of EPCs along the market chains in the country Develop and Adopt Prototypes for Off-Grid Areas 		

Appendix F: Abbreviations

ADD-MECS-Ta	Approach to Designing Delivery Models for MECS in Tanzania
CBO	Community Based Organisation
DFID	Department for International Development
DP	Development Partners
EAC	East African Community
EPC	Electric Pressure Cooker
EU	European Union
EWURA	Energy and Water Utilities Regulatory Authority
FI	Financial Institution
GM	Gross Margin
LGA	Local Government Authority
LPG	Liquefied Petroleum Gas
LU	Loughborough University
MECS	Modern Energy Cooking Services
MFI	Micro-Financial Institution
NBS	National Bureau of Statistics
NGO	Non-Governmental Organisation
PAYG	Pay as You Go
PO-RALG	President Office-Regional Administration and Local Governments
PRA	Participatory Rural Appraisal
PS	Private Sector
RAT	Risk Assessment Tool
REA	Rural Energy Agency
SACCOS	Savings and Credits Cooperative Society
SADC	Southern African Development Community
SE4All	Sustainable Energy for All
SME	Small and Medium Enterprise
TANESCO	Tanzania Electric Supply Company
TaTEDO	Tanzania Traditional Energy Development Organisation
VICOBA	Village Community Bank