



EAST AFRICAN CENTRE OF EXCELLENCE FOR RENEWABLE ENERGY & EFFICIENCY

TECHNICAL ASSISTANCE FROM:



Situation Analysis of Gender and Sustainable Energy in the East African Community 2018



WITH THE SUPPORT OF:



Note:

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TABLE OF CONTENTS

INTRODUCTION	8
1. Background	8
East African Community	8
EACREEE Impetus for Action.....	9
International Agreements and Commitments.....	9
Learning from ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW-GEN)	10
2. Questions Guiding the Research.....	11
3. Methodology.....	11
CONTEXT	13
1. EAC At-a-Glance	13
2. Energy in the EAC.....	15
Renewable Energy	16
Electricity Access.....	18
Cooking Fuels and Technologies.....	21
3. Salient EAC Gender Issues.....	24
Health and Education	26
Time Use and Work	27
Land, Inheritance and Family Law	28
Political Representation.....	29
GENDER AND ENERGY ACCESS.....	31
1. Electricity Access and Gender	31
Grid Extension.....	32
Gender Effects of Tariff Structures	33
Gendered Product and Service Preferences.....	34
2. Clean Cooking Access and Its Gendered Impacts.....	34
3. Productive Capacity	37
Farming and Livestock	37
Post-Harvest Processing	38
Food Preparation	39
4. Other Vulnerable Groups	39
People Living with Disabilities	39
Displaced People.....	40
Youth.....	41

ACCELERATING THE CLEAN ENERGY TRANSITION	43
1. Women’s Entrepreneurship in the Energy Value Chain.....	43
2. Workforce	44
Hiring and Promotion	45
Pay Gap	46
Role of Technology	46
Changing Roles of Women in Conflict Settings.....	47
3. Barriers to Equal Participation in the Energy Sector	47
Awareness, Education and Technical Capacity on Energy Technologies and Services.....	47
Access to Finance.....	48
Policy and Regulatory Safeguards	50
Cultural and Social Norms	51
Informal vs. Formal Businesses.....	52
POLICY LANDSCAPE IN THE EAC.....	53
1. EAC Regional Policies, Programmes and Initiatives	53
Gender and Energy Policy Overview.....	53
Gender Integration in the Programmes and Initiatives	54
2. National Policies, Programmes and Initiatives.....	56
Gender Sensitivity of Energy Policies and Programmes in Place.....	56
Gender Integration in National Energy Policies.....	58
Institutional Framework for Mainstreaming Gender and Energy	58
Civil Society Organizations in the EAC at the Nexus of Gender and Energy.....	60
Select National Level Flagship Programmes.....	61
GOING FORWARD	63
1. Data Gaps.....	63
Energy Access Data Gaps.....	63
Energy Supply Data Gaps for Entrepreneurship, Public and Private Sector Workforce.....	63
Enabling Environment Data Gaps	64
2. Programme Design Considerations.....	64
3. Next Steps	67
BIBLIOGRAPHY	69
ANNEX 1: EACREEEE BASELINE STUDY: LIST OF PEOPLE INTERVIEWED	76
ANNEX 2: WORLD BANK ENTERPRISE SURVEYS.....	77

LIST OF TABLES, FIGURES, AND BOXES

Table 1: Share of biomass-based resources in total final energy consumption (2015).....	15
Table 2: Annual Per Capita Electricity Consumption in the EAC.....	16
Table 3: Grid-connected Renewables in the EAC (2014)	17
Table 4: Population without access to electricity	19
Table 5: Population and Percentage of People without access to modern cooking	22
Table 6: Closing the Gender Gap in the EAC.....	24
Table 7: Social Institutions and Gender Index in the EAC.....	25
Table 8: Gender Indicators in the EAC.....	25
Table 9: Gender and education indicators in the EAC	26
Table 10: Health and well-being in the EAC.....	26
Table 11: Dependency Ratio in the EAC Partner States (2016)	28
Table 12: Landholding by Gender in the EAC.....	29
Table 13: EAC Political Participation of Women	30
Table 14: Percentage of Female-headed Households in the EAC.....	33
Table 15: Indoor air pollution deaths in the EAC.....	35
Table 16: Average time spent on disaggregated work activities in a day by sex.....	36
Table 17: Examples of mechanized processing around the world	38
Table 18: Internally Displaced People and Refugees in the EAC	41
Table 19: Youth as a percentage of the population (2017)	41
Table 20: Youth Unemployment in the EAC (2017)	42
Table 21: GVEP DEEP male and female entrepreneurs by sector.....	44
Table 22: EAC labour participation rate in the formal sector by gender	45
Table 23: Percentage of women representation as firm owners, managers, and workers	46
Table 24: Percentage of firms in the EAC using technology	47
Table 25: The 6 Key Barriers Globally for Women Entrepreneurs.....	49
Table 26: Workplace protections in the EAC	51
Table 27: International Gender and Energy Programmes Implemented in the EAC.....	55
Table 28: Energy and gender linkages in EAC energy policies per country	57
Figure 1: Population Growth from 1990 – 2015 in East Africa	13
Figure 2: Rural and urban poverty rates	14
Figure 3: Historical Electrification Rates for the EAC.....	19
Figure 4: Multi-Tier Tracking Framework for electrification.....	20
Figure 5: Primary fuels used for cooking in East Africa.....	23
Figure 6: Multi-tier framework for clean cooking.....	24

Box 1: The East African Power Pool	16
Box 2: Gender Dimensions of Large Scale Renewables	18
Box 3: Spotlight on Kenya.....	20
Box 4: Pay-As-You-Go (PAYG) Technology in the EAC.....	21
Box 5: Theorized Impacts of Electricity Access.....	31
Box 6: Gender Preference in an Electrification Project In Zanzibar	34
Box 7: Fruits of the Nile: Ugandan company combined organic fruit production with solar drying for export	39

INTRODUCTION

The East Africa Centre for Renewable Energy and Energy Efficiency (EACREEE) is committed to rapidly expanding access to modern, affordable, and reliable energy services; achieving energy security; and protecting the environment. Through EACREEE's activities in the areas of policy, capacity development, knowledge management, and awareness raising, as well as business and investment promotion, EACREEE aims to create an enabling environment by mitigating existing barriers and in promoting a competitive sustainable energy market, as well as leading in the coordination and harmonization of donor and partner activities.

Recognizing the pivotal role that women can play in this process, EACREEE is ushering in a Programme on Gender Equality, Women's & Youth Empowerment in Sustainable Energy (EACREEE-GEN) that is based on the principles laid out in the EAC Regional Strategy¹, and is aligned with the EAC regional gender policy². EACREEE-GEN aims to help remove existing barriers that hinder the equal participation of women and men in expanding energy access, by providing support for gender sensitive renewable energy and energy efficiency policies and projects, promoting women's entrepreneurship, and expanding the number of women pursuing technical and management careers in the energy sector.

To build the foundation for the new programme in the EAC on gender and energy (EACREEE-GEN), it is necessary to understand the current state of affairs with respect to gender and energy in the region. This baseline study on gender equality and women's empowerment in the EAC reflects the current status of women in the energy sector and related areas and decision-making positions in East Africa and presents the main barriers to and achievements of gender equality and women's empowerment in EAC. The study examines the current policy, regulatory, and institutional frameworks around gender mainstreaming in the clean energy sector in the Partner States of the EAC and will support governments in focusing and harmonizing their current efforts at gender mainstreaming, and collectively mobilizing support for a gender inclusive energy sector. This work was developed in partnership with the Clean Energy Solutions Center, an initiative of the Clean Energy Ministerial, with the generous support of Power Africa. The National Renewable Energy Laboratory serves as the Operating Agent for the Clean Energy Solutions Center.

1. Background

East African Community

Since 2013, the East African region of Africa has cemented its leadership position in fostering innovation for modern energy access solutions. A vibrant region full of potential, entrepreneurs and innovators from all over the world have been flocking to this region with intentions to set up, test, and implement new ideas on scaling modern energy access services. This has involved female and male actors in the energy sector operating in both urban and rural areas. Local entrepreneurs have been increasingly the engine of growth for new programmes and initiatives coming from government, the international donor community, as well as the private sector.

¹ EAC Regional Strategy for Scaling Up Access to Modern Energy Services was approved in 2006, with the objective to enable at least half of the East African population to access modern energy services by 2015. An updated strategy, linked to the SDGs and the Paris Climate Agreement, will be led by EACREEE, in collaboration with the EAC Secretariat and Partner States, but has not yet started.

² EAC Gender Policy includes energy access as one of the priority areas. The draft policy is still being finalized; the plan is that the policy will be validated in February/March 2018 and adopted by April 2018.

Despite the above-mentioned progress, the East African region has been experiencing major challenges in achieving universal energy access. These include the following:

- 1) Issues of affordability and accessibility have long remained large challenges in implementing a modern energy transition at scale. Yet, achieving gender equality and transitioning to clean energy is necessary for true universal energy access to occur.
- 2) Although women contribute to economic, social, political, and environmental development, they have not reaped equal and increased benefits over time.
- 3) Women's work often is unremunerated. Worse still, women continue to be left out of decision making, especially when it comes to policymaking processes.
- 4) Clean cooking solutions, especially in the rural areas, have not been keeping pace with electrification. This is mostly due to population growth and deep-seated cultural cooking and heating norms that have a disproportionate effect on women.

EACREEE Impetus for Action

EACREEE has core funding from the United Nations Industrial Development Organization (UNIDO) and the Austrian Development Agency (ADA). The multi-year funding from the core donors has been instrumental in setting up the technical and institutional operations of EACREEE. Now, with the establishment of the programme for promoting gender equality and empowerment of women in the energy sector, EACREEE is poised to build its presence in the region with gender and social inclusion being central to its programming, resource mobilization, and partnerships. The gender programme is an important step in enabling actions to address existing barriers that may hinder the equal participation of female and male actors across the energy value chain. This is also an excellent opportunity for EACREEE to strengthen and increase the visibility for the work being done in the EAC Partner States, building on the extensive work that has been done by others.

International Agreements and Commitments

Gender and energy linkages are now universally recognized and momentum is building internationally and at the grassroots levels for inclusivity. There are a number of international agreements that provide the foundation for meeting goals and targets in the EAC for: (1) increasing access to energy, (2) facilitating investment in projects and programmes, (3) promoting gender inclusive strategies, and (4) increasing the adoption of renewable energy, energy efficiency and modern cooking options. The challenges faced by governments, civil society, investors, donors, and the private sector, are mainly linked to difficulties in translating these goals and targets into blueprints for action. The international agreements highlighted below are important guidelines for sub-regional climate and energy policies and initiatives, in which mechanisms are required for gender mainstreaming. These are further expanded upon in Section 5 of this study.

The Istanbul Declaration and Programme of Action in 2011 was adopted to chart the international community's vision and strategy for the sustainable development of the Least Developed Countries (LDCs) for the next decade, focusing on productive capacities. As 5 of the 6 Partner States of the EAC are LDCs, this declaration played an important role in acknowledging the role of energy in accelerating the development of viable industries and services and creating a business-friendly environment. In addition, the Declaration highlights energy access as a priority area for action along with gender equality and the empowerment of women. In 2016, the Istanbul Action Plan was reaffirmed by leaders, acknowledging that significant progress had been made on agriculture, human development, and achieving peace, but still significant progress was required across sectors, including energy (Buldys, 2016).

In 2012, the United Nation's Secretary General Ban Ki Moon created the *Sustainable Energy for All initiative (SEforALL)*, bringing together government, the private sector, and civil society to achieve three objectives: universal access to modern energy services; doubling the share of renewable energy globally; and doubling the rate of energy efficiency globally. Of note is that the three pillars of SEforALL incorporate gender inclusive approaches. SEforALL also led the global momentum to include energy as one of the United Nations Sustainable Development Goals (SDGs).

The *Sustainable Development Goals* were adopted on September 25th, 2015 by member countries to end poverty, protect the planet, and ensure prosperity for all. SDG Goal number 7 on Affordable and Clean Energy, sets one of its targets "to ensure access to affordable, reliable, sustainable and modern energy for all" by 2030. With SDG 7, it was the first time the international community adopted energy access as a global goal, an important step in prioritizing this issue on a global level. SDG 5 sets out to

"achieve gender equality and empower all women and girls," which has the potential to transform unequal power relations between women and men and address structural barriers impeding progress. With the SDG framework in place, the international community is committed to each goal and can deliver on the targets. Even though SDG 7 and SDG 5 are separate, they are inextricably linked, and gender and sustainable energy is now in the forefront of the development agenda.

More recent is the *Paris Climate Accord*, where representatives from 196 countries made a pact on December 12, 2015 to "adopt green energy sources, cut down on climate change emissions, and limit the rise of global temperatures". The central goal of the agreement was limiting the rise in temperature to 2 degrees. Though it is feasible to reach this objective and SDG7, business-as-usual efforts in policies, investments, and business are not enough. Additionally, according to the United Nations Framework Convention on Climate Change (UNFCCC), because 70 percent of the world's poorest are women, women face more catastrophe due to the effects of climate change; female participation in decision-making processes regarding climate-related planning, policy-making and implementation are critical (UNFCCC, 2015). Going into effect in 2020, the Paris Agreement calls upon each country to help achieve the global goals through its own nationally determined contribution (UNFCCC, 2015). The Accord also requires the developed world to invest USD 100 billion a year into developing countries switching to clean energy (Domonoske, 2017). There is also a formal recognition of the intersection of climate change and gender equality, empowerment of women, and mandates gender-responsive adaptation actions through a Gender Action Plan.

Learning from ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW-GEN)

ECOWAS is making great strides in working towards its goal of full inclusivity to achieve its full economic potential. Therefore, an important starting point for EACREEE is the work that has been done by its sister organization--the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), that offers a number of lessons learned that can guide programme development of EACREEE. With 15 Member States ECREEE has been a pioneer in tackling gender equality in the energy sector by creating the ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW -GEN) in 2013. The ECOW-GEN Programme is ground-breaking in its high-profile role to help shape and influence energy expansion in the region. It aims to guide Member States in mainstreaming gender in policy formulation, legislative drafting, energy project and programme design and implementation with the intention to promote equality in energy development through equal access to resources and equal contribution to the decision-making processes. ECOW-GEN is an influential example that has paved a new path for inclusion in national energy access targets, in order to reach SDG 7 targets and expanding women's potential in the production and supply of energy services.

Key projects of ECOW-GEN include:

- Training energy experts on mainstreaming gender in energy policies, programmes, and projects;
- Convening Gender and Energy Ministers, women groups, associations, civil society organizations, parliamentarians, and more, on developing Gender Action Plans;
- Developing a specific framework action plan in a sub-region; and
- Creating a Women’s Business Fund to demonstrate clean energy projects in Ghana and Senegal through grant support.

In addition, 2015 saw big advances by ECREEE in their decision to conduct research on gender and energy interlinkages in the Member States to build the evidence-base for a policy focusing on gender mainstreaming in energy access (ECOWAS 2015). The ECOWAS policy on Gender Mainstreaming in Energy Access is the first of its kind and serves as a model for others. ECOWAS has also taken the next step toward implementation of this Policy, with a Legal Directive mandating gender assessments in energy projects that was validated by Energy Regulators in June 2017. The Directive provides flexibility for each Member State to determine how to integrate the provisions into their existing legislation (ECOWAS 2017). The ECOWAS Policy and the Legal Directive can serve as a blueprint for other regions—in terms of approach, methodologies, research, templates, etc.

2. Questions Guiding the Research

The baseline study was framed around a series of questions that helped organize the perspectives of different stakeholders in the EAC and understand the context of each Partner State.

- 1) Do women and men in the EAC experience energy poverty differently from the population as a whole?
- 2) What are the impacts of energy poverty on women and men in the EAC?
- 3) What special concerns do other vulnerable groups, such as youth, people with disabilities, and displaced people have when it comes to energy access?
- 4) To what extent do women and men participate in the energy sector as workers and business owners?
- 5) What is preventing women and men from more fully engaging in the renewable energy/energy efficiency sector?
- 6) What existing policies support women and men to enjoy full access to energy services, how were they developed, were women groups consulted, what policies are hindering them, and which policies have failed to address the issue?
- 7) What are Partner States doing within their national energy and gender and social inclusion machinery to support the mainstreaming of women and men into the energy sector?
- 8) What are the data gaps that must still be addressed?
- 9) What key features should a regional policy and programme on inclusivity in the energy sector possess?

3. Methodology

The baseline study of gender and energy in the EAC region involved research, interviews, and data analysis on key issues, strategies, and challenges to help spur the development of a more gender

inclusive energy sector. Desk research on the range of various policies, programmes, businesses, and grassroots efforts at the regional and national level informs the bulk of this report (e.g., policy and strategy papers, scholarly studies, programme documents, donor published reports, data sets and presentations). In addition, interviews, both in person and via skype, were conducted with experts from government agencies, academia, NGOs, multilateral development organizations, and the private sector, to uncover nuances and new ideas on the topic that otherwise are not reflected in the published literature. The engagement of this group of people also created more awareness about EACREEE and its gender and energy agenda. See Annex 1 for the list of people interviewed for this study.

This baseline study reports on the results of desk research and interviews to document, assess, summarize and analyse how gender considerations are incorporated into the EAC Partner States' energy access agendas. The report presents the following:

- 1) Current context for energy access and the clean energy transition in the EAC;
- 2) Linkages between energy access and gender issues, including the differential access, use and effects of energy sources and development impacts;
- 3) Role of women as business owners, managers, and technical experts, including barriers that need to be addressed to accelerate the clean energy transition in the EAC; and
- 4) National and regional energy sector strategies that may reference gender, EAC policies, laws or regulations pertinent to energy and gender, and international treaties and commitments relevant to the EAC.

It should be noted that gender disaggregated data was not widely available, and this is not unique to the EAC, but something that will require more attention by actors at various levels of planning, implementation, monitoring and evaluation including researchers, implementers, donors and development partners. However, some countries had large amounts of data and reports, while for others it was more difficult to delve into the details.

The draft baseline study will be presented for review and consultation at the Sustainable Energy Forum 19-21 March 2018, in Kigali, Rwanda. The aim is to highlight the findings, validate assumptions, and get feedback on the report to finalize it. The report will hopefully spur interest and engagement in the topic so that next steps can be identified and planned, including the formation of a technical advisory group on gender and energy comprised of government ministry stakeholders, thought leaders, academics, and entrepreneurs working at the intersection of gender equality and energy access as well as the development of a strategy to identify areas of cooperative actions, allocation of resources, and the steps to take in addressing gender inequalities on energy access and development in the EAC.

CONTEXT

This section analyses the socioeconomic figures and population growth trends in the EAC, which directly impacts the rate of access to energy. Achieving universal energy access includes extending access to new populations, thus understanding these figures is important for setting the context. In addition, this section analyses the region's income patterns and economic activities. This is necessary as clean energy technology affordability is a major barrier to adoption. Similarly, the urban and rural divide impacts the acceleration rate of access to clean energy. Last to be covered is current energy use, figures, and trends and the potential for renewable energy in the region.

1. EAC At-a-Glance

The EAC is comprised of six partner nations—Kenya, Uganda, the United Republic of Tanzania, Rwanda, Burundi and South Sudan—aiming to increase their shared peace and prosperity through measured steps of harmonization and integration, such as establishing a common market, creating customs and monetary unions, and eventually supporting political federation. The outlook for the EAC and wider East African Region includes strong trends for population growth, economic growth, and urbanization.

The EAC is home to 169 million citizens (50.4 percent of which are female), a population growing at 2.3% p.a. and spread over 2.467 million square kilometres, 78 percent of which live in rural areas (EAC Secretariat 2016b). Tanzania, Kenya and Uganda are among the world's 33 countries projected to see their populations increase five-fold or more by 2100 (UN DESA 2017). Burundi, Rwanda, and South Sudan's population growth has modest by comparison, mostly as a result of the conflicts and civil wars over the past two decades (Figure 1).

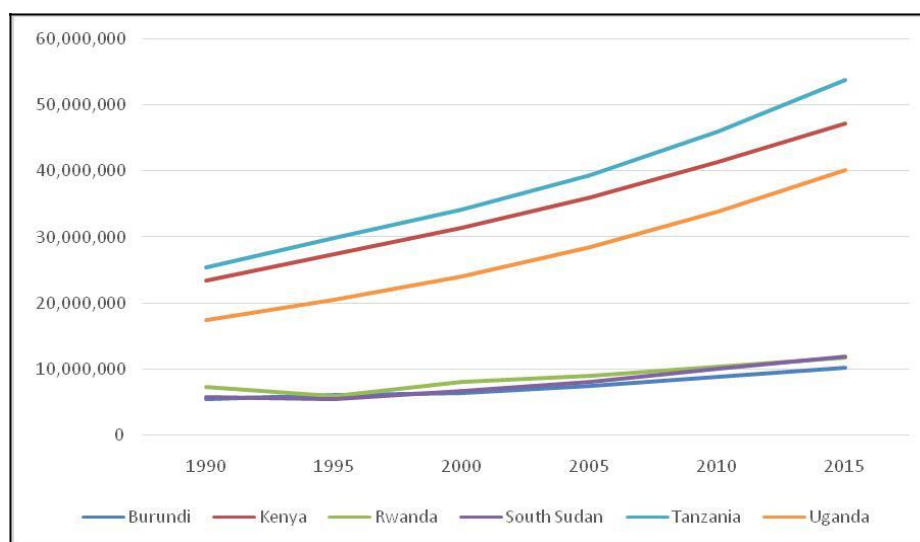


Figure 1: Population Growth from 1990 – 2015 in East Africa³

Source: World Bank Open Data (2017)

In 2016,⁴ the GDP of the EAC is \$166 billion (World Bank 2017), or roughly \$1,000 per capita. The EAC economies have large informal sectors; the informal sector's contribution to GDP in the EAC can be as

³ The World Bank's data includes retroactive estimates of South Sudan's population pre-independence.

⁴ The latest available data for South Sudan is 2014.

much as 30-40 percent and it accounts for anywhere from 70% (Uganda) to 92% (Rwanda) of employment (AFK Insider, 2017). The Gini Coefficient, a statistical measure of income inequality, is highest in Kenya (0.55) and lowest in Burundi (0.4) and 48% of individuals in the EAC fall below the poverty line of \$1.25 per day (EAC Secretariat 2016b).

Agriculture is a major economic activity in the EAC constituting more than 30% of each country’s GDP except Uganda (25%) (USAID 2017). It employs large numbers of people, for example, 90 percent of the population in Rwanda work in agriculture (CIA 2018). However, the EAC is also one of the fastest growing economic regions in Africa, growing between 5 – 8 percent per annum (Ibid.). Telecommunications, finance, and in particular mobile financing services are particularly strong, with Kenya serving as the financial hub for Central and East Africa. East Africa, especially Kenya and Tanzania, is also a major hub for tourism with the abundance of natural wildlife and activities; 17.5 percent of Tanzania’s GDP is from tourism, with 25 percent transacted in foreign currency (Tanzania Invest 2017). Of course, this is not true for the entire region. South Sudan and Burundi are both on the World Bank’s Harmonized List of Fragile Situations.

The EAC is experiencing rapid urbanization with more people migrating to cities in search of a better quality of life, greater diversity of employment, and higher incomes (Figure 2 shows poverty rates are significantly higher in rural areas than urban ones). Similar to trends in other EAC countries, urbanization in Rwanda almost doubled from 15 percent in 2000 to 28 percent in 2014; and, the population of major EAC cities is expected to double again by 2030 (REN21, 2016), creating additional demands on urban infrastructure, including energy infrastructure, in the region. At the same time, with thoughtful planning and adequate investment, governments can take advantage of urbanization to provide energy services to citizens more cost effectively on a per unit basis⁵ than if they remained in the countryside. However, poorly planned urbanization can fail to bring about inclusive growth instead resulting in proliferation of slums, urban poverty and rising inequality.

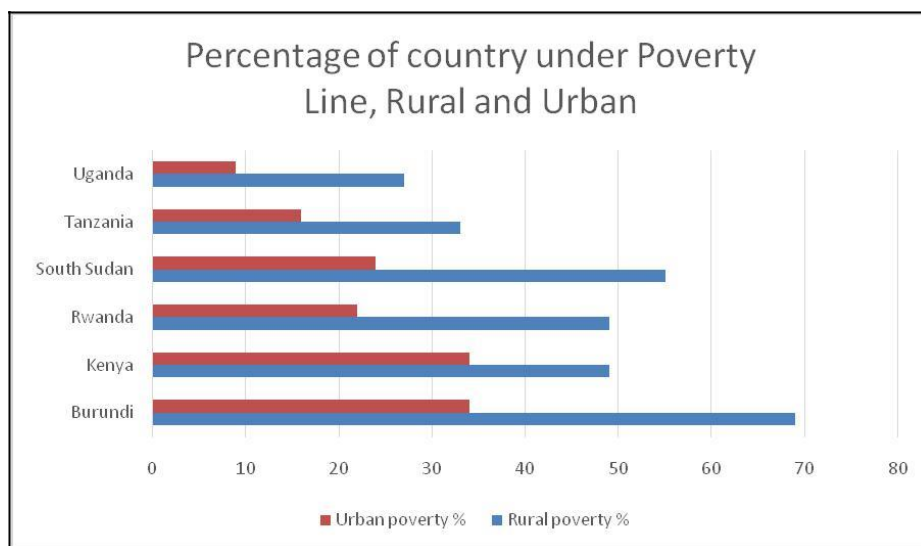


Figure 2: Rural and urban poverty rates
Source: Population Reference Bureau, 2018

⁵ For example, per capita investment in electricity grids and LPG distribution is reduced in higher density areas and energy consumption and ability to pay are elevated in urban areas.

2. Energy in the EAC

This section broadly characterizes the energy consumption patterns in the EAC, the extent of renewable energy use and potential, and energy access trends for electrification and cooking. Key statistics are briefly presented in order to set the stage so that women’s and men’s relationships to various energy systems can be discussed in greater depth later in the report.

The energy situation in the EAC is typified by high levels of reliance on biomass coupled with low levels of electricity consumption. Biomass constitutes the great majority of primary energy supply and consumption in every country except South Sudan⁶ (United Nations Statistics Division 2017b, 2017a). Charcoal and “biofuels/waste,” a classification that encompasses traditional biomass like wood and crop residues for cooking and heating, is the source of 65 percent of the total final energy consumption in Kenya and 93 percent in Burundi (see below).

Table 1: Share of biomass-based resources in total final energy consumption (2015)

Country	Total final energy consumption (Terajoules)	Total final energy consumption (Gigajoules per capita)	Share of charcoal + biofuels/waste in total final energy consumption (%)
Burundi	51,994	5	94
Kenya	496,086	11	65
Rwanda	79,545	7	86
South Sudan	17,576	1	39
Tanzania	935,969	18	85
Uganda	529,659	14	87

Source: Calculated from United Nations Statistics Division (2017b, 2017a)

Economic growth is typically accompanied by decreases in traditional biomass use and increases in electricity consumption (International Energy Agency 2017). Per capita consumption of electricity in the EAC countries is very low when compared to sub-Saharan Africa as a whole (480 kWh/capita/year) and even the set of 47 Least Developed Countries (205 kWh/capita/year) (see below). Grid-based electrification is still mainly limited to urban and peri-urban areas in the EAC, can often be unreliable, and is expensive (both the connection fees and the tariffs). The EAC has about 5 GW of installed electric generation capacity with 64 percent from renewables, a figure more than twice as high as ECOWAS or SADC (REN21 2016). Mostly, this phenomenon is driven by large scale hydro developments, currently the largest source of electricity in East Africa, which is natural given the topography of the area and hydro’s history of being a well-proven and lower cost technology.

⁶ South Sudan’s relatively lower share of biomass in final energy consumption can be attributed to its oil production and the way in which energy balances are calculated.

Table 2: Annual Per Capita Electricity Consumption in the EAC

Country	Year	Annual Electricity Consumption (kWh/per capita)
Burundi	2011	23
Kenya	2014	167
Rwanda	2012	80
South Sudan	2014	40
Tanzania	2014	99
Uganda	2010	62
Least Developed Countries	2014	205
Sub-Saharan Africa	2014	480
World	2014	3,125

Source: World Development Indicators (2018)

Box 1: The East African Power Pool

The East African Power Pool was established in 2005 by Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan and in 2010 joined by Tanzania, 2011 by Libya, and 2012 by Uganda. South Sudan is the only member of the EAC that does not belong to the East African Power Pool though it plans to join. Through regional power interconnections, the goal is “to ease the access to electricity power supply to all people of... the East African Region” (eappool.org). Currently there are several interconnectors and jointly developed hydro projects, with more interconnections and upgrades planned for the future.

Renewable Energy

The EAC Partner States are endowed with a significant amounts of renewable energy resource potential. This includes 13.4 GW for large scale hydro, 4 GW of small scale (defined here as <10 MW) hydropower, 15.8 GW of geothermal, at least 1 GW of wind (probably more), and solar irradiance levels between 4-6.5 kWh/m²/day year-round, some of the highest in the world (REN21 2016). The region also has access to organic wastes, such as from sisal production in Tanzania suitable for commercial scale biogas applications, and bagasse in Kenya, sawdust from lumber mills, and by-products of the tea and coffee industries throughout the region that can be used directly for power or co-generation opportunities.

Table 3: Grid-connected Renewables in the EAC (2014)⁷

Country	Hydropower	Geothermal	Biomass Power	Wind	Solar PV	Total
Burundi	33.8	0	0	0	0.4	34.2
Kenya	820	598	26	25.5	0	1,469.5
Rwanda	78.8	0	0	0	8.75	87.6
South Sudan	0	0	0	0	0	0
Tanzania	562	0	27	0	0	589
Uganda	693	0	57.5	0	0	750.5
Total	2,187.6	598	110.5	25.5	9.15	2,930.75

Source: REN21 (2016)

As seen from, as of 2014 Kenya was the Partner State with the greatest installed renewable capacity, the greatest number of different technologies utilized, and the only Partner State with experience in geothermal and wind development. In the field of grid connected PV, Rwanda was a leader having the first sizable (8.75 MW) PV plant in the region.

Uganda also stands out as an internationally lauded example of renewable energy development, particularly in regard to its GET FiT programme, which combined a feed-in tariff with DFI-supplied top-up payments to small grid-tied renewables. According to the 2016 annual programme report, there were 17 projects representing 157 MW of capacity in the portfolio, 11 of which have reached financial closure, 86 MW of which is under construction, and 30 MW of which has already been commissioned (KFW and Multiconsult 2016).

Other grid-connected technologies exist in the region, notably biomass and biogas, with examples usually tied to agro-industrial operations generating power for their own use and selling surplus into the grid. Tanzania has the greatest number of grid connected projects of any EAC partner state at three, one from a coconut farm, another from a textile producer, and one from a sugar mill (REN21 2016).

⁷ Not inclusive of hydroelectric power imports.

Box 2: Gender Dimensions of Large Scale Renewables

The region's large-scale renewables projects furnish numerous opportunities to benefit disadvantaged groups. Several examples include:

- Kenya's Geothermal Development Company, where by law 30% of the workforce must be female, is also pioneering direct use applications of the heat and fluids for activities like greenhouses, laundry, milk pasteurization and more, all of which could potentially create income generating opportunities for local women and men (Nyambura 2011).
- Uganda's GETFit programme combining technical assistance and top-up payments for feed-in tariffs led to the development of smaller, run-of-river hydro projects that result in fewer negative local impacts on women, men and their environments (KFW and Multiconsult 2016).
- Developed at the Agahozo-Shalom Youth Village, a social enterprise providing housing, rehabilitation services, and education for orphans in Rwanda, Gigawatt Global's 8.5 MW solar PV project's lease provides long term income for the orphanage and solar training for its residents (Private Infrastructure Development Group n.d.).
- Many medium- to large scale biomass/biofuels/biogas projects provide natural entry points to work with farmer and producer cooperatives, some of which include large numbers of women.

On the other hand, failure to adequately (and perhaps separately) consult men and women and address their distinct concerns can pose serious risks to renewable energy projects. For example, the 61 MW Kinangop Wind Park in Kenya, the 1st large scale commercial wind project in the country, was cancelled in 2014 over local land protests even after it had reached financial closing (McGovern 2016). Like with any infrastructure projects, renewable energy development can result in land and natural resource loss for which women must be justly compensated, and an influx of temporary workers, which carries risks of gender-based violence, demand for sex work, sexually transmitted diseases, and substance abuse. For more about these and other gendered impacts, please see ESMAP (2017) "Focus on Gender in Energy and Extractives Operations" and ESMAP (2018) "Getting to Gender Equality in Energy Infrastructure."

Despite large renewable potential and momentum in the sector, the EAC is not without challenges. Wind and solar are variable and intermittent sources of power, but grid systems in East Africa have been designed to support controlled generation. Thus, one of the biggest challenges and opportunities is for the EAC to utilize intermittent sources of renewable energy is to build a power system enabled with ICT and smart grid technology with real-time system monitoring and remote control of voltage and power flow conditions (Avila et al. 2017). In addition, technological improvements to battery storage, operations, and institutional strategies for new market designs are required. Finally, hydroelectric generation in Eastern Africa is increasingly affected by long term climate change and increased climate variability, rendering some hydro projects more expensive and increasing their risk exposure.

Electricity Access

In a positive development, the EAC has witnessed a significant acceleration in electrification over the past five to seven years (Figure 3). The wider eastern Africa region⁸ accounted for 80 percent of the electrification efforts on the continent. However, wide disparities still exist; Kenya, for example is on track to meet the SDG goal for electrification (see **Error! Reference source not found.**) (International Energy Agency 2017) while South Sudan is the least electrified nation on the continent, with less than 5 percent having access to electricity (World Bank 2017).

⁸The IEA made its calculation based on: Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, and Uganda

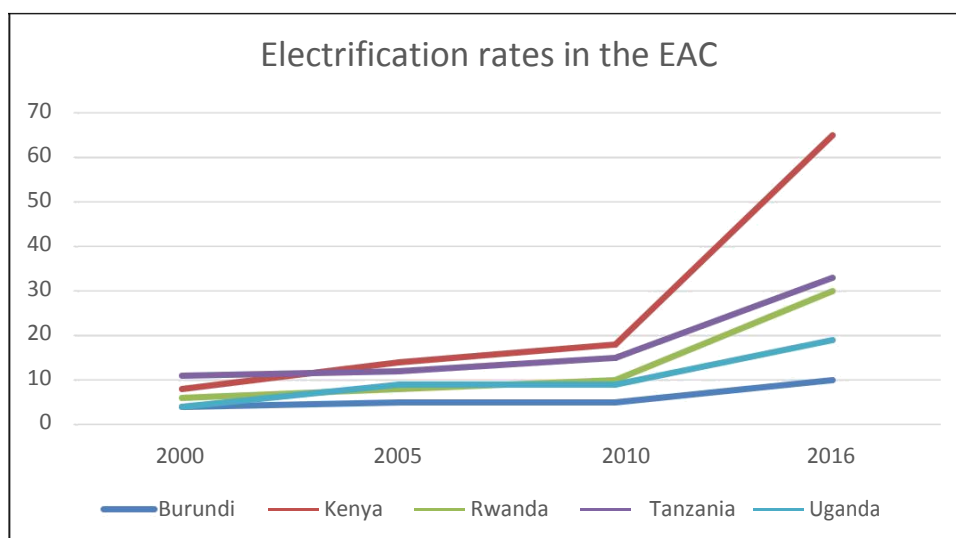


Figure 3: Historical Electrification Rates for the EAC⁹
Source: International Energy Agency 2017

The urban rural divide is also significant in energy access rates; in Rwanda, for example, 28 percent lack access to electricity in urban areas whereas in rural areas it's 88 percent. Much of the work to be done in off-grid electrification needs to be focused in rural areas to achieve the SDG7 target.

Table 4: Population without access to electricity

Country	Total population (Millions)	Population without electricity (Millions)	Population without electricity (%)	Urban population without electricity (%)	Rural population without electricity (%)
Burundi	10	10	90	65	94
Kenya	47	17	35	22	40
Rwanda	12	9	70	28	88
South Sudan	12	13	99	96	100
Tanzania	54	37	67	35	87
Uganda	40	33	81	77	81

Source: International Energy Agency 2017

In order to better define access to electricity, the World Bank Group has created a multi-tiered tracking framework placing household energy access along a continuum of service levels, from traditional fuels to basic lighting and phone charging all the way up to modern 24-hour electricity for other applications

⁹ Established in 2011, South Sudan lacks data points for prior years.

including productive uses (Figure 4). That is, having an electricity connection does not necessarily mean having access to electricity under the new definition, which also takes into account other aspects, as for example reliability and affordability. Energy access is measured in the tiered-spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access) (Bhatia and Angelou 2015). The vast majority of East Africans fall into Tier 0 – 2 for energy consumption, with few urban users achieving Tier 3 and up for their power consumption. The World Bank is planning a baseline study for Kenya, however, using the new framework.

	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Capacity		Capacity (from 3W to above 2kW) and ability to power appliances (applicable for off-grid solutions)				
Duration - day		From at least 4 hours a day to over 23 hours a day				
Duration - evening		From at least 1 hour in the evening to over 4 hours				
Reliability					Number and duration of outages (applicable for Tier 4 & 5 only)	
Quality					Voltage problems do not affect the use of desired appliances (Tier 4&5)	
Affordability					Basic service less than 5% of a household income (Tiers 3-5)	
Legality					Service provided legally (Tier 4&5)	
Health and Safety					Absence of accidents (Tier 4&5)	

Figure 4: Multi-Tier Tracking Framework for electrification

Box 3: Spotlight on Kenya

Kenya is currently the only country in East Africa on track for meeting the Sustainable Development Goal of universal electricity access by 2030. The access rate increased from 20% to 65% since 2012 (International Energy Agency 2017), the year a survey showed 73% of Kenyans were using kerosene for lighting and 48% used dry cell battery or torch power as a secondary source of lighting (Bloomberg New Energy Finance and Lighting Global 2016). Government initiatives, such as the removal of a value-added tax for solar imports and the Last Mile Connectivity project, which brought grid extensions to 1.5 million Kenyans have, accelerated access to electricity. Private-public partnerships, such as tapping into Rift Valley geothermal resources, and international support and financing has also led to the tripling of connected customers since 2012 (International Energy Agency 2017). Kenya is also the largest market for off-grid solar home systems and solar lanterns in Africa (Bloomberg New Energy Finance and Lighting Global 2016). Due to a favorable investment climate, foreign direct investment in energy access has flowed into Kenya, helping it to meet its electrification targets.

Source: Bhatia and Angelou, 2015

East Africa has a large number of off-grid renewable electricity companies, utilizing a variety of approaches and different financing models to reach rural consumers with mini grids, stand alone systems (including solar home systems) and pico solar products like lanterns. The region has been as a proving ground for decentralized systems, digital mobile payment platforms, and other innovations which has led to the acceleration of its off-grid energy sector, particularly in Kenya and Tanzania. In Kenya, as much as 30 percent of the grid-unelectrified population has experience using solar, and the country has potentially already seen its annual adoption rate peak (i.e., it is becoming a “mature” market) (Bloomberg New Energy Finance and Lighting Global 2016). Tanzania in 2016, according to a report by World Resources Institute, had 109 mini-grids serving over 180,000 people with an installed capacity of 157.7 MW in 2016 (Odarno et al. 2017).

Ren21 (2016) roughly estimates the EAC annual market for off-grid solar PV stands between 25 MW and 40 MW. Most popular household off-grid stand-alone systems are comprised of solar with 10 W panels or less, but bigger systems are increasingly in demand through Pay-As-You-Go technology (see Box 4). Pico solar lanterns, usually one or a couple light sources that may be combined with phone charging, are also popular in East Africa, and are the fastest and least expensive way to begin the ascent on the energy access ladder (Harrison 2017). The EAC accounted for over half of the pico systems sold on the continent in the second half of 2015, and Kenya fully accounted for 30 percent of continent-wide sales from July 2014 – July 2015 (Bloomberg New Energy Finance and Lighting Global 2016). Companies such as SunnyMoney, D.Light, and Greenlight Planet have invested significantly in East Africa with their lantern technology. In 2015, SunnyMoney has sold 1.7 million solar lanterns in East Africa reaching approximately 10 million people. Lanterns are typically sold at market rates, though access to credit is becoming feasible through embedded pay-as-you-go technology (PAYG) through companies such as Angaza. Solar thermal applications, especially for water heating, are not particularly common in the EAC, with the exception of Kenya, where 80 percent of the solar water heating market exists and where a 2012 regulation mandates the uses of solar water heaters wherever the capacity for hot water production exceeds 100 litres per day (REN21 2016).

Box 4: Pay-As-You-Go (PAYG) Technology in the EAC

Utilizing mobile networks to provide energy through PAYG has been especially targeted and popular in East Africa. PAYG is a type of technology where customers can either rent-to- own or lease an off -grid PV system thanks to the confluence of falling PV prices, metering technology, and mobile money systems. PAYG companies have taken advantage of their internal data collection to build client credit histories and target more products to credit worthy individuals. The most popular PAYG companies operating in East Africa are M-KOPA, Off-Grid Electric, Mobisol, Fenix, and BBOX. Kenya, Tanzania, Rwanda, and Uganda are a hotbed for PAYG technology companies owing to their well-established telecoms, mobile money systems, and a greater ease of doing business than other parts of Africa. According to IEA (2017), however, though the majority of growing investment in off-grid solar PV has flowed to businesses with PAYG models, the majority of people who have gained access to electricity did so through other means, mostly via grid connection.

Cooking Fuels and Technologies

Currently, the region exhibits high shares of renewables as a percentage of final energy consumption; South Sudan registers at only 30 percent from renewables, but the other 5 countries are in excess of 75

percent and as high as 90 percent in the case of Burundi (ESMAP 2014). However, in every country, less than 4 percent of total final energy consumption comes from “modern renewables,” (Ibid.) meaning most renewable utilization is in the form of traditional biomass for cooking and heating.

A total of 156 million people lack access to modern cooking facilities in East Africa. Biomass remains the dominant cooking and heating fuel, with up to 96 percent of the EAC utilizing it (though not necessarily exclusively; “fuel stacking” is commonly practiced)(Kirai and Hankins 2009); only Kenya has demonstrated moderate success in improving this figure. In fact, clean cooking adoption rates are not keeping up with population growth in most areas.

Table 5: Population and Percentage of People without access to modern cooking

Country	Total population (Million)	# without clean cooking facilities (Million)	% without clean cooking facilities
Burundi	10	11	>95
Kenya	47	34	86
Rwanda	12	11	>95
South Sudan	12	12	>95
Tanzania	54	50	>95
Uganda	40	38	>95

Source: International Energy Agency 2017

Significant inequalities exist between urban and rural areas in cooking practices and fuel access. Urban citizens tend to use electricity, charcoal, liquefied petroleum gas (LPG), kerosene and other fuels, whereas rural citizens almost exclusively use traditional biomass and firewood for cooking. In addition, access to modern energy sources such as LPG or electricity is only available in a few urban centres. In urban areas in East Africa,¹⁰ over 50 percent of the population use biomass for cooking, with a quarter using LPG. In the rural areas, over 90 percent use biomass with the small remainder using LPG (Accenture Development Partners and GVEP International 2012). Lack of distribution networks and affordability remains the biggest barrier for LPG usage across East Africa. Dwindling biomass availability also causes the prices (or shadow prices) of those fuels to climb.

¹⁰The countries covered by the referenced ADP/GVEP market assessments here include only Kenya, Uganda, Tanzania and Rwanda.

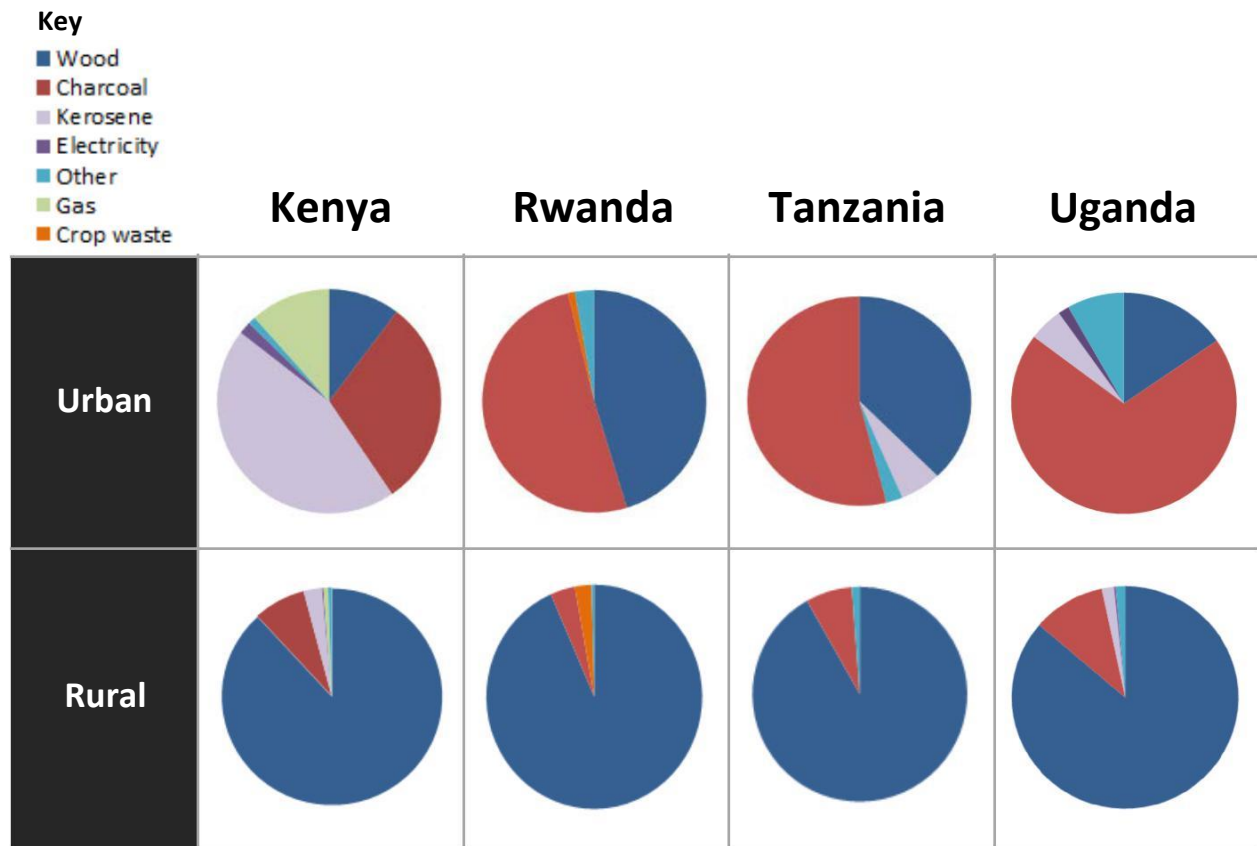


Figure 5: Primary fuels used for cooking in East Africa

Source: Project Gaia 2015

Table 15 in the next section further expounds on the figures of deaths contributed by indoor air pollution caused by traditional cooking fuels. Due to population growth, the number of people without access to clean cooking continues to rise. Because of these population growth trends, deforestation from fuelwood and charcoal demand has been occurring at an alarming rate. According to the State of East Africa Report (2012), the region’s 107 million hectares of forest decreased by more than 9 percent to 98 million hectares between 1990 and 2000, and a further 13 percent to 85 million hectares in 2010, most of which occurred in Tanzania.

Some ambiguity and debate arises from the broad definition employed of “clean cookstove,” which can encompass everything from a very rudimentary improved device costing only a few dollars to an LPG stove or electric one costing a hundred or more. Some experts believe only a zero -emission stove can be considered clean, whereas others claim that any stove that is an improvement on a three-stone fire or traditional charcoal stove is clean. Others believe that the vessel should not be the focus, but the fuels being burned, advocating for ethanol, natural gas, LPG, and electricity.

A multi-tier tracking framework was also developed by the World Bank/ESMAP for measuring access to clean cooking (

) in addition to that for electricity (Figure 4) (Bhatia and Angelou 2015).

	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Indoor air quality		Concentration of PM2.5 and CO; tiers aligned with WHO guidelines				
Efficiency		Tier benchmarks under development, awaiting results of ISO process				
Convenience			Stove preparation time and fuel collection and preparation (applicable from Tier 2 on)			
Safety			Absence of accidents and alignment with the ISO process (from Tier 2 on)			
Affordability					Levelized cost of cooking solution < 5% of household income	
Quality and availability of fuel					Cooking not affected by seasonal variations in fuel quality and	

Figure 6: Multi-tier framework for clean cooking

Source: Bhatia and Angelou, 2015

The clean cooking sector in EAC is extremely fragmented and there is little reliable data. What is known is that adoption of Tiers 4 and 5 modern cooking energy is low. The vast majority of people in the EAC cook at the lower tiers with a traditional metal sigiri or charcoal cookstove, or a 3-stone fire (Project Gaia, 2015). Figure 5 shows that wood is the primary source of fuel in rural east Africa, followed by charcoal. In urban areas, charcoal is the dominant source of fuel, whereas in Kenya kerosene is also popular.

3. Salient EAC Gender Issues

The countries of the EAC, despite lingering inequality, are fairly progressive in terms of gender issues compared to other countries with similar levels of economic development.

The Gender Gap Report (World Economic Forum 2016) measures women’s disadvantage compared to men’s in the areas of health, education, economy and politics. The five ranked EAC Partner States are all in the top half of the 144 globally ranked countries, well above the averages for other regions such as West Africa, North Africa and the Middle East, and South Asia. Table 6 below shows what “percent” of the gender gap has been closed, for example, Rwanda has closed 80 percent of its gender gap while Kenya only 70 percent. For comparison, the country with the smallest gender gap is Iceland, at 87 percent closed, while the country with the largest gap is Yemen, at 52 percent closed.

Table 6: Closing the Gender Gap in the EAC

<u>Country</u>	<u>Gender Gap Index Rank</u>	<u>Index Value (percentage of gap closed)</u>
<u>Rwanda</u>	5	0.80
<u>Burundi</u>	12	0.77
<u>Tanzania</u>	53	0.72
<u>Uganda</u>	61	0.70
<u>Kenya</u>	63	0.70
<u>South Sudan</u>	NO DATA	
<u>Average for Sub-Saharan Africa</u>		0.68

Source: World Economic Forum, 2016

In a similar vein, the OECD's Social Institutions and Gender Index (SIGI) (OECD 2014) measures discrimination against women in social institutions (e.g. laws, norms, practices). The index is composed of five sub-indices in areas found to greatly impact women throughout their lives: family code, physical integrity, son bias, restricted resources/assets, and restricted civil liberties. Countries are grouped into five categories, with low SIGI scores being better (first ranked Belgium's score is 0.0016, last ranked Yemen's is 0.5634). Four EAC members are in the middle group; only Tanzania falls slightly outside, and there is no data for South Sudan (Table 7).

Table 7: Social Institutions and Gender Index in the EAC

Country	SIGI 2014 Category	SIGI Value 2014
Burundi	Medium	0.1662
Kenya	Medium	0.2157
Rwanda	Medium	0.1339
Tanzania	High	0.2504
Uganda	Medium	0.2163

Source: OECD, 2014

The Gender Inequality Index (GII) and the relatively older Gender Development Index (GDI) are both measures created by the UNDP, which is also responsible for publishing the Human Development Index (HDI). The GII is based off indicators for women's health, labour market participation, and empowerment, whereas the GDI more closely tracks a country's HDI and makes a small correction for gender inequality. Both are presented below, along with disaggregated data for the HDI, income, and labour market participation (Table 8). Particularly interesting is that all five countries for which there is data have a GII rank that outperforms their HDI rank, that is they exhibit less gender inequality than might be suggested by their overall level of human development. Also, in both Rwanda and Burundi, women work in the labour force at greater rates than men.

Table 8: Gender Indicators in the EAC

HDI Rank	Country	Gender Inequality Index		Gender Development Index		Human Development Index		Estimated gross national income per capita		Labour force participation rate (%)	
		Value	Rank	Value	Group	Female	Male	Female	Male	Female	Male
146	Kenya	0.565	135	0.919	4	0.531	0.577	2,357	3,405	62.1	72.1
151	Tanzania	0.522	121	0.937	3	0.512	0.546	2,359	2,576	82.3	87.7
159	Rwanda	0.383	84	0.992	1	0.491	0.495	1,428	1,822	86.4	83.2
163	Uganda	0.544	129	0.878	5	0.459	0.523	1,266	2,075	74	83.3
184	Burundi	0.474	108	0.919	4	0.388	0.422	632	752	84.6	82.7

Source: UNDP (2015)

Health and Education

Even though the gender education gap has been one of the fastest to close (World Economic Forum 2017), disparities still persist in the region, as can be seen below in Table 9. Of note, in Rwanda, the expected years of schooling estimated for female children is now higher than that for males. Energy is potentially important for education in that can permit children’s chores and studying to be done at night; decrease the burden on children for water and fuel collection; give mothers more time to supervise their children’s studies; provide lights, cooling and computer use at schools; and attract and retain teachers in underserved rural areas.

Table 9: Gender and education indicators in the EAC

HDI Rank	Country	Expected years of schooling ¹¹		Mean years of schooling		Population with at least some secondary education (% ages 25 and older)	
		Female	Male	Female	Male	Female	Male
146	Kenya	10.8	11.4	5.7	7	27.8	34.1
151	Tanzania	8.3	9.3	5.4	6.2	25.9	32.1
159	Rwanda	11.4	9.3	3.3	4.4	10.5	16.4
163	Uganda	9.9	10.1	4.5	6.8	10.1	15.3
184	Burundi	10.2	11.1	2.6	3.6	7.1	9.6

Source: UNDP (2015)

Similar to global and historical trends, in all five countries for which there is data, women on average live longer than men. Globally, the difference is about 5percent, but in conflict zones there is often excess male mortality. As for other indicators of women’s health and wellbeing, such as maternal mortality and adolescent birth rate, there is considerable variability throughout the region (Table 10) . For example, Burundi’s maternal mortality ratio is twice that of Rwanda’s and Tanzania’s adolescent birth rate is four times that of Burundi. Energy is potentially relevant to health outcomes as it provides light for childbearing, refrigeration for vaccine storage, heat for sterilization, enables communication devices for health extension and epidemiological reporting, and its presence may help attract qualified health workers to rural areas.

Table 10: Health and well-being in the EAC

HDI Rank	Country	Life expectancy at birth		Maternal mortality ratio	Adolescent birth rate
		Female	Male		
146	Kenya	64.1	60.3	510	90.9
151	Tanzania	66.9	64.1	398	118.6

¹¹This represents the number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child’s life.

HDI Rank	Country	Life expectancy at birth		Maternal mortality ratio	Adolescent birth rate
		Female	Male		
159	Rwanda	67.4	61.8	290	26.3
163	Uganda	61.1	57.3	343	111.9
184	Burundi	59.2	55.1	712	28.3

Source: UNDP (2015)

Time Use and Work

As a product of cultural norms, women and men are often found performing different kinds, and amounts, of work. Energy services' ability to make other work more efficient, flexible, and productive are thus important within this gendered context. Acquiring forms of energy, especially cooking fuel, also requires one's time and [metabolic] energy, for which there are many competing needs. One definition of energy is "the ability to do work," and wisely harnessing energy could in theory help close the gender time/work gap.

Patterns of time use vary from country to country and between rural and urban areas within the EAC, but as a rule, women generally, but certainly not always, spend more time collecting cooking fuel, preparing meals, and collecting water, with the last two activities being significantly more consistently gendered than the first (Cooke, Köhlin, and Hyde 2008; Wodon and Blackden 2006). Women also tend to work more overall hours than men, performing the majority share of unpaid work (United Nations Statistics Division 2016), and suffering at greater rates from time poverty, meaning a lack of time to produce all the necessary goods and services for their livelihood and personal maintenance.

"Women continue to suffer very high time burdens in pursuing their livelihood strategies. The Uganda Strategic Country Gender Assessment (World Bank 2005) reveals that women work considerably longer hours than men (between 12 and 18 hours a day, with a mean of 15 hours), compared with an average male working day of 8 to 10 hours. Women bear the brunt of domestic tasks, in addition to agricultural and other productive work. The time and effort required for these tasks, in almost total absence of even rudimentary domestic technology, is staggering. This has a negative effect on food security, household income, children's schooling, participation in community life, health, and overall productivity." (Republic of Uganda 2007)

Small children often exert some of the greatest time and work burdens on their mothers (via pregnancy, breastfeeding, the need for personal care, etc.), who cannot completely neglect other domestic, agricultural and production work. This is known as the double burden. It incidentally peaks for mothers just at the time when their children most need timely access to nutrition, healthcare and supervision to thrive; and when children's caregivers' time is most taxed, it increases the likelihood that appropriate care can't be given (Wodon and Blackden 2006). Seasonality also affects the time pressure on men and women to collect fuel. During the rainy seasons, prices for fuelwood increase and during periods of intense agricultural production, men and women have many urgent competing uses for their time (Kigodi and Poncian 2016). Better energy services are one component of a holistic approach to better manage these burdens.

Another important measure around cultural norms related to work is the dependency ratio. This ratio shows the number of children under 15 and elders over 65 relative to the number of working age adults, aged 15-64. A dependency ratio of 100 means there is one dependent, old or young, for every adult aged 15-64. A higher dependency ratio means a greater burden of care on the working age population, usually women. The dependency ratios in the EAC (Table 11) are significantly higher than the world average of 52.5, and every Partner State’s ratio is higher than the average for least developed regions as well (UNFPA 2016), driven in great part by the youthfulness of the population.

Table 11: Dependency Ratio in the EAC Partner States (2016)

Country	Dependency Ratio
Burundi	90.5
Kenya	80.3
Rwanda	76.8
South Sudan	83
Tanzania	93.6
Uganda	101.3
World average	52.5
Least developed regions average	76.4

Source: UNFPA 2016

Land, Inheritance and Family Law

The possession of land and other assets is a mediating factor in the quest for universal energy access. Landholding and secure rights to that holding can promote investment in improved energy technologies in three ways: by providing physical space for energy production, businesses and applications; by serving as collateral for energy-related investments; and by lowering the risk that energy-related investments can be later appropriated. Additionally, when land is acquired for energy projects, whether on a willing buyer/seller basis or by eminent domain, women’s and other vulnerable groups’ ability to be justly compensated is often complicated by local tenure practices.

The EAC is characterized by a diverse set of land tenure regimes, sometimes within a single Partner State, where land is governed by a wide variety of both statutory and customary practices. Depending on the location, land may be held communally, privately, or in trust by the government. Individuals’ ability to access, use, hold, and transfer land under those regimes are embedded in diverse procedural forms, some of which clearly disfavour women, such as patrilineal inheritance and widowhood practices; on the other hand, there are several matrilineal groups within the region as well (Dancer 2017).

Despite lingering challenges, there are signs of progress. For example, the new Kenyan constitution (2010) and Land Act (2012) grant all citizens the right to own land and espouse ideals of gender equality in land distribution. Also, two Tanzanian widows successfully petitioned the U.N. Committee on the Elimination of Discrimination seeking remedies against the State for permitting customary practices to dispossess them of their land (Committee on the Elimination of Discrimination against Women 2015). Rwanda, in particular, is notable for not recognizing polygamous marriages, making the default marital

regime that of community property, treating male and female children equally in inheritance matters, and granting property to widows (FAO 2017).

There are still gaps between male and female landholding, as can be seen from the table below where data is available for Burundi, Rwanda, Tanzania, and Uganda. Table 12 shows women holding less agricultural area, being less likely to be agricultural landholders, and being more likely, when they are landholders to be joint (as opposed to single) owners. However, these discrepancies between men and women are uniformly less than those found for West African Countries in the same Gender and Land Rights Database (FAO 2017).

Table 12: Landholding by Gender in the EAC

Country (Year)	% of agricultural landowners who are female			
Tanzania (2013)	45.2			
Uganda (2011)	49.6			
Country (Year)	% of total population that owns agricultural land			
	% of females who are sole or joint owners	% of females who are sole owners	% of males who are sole or joint owners	% of males who are sole owners
Uganda (2011a)	39	14	60	46
Uganda (2011b)	31	9.10	34.10	13.90
Tanzania (2010)	30	8	NA	NA
Tanzania (2013)	31.7	13.20	42.30	23
Rwanda (2010)	54	13	55	25
Burundi (2010)	54	11	64	50
Country (Year)	% of agricultural land owned by women and/or men			
	% of land owned by females	% of land jointly owned	% of land owned by males	
Tanzania (2010-2011)	16	39	44	
Uganda (2009-2010)	18	48	34	

Source: UN FAO Gender and Land Rights Database (2017)

Political Representation

Gender balance in politics and public service is a positive contributing factor to gender equality in energy access. This can occur by bringing more diverse perspectives to bear during deliberative processes, increasing voter choice, and broadening the avenues effectively used in advocacy work. At the same time, greater female political participation in many countries is an indicator of generally progressive attitudes and can be expected to correlate with forward-thinking and inclusive energy access policies.

As a bloc, the EAC is a global leader in women’s parliamentary representation. Overall female participation is higher in the EAC (32 percent) than any other region except the Nordic Countries (42 percent), and significantly above the global average (24 percent), according to the Inter-Parliamentary Union (IPU) (2017b). *Rwanda, notably, is ranked first worldwide, with 61 percent of the seats in its lower chamber held by women, (see Table 9 for details).*

Table 13: EAC Political Participation of Women

Rank	Country	Lower or Single House				Upper House or Senate			
		Election Year	Seats*	# of Women	% Women	Election Year	Seats*	Women	% Women
1	Rwanda	2013	80	49	61.30	2011	26	10	38.50
22	United Republic of Tanzania	2015	393	145	36.90	---	---	---	---
24	Burundi	2015	121	44	36.40	2025	43	18	41.90
30	Uganda	2016	449	154	34.30	---	---	---	---
51	South Sudan	2016	383	109	28.50	2011	50	6	12.00
86	Kenya	2017	349	76	21.80	2017	68	21	30.90
	EAC		1775	577	32.51		187	55	29.41

Source: Inter-Parliamentary Union 2017

Every EAC Partner State has instituted some form of electoral quota system for women and four of the EAC countries make provisions for other groups: Uganda (youth), Kenya (youth, persons with disabilities, workers), Rwanda (youth, persons with disabilities), and Burundi (ethnic groups) (Dahlerup et al. 2013). These quotas with, importantly, their enforcement mechanisms have decisively contributed to female political inclusion, but there are still impediments to fuller equality. For example, in Uganda, the seat reservation system increases voter pressure on women not to compete for open seats and thus “take them away” from men (Inter-Parliamentary Union (IPU) 2017a). In South Sudan, despite women holding 29 percent of the seats, a female representative had this to say:

“The only problem with men— particularly in South Sudan—is that decisions are not made at the table. Decisions are made under the table. Decisions are made at night. Decisions are made after working hours, where women don’t go. Even if they can influence decisions, it is difficult for them to do so when they don’t know, because a decision is made when they’re not there. Information is power.” — Betty Ogwaro, member of the Transitional National Legislative Assembly and former Minister of Agriculture and Forestry (Stoddard 2016)

GENDER AND ENERGY ACCESS

Energy access is mediated through the lens of gender in multiple ways: one's gender can potentially influence the ways in which energy poverty is experienced, the ability to access better energy, and the complex processes through which that happens. This section looks at the ways in which gender plays a role in electrification rates, pricing, and choices; health and time use impacts of cooking and product preferences; and gender issues surrounding productive use applications, with examples drawn from all along the agriculture value chain, from cultivation to value-added processing to commercial food preparation.

1. Electricity Access and Gender

Electrification has long been recognized as a vital policy goal, unlocking unparalleled advances in productivity, socio-economic development, enhanced livelihoods and social welfare. A survey of global researchers rated electricity as the most significant technical advance of all time, with 37 percent of votes, trailed quite a bit by antibiotics, at 14 percent, and vaccines at 11 percent (National Academy of Engineering, in Pellegrini and Tasciotti (2013)). While there are many hypotheses regarding electrification's impacts on women, men, and the gender relations between them (See Box 5) these topics are the subject of only limited scientific studies using large data sets, random sampling, and attempts to control for other, linked variables. Such was the conclusion in 2011 (Köhlin et al. 2011; Clancy et al. 2012) and was reaffirmed recently by Clancy (2017).

Box 5: Theorized Impacts of Electricity Access

Positive Hypothetical Impacts

- Girl children may withdraw less frequently from school to help mothers with chores as they can be completed more efficiently and with greater time flexibility (i.e. at night);
- Children's school attainment may improve with longer access to light so both chores and studying may be pursued;
- Electrification paired with appliance acquisition can increase the productivity of domestic work;
- Women's ability to perform paid work will increase as household chores take less time and/or with the complementary input of electricity, the opportunity cost of their paid labor becomes more valuable;
- Women will have more leisure time;
- There will be fewer burns, fires, and indoor air pollution associated with fuel based lighting;
- Patriarchal attitudes begin to erode when electrification is paired with relatively progressive gender messages on radio and TV programming;
- As women's time becomes more valuable through electrification, other labor saving investments (e.g. improved stoves) become more attractive for households to pursue;
- Activities at night (e.g. transportation, night markets, etc.) will become less dangerous and more attractive with the addition of street lights;
- Electrification of clinics and equipment carried by mobile health workers will improve neo- and peri-natal outcomes for mothers and their children and also complement public health initiatives such as vaccination; when paired with advances in ICT access, electrification could also support telemedicine, information campaigns, and reporting of disease epidemics;
- When paired with financial and technical support for business development, electrification can help women start and grow enterprises, raising incomes, strengthening empowerment, and providing goods and services in their communities; and
- When paired with access to credit and appropriate technology, electrification can make agriculture and post-harvest processing more productive and foster linkages to markets.

Negative Hypothetical Impacts

- Women's overall work burden (paid and unpaid) will increase when lighting lengthens the workday;
- Street lights may decrease women's safety by allowing potential attackers to see their victims; and
- Electricity connections and appliances may be subject to male capture, leading women to realize relatively fewer benefits and become disempowered vis-a-vis male counterparts.

A recent IADB review (Jiménez 2017) summarizes the results of the experimental and quasi-experimental electrification studies through 2016, including gender-disaggregated ones. It determined that, despite much variability, *on balance* studies are detecting greater gains from electrification for girls relative to boys in education¹² and women relative to men in labour force participation.¹³ However, there are mixed results for male relative to female wage growth, with male wages growing more than women's in several cases.¹⁴ Several studies detected statistically significant lower fertility in rural areas,¹⁵ while others found no effect.¹⁶

Education, as an issue of particular concern to youth, bears special mention. While the majority of studies find positive electrification's overall effects on schooling level, especially with girls (Jiménez 2017), there is not always a clearly defined gender-differentiated education outcomes,¹⁷ or sometimes it is not possible to document significant positive correlation between electrification and education outcomes.¹⁸ No gender -differentiated statistical studies of electrification outcomes could be identified from EAC countries for this study. Within the EAC, Ye (2017) found electrification contributed to increasing years of schooling in Kenya; Bensch et al. (2011) found no difference in children's study hours as a result of electrification in Rwanda; and Furukawa (2013) found the use of solar lamps for studying actually decreased test scores. The seemingly conflicting results illustrate the need for more research on impact of electrification with attention to gender disaggregated data.

Grid Extension

Grid extension, in terms of where the grid is built and when, is driven by cost and political considerations. Generally, wealthier areas are connected earlier and more intensively to grid networks. The reasons are multiple. Sometimes communities must shoulder part of the infrastructure cost; utilities target high demand areas to aid in cost recovery; and wealthier communities have more political influence (World Bank 2008). When individuals must pay connection fees (often several hundred dollars), female-headed households, which are disproportionately poor, may struggle more to connect. At least one study (Bensch, Kluve, and Peters 2011), however, did not find econometric evidence of this in Rwanda, though education of the household head and the size and cost of the home were highly significant (<1 percent level) predictors of a household's decision to connect. In the 2015 Global Tracking Framework (IEA and World Bank 2015), most, but not all, countries showed lower rates of electrification for female-headed households. EAC countries have between a 24 percent and 36 percent of their households headed by a female (Table 14), according to World Bank Data (2012, 2015 and 2016), making it clear that focusing on this demographic is important for the EAC. In this case, financing arrangements can and should be made to expand connectivity. For example, Kenya Power and Lighting Company (KPLC), in its Last Mile Connectivity Initiative, connected 1.3 million people in just a year, going from 27 percent electrification to 55 percent, allowing poor households to pay the KSH 15,000 (USD 140) connection fee in instalments (Ye 2017; Kenya Power and Lighting 2016).

¹²See: ADB 2010

¹³See: Barkat 2002; Grogan and Sadanand 2009; Chowdhury 2010; Dinkelman 2010; Grogan 2013.

¹⁴See: Dinkelman 2011;

¹⁵See: Grogan and Sadanand 2009; Grogan 2016; ADB 2010; Peters and Vance 2011

¹⁶See: Arráiz and Calero 2015; Lipscomb et al. 2013; van de Walle et al. 2013

¹⁷See: Barkat 2002; Khandekar 2009a, 2009b

¹⁸See: Bensch et al. 2011; Barron and Torero 2014; Squires 2015

Table 14: Percentage of Female-headed Households in the EAC

Country Name	Female-headed households as % of total	Data Year
Burundi	24.5	2012
Kenya	36.1	2015
Rwanda	31	2015
Tanzania	24.5	2016
Uganda	26.9	2015

Source: World Development Indicators 2017

There is very limited gender disaggregated data on connections to the electrical grid because utilities tend to treat customers in a gender blind fashion, focusing only on increasing total number of connections, reducing losses, and achieving cost recovery. One area where gender-disaggregated data was found on grid access was among the entrepreneurs surveyed by the World Bank/International Finance Corporation (IFC) for the Enterprise Surveys (World Bank 2011a, 2013, 2014). This data is available in Annex 2, but it does not show consistent gender trends across countries or indicators. For example, in Kenya and South Sudan, women -led businesses waited much longer to obtain an electricity connection, though in Uganda and Tanzania the situation was reversed.

Gender Effects of Tariff Structures

One promising area for gender analysis in the electricity sector is looking at whether tariff schemes have the potential to inadvertently favour one gender over another. In Latin America, for instance, 14 out of 15 electric utilities were found to offer lower prices to commercial users (Komives et al. 2005), which could have inadvertently disadvantaged female-led businesses operating disproportionately from home or informal premises (World Bank 2011b).

Five EAC Partner States have pro-social lifeline tariffs for the benefit of poorer households, except for South Sudan. In Kenya, households that are consuming electricity at or above the lifeline level, but less than 1,500 kWh per month, have tariffs that are similar but not identical to the smallest commercial tariff (KES 12.75 vs. KES 13.50, respectively) (Regulus Limited 2017)—meaning gender effects of the kind seen in Latin America are probably absent. In Rwanda, domestic consumers pay lower rates than commercial consumers, though industrial, high voltage users pay the least on a per unit basis (Rwanda Development Board (RDB) 2017). In Tanzania and Uganda, the average commercial tariffs are lower than the domestic ones (TANESCO 2016; Electricity Regulatory Authority (ERA) 2017). This could potentially be benefitting men more as their businesses are more likely to be formalized so that they are paying lower rates. In Burundi, low voltage access has unit prices and fixed charges that vary between domestic and commercial customers (Agence Bujumbura News 2017); so without knowing a user’s final consumption in kWh, it would be impossible to make general statements about which group has the higher all-in cost. More significant, though, were the recent and dramatic overall price increases, with typically male dominated electricity-intensive businesses, such as welders and machinists being especially hard hit (Voice of America (VOA) Afrique 2017).

Gendered Product and Service Preferences

Men and women often are responsible for different tasks at different times of the day in their homes, and it is not surprising that they have varied preferences for types of electrical devices in use, their features, and also potentially, their placement within the house. It is also well documented that household decision-making practices are a reflection of the tension between individual preferences and the relative bargaining strength of each of those individuals. An IFC/Lighting Africa survey (Alstone et al. 2011) of 5,000+ households and 2,500 business estimated that women were responsible about 40 percent of the time for lighting purchase decisions; that women and men exhibited differences in product preference, although regional differences were more pronounced than gender ones; and that the type of enterprise, not the gender of the manager, typically drives preferences within businesses.¹⁹ Evidence for the existence of both gendered preferences and intra-household bargaining is also found by Winther (2011) in her study of an electrification project in Zanzibar, Tanzania (See Box 6).

Box 6: Gender Preference in an Electrification Project In Zanzibar

During a community-based electrification project in Zanzibar, many gender differences were discovered, ranging from where connections happened to what the electricity was ultimately used for. Women could not attend planning meetings in the afternoon because of work obligations. Neither did they hold any official religious or planning posts giving them leadership roles at the meetings. As such, their influence was extremely limited. Perhaps not surprisingly mosques and the fish market, where men routinely gathered, were connected, but the village mill used by women was not, nor was the kindergarten where older women kept the children of young mothers. Also of note, after several years, it was found that almost all the household electrical appliances were owned by men. The investigator believes electricity became a male domain because houses were largely male property, electricity contracts were in their name, and men's social responsibilities evolved to include furnishing an electric connection and also paying the bills. Thus appliances that use electricity and cost men money are selected by them, even if women end up using them relatively more due to being present in the home more often.

Source: Winther, 2011

2. Clean Cooking Access and Its Gendered Impacts

The major gender dimensions of cooking stem from who is doing it, how much time is spent, and what kind of stove is being used. Along with childcare, home-based food preparation is largely considered women's work, though men are frequently seen cooking in commercial settings. Household cooking, with the impacts related to arduous fuel collection and indoor air pollution, is perhaps the oldest and most established sub-field in the gender and energy discourse, with literature and women-focused stove programmes extending back easily 50 years or more. However, the clean cooking sector is still nascent in EAC, and developing countries more broadly, with a wide range of products, a fragmented supply chain, limited uptake of improved cookstoves, and low profit margins for businesses. Some ambiguity arises from the broad definition applied to "clean cookstove" (see section on cooking fuels and technologies Section 3.2). Regardless, the two most discussed benefits of cleaner cooking are: 1) freed-up time because with efficient stoves less time is spent collecting fuel, tending stoves, and cleaning vessels blackened by soot and 2) reduction of health hazards from indoor air pollution, and 2. And

¹⁹ For example, barber shops often have different energy needs (power to run clippers for long periods during the day) than vegetable stands (perhaps a few hours of lighting at night); and men may more frequently run the former and women the latter.

because women are primarily responsible for domestic cooking, it is often assumed that these benefits accrue almost entirely to them. While the time reductions from improved cooking are documented, currently there is little definitive and statistically robust research linking that saved time to women's income-generating activities. One study in Kenya did find that spending greater than two hours per day on resource collection (firewood and water) did decrease children's likelihood of being in school, though the effect was not present for less intense collection practices (Ndiritu and Nyangena 2011).

More informed energy choices and access to modern technologies are undeniably important factors for labour and time saving, but these are only one of many plausible factors in rebalancing gender roles related to cooking. At least two different ethnographic studies suggest that men may take on more of the cooking tasks when electricity is used for cooking (see Cecelski and Matinga (2014) pg 31), but few studies, if any, empirically demonstrate the degree to which switching to better cooking fuels and technologies lead to men becoming the household's primary cook.

On the other hand, as defined by the multi-tier framework discussed earlier in Figure 6, upgrading to a tier 4 cooking solution can fully eliminate the hazards associated with indoor air pollution affecting women, men, children. In the EAC, at least an estimated 90,000 individuals die annually as a result of household air pollution (WHO 2012), with half of those being children aged four and under. Perhaps counterintuitively, in every country, adult males were affected by indoor air pollution at slightly higher rates than adult females, even though women are primarily the ones cooking (Table 15). It is unclear whether this is from socially derived differences in exposure (e.g., men spending more time in smoke-filled rooms), sex-linked physiological differences in exposure response (e.g., men are more likely to become ill after breathing the same amount of particulates as women), or an artefact of the World Health Organization's estimation methodology (e.g., there is overlap between tobacco-use deaths and indoor air pollution).

Table 15: Indoor air pollution deaths in the EAC

	Total deaths from HAP	Deaths of 0-4 year olds	% of total	Deaths of males 18+	% of total	Deaths of females 18+	% of total
Burundi	9,375	5,189	55	2,268	24	1,918	20
Kenya	21,691	11,314	52	5,658	26	4,719	22
Rwanda	6,291	2,650	42	1,876	30	1,765	28
South Sudan	9,200	5,062	55	2,145	23	1,993	22
Tanzania	21,671	9,219	43	6,633	31	5,820	27
Uganda	20,954	10,039	48	5,682	27	5,233	25
Total	89,182	43,473	49	24,262	27	21,448	24

Source: World Health Organization, 2012

Disappointingly, there are generally less gender disaggregated data and empirical analyses about the positive impacts of clean cook stoves than might be expected. The health benefits, in terms of reduced incidence of pneumonia and lung disease – most seen with the adoption of modern, improved cookstoves – are now exceedingly well documented by the public health community, but often not in a gender disaggregated fashion. A notable and early exception is Ezzati and Kammen (2002) who found

that in a sample of 55 Kenyan households, air pollution exposures did decrease both relatively and absolutely more for women adopting a clean stove. However, a literature review by Köhlin et al. (2011) found conflicting reports of men benefiting relatively more, women benefitting relatively more, and both sexes benefitting equally, and so it seems the question is not yet settled.

There are other hazards of cooking, unrelated to indoor air pollution (e.g., burns, scalds, explosions, house fires, blunt trauma, inhalation injuries) as well as hazards of fuel collection. Where fuelwood is scarce, individuals must venture increasingly further away to collect it, increasing the likelihood of robbery, assault, kidnapping, and gender-based violence and also spending larger amounts of time (See Table 16). Even just the physicality of carrying heavy loads fuelwood can have negative health implications for women, men and children (Matinga 2010), though more scientific research is needed to document it.

Table 16: Average time spent on disaggregated work activities in a day by sex

Activity	Mean minutes per day		
	All	Female	Male
<i>Employment for Establishments</i>			
Wage Employment	23.6	10.5	37.9
Self-employment and home-based work	17.9	12.9	23.4
Paid domestic and personal services	9.7	5.8	14
Travel	9.1	5.2	13.4
Other	.7	.4	1.1
<i>Primary Production Activities not for Establishments</i>			
Crop farming	76.3	71.8	81.2
Tending animals and hunting	20	7.1	33.9
Collecting firewood or dung	6.2	7.7	4.6
Travel	47.9	50	45.7
Other	5.2	4.3	6.1
Services for income and other production of goods not for establishments	6.3	6.9	5.7
<i>Household maintenance, management, and shopping for own household</i>			
Activities related to food preparation	70.9	119.1	18.4
Cleaning house and care of clothes	19.9	28.3	10.8
Do it yourself	5.7	3.6	7.9
Chopping wood	2.8	3.7	1.8
Travel	8.9	9.7	8.1
Other	5.2	5.4	4.9
<i>Care for children, the sick, elderly and disabled for own household</i>	23.9	35.4	11.5
<i>Community services and help to other households</i>	8	7.2	8.9

Source: Tanzania Time Use Survey, 2006

In addition to the gendered impacts of cooking fuel and stove choice, gender plays a role in determining the successful uptake and continued use of technologies. Just as with electric appliances, women and men have different preferences when it comes to stove purchase. Successful contemporary international designers and vendors of improved cooking technologies in East Africa (e.g., Envirofit, Ecozoom, and others) are incorporating women's concerns into the design of their products, aware these concerns vary across populations depending on the food staples, cooking methods, and cultural practices in that region. The sales departments of successful commercial stove companies also tend to invest heavily in tailoring their marketing messages to women and devising strategies to connect directly with the end users, including access to finance.

However, even well-intentioned efforts to design for and market to women can be circumscribed by gender relations limiting women's agency and empowerment. For example, by randomly varying the prices of stoves marketed to men and women in Bangladesh, Miller and Mobarak (2013) found that while women have stronger preferences for lower emission and more efficient stoves, they often lack the intra-household bargaining power to make the purchase decision. This suggests not only do companies/programmes need to market more effectively to women, they must also find ways to overcome the intra-household cultural barriers that hinder women's decision making.

3. Productive Capacity

There are numerous case studies documenting examples of interventions enabling women to access mechanical power or productive use technology and the specific benefits realized in each case. But cases are often diverse, difficult to directly compare, and balanced by an equal number of lessons learned and context-specific caveats that make it difficult to generalize about the gender-differentiated impacts of productive uses for individuals and communities. According to Practical Action (2014), energy for productive uses is one of the least documented areas of the energy access debate to date. Dutta (in Practical Action, 2014), however, characterizes women's economic activities in developing countries as generally being heat intensive (for food preparation), labour intensive (for example, in manual agro processing), and light intensive (since they more often take place indoors). In this section, as one example, energy access is examined throughout the food value chain, from farming, to post-harvest processing, to commercial food preparation. Specific energy use cases for other gendered professions, such as tailoring, welding, hand crafts, barber/beauty shops, construction, petty trading, automotive repair, midwifery etc. are numerous and important but are not covered in this study.

Farming and Livestock

Improved energy interventions for agriculture can have outsized impacts on women since they are over represented in the sector. Overall, women provide the majority of the agricultural labour, producing up to 80 percent of basic foodstuffs for home consumption and sale in sub-Saharan Africa (FAO in World Bank et al. (2008)), but their plots are often smaller and less productive than men's, evidence of which was found in Uganda (Peterman et al. 2010). Any proposed energy intervention should consider the gendered nature of the specific agricultural tasks being performed so that both women and men can benefit. For example, men perform much of the land clearing while women primarily process crops, transport them, hoe and weed (Kes and Swaminathan 2006; Dejene 2008; Kasente et al. 2000). But these roles vary between locales and are not immutable. For example, in Kenya, men will tend to large livestock as pastoralists, but women take over this work as groups limit their transhumance; similarly, men have historically controlled cash crops (as opposed to subsistence agriculture), but women become increasingly involved in this type of production in the case of male out-migration (Geisler 2007).

About 65 percent of the power for land preparation in Sub-Saharan Africa is provided by humans, with a typical family using their own power limiting their cultivation to around 1.5 hectares per year. If draught

animal power is used, the same family can cultivate 4 hectares, and with tractor power available, 8 hectares (Sims and Kienzle 2006). While it takes around 60 days to prepare a hectare for planting by hand, it takes about a half a day using a tractor (Bishop-Sambrook 2003). In the past, however, it has been noted that on-farm energy interventions like supplying tractors and draught animals mainly benefited men by helping with tasks typically done by men. In some cases, women’s workload increased because they were left weeding and harvesting greater amounts of land with only hand tools, or crops were lost because weeding couldn’t be completed in time to increase yields (World Bank, FAO, and IFAD 2008). In addition to tractors, energy is also needed for fertilizer manufacture and/or transport, as well as pumping water for irrigation, both key inputs for agricultural crop productivity. For a more complete list of energy use cases in agriculture, see USAID Powering Agriculture.²⁰

Post-Harvest Processing

After harvesting, rural and poor women can spend much of their time processing crops manually in the absence of machines and energy to power those machines (Wodon and Blackden 2006). Oil expellers, cassava graters, and grain mills are found now in many villages around the world; some—like the Multi - Function Platform found in West Africa but also Tanzania—are owned by community groups, but most are owned by single entrepreneurs, usually men, and very poor women and men might be unable to afford the services (World Bank, FAO, and IFAD 2008), or may still have to walk long distances to reach them. Some older survey examples of the time and labour saving from mechanized processing around the world are included in Table 17.

Table 17: Examples of mechanized processing around the world

Country	Crop	Manual Processing	Machine Processing	Reduction in Time Spent (%)	Source
Nepal	Rice	19 minutes per kilogram	0.8 minutes per kilogram	99.58	Intermediate Technology Development Group 1986, in World Bank 2008
Botswana	Sorghum	2-4 hours for 20 kilograms	2-4 minutes for 20 kilograms	96.67-99.17-	Spence 1986, in World Bank 2008
Nigeria	Cassava	2 hours per basin	1 minutes per basin	99.17	May 1990, in Saito et al 1994

Other agricultural processing techniques focus more on preventing crop losses, creating higher value products, and opening up new marketing opportunities (). This is the case for technologies used to establish cold chain storage or supply process heat (e.g., solar thermal, captured waste heat from other applications, or more efficient biomass boilers), which aid in production sectors that tend to be gendered, such as fruit, fish, dairy, and staple parboiling. The inability to properly dry peanuts or smoke fish are two cases where improved energy systems could reduce toxins in the finished product, potentially opening up export opportunities (University of Twente et al. 2015). Of note is that whether women or men involved in any particular processing sector varies depending the exact location and culture in question within the EAC.

²⁰<https://poweringag.org>

Box 7: Fruits of the Nile: Ugandan company combined organic fruit production with solar drying for export

An Ashden Award winner in 2008¹, Fruits of the Nile was exporting fruit to Europe from more than a hundred producer groups, constituting 70% women. The company helped supply simple solar dryers built from wooden frames and plastic sheets to protect and increase the quality of the product. Said one producer, Norah Kagimu “I’m a widow and people told me that I’d never make a business from solar drying, but I’ve earned enough to put my five children through school and by next year three of them will be at University.” Source: Ashden, 2008

¹Ashden Awards (ashden.org) uncover and reward the most exciting sustainable energy pioneers in the UK and developing world, who are leading the way to a thriving low-carbon future.

Food Preparation

Commercial food preparation for example in restaurants and bakeries, and especially in informal settings such as street stalls and in markets, is one sector where women participate in great numbers, on their own as micro or small enterprises, or behind the scenes of a male relative’s business (University of Twente et al. 2015). Energy is important not just for cooking, but also maintaining safe hot and cold temperatures and reducing spoilage, potentially leading businesses to be more profitable and competitive. Empirical studies on the gender impacts of clean energy adoption in the food sector in the EAC are very limited, though a study is underway in Rwanda (Clancy 2017).

4. Other Vulnerable Groups

Compared to women, relatively little is known about energy access issues related to other vulnerable groups, such as people living with disabilities, youth, and individuals who are displaced. There is intersectionality between these vulnerable groups as well as with women that must also be recognized. Given the commitments to these groups by the EAC (See EAC Policy on Persons with Disability 2012²¹) and Partner States, they should be included expressly in the analysis, programme design, and policy formulation of EACREEE going forward.

Other vulnerable groups often share some of the same characteristics that make poor women’s access to energy problematic, including: having low levels of income and wealth; being the targets of preconceived cultural stereotypes about work roles and energy needs; exercising limited agency; and facing structural barriers. Without access to energy these vulnerable groups are further marginalized and are unable to realize the economic and social benefits that others do. When these groups live in geographically isolated or ecologically fragile areas, such as rural villages or settlement camps, energy access difficulties are only further compounded.

People Living with Disabilities

This segment of the population encompasses individuals with a wide range of health conditions, mental and physical. The EAC estimates there are at least 18 million people—and probably more because of

²¹See EAC Disability Policy at http://meac.go.ke/wp-content/uploads/2017/03/adopted_eac_disability_policy_march_2012.pdf

conflict situations—with disabilities in the region (EAC 2012) . They require at least the same degree of energy services as others, and in many cases more, yet they often have reduced capacity to access these services, leaving many needs—food, clean water, health services, education—unmet. Some people with disabilities require powered assistive devices for communication, movement, or to otherwise increase autonomy, or they need ways to keep medicine continually refrigerated, even in the case of grid failures.

The already harmful effects of using low-quality energy options can be greatly magnified for people living with disabilities, preventing them from maintaining a safe and secure living environment. To illustrate only a couple of examples, indoor air pollution is excessively problematic for people with pre-existing respiratory conditions or compromised immune systems, and fires from fuel-based lighting likely pose an even greater risk to people with mobility restrictions or epilepsy. In South Africa, women diagnosed with HIV had concerns about the effect of cooking smoke on tuberculosis co-infections, but felt unable to stay away from the kitchen, whereas men had this option (Matinga 2010). In two studies in India and South Africa, individuals having epileptic episodes while cooking were found to account for approximately 5 percent of stove burn victims (Peck et al. 2008). Lastly, energy needs of caregivers for people with disabilities, such as for space heating, washing clothes, bathing, generally are a women’s burden.

Displaced People

This group includes people who are internally displaced or refugees because of war, natural disasters, or discrimination. When displaced people are living in large camps they have poor access to even basic services. In these conditions, people often struggle to meet their energy needs, especially for cooking, arguably the most basic of energy needs. In 2016, there were more than 2.1 million internally displaced people within the EAC, most within South Sudan (Internal Displacement Monitoring Centre 2017) and Partner States were collectively hosting 1.9 million refugees, the largest number of which was in Uganda (Table 18) (UNHCR 2016). Taken together, refugees and internally displaced people account for between 2-3 percent of the total EAC population. This is a large -scale and long-term problem, with some camps active for decades. In longer-lived refugee camps that are starting to resemble established towns with buildings and basic infrastructure, energy access becomes as much of an issue as it would be for other urban or peri-urban areas. However, the politics of supplying these areas with energy services such as grid electricity can become fraught, sometimes with host governments unwilling to allow connections or support electrification for fear that settlements will become permanent.

A large number of people crowded into small areas can quickly exhaust local firewood and cooking fuel sources leading men, women and children farther away from camp to gather fuel, decreasing their personal safety and increasing the likelihood of new conflict with host communities over dwindling natural resources (Thulstrup and Henry 2015). Without sufficient fuel for cooking, individuals’ nutrition is compromised making them more vulnerable, more susceptible to disease, less able to work, and ultimately increasing the risk of premature death.

Other detrimental outcomes documented in camps for displaced persons in Uganda were identified by researchers (Kasirye, Clancy, and Matinga 2009). They found that some individuals, in order to meet their need for cooking fuel, resorted to selling their food rations, limiting their cooked meals to just one a day, and selling sex. In the same study, at least one male reported, “We men risk being attacked by rebels by venturing into the bush to collect firewood in order to save our wives and daughters from being attacked and sexually harassed” (Ibid.). Lighting of public spaces in refugee settings is another way to create a safer and more secure environment for women and men (Corbyn and Vianello 2018).

Table 18: Internally Displaced People and Refugees in the EAC

Country	Number of Displaced People	Refugees hosted
Burundi	59,000	N.D.
Kenya	138,000	451,099
Rwanda	N.D.	N.D.
South Sudan	1,854,000	262,560
Tanzania	N.D.	281,498
Uganda	53,000	940,835
Total	2,104,000	1,935,992

Source: Internal Displacement Monitoring Center, 2016 and Africacheck.org 2017

Youth

Young people represent a vulnerable group, one that comprises a large portion of the total population of the EAC and whose numbers are increasing (Table 19). The segment of the population under 15 years old ranges from 40 percent of the total population in Kenya to 48 percent in Uganda. These young people will need to be cared for, educated, and ultimately integrated into the workforce in order to create a politically stable and economically growth-oriented society.

Table 19: Youth as a percentage of the population (2017)

Country	% of population aged 0-14
Burundi	45
Kenya	40
Rwanda	40
South Sudan	42
Tanzania	45
Uganda	48
World	26

Source: UNFPA 2017

East Africa also has a predominantly young population. Uganda, in particular, has the youngest population in the world, with 77 percent under the age of 30. 45 percent of those living in the EAC are under age 15, and 28 percent are youth between 15 and 24 years old (AFIDEP 2018). The large population of young people in the EAC is an opportunity to help to stimulate economic development in the region with sufficient investment in education, health, and jobs. Kenya is the EAC member with the highest rate of youth unemployment (no data exist for South Sudan), with 22 percent unemployment for

persons aged 15-24, well above the world average and that of sub-Saharan Africa (Table 20). The other countries have much lower rates comparatively.

Table 20: Youth Unemployment in the EAC (2017)

Country	Share of the labour force age 15-24 without work but seeking employment (%)
Burundi	3.0
Kenya	22.1
Rwanda	3.3
Tanzania	5.4
Uganda	4.0
Sub-Saharan Africa	12.9
World	13.8

There are several possible pathways by which energy access impacts youth, the most empirically studied of which is via educational opportunities (see previous section on electrification). The presence of light at night can mean increased time for children and youth to complete their chores and do school work on any given day. Time- and labour-saving energy technologies (e.g. fuel efficient stoves, clean cooking, electrical appliances) are thought to also reduce the demand for children’s labour to assist their parents with domestic chores, especially girl children who are more often taken out of school to help their mothers (Köhlin et al. 2011). However, boys and girls both help with chores, and are likely to continue doing so even while enrolled in school (Clancy et al. 2012).

Cooking injuries to youth were found to increase once they start assuming more responsibilities in the kitchen. It was found that children under five were more likely to be burned than other children, especially if they lived in child-headed households, but that injuries increased again in adolescence (Peck et al. 2008).

ACCELERATING THE CLEAN ENERGY TRANSITION

This section explores the economic opportunities—specifically entrepreneurship and clean energy jobs—available for women and men to speed the clean energy transition, as well as some of the barriers holding them back. The section will further analyse national workforce data, business formality, education, income, and gender with conclusions as to how these areas impact the ability to increase energy access in the region.

1. Women’s Entrepreneurship in the Energy Value Chain

In order to supply modern, sustainable energy to the whole EAC, private sector participation is needed—as IPPs, as small scale rural retailers, and everything in between. Entrepreneurship is the force supplying the much-needed dynamism for private sector growth and innovation, but women and men are not contributing equally as clean energy entrepreneurs, potentially with implications for the region’s development. This section examines the gendered nature of entrepreneurship in the EAC generally and in the energy sector specifically.

Somewhere between 35 percent and 55 percent of total businesses in the EAC are estimated to be owned by women (EAC Secretariat 2016a). However, women are much more likely to be involved in smaller enterprises, which generate lower revenues (IFC 2011). Women, especially in the rural areas, tend to be employed in the informal sector, especially in agricultural businesses. Due to limited employment opportunities and the need for financial security, women entrepreneurs tend to favour businesses that they can quickly set up and start earning income, without requiring long incubation or in-depth research. In addition, it is reported that women entrepreneurs in sub-Saharan Africa tend to start businesses more frequently than men, but their businesses are more likely to fail than those run by men (Kelley et al. 2017). This suggestion, that female-led businesses face extra perils once in operation, requires a public policy response providing the needed supports and favorable conditions so that women’s ventures succeed at the same rates as men’s, with all of the attendant benefits of job and wealth creation. Regardless of a country’s level of wealth, countries with favourable entrepreneurial conditions for micro - small and medium-sized enterprises (MSMEs), good governance, and conducive conditions for doing business tend to have more women business owners (Mastercard 2017).

The importance of engaging women as entrepreneurs in expanding access to clean energy is clear. This is due to the fact that women have been playing, and are playing, a major role in the management of energy resources in their homes and for their businesses. Women can be involved in producing, using, and selling energy services through local enterprises and play a critical role in designing energy products and interventions. Usually women and their children are the main beneficiaries of clean energy and therefore represent the most logical entry point in creating and sustaining local energy enterprises.

Women have a track record of being successful energy entrepreneurs in the EAC, but are not yet widely found throughout all markets and in all parts of the value chain. The EAC has notable successes working with a limited set of programmes led by NGOs and the private sector focused on gender-inclusive market-led transformation, including Mercy Corps, Energy 4 Impact, wPower, and Practical Action, among others. For example, many women’s economic empowerment programs include business and leadership training that covers marketing, pricing, financial planning, management, business growth, and agency empowerment for sales agents and entrepreneurs. Armed with this type of training, women entrepreneurs are more likely to create profitable businesses that are well-suited to their markets.

Consistent with the global literature on female entrepreneurship, it does appear that women are predominantly found working in certain energy subsectors, particularly those that are less capital intensive at start-up, less profitable, utilize less advanced technology, and employ business models that

are “closer” to the final customer. Businesses selling household energy products (e.g., pico solar lanterns and improved cookstoves), or women employees working as sales agents in networks created by product distribution organizations (such as Solar Sister and Living Goods) are widespread in the EAC. When women’s energy sector activities cluster at the lower end of the value chain in spaces where substantial and core financial investments are not required, it might have two consequences. It could overly focus donor resources on where women are (in small, capital non-intensive ventures) as opposed where they should be. It may also obscure women with great potential from the view of many SME and commercial lenders and private equity investors.

The Global Village Energy Partnership’s (GVEP, now Energy 4 Impact (E4I)) Developing Energy Enterprise Project (DEEP) that concluded in 2013 seems to confirm this bias, even *within* the narrow confines of “last mile” energy provision. Started in 2008 in Kenya, Uganda and Tanzania, DEEP worked with over 800 micro enterprises, mostly informal, 42 percent of which were headed by a female (the project design called for gender parity). In this project, female entrepreneurs showed a strong preference for the cook stove and briquette sectors while men disproportionately favoured solar PV, battery charging and biogas.

Table 21: GVEP DEEP male and female entrepreneurs by sector

Technology	Female	Male	Mixed Groups
Cook stoves	196 (53%)	181 (36%)	10 (50%)
Solar	47 (13%)	183 (37%)	4 (20%)
Battery charging	3 (1%)	27 (5%)	0
Briquettes	104 (28%)	59 (12%)	6 (30%)
Biogas	1 (<1%)	28 (6%)	0
Others	18 (5%)	18 (4%)	0
Total	369 (100%)	496 (100%)	20 (100%)

Source: Kariuki, 2011

This may be attributable, according to GVEP, to women’s restricted mobility preventing them from sourcing information and products and also selling in distant markets, and also their relatively poorer access to capital causing them to prefer labour-intensive businesses (Kariuki and Balla 2011). Even within single sub sectors, there are gender discrepancies. Anecdotally, women are more likely to be engaged in making the ceramic inserts for stoves, consistent with pottery being an acceptable “female vocation,” instead of manufacturing the metal cladding; they are more likely than their male counterparts to manually fabricate briquettes instead of using more automated equipment; they are more likely to be involved in the distribution and retail sales of liquid petroleum fuels as opposed to exploration, production and wholesaling.

2. Workforce

It is said that women are the backbone of Africa, and the resulting rates of participation in the labour force, and high number of entrepreneurs in sub-Saharan Africa confirm this. In sub-Saharan Africa,

female participation in the labour force is 65 percent, but unemployment rates are slightly higher for women than men, 8 percent vs. 7 percent, respectively (International Labour Organization 2013). In East Africa, the participation rate of women in the formal labour force is generally much higher, and in some cases women’s participation rate is even higher than men (Table 22).

Table 22: EAC labour participation rate in the formal sector by gender

Country	Men %	Women %
Burundi	82.2	84.3
Kenya	71.8	62.3
Rwanda	83.7	86
South Sudan	73	69.3
Tanzania	83.1	73.9
Uganda	87.7	82.5

Source: ILO Labour Participation Data Set 2018 (<http://www.ilo.org/ilostat>)

Hiring and Promotion

Women’s representation in the energy sector workforce, both in the public and private sectors, is highly unequal in the EAC. For example, interviewees familiar with the situation Uganda and Burundi reported energy sector positions were approximately two-thirds filled by men. That they also said the most qualified job candidates were hired suggests companies and government departments may not be paying attention to issues such as recruitment pipelines, gender awareness outreach, and unconscious bias. The gender imbalance, through improving, in energy ministries is more pronounced in technical fields and among leadership roles according to the interviews conducted for this report, but more data is needed. Donor partners that fund energy ministries sometimes require gender mainstreaming to be considered; GIZ, for example, has in fact developed a mentorship programme to empower women to be placed in more technical internships. This has shown to be a good practice for encouraging women in technical roles and is an example for energy ministries to follow.

In order to understand women’s economic empowerment in the private sector, it is important to be able to measure women’s participation in firm ownership, management, and the workforce. Data shows that East Africa ranks lower than sub-Saharan Africa’s average of women in majority ownership positions (benchmark is 13 percent), but higher in the percentage of permanent full-time women workers, (Table 23).). Women have typically found energy sector employment opportunities in middle management and below, or in non -technical, corporate services -type roles, but women working in higher supervisory, executive, and board roles are still relatively small in number. The development community has made significant efforts to support women micro energy entrepreneurs, such as the thousands participating in initiatives like Solar Sister, wPower initiative, Energy 4 Impact, and more, but relatively less attention and resources has been accorded to women leading and working for medium and large enterprises.

Table 23: Percentage of women representation as firm owners, managers, and workers

Country	% of firms with majority women ownership	% of firms with a woman as a top manager	% of permanent full-time women workers
Burundi	9	16	25
Kenya	9	13	29
Rwanda	13	20	32
South Sudan	7	10	23
Tanzania	10	14	44
Uganda	10	15	40

Source: World Bank Enterprise Surveys, 2018

Pay Gap

The pay gap in the EAC is another symptom of overall gender disparities. In East Africa, women are paid 62 percent of male salaries in trade, 72 percent in personal services, and 35 percent in mining in East Africa (Diaz-Garcia et al. 2016). However, it was recently reported that Burundi and Rwanda are among 13 countries in the world that have closed more than 80 per cent of their economic participation and opportunity gender gaps. Whereas, Kenya, Uganda, and Tanzania are ranked 44th, 59th, and 69th, respectively in the index (World Economic Forum 2017). There is however no reliable data on pay equity in the energy sector in East Africa, but it is likely an issue, and more research is needed.

Role of Technology

Technology is a key enabler for the workforce to thrive and become more efficient, and the EAC countries are no exception. Digital literacy is low in sub-Saharan Africa, yet computers and the internet are essential tools for workplace development and competitiveness. Across East Africa less than half or quarter of companies have a website, and digital literacy impacts the ability of energy entrepreneurs and businesses to utilize technology for marketing, sales, bookkeeping, and other business functions (Table 22).). Moreover, technology can play an important role for clean energy enterprises, both in product sourcing, business expansion, market research, and customer relationship management tools. Home to pioneers of mobile financial services, East Africa has also served as a launch point for many new mobile services and start-ups, which had a direct positive impact on East Africa’s off-grid electrification efforts. This includes “Pay-as-you-go” technology, which facilitates a rental or lease-to-own model for solar home systems. It is also important to consider the gender divide on digital literacy; there is no established sex disaggregated data on workforce and technology, but according to the GSMA, digital literacy is higher among the male populace in East Africa. Another major role for technology is in the use of PAYG for customer purchases and financing that is covered in Section 6.2 of this report.

Table 24: Percentage of firms in the EAC using technology

Country	% of firms that have a web site	% of firms that use email to interact with clients	% of firms that introduced a new product or service
Burundi	26	67	45
Kenya	46	72	69
Rwanda	34	76	58
South Sudan	26	51	48
Tanzania	23	30	51
Uganda	19	40	67

Source: World Bank Enterprise Surveys (2017)

Changing Roles of Women in Conflict Settings

Shifting gender roles in the workplace can happen in conflict settings and should never be minimized. When emerging from conflict situations, gender roles are often redefined because women had assumed greater responsibilities as fighters, such as the Katiba Banat female battalion in South Sudan, or economic producers in the absence of working age males, or because, as peace negotiators, they helped to bring the conflict to an end. The breakdown and reformation of gender norms post-conflict can hold implications for the energy sector by opening traditionally male-dominated jobs to women and the participation of women in reconstruction can influence energy planning priorities, with Rwanda being a globally noted example. There, significant numbers of women entered the construction field post-conflict, an historically male-dominated trade (Izabiliza 2005).

3. Barriers to Equal Participation in the Energy Sector

Just as in global trends, there are social and historic reasons for gender disparity in the energy sector and workforce. This section aims to explore the reasons for this disparity, including awareness, education, technical capacity, access to finance, policies, and cultural norms.

Awareness, Education and Technical Capacity on Energy Technologies and Services

Awareness, education, and technical knowledge of energy technologies, service requirements, financing, and business operations are common barriers. The energy sector is a male dominated field, with women underrepresented in the technical, business, and management and fewer women overall have the necessary educational and work experience to be able to enter the energy sector at the same rates as men. Education is a key determinant, along with previous entrepreneurial experience, in influencing the kind of business women elect to enter, what sector, how formal, and at what scale. The data from the responses from the interviewees for this study indicated that women in East Africa typically enter the fields of health, education, agriculture, food value chain management, trade, and textiles—not energy. All respondents mentioned that for most of these fields, including energy, women work on the small-scale level, as men tend to work for bigger corporations.

According to the GEM (2017), though Uganda was ranked highly for women's entrepreneurship, it did not fare as highly for education. Education in technical fields and business are key for equal opportunities and access to clean energy jobs. Many of the interviewees expressed a need to target and train women on technical skills, but also the need to tailor existing technical trainings to encourage women to participate. Though the number of women in science, technology, engineering, and math (STEM) is increasing, men continue to outnumber women, in the EAC and globally. Though girls and boys show an equal propensity for STEM in primary school, as they continue to advance in school, there is a steep drop in the enrolment of women (Hill, Corbett, and Rose, 2010). A global problem, the top reasons for women for discontinuing STEM education are beliefs about intelligence, existing stereotypes, self-assessments, spatial skills, implicit bias, and workplace bias (Hill, Corbett, and Rose, 2010). According to people interviewed for this study, the biggest disadvantage women have in entering the energy sector at similar rates as men is that fewer women have the necessary education and work experience. Barefoot College is taking an innovative approach that has trained more than 140 women from 21 African countries, many of them older and lacking formal education for engineering vocations in solar PV (Bunker Roy 2011).

Access to Finance

Access to finance for entrepreneurs remains a key barrier for equal opportunities in energy businesses. Twelve sub-Saharan African countries were surveyed by the GEM, and the data shows that private individuals and venture capitalists provide the least amount of capital flows, at only 12 percent of private investing is from Africa. Countries in the EAC were not featured in the data, and only Uganda was included. Out of the ten countries surveyed by GEM, the only EAC country was Uganda, and according to its financial inclusion and financial literacy for women, Uganda was ranked quite low of all countries indexed (GEM 2017). This problem is exacerbated by the fact that many women and men do not have credit history, are unaware of existing credit schemes, and women lack collateral for a loan, which is typically registered in the father or husband's name. Similarly, the enabling conditions for entrepreneurs such as favourable market dynamics, targeted support for Small and Medium Enterprises, ease of doing business conditions, cultural perceptions of women entrepreneurs, and sound governance were also scored low in Uganda by the GEM. This suggests that women face substantial challenges in setting up a business.

However, East Africa has received the bulk of financing available for off-grid energy access, accounting for 57 percent of total funding deployed in 2017 (GOGLA, 2018). The reasons cited for this include a fertile environment for commerce, relatively high ease of business compared to other regions, strong payments ecosystem, enabling regulatory environment, and digitally connected customer base. Consumer protection frameworks have also supported this development, with Kenya and Uganda adopting Lighting Global's proposed framework and methods for quality testing, including truth-in-advertising, durability, system quality, lumen maintenance, and warranty (GOGLA, 2018). In addition, substantial investments from marketing and consumer education campaigns created awareness for these technologies early-on, leading to increased adoption rates.

Table 25: The 6 Key Barriers Globally for Women Entrepreneurs

	Global	EAC
Lack of Funding	✓	✓
Regulatory restrictions	✓	✓
Lack of self-belief / confidence	✓	Sub-Saharan African women reported the highest capability perceptions worldwide.
Fear of Failure	✓	75% of sub-Saharan African women do not fear failure.
Socio-cultural restrictions	✓	✓
Lack of education	✓	✓

✓ = yes, this is a problem

Source: Global Entrepreneurship Monitor, 2017

Interestingly, entrepreneurs in sub-Saharan Africa have high perceptions of their ability to start and successfully run a business, substantially higher compared to other regions of the world (GEM 2017). However, lack of business training has long been a barrier for entrepreneurs in the EAC countries and developing countries in general. Yet low or lack of capacity as well as skills greatly impacts the ability of a business to receive investment or be considered “investment ready”. This was cited by people (8 females and 9 men) interviewed for this project as detrimental to the success of businesses for both men and women. In a study by Energy4Impact (formerly Global Village Energy Partnership (GVEP)) in East Africa, it was shown that micro-energy enterprises they funded “displayed a weakness in innovation, lacked financial acumen, marketing, entrepreneurial flair, practical knowledge, and human resource management” (Kariuki and Balla 2011). This was mainly due to the limited education and lack of business training of the entrepreneurs. Innovation here is clarified as the “newness” of services compared to their competition, which was lacking. Many businesses were found to fail to succeed (from a micro-enterprise to a small and medium enterprise) due to these barriers, and all of this report’s interviewees suggested more training, mentorship, and financial literacy programs to improve business growth and access to financing for women.

Despite the vibrant energy sector in the EAC, lack of access to financing has long been indicated as the biggest barrier, especially in the Least Developed Countries. More than half of the interviewees for this study acknowledged that much of the capital flowing into the renewable energy sector is geared towards large-scale, infrastructure projects. The fact is that most investors are more interested in larger deals with higher returns and also in working with companies with an established track record. Development finance institutions (DFIs) are also an important piece, filling the gap where the private sector is reluctant to participate. However, it has been shown that more than 70 percent of the projects that DFIs are investing are large projects that either did not have a sustainable energy and/or energy access focus (OCI/Sierra Club, 2016). Although these large-scale developments are important for the region, it has been noted by this study that such scale will not solve the energy access problem. It is necessary to recognize the dynamic market for smaller, distributed generation projects in the EAC.

The gender disparities are quite clear in access to finance and investment flows. The nature of women-owned businesses is that they are usually smaller businesses that may be run out of the home with a small market reach. Energy businesses popular with women, such as pico solar lantern distribution, retail, and small-scale production in briquettes and stoves tend to have low revenue and operate with slim margins. They are typically funded by grants rather than investment capital, making it difficult for

the micro and small businesses to grow. Most of the Microfinance institutions have not supported energy entrepreneurs at the scale originally envisioned due to lack of expertise and experience with energy lending. In Kenya, Practical Action has pivoted away from working with microfinance institutions to working with the large number of Village Savings and Loan Associations to get working capital into the hands of women entrepreneurs (Key informant interview with staff of Practical Action).

Policy and Regulatory Safeguards

Certain legislation or practices can also encourage directly or indirectly unequal access to resources for men and women. Through the research and interviews conducted for this study, East Africa has fairly strong laws and provisions on gender equality at the policy level. However, it is not always clear how well the policy agenda translates into action on the ground. For example, in land tenure, certain loopholes in policies can allow for conflicts to arise. Culturally, women inherit land from men, not from women (Key informant interview with May Sengendo). And even so, there is a preference for men in the family to have first rights to these assets, for example a deceased father's brother would receive priority to the land over his daughter in certain tribes. Interviewees also discussed how even when a woman owns the land title, she may be pressured by the familial men in her life to use, cultivate, and profit off her land, without her receiving the financial benefits. The ability of women acquiring, keeping, investing, contracting, and profiting from land strengthens her ability to also conduct business, which is vital in the energy sector.

Gender considerations in all policymaking realms are important, and the institutions designed to mainstream gender are fairly strong in the EAC. According to the interviews conducted for this study, there is generally a high confidence in the ability of the government to consider gender equity and equality at the decision-making level. However, at the policy level in parliaments, laws are typically written as "gender-blind", meaning that the law does not consider gender and it is up to the Ministries to interpret and mandate gender mainstreaming into the implementation of the laws. Policy and regulatory safeguards can also affect the ability of energy enterprises to be competitive. This includes bidding registration or licensing procedures that are overly cumbersome and waived import duties or VAT that only applies to larger equipment. This may disadvantage women more by requiring experience, networks, literacy, and travel to conduct business.

Furthermore, the percentage of females and males in the workplace are important in determining gender equal norms. Representation is needed by both genders to inform a discussion on furthering opportunity and advancement in the workplace. In the Ugandan Ministry of Energy, approximately one-fifth of the staff are female, working mostly in administrative roles (Key informant interview with Michael Ahimbsebe). The Ugandan Equal Opportunities Commission (EOC) has a 50/50 split between females and males in both administrative and technical positions (Key informant interview with Evans Jjemba), though that is a mandate given the mission of the EOC. The Ugandan Rural Electrification Agency also has a 50/50 split in gender, though more females are in administrative roles (Key informant interview with Dr. Patricia Lithio). The Ministry of Energy in Burundi reported 10 males and 4 females in the Renewable Energy Department, with the same number in administrative and technical roles (Key informant interview with Dr. Aloys Sahiri).

For true equality to occur, fair practices, anti-discrimination statutes, maternity leave provisions, and equal pay are all necessary policies to enact a level-playing field for energy access initiatives. According to the table below, all the countries mandate maternity leave, and only South Sudan does not have paternity leave. Specific women workplace protections, such as sexual harassment policies, equal pay measures, and parental leave policies must be addressed (Chirwa 2014). Another example is GIZ's sexual

harassment policy in Uganda, which requires a contact structure, with representatives in councils, human resources, and gender focal points.

Table 26: Workplace protections in the EAC

Country	Includes specific policy for gender equality	Recognizes equal rights to work, right to equal pay for work of equal value, or both	Maternity Leave	Paternity Leave
Burundi	Yes	Yes	12 weeks	4 days
Kenya	Yes	No	12 weeks	14 days
Rwanda	Yes	Yes	12 weeks	4 days
South Sudan	N/A	N/A	8 weeks	0
Tanzania	Yes	Yes	84 (100 for twins +) days	3 days
Uganda	Yes	Yes	60 days	4 days

Source: Hallward-Driemeier, 2013

Cultural and Social Norms

Cultural attitudes play a strong role in promoting gender equality in energy access, including widely held perceptions, stereotypes, and biases on a woman’s role in the energy sector. However, it is difficult to make assumptions given the diversity of tribes, cultural practices, and religions in the EAC. However, women in East Africa are mainly responsible for household chores and child rearing makes it even more difficult for them to successfully climb to management positions, either because these other responsibilities can conflict with work obligations or because women’s superiors incorrectly *assume* there would be a conflict.

There are certain considerations that influence the ability for women in the clean energy sector. According to Energy4Impact (formerly known as GVEP), women micro- and small-scale entrepreneurs in their East African programme were less likely to travel compared to their male counterparts (Kariuki, 2012), perhaps because of obligations also placed on them for child rearing and domestic work. The report stated that male entrepreneurs in their programme were relatively more likely to be engaged in solar PV, battery charging, and biogas projects, while women were found more frequently producing briquettes; men and women participated in the stove sector in equal numbers. Traveling away from home for business and to seek out new customers was associated with having greater access to market information and new business opportunities.

In addition, other cultural barriers also preclude a woman’s ability to enter the energy sector. One of the interviewees, a woman who runs an improved cookstoves factory, expressed that she prefers hiring men for welding, ceramic firing, and mechanical work due to risk of injury and danger presented. All the interviewees also expressed optimism, that with modernity and time these cultural attitudes will decrease and gender equality will be achievable. This is echoed on a global level, with the rise of gender equality norms and acceleration of feminist movements in recent times. This section explores entrepreneurship as a pathway for accelerating the clean energy transition, as well as general economic competitiveness of the EAC. The section will further analyse national workforce data, formality,

education, income, and gender with conclusions as to how these areas impact the ability to increase energy access in the region.

Informal vs. Formal Businesses

There are many informal businesses in the EAC that do not necessarily have a clear path for becoming a formal business. Women seem to have even more difficulties illustrated by their generally low participation in the formal as opposed to their high participation rates in the large informal sector. Companies strive to move from informal enterprises to formal businesses to take advantage of supportive business regulations and incentives, consistent hiring practices, access to formal financial markets and international donors, higher growth potential, and more visibility. However, there are usually hurdles that an entrepreneur faces such as limited business training, lack of confidence, limited access to finance, inconsistent business practices, and prohibitive social norms that may make the transition from informal to formal businesses difficult. In addition, laws regarding incorporation and licenses can be unclear and change frequently, leading to uncertainties and complexities for entrepreneurs to register the business. On the other side, nearly a third of formal businesses reported feeling that they face unfair competition from unregistered, informal businesses. This is because the informal sector can benefit from not paying taxes and avoid regulations that formal businesses must adhere to (World Bank 2017).

Until recently, many energy policies were drafted to be *gender neutral*²², assuming that well-designed energy policies, programs and initiatives will benefit both men and women equally. In reality, these traditional policies and programs fail to recognize that men and women have different energy needs and that women's needs and potential contributions in the energy sector are often excluded or overlooked (Khamati-Njenga and Clancy 2003). In more recent decades, attention is being paid for more gender-aware policies in the energy sector that recognize women and men as equal participants in energy development and that realize women as powerful agents of change in the transition to better access to modern energy services.

This section will first review energy policies in the East African Community (EAC) at the regional level with an eye towards the relevant gender considerations; it will then discuss the topic at the national level, highlighting relevant programs and initiatives as well.

1. EAC Regional Policies, Programmes and Initiatives

Gender and Energy Policy Overview

Since its establishment in 1999, the East African Community (EAC) has continuously worked to bring economic integration in the region, foster peace, preserve natural endowments, mainstream gender, and raise the standard of living. Modern energy services enable these goals. Currently, the main concerns of policy makers in the energy sector are to increase energy access and address energy security issues. Gender issues and those of vulnerable groups, however, have been woven throughout these prior regional level commitments.

- 1) *The EAC Vision 2050* serves as a regional strategy on scaling up access to modern energy services. The stated vision is to become a globally competitive upper-middle income region, but insufficient energy supplies are identified as a constraint on growth and development in the Community. Among the strategic goals to achieve this vision are access to affordable and efficient transportation, energy, and communication for increased regional competitiveness. In this framework, gender and women's empowerment serve as an enabler to achieve the strategic goals (EAC Secretariat 2016b).
- 2) *The Sustainable Energy for All (SEforALL)* initiative provided EAC a blueprint for securing access to modern energy services and increasing the proportion of renewable energy in the regional energy mix. Additionally, the initiative recognized women and children as a group that are most often disproportionately affected by the lack of access to modern energy services (SEforALL 2015). SEforAll is implemented at the country level through action planning and investment prospectuses. All EAC Partner States have made progress in achieving the main objectives of the initiative (REN21 2016).
- 3) *EAC Industrialisation Policy and Strategy 2012-2032* aims to promote collaboration for sustainable industrial development through the promotion of sustainable production and consumption (SPC) and resource-efficient and cleaner production (RECP) principles in the region. Establishing policies, programs and a regulatory framework to promote energy efficiency in industries are some of the specific policy measures identified in this document. The policy

²²Traditional policies and programs view communities in terms of 'households' rather than men, women, children, or any other social-cultural distinctions within households.

also promotes gender equality and regulates gender inclusivity in industrial development in detail. However, there are no linkages between energy and gender in the overall policy.

- 4) *The EAC Energy Security Policy Framework* that was launched in July 2017 seeks to ensure energy security of the region's biomass, electricity and oil and gas supplies. The framework structures eleven dimensions of actions to restore the system back to greater sustainability and security (EAC 2017), including resource stocking and improving the efficiency of cooking technology. Although the framework notes household energy concerns, the document does not clearly reference gender issues.
- 5) *EAC Gender Equality and Development Bill* was passed into Law by East African Legislative Assembly on 8th March 2017 in Kigali Rwanda. This is seen as a landmark achievement that advances gender equality across the five EAC Partner States in the economic, political, social and cultural spheres in one legally binding document. There are no specific provisions on energy, but there are clear links the issues covered in the Bill, including education, health, economic empowerment, climate change, land rights, and marginalized groups. This can serve to reinforce the work done in the EACREEE Gender Programme.

Across the continent, there are increasing trends to integrate gender equality into energy policies at both regional and national levels, although in East Africa the trend is much stronger in the latter. Several existing regional policies discuss energy issues, but the only current regional energy policy in the EAC is the Energy Security Policy Framework,²³ and the articulation of gender concerns in this document is unclear. The reason for this is perhaps that EAC's past and current agenda is heavily focused on establishing foundations for better regional markets and trading. Or, it could be a result of partner states devolving less decision-making authority to the EAC compared to, say, ECOWAS. The EAC Vision 2050 and the EAC Industrialisation Policy and Strategy articulate energy issues but are not dedicated, standalone energy policies. Additionally, SEforAll is an initiative driven by an institution outside the EAC. According to an interviewee, EACREEE and its sister centres served as regional nodes for SEforAll when it was part of the UN, but since its evolution to an independent NGO, this has not been continued.

Efforts in gender mainstreaming in the energy sector are driven more at the national level. However, a regional approach to developing gender and energy policies is needed to accelerate the gender mainstreaming process in the EAC. Bazilian et al., argue that in the absence of additional dedicated policy actions, the number of people lacking access to modern energy services may decline only marginally in the coming decades, which means that, without a gender focus in place, women will still be marginalized without a gender focus in place (Nalule 2016).

Gender Integration in the Programmes and Initiatives

Many of the existing energy programs and initiatives in the EAC do not clearly reflect gender considerations, and those that do are driven mostly by external actors. Table 27 lists several key programmes and initiatives implemented in the EAC region.

²³The EAC Energy Security Policy framework focuses on putting forth an approach for conceptualizing, measuring, monitoring and managing energy security in the biomass, electricity and oil and gas subsectors. It further identifies the institutional and operational arrangements for ensuring energy security.

Table 27: International Gender and Energy Programmes Implemented in the EAC

Programmes/ Initiative	Summary of the Programme	Initiators	Where implemented in the EAC
ENERGIA Women's Economic Empowerment	Creates and strengthens women-led energy enterprises serving primarily last mile customers; programme has a strong gender mainstreaming and women's empowerment focus throughout	ENERGIA, Practical Action East Africa, SCODE, Solar Sister	Tanzania, Kenya, Uganda
AFREA Energy and Gender Programme (ESMAP 2012)	Provides a gender approach and methodology for energy projects in the Africa region and aims to build a network of experts at local, regional and global level	The World Bank	Tanzania, Uganda, Kenya
Africa Electrification Initiative (Africa Electrification Initiative 2012)	An initiative to create a network of Sub-Saharan Africa (SSA) practitioners for the development of electrification programs, introducing gender sensitive approach and methodologies in electrification projects in 2011	The World Bank	Tanzania
Africa Clean Cooking Energy Solution (ACCES)	Promotes enterprise based adoption of clean cooking solutions in SSA	The World Bank	Uganda
Africa Biogas Partnership Programme (ABPP)	Provides access to energy through installation of biogas digesters, with key objectives including to engage women and youth in low-carbon employment	Hivos, SNV	Kenya, Tanzania, Uganda
The Global Alliance for Clean Cookstoves	Initiative to improve livelihoods and empower women by creating a global market for clean and efficient household cooking solutions	UN Foundation	Kenya, Uganda
Safe Access to Fuel and Energy (SAFE)	Initiatives to ensure access to fuel and energy for cooking, heating lighting and powering for crisis-affected populations through local projects, positively affecting the livelihoods of women and girls	SAFE Humanitarian Working Group	Kenya, Uganda, Tanzania, Rwanda, Burundi, South Sudan
Lighting Africa	Has established standards for pico PV lighting products and researched gender disaggregated differences in product preferences	World Bank/IFC	Kenya, Tanzania, Rwanda, Uganda
Barefoot College	Innovation to bypass barriers restricting women's active participation in the energy sector	SEforALL, UN Women, Clinton Global Initiative	South Sudan, Tanzania
wPower	Promotes the role of women in clean energy entrepreneurship and in addressing climate change.	Department of State and USAID	East Africa

The programs above have been well established internationally and within the countries in East Africa. The SAFE programme, for example, started operating in 2007, reaching more than 2.8 million people in 36 countries worldwide. Although these international programmes have been successfully implemented in the EAC Partner States, coordinated regional approaches on gender and energy emanating from the EAC itself are needed to achieve SDG 7: “Ensure access to affordable, reliable, sustainable and modern energy for all.”

There are several energy programmes currently being implemented or developed jointly with Eastern Africa Power Pool (EAPP) (See Box 1) without a clear articulation of gender considerations. They include:

- **Cross-Border Electrification Programme**, to enable border centres to access electricity from the nearest grid and increase access in a cost-effective manner. A cross border electrification policy and model power supply agreement have been developed to regulate and guide development of projects. Current schemes exist between Uganda and Tanzania, Tanzania and Kenya, Uganda and Kenya, Rwanda and Uganda, Burundi and Tanzania, and Burundi and Rwanda (EAC N.D.).

Possible Gender Entry Points. Potential changes to the programme could include: 1) In consultation with women and men community members, a requirement for siting transmission lines to avoid areas sensitive for livelihood production and/or address potential beliefs that high voltage lines impact women’s reproductive health; and 2) Ensuring compensation for land acquisition should adhere to global best practices, meaning fair compensation for women who disproportionately lack legal title to their land or derive use rights from informal or kinship networks.

- **Regional Power Master Plan**, completed in 2011, promotes reliable supply and access to modern energy sources on a regional basis through electricity interconnection and trade. Implementation plans and monitoring reports are being developed from time to time (EUEI Partnership Dialogue Facility 2011)

Possible Gender Entry Points. A gender-sensitive master plan would consider the gender impact implications of various technology options and grid extension criteria, perhaps tempering least cost methodologies with social justifications and looking to extend not only to where suitable base loads already exist, but also liaising proactively with development partners who build up domestic industry and productive uses. Functions such as metering, billing and collections could be jobs easily done by women.

- **Establishment of a Regional Power Market and Power Interconnection Code**, a set of rules for the EAC to ensure the transmission grid is operated in a safe, reliable, secure and efficient manner (East Africa Power Pool 2018)

Possible Gender Entry Points. A regional power market planning document could be made gender aware is to compel gendered analyses of the effects of localized load shedding, brown outs, and tariffs for specific groups based on geography, occupation and income level.

2. National Policies, Programmes and Initiatives

Gender Sensitivity of Energy Policies and Programmes in Place

Table 28 provides a summary of national energy policies in the EAC Partner States and provides a binary review of energy and gender linkages within the policies. At a national level, all EAC Partner States have established energy policies in the form of a national policy, an act or, in the case of South Sudan, a

development plan serving as an interim policy. These national energy policies have all included a framework that promotes renewable energy and energy efficiency.

Table 28: Energy and gender linkages in EAC energy policies per country

Country	Energy Policy			Gender Policy		
	National Energy Policy	Renewable Energy Policy or RE Incorporated into Energy Policy	Energy Efficiency Policy or EE Incorporated in Energy Policy	Gender Dimension Included	National Gender Policy	Energy Dimension Included in Gender Policy
Burundi	✓	✓	✓	✓	✓	✓
Kenya	✓	✓	✓	✓	✓	✗
Uganda	✓	✓	✓	✓	✓	✗
Rwanda	✓	✓	✓	✓	✓	✓
South Sudan	✓	?	?	?	✓	✓
Tanzania	✓	✓	✓	✓	✓	✓

✓ = yes ✗ = no ? = Information not available

Several countries, such as Uganda, Tanzania, Kenya and Rwanda, on the other hand, have standalone, sectoral renewable energy and/or energy efficiency policies. Furthermore, we can conclude from Table that almost every EAC Partner State has acknowledged gender dimension in their national energy policies, although some are more detailed than others. Gender concerns in the policies are mostly associated with energy use by households (firewood for cooking, heating and lighting). The argument for gender equality in the policies focuses mainly on reducing the burden and health impacts of wood fuel to women and children at the household level.

Burundi's national energy policy provides an elaborated section on gender equality highlighting the importance of meeting the needs of women in energy policy and supporting solutions that consider the point of view of women, especially in household energy usage, development of alternative energy, health issues, and impacts that affect women and children.

- 1) Uganda's renewable energy policy recognizes a linkage between energy, gender and poverty and attempts to address gender inclusiveness issues by developing the following strategies:
- 2) Studying the linkages and mechanisms between poverty eradication, gender, and renewable energy;
- 3) Sensitizing stakeholders on the linkages between gender, poverty and renewable energy;
- 4) Implementing a comprehensive integrated renewable energy, gender sensitive, poverty alleviation plan; and
- 5) Reinforcing the gender related benefits of renewable energy.

In Rwanda, the energy policy recognizes the link between gender equity, environment sustainability and climate change. Gender concerns are to be mainstreamed across energy planning processes and

strategies. Additionally, the policy also addresses institutional responsibilities for mainstreaming and monitoring gender equity.

Gender Integration in National Energy Policies

Women are often discriminated and constrained by traditional socially accepted gender roles. However, because gender roles are determined not by nature but rather by the social environment in which the person is raised, perception of gender roles can actively be encouraged to change through policies (Khamati-Njenga and Clancy 2003). The UN Women and UNDP-UNEP Poverty and Environment Initiatives (PEI) have proposed that a gender-responsive energy policy should recognize and identify the following issues: 1) the different gender-specific energy needs that exist; 2) the need to increase women's participation in decision-making processes related to energy; and 3) actions to address gender-related issues in the sector (UNDP and UNEP 2015)

Rwanda's energy policy meets the three criteria (Ibid.): First, the national energy policy recognizes that "guidelines for gender mainstreaming shall be adopted in energy planning strategies. In practice, this means fundamentally recognizing that men and women can have different roles, responsibilities and decision-making powers over energy usage." Second, this policy is supported by a set of concrete actions to mainstream gender in the national energy planning; for example, development of micro-finance programs targeting women and clean energy technologies (Ministry of Infrastructure 2015).

Burundi's national energy policy (Lettre de Politique Énergétique Nationale) also incorporates all three criteria. Uganda's national energy policy only references the first criterion; however, its Renewable Energy Policy meets all three criteria. Tanzania's national energy policy only references the second criterion; and Kenya's national energy policy references the first and third criteria. South Sudan's national energy policy section of the development plan makes no reference to gender nor does it address the three criteria above.

Although most of the national energy policies in the EAC identify gender mainstreaming as an issue linked to objectives and strategies in the policy, several lack tangible and quantifiable indicators to measure the success of strategy implementation. Planning for such policies usually omits strategies to link energy ministries with their gender and women affairs and community development counterparts to work together. Without a link to implementation metrics, it is difficult to assess the success or impact of these policies. One exception is Kenya's energy and petroleum policy which possesses measurable indicators. Under Article 175, the Kenyan policy states that "*no more than two-thirds of the members of representative bodies in each country government shall be of the same gender.*" Furthermore, the energy policy provides a timeframe for implementing strategies on mainstreaming gender.

Institutional Framework for Mainstreaming Gender and Energy

One of the fundamental principles of the EAC is gender equality. As stated in Article 5(3) of the Treaty, the EAC ensures the mainstreaming of gender in all its endeavours and the enhancement of the role of women in culture, social, political, economic and technological development. Additionally, the Treaty also states that gender balance be taken into account in determining staff and compositions of the organs and institutions. At the regional level, the Sectoral Council on Gender, Youth and Community Development in the EAC is responsible for mainstreaming gender into all strategic interventions of the Community. Under the EAC Strategic Plan for Gender, Youth, Children, Persons with Disability, Social Protection and Community Development (2012-2016), the EAC envisages to promote gender equality, equity and women and girls' empowerment as normative in the EAC Partner states by mainstreaming gender into all strategic interventions and sectors of the Community (EAC 2012). The institutional

framework at the national level in the EAC Partner States includes ministries of energy and of gender in every country.

Countries with Gender Units

The Gender Focal Units (GFUs), located within the energy ministries or related energy agencies, are one way to promote gender mainstreaming. The role of GFUs is to ensure that gender equality is included in policy making, planning and implementation. GFUs can become agents of change to educate their colleagues and encourage the adoption of gender sensitive practices (ECOWAS 2015). In West Africa, Member States with gender focal units showed the most progress and commitment to gender and social inclusion (Ibid.).

In the EAC, Kenya and Uganda have Gender Focal Units (GFU) within the ministries of energy. It needs to be confirmed if other Partner States in the EAC (Burundi, Rwanda, Tanzania and South Sudan) whether a GFU exists in the ministries of energy. In Kenya and Uganda, the Renewable Energy Directorate in the Ministry of Energy and Petroleum is in charge of mainstreaming integration of climate change and gender (Kenya Ministry of Energy 2018). Equity concerns/issues have also begun to be integrated in some countries' ministries and institutions. For example, the Ugandan government has emphasised gender and equity budgeting at all levels, forcing them to plan and implement such considerations. The Ugandan Ministry of Energy and Mineral Resources includes and caters budgets which target energy services to the elderly, youth and children, with consideration of location concerns with far to reach areas.

it is also interesting that the position for Minister of Energy in Uganda and Rwanda is held by women and women in the Rural Electrification Agency of Tanzania and Kenya are well represented. There was no clear evidence of Energy Focal Units (EFU) within gender ministries in any of the Partner States, but Burundi has an energy focal person in its gender ministry. Lack of clear articulation of energy-related concerns in the national gender policies may be the reason behind the absence of EFUs in the gender ministries.

Role of Gender Focal Units and Their Influence on Policies

Rwanda, Tanzania, South Sudan, and Uganda's gender policies require that GFUs be instituted at the government bodies to sensitize them on gender issues. For example, Rwanda's Gender Policy provides that all departments at the operational level be required to appoint directors of planning as the new GFUs. GFU are given the capacity to 1) monitor implementation progress of the National Gender Policy within their respective institutions and sectors; 2) advocate for all data to be disaggregated by sex; 3) ensure that all their policies, programmes and budgets are gender-responsive; and 4) oversee the capacity needs in gender mainstreaming within their respective institutions. In Kenya, the Renewable Energy Directorate in the Ministry of Energy and Petroleum is the GFU and is given specific functions that include integration of gender and climate change into renewable energy policy.

Uganda has ensured a gender focal point in both the Ministry of Energy and the Rural Electrification Agency to ensure that gender aspects are adequately disseminated and mainstreamed during planning, budget, and implementation of energy projects. Similarly, Kenya also has a gender focal point and gender mainstreaming is actively implemented. The Ministry of Finance is the body that approves the budget and requires allocation for gender in the ministerial budgets: if a proposal does not have a budget line for gender, the Ministry of Finance rejects it. A separate commission, called the Equal Opportunity Commission and in Kenya the National Gender and Equality Commission determines and reviews all budgets made at the Ministerial level to ensure that gender mainstreaming is being done.

Capacity Building and Training Offered

There are several gender and energy capacity building programs and modules offered from both within the EAC and from outside. UNDP published a gender and energy training module and policy brief to build capacity for gender issues related to energy in the African region. ENERGIA's Gender Mainstreaming Plan assisted government organizations in several Partner States, such as Kenya Power and Lightning Company, where it provided gender training for staff and helped progress towards the target of 30 percent women for senior management positions in the company. Also in Kenya, the Women's Enterprise Development Fund and Uwezo Fund of Women and Youth empowerment facilitates the availability of funds and training for women entrepreneurs. Tanzania's Gender Policy also requires capacity building of ministries, departments and other government institution by providing gender training to policy makers, GFUs, and other actors on gender analysis, gender policy, and gender budgeting. At the operational level, this policy is implemented through organisations such as the National Gender and Sustainable Energy Network (NGSEN) that aims to engender energy through advocacy, capacity building and awareness raising.

Public Sector Recruiting, Hiring and Promotion and Procurement

Some EAC Partner States have defined a more detailed strategy to promote gender inclusivity in the recruiting, hiring and promotion and procurement within the public sector. In Kenya, Articles 27 (8), 54, 55, and 56 of the Constitution require that members of appointive bodies shall not be more than two thirds of the same gender, at least 5 percent are persons with disabilities; and youth, minorities and marginalized groups be provided with special opportunities for access to employment. However, according to the Public Services Commission baseline study 2013-14, the ratio of women at the policy making levels is at 23 percent, when the constitution provides for the principle that not more than two-thirds of members be of the same gender (Republic of Kenya Public Service Commission 2016). Tanzania's Gender Policy aims to increase the number of seats in Parliament allocated for women to at least 50 percent.

Civil Society Organizations in the EAC at the Nexus of Gender and Energy

There is a strong presence and engagement of NGOs, civil society and lobbyist groups in all countries ensuring and calling out any unfair practices, such as the Women of Uganda Network (WOUGNET), a network of feminist organizations that effectively address national and local problems of sustainable development through enhanced technology communications. Furthermore, there are many civil society organizations and international development agencies that work towards mainstreaming gender in energy in the region, from high level approaches to grassroots movements. These organizations play an important role in the acceleration of gender equality, whether aiming to influence policies in energy development or working to change society's perspective. A few examples are noted below:

High level:

- 1) Association of Women in Energy and Extractives in Kenya (AWEIK) works to provide women with opportunities for equitable professional and economic development within Kenya's extractive industries. Among their strategic priorities include organizational development, capacity development, advocacy & lobbying, and business development services²⁴;

²⁴<https://www.aweik.or.ke/about-aweik/>

- 2) Power Africa, an initiative funded by USAID, aims to increase women's influence in the energy sector policy development and project planning processes;²⁵ and
- 3) Women in Energy Awards Kenya hosts annual conferences that discusses how women can add their voices in the energy landscape in the region.²⁶

Grassroots level:

- 1) The Organization of Women in International Trade (OWIT) in Kenya holds intervention programs that provide women in rural and urban centres access to energy solutions;
- 2) Zawadisha provides microfinancing programs for rural Kenyan women to access items such as solar lamps and clean cook stoves;²⁷ and
- 3) Rwanda Women's Network who partnered with Atmosfair to provide efficient firewood stoves for households in Rwanda.²⁸

Select National Level Flagship Programmes

- ❑ **Last Mile Connectivity Project** in Kenya is an electricity access project focused on expanding the distribution network to connect low-income customers. The project is being implemented by the Kenya Lighting and Power Company and is funded by the African Development Fund of the African Development Bank. Gender considerations were included from the project's inception to help address differentiated gender needs in planning and developing the project, with a particular focus on rural energy and related development impacts. Funds were allocated (USD 350,000) for capacity building programmes for power station staff, including gender mainstreaming workshops in all regions.²⁹
- ❑ **The Post-Harvest Programme** in Uganda advocates for the use of small-scale solar dryers for long-term storage and household consumption of fruit and vegetables for rural women. Women are active participants in the preservation of indigenous vegetables which have potential in the strengthening of the export base and income generation from the industry and food security. The technology is suitable for use with pineapples, pawpaw, mangoes, apple bananas, and tomatoes. The Fruits of the Nile Company (CROSS REFERERNCE) was formed in 1992 to link rural producers with the European market for dried fruit. Today, the Fruits of the Nile Growers Association has about 700 members, with about 70 of the farmers using solar dryers for their fresh fruits (pineapples and bananas). More than 50 women's groups have incorporated the solar drier technology. The solar dryers are also used to preserve vegetables and fruits for home storage and consumption.³⁰
- **The Upesi Rural Stoves Project in Kenya** trained women in stove production, distribution and installation, which led to widespread adoption of the fuel efficient stoves. The project worked primarily with eight women's groups each, with differing levels of marketing skills and knowledge to produce, market, and sell the stoves. The women, who previously had been

²⁵Power Africa. Advancing The Roles Of Women In African Power. Retrieved from <https://www.usaid.gov/power-africa/newsletter/feb2016/advancing-roles-of-women>

²⁶<http://womeninenergy.net/>

²⁷<http://www.zawadisha.org/>

²⁸<http://www.rwandawomennetwork.org/RWN-Atmosfair-StoveProject.html>

²⁹<https://www.afdb.org/en/projects-and-operations/project-portfolio/p-ke-fa0-010/>

³⁰<http://www.energia.org/resources/newsletter/enarchive.html>

involved in various agricultural and pottery activities for income generation, also received training in costing and pricing, record keeping and marketing. The final project evaluation stated that 16,000 stoves had been manufactured, purchased and installed. Monthly fuel savings of 90 kilogrammes of wood were noted, representing 40 percent fuel use savings and the greenhouse gas reductions are being monetized.³¹

31 http://www.bioenergylists.org/stovesdoc/Kenya/05_Kenya.pdf

GOING FORWARD

This baseline study has revealed a number of steps that EACREEE can take to realize its vision for a gender inclusive energy sector in the EAC. The aim for EACREEE is to focus on practical and realistic actions for continued work and progress on issues of gender and social inclusion in the clean energy sector of the EAC. The entry points identified below are based on the research and interviews conducted for this study, and it will be necessary to validate these ideas with EACREEE's stakeholders and donors.

1. Data Gaps

Building the evidence base is an important way to create a more gender and socially inclusive energy sector in the EAC. Disaggregated statistics need to be routinely collected in all Partner States, but especially in South Sudan where data is scarce, to provide support for high quality empirical studies of gender-differentiated energy impacts, and deeper investigations into which practical methods are most effective for increasing gender equality in the energy sector.

The data gaps could form a kernel of a research and monitoring agenda for a future EACREEE gender programme (Section 6.2). EACREEE could lead the charge for adopting industry-wide indicators and methodologies to collect gender-disaggregated statistics from government agencies, donors, and the private sector. Building on its relationship with Makerere University, EACREEE could partner with academics to promote the empirical study of the nuanced interplay between gender, youth, disability, displacement, and energy. It could also work with donors to find and refine practical, evidence-based techniques to correct gender imbalances in the energy sector, public and private, in offices and out in the field. With high quality data in hand, it will be possible to build the sector in a way that both serves the full population and takes advantage of women and men's talents. The following are data gaps in the EAC Partner States that were identified through this research and could form the basis of a workstream for the EACREEE gender programme:

Energy Access Data Gaps

- 1) Electrification rates (by tier) and impetus for decisions made on connecting to the grid based on whether there are differences for female- and child-headed households, households containing people with disabilities, and displaced individuals;
- 2) Context- and location-specific quantifiable impacts of electrification and improved cooking on women's production, income, agency, and empowerment;
- 3) Context- and location-specific empirical studies of electrification and improved cooking on the educational achievement of children, especially girls and school age children exhibiting excessive vulnerability;
- 4) Subnational geographic survey information on use of different cooking fuels and technologies;
- 5) Gender-disaggregated reporting of energy use and demands in settlement camps, and impact quantification; and
- 6) Deeper analysis of the energy access issues facing people with disabilities, disaggregated by disability type.

Energy Supply Data Gaps for Entrepreneurship, Public and Private Sector Workforce

- 1) Estimates of men and women supplying energy via business creation and distinguishing characteristics of male-led and female-led enterprises, both at small and large scales, and by nationality;

- 2) Scientific survey of the barriers faced specifically by different types of energy enterprises, disaggregated by gender;
- 3) Disaggregated data on energy sector workforce, public and private, by subsector, job classification, and ownership structure; and
- 4) Analysis of the root causes and implications of women's failure to enter and advance in energy fields in the EAC.

Enabling Environment Data Gaps

- 1) Data on gender considerations in policy provisions at the national and regional level in the EAC;
- 2) Implementation and compliance statistics of gender equality regulations and incentives; and
- 3) Analysis of differences in the ways that men and women benefit from energy policies and programmes.

2. Programme Design Considerations

The EAC is moving rapidly to transform the energy sector, and it is imperative that gender considerations are part of that transformation. The EACREEE gender programme will be designed to be responsive to local priorities and on-the-ground realities with a progressive agenda on gender and social inclusion. There are a number of ground-breaking developments in the EAC to be reflected in the programme, such as its leadership in PAYG technology, recent advances in rural electrification, progressive gender policies, and electoral quotas, as well as negative ones such as the continued and devastating impacts of conflict in the region and gender disparities in compensation, rights, and education. Also, the high number of young people in the EAC poses both challenges and opportunities that should be addressed by any envisioned programme.

The successful experience and learning over the past five years with the ECOW -GEN programme in West Africa will be considered in the design of the EACREEE programme. Moreover, research and interviews conducted for this baseline study have raised some questions and provided preliminary insights into others, but more debate is needed before arriving at a final programme concept and action plan. What follows below is a number of considerations in designing and launching a EACREEE gender and energy programme. Issues raised below are meant to stimulate further discussion and debate among stakeholders.

Programme Name. Given the EAC and Partner States' commitment not only to gender, but also to youth, people with disabilities, displaced people, and other disadvantaged groups, EACREEE may want to choose a programme name that reflects issues more broadly than gender but isn't overly cumbersome with a long and unpronounceable acronym. Some ideas include using terms like "pro-social energy" or "inclusive energy," "energy justice," "gender plus," or others.

Problem Statement and Opportunity. The available evidence suggests that energy access in the EAC is rolling out unevenly to the population, with certain groups lagging. By the same token, women are not participating in the clean energy value chain at the same rates as their male counterparts, depriving the EAC of much-needed talent and dynamism as it pursues the clean energy transition. The following are opportunities for a future EACREEE programme to consider exploiting:

- Reduce gender inequality in energy access and RE/EE supply chain through innovative policy instruments and incentives;

- Offer guidance and technical assistance to Partner States as they endeavour to mainstream gender and make their energy sectors more equitable;
- Cultivate a critical mass of gender-aware policy makers, empowered men and women entrepreneurs and technicians to serve as champions to advocate for change;
- Bridge knowledge gaps among and between gender and energy practitioners, serving as a regional node for experience, knowledge and technology transfer;
- Invest in clean energy development by and/or for disadvantaged groups, including via market-based approaches;
- Create training opportunities on gender mainstreaming for policymakers, business owners, and NGOs; and
- Represent the EAC region internationally and network with other centres of excellence.

Framing Issues. At the outset it will be important to identify and define the scope and approach that EACREEE might take as it develops and launches a gender programme. Clear framing of the programme will be important in order to build the right support for it, both within and outside the EAC. Framing questions to consider are:

- To what extent would a future programme seek to balance [sometimes] competing social, environmental, and economic objectives in its transactions?
- What activities will fully have a gender, as opposed to a women’s empowerment, focus?
- What is the balance of rights-based versus efficiency-based arguments used as the programme’s justification?
- Will the programme seek to address energy access as well as energy supply and the enabling environment, or limit itself to only one or two of the three?
- What cross-cutting issues, such as health, water, agriculture, and productive uses should be highlighted, and to what extent?
- Will the programme be an opportunity to include people in disadvantaged situations (e.g., people with disabilities, displaced people, and youth)?

Strategic Niche. The EAC is comparatively crowded with energy programmes, initiatives and businesses, some of which integrate gender and social inclusion. In order to design a relevant programme, build support from the Partner States, and mobilize funding, EACREEE may want to focus on areas that are currently receiving relatively less attention. The issues, sometimes intersecting, of youth, displaced people, and people with disabilities are all strategically important to the EAC and there is relatively little research or implementation experience to date, presenting one possible avenue for EACREEE to pursue.

Another potential concrete area for EACREEE to consider is to begin work on regional policy issues at the gender-energy nexus. Because there is not currently an updated regional policy for energy, for RE/EE, or for gender mainstreaming in energy, this avenue is wide open with EACREEE a natural choice to help lead the work. One interviewee for this baseline study noted that the ECOWAS RE/EE regional policies³²

³²The renewable energy and energy efficiency policies are part of a comprehensive ECOWAS policy framework for achieving Sustainable Energy for All, aiming for universal access by 2030 and also contribute to the goals of the

and the policy for gender mainstreaming in energy access³³ were important in laying the groundwork and justifying future investment in the region. The ECOWAS policies were heavily referenced by subsequent gender and energy activities.

Women working in medium to large scale renewable energy infrastructure projects is another area that could have opportunity for EACREEE to take a leadership role. Developing a more gender balanced energy workforce, where women can benefit from a technical education allowing them to enter the field and have a successful career is an important but overlooked area. EACREEE could exercise leadership to address the gender employment gap and workforce issues, perhaps with gender based targets.

Partnerships. The choice of which partnerships for EACREEE to pursue will shape the future programme in important ways. Partnerships can help to strengthen EACREEE and build its constituency within its Partner States. In addition to the EAC Partner States, partnerships will likely take shape with the other regional centres (e.g., ECREEE in West Africa and SACREEE in Southern Africa), the private sector, multilateral and bilateral development organizations, NGOs, and academic institutions. Another decision point is the positioning of EACREEE: the envisioned EACREEE gender programme can position itself to be entirely energy driven (e.g., from EACREEE, energy ministries and utilities), or it could evolve into a fuller, more equal partnership with champions engaged from the gender and social side (e.g., The EAC Directorate of Social Sector Development and national gender ministries). A closer collaboration with gender institutions could theoretically result in 1) a wider funding base and stakeholder support; 2) more tools and levers with which to address implementation challenges; and 3) more balance in promoting the virtuous circle of women's empowerment and energy development. The funding partner relationships that need to be developed by EACREEE must also align with the suite of activities selected for priority implementation (e.g., energy efficiency programme and gender programme are the first to be launched).

Budget. EACREEE will want to set a separate funding target for the gender programme that is realistic, considering that it is in the design and launch phase, yet also reflects meaningful implementation in the first year. It will be important to build an early track record and continue to advance a value proposition quickly in order for EACREEE to build a base of support for the Centre overall, and the gender programme, in particular. Joint implementation with other regional centres in Africa (e.g., ECREEE and SACREEE) can be a way to leverage budgets and foster collaboration, and should be considered as a possibility. Crafting a modular programme approach, incrementally adding on each component as EACREEE grows, would allow each piece to be pitched separately to the most interested funding partners. This would allow the Centre to grow organically.

Africa-EU Energy Partnership. Renewable energy policy: http://www.ecreee.org/sites/default/files/documents/ecowas_renewable_energy_policy.pdf and Energy efficiency policy: http://www.ecreee.org/sites/default/files/documents/ecowas_energy_efficiency_policy.pdf

³³The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), in partnership with the African Development Bank (AfDB) and the United States-based National Renewable Energy Laboratory (NREL), developed the ECOWAS Policy for Gender Mainstreaming in Energy Access to address existing barriers that may hinder the equal participation of women and men in expanding energy access in West Africa.

<http://ecowgen.ecreee.org/index.php/ecowas-gender-and-energy-policy/>

In setting a funding target for the gender programme, it may make sense to allocate a percentage of the core funding to get started and then make a 1- to 5-year budget projection based on expected staffing levels, programmes deployed and administrative costs. With a clear estimation of the budget and projected growth, it will be easier to develop a resource mobilization strategy.

Governance and Institutional Structure³⁴. EACREEE is now housed at Makerere University in Kampala, Uganda, with its staff hired through UNIDO using funds from Austrian Development Agency (ADA). The vision is that EACREEE will become a standalone Centre in approximately 3 years as part of the EAC. As EACREEE transitions into a full EAC institution, it will be able to receive budgetary allocations from the Partner States and shore up its funding base. It is assumed that EACREEE along with the energy ministries will be the primary implementers of a gender programme, with other stakeholders brought in under contracts or cooperative agreements on a programmatic basis.

EACREEE and the future gender programme will be subject to the multiple sources of oversight from the University, UNIDO/ADA, various EAC organs, and presumably any new co-funders brought on board, potentially increasing the management and reporting burden. At the very least, EACREEE should consider a streamlined reporting structure that is in line with the current structures in place with UNIDO. For the institutional structure, EACREEE has a steering committee, but the expertise on gender is very limited. Therefore, it may be advisable to create a separate technical advisory group for a future gender programme; this worked very well for the ECOWAS gender programme and was instrumental in its success. A Technical Advisory Group in EACREEE could be composed of gender focal points from within the national energy ministries, a representative from the EAC Department of Gender, and an academic, a business leader, and civil society representative from the region.

3. Next Steps

Below are three concrete next steps needed to finalize and validate this baseline study and move forward with the launch of a new gender and energy programme. These steps include additional consultation, creating a programme design document and action plan, and resource mobilization.

- 1. Consultation.** The situational understanding set forth in this baseline study stems from literature reviews and a limited number of key informant interviews conducted by external consultants. To ensure all regional realities and priorities are reflected and accorded proper weight, and to generate buy-in and momentum for a future programme, additional consultation and validation are needed. Any final programme design considerations should be based off of democratic and broad-based consultations and adhere to a clearly defined validation process that includes representatives from energy and gender ministries, grassroots civil society groups, development organizations, and funding partners. This could be facilitated with the involvement of a Technical Advisory Group and will hopefully be a part of the strategy going forward. In addition, the opportunity to arrange consultations is planned for the sustainable energy forum in Kigali (March 19-21), Rwanda, where the baseline study will be presented and discussed. Consultation will be limited to meeting participants, so EACREEE should consider alternative and affordable ways to receive public and expert comments on this baseline study and the proposed programme design such as through a website, via social media, or leveraging attendance lists at other related conference events.

³⁴Note: The proposals put forth in this section for the structure of the EACREEE Gender Programme are meant to stimulate discussion in order to consider various options before decisions are made by EACREEE and the Partner States.

- 2. Complete Programme Design and Roll Out Plan.** With additional input and feedback from the consultative process, the basic contours and components of the EACREEE gender programme can be finalized and agreed upon in a standalone document. From there, and subject to resource constraints, a clear and realistic action plan for roll out is needed, likely focusing initially on just one or two of the many proposed initiatives. As EACREEE works to build credibility and showcase its value to the national ministries, it is important to put forth a compelling and far-reaching vision in the general programme document while at the same time selecting an achievable and highly strategic series of first steps for the roll out plan. For example, if deciding to first push for a policy, as ECREEE did in West Africa, is it likely to be successfully adopted and have a meaningful impact on future efforts? If not, what other actions might be more logical early wins to pursue?
- 3. Resource Mobilization.** An important opportunity for EACREEE is evident given the rising global interest in gender and energy issues, especially interest from other development partners active in the EAC region. UNIDO, NREL, and ADA are providing support for EACREEE’s work in designing and launching EACREEE-GEN. Now, resource mobilization must get underway to expand the donor base, so that it is possible for EACREEE to speed the launch and deepen the reach of the proposed programme that will be rolled out in the EAC Partner States. A resource mobilization strategy would identify partners to approach and specific areas of possible collaboration for each. Examples of donors active in this space include the UK’s Department for International Development (DFID) Energy Africa initiative which catalyses private sector markets in solar home systems (SHS) and United States Agency for International Development (USAID’s) Power Africa initiative which brings together technical and legal experts, the private sector, and governments from around the world to work in partnership to increase the number of people with access to power. Multi-stakeholder approaches are also an option with donors such as UNIDO, UNCDF, World Bank, GIZ, European Union, Swedish International Development Agency (SIDA), and Norwegian Agency for Development Cooperation (NORAD) that are allocating resources for off-grid electrification and modern cooking in East Africa, with an emphasis on gender and social inclusion. Other partnerships—such as with international networks like ENERGIA and wPOWER, international implementing NGOs like Practical Action East Africa and Energy4Impact—could also be considered for joint fundraising efforts.

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ANNEX 1: EACREEE BASELINE STUDY: LIST OF PEOPLE INTERVIEWED

Title	First Name	Last Name	Position	Organization
Ms.	Mary	Abbo	Managing Director	Center for Renewable Energy and Energy Efficiency Conservation (CREEEC), Makerere University
Ms.	Harriet	Aching	Gender and Energy Specialist	Center for Renewable Energy and Energy Efficiency Conservation (CREEEC), Makerere University
Mr.	Michael	Ahimbisibwe	Executive Director	East African Center for Renewable Energy and Energy Efficiency (EACREEE)
Mr.	Izrael	Da Silva	Professor	Strathmore University
Mr.	Fred	Ishugah	Sustainable Energy Expert	East African Center for Renewable Energy and Energy Efficiency (EACREEE)
Mr.	Michael	Kiza	Programme Management Expert	East African Center for Renewable Energy and Energy Efficiency (EACREEE)
Mr.	Mou Athian	Kuol	Secretary General of South Sudan EAC Secretariat	EAC
Mr.	Julius	Magala	Country Manager	Energy 4 Impact
Mr.	Moise	Makuwa	Permanent Secretary	Ministry of Energy
Ms.	Rehema	Nyakazze	CEO	Uganda Stoves Manufacturers Ltd
Ms.	Karin	Reiss	UNIDO/SACREEE Sustainable Energy Expert	SADC Centre for Renewable Energy and Energy Efficiency (SACREEE)
Mr.	Aloys	Sahiri		Ministry of Energy
Mrs.	May	Sengendo	Professor	School of Women and Gender Studies, Makerere University
Mrs.	June	Sengendo	Professor	School of Women and Gender Studies
Mr.	Francis	Wainaina	Energy Advisor	Practical Action

ANNEX 2: WORLD BANK ENTERPRISE SURVEYS

All firms

Top manager is female

Top manager is male

Country	Year	Average/SE/N	Percent of firms experiencing electrical outages	Number of electrical outages in a typical month	If there were outages, average duration of a typical electrical outage (hours)	If there were outages, average losses due to electrical outages (% of annual sales)	Percent of firms owning or sharing a generator	If a generator is used, average proportion of electricity from a generator (%)	Days to obtain an electrical connection (upon application)	Percent of firms identifying electricity as a major constraint	Number of water insufficiencies in a typical month*	Proportion of products lost to breakage or spoilage during shipping to domestic markets (%)*	Percent of firms identifying transportation as a major constraint
All		Average	58.8	6.3	4.4	4.6	34.1	20.9	31.9	31.0	1.1	1.3	19.1
Sub-Saharan Africa		Average	78.9	8.6	5.7	8.3	52.8	28.5	35.9	40.0	1.9	1.9	26.2
Burundi	2014	Average	85.1	16.6	4.8	3.4	64.2	17.5	25.3	46.9	2.9	1.4	15.2
Burundi	2014	SE	5.3	3.0	0.9	0.8	6.9	2.9	8.1	7.3	1.2	1.1	5.3
Burundi	2014	N	153	152	124	117	157	92	17	157	55	47	157
Burundi	2014	Average	80.4	16.3	2.9	4.4	58.4	30.3	n.a.	51.0	4.3	n.a.	25.1
Burundi	2014	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Burundi	2014	N	27	27	20	19	27	11	2	27	7	5	27
Burundi	2014	Average	86.0	16.6	5.1	3.2	65.4	15.7	26.5	46.1	2.7	0.9	13.3
Burundi	2014	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Burundi	2014	N	126	125	104	98	130	81	15	130	48	42	130
Kenya	2013	Average	89.4	6.3	5.6	7.0	57.4	14.0	43.0	22.2	2.1	2.0	21.6
Kenya	2013	SE	1.8	0.4	0.4	0.7	2.7	1.0	18.8	2.4	0.4	0.8	2.3
Kenya	2013	N	778	722	637	607	781	432	77	778	345	334	778
Kenya	2013	Average	82.9	6.4	7.2	7.1	48.5	17.5	100.9	20.2	1.7	1.5	21.6

Country	Year	Average/SE/N	Percent of firms experiencing electrical outages	Number of electrical outages in a typical month	If there were outages, average duration of a typical electrical outage (hours)	If there were outages, average losses due to electrical outages (% of annual sales)	Percent of firms owning or sharing a generator	If a generator is used, average proportion of electricity from a generator (%)	Days to obtain an electrical connection (upon application)	Percent of firms identifying electricity as a major constraint	Number of water insufficiencies in a typical month*	Proportion of products lost to breakage or spoilage during shipping to domestic markets (%)*	Percent of firms identifying transportation as a major constraint
Kenya	2013	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Kenya	2013	N	79	73	64	61	80	42	6	80	25	27	79
Kenya	2013	Average	90.4	6.3	5.4	7.0	58.8	13.5	37.1	22.5	2.2	2.0	21.6
Kenya	2013	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Kenya	2013	N	699	649	573	546	701	390	71	698	320	307	699
Rwanda	2011	Average	62.5	4.0	4.3	2.6	48.8	7.8	31.4	15.4	1.0	...	27.7
Rwanda	2011	SE	4.5	0.5	0.9	0.6	4.4	1.1	2.3	3.2	0.4	...	4.2
Rwanda	2011	N	238	224	160	108	241	97	7	239	67	...	236
Rwanda	2011	Average	64.8	4.6	6.4	1.4	60.1	6.8	n.a.	17.2	1.9	...	22.7
Rwanda	2011	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	...	n.c.
Rwanda	2011	N	48	44	34	23	48	19	1	48	11	...	47
Rwanda	2011	Average	61.9	3.9	3.8	3.0	46.1	8.1	32.6	15.0	0.8	...	29.0
Rwanda	2011	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	...	n.c.
Rwanda	2011	N	190	180	126	85	193	78	6	191	56	...	189
South Sudan	2014	Average	15.3	1.5	4.7	13.6	73.3	94.2	9.7	58.6	0.3	0.1	46.2
South Sudan	2014	SE	1.7	0.3	0.9	2.4	1.7	0.7	1.2	2.2	0.2	0.2	2.4
South Sudan	2014	N	724	711	89	100	738	483	213	737	77	76	732
South Sudan	2014	Average	23.5	5.3	7.2	20.4	78.0	92.3	16.2	58.7	0.5	0.0	47.4
South Sudan	2014	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
South Sudan	2014	N	70	68	11	13	70	47	23	70	6	6	70
South Sudan	2014	Average	14.4	1.0	4.3	12.5	72.8	94.5	8.9	58.6	0.3	0.1	46.1
South Sudan	2014	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.

Country	Year	Average/SE/N	Percent of firms experiencing electrical outages	Number of electrical outages in a typical month	If there were outages, average duration of a typical electrical outage (hours)	If there were outages, average losses due to electrical outages (% of annual sales)	Percent of firms owning or sharing a generator	If a generator is used, average proportion of electricity from a generator (%)	Days to obtain an electrical connection (upon application)	Percent of firms identifying electricity as a major constraint	Number of water insufficiencies in a typical month*	Proportion of products lost to breakage or spoilage during shipping to domestic markets (%)*	Percent of firms identifying transportation as a major constraint
South Sudan	2014	N	654	643	78	87	668	436	190	667	71	70	662
Tanzania	2013	Average	85.8	8.9	6.3	15.1	43.0	24.5	52.6	45.8	2.1	4.0	36.7
Tanzania	2013	SE	2.1	0.6	0.3	1.4	2.6	2.6	9.3	2.8	0.6	0.7	2.9
Tanzania	2013	N	805	624	485	361	805	246	49	789	269	191	743
Tanzania	2013	Average	77.5	9.1	5.6	16.9	40.7	32.5	44.7	34.1	5.5	0.0	29.2
Tanzania	2013	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Tanzania	2013	N	101	76	50	38	103	21	6	97	28	23	96
Tanzania	2013	Average	87.1	8.9	6.4	14.8	43.4	23.6	53.9	47.9	1.6	4.6	38.0
Tanzania	2013	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Tanzania	2013	N	700	546	434	322	698	224	43	690	241	168	645
Uganda	2013	Average	81.5	6.3	10.1	11.2	52.2	17.6	18.1	26.8	0.4	2.0	15.7
Uganda	2013	SE	3.2	1.3	1.9	1.3	4.3	2.4	3.3	3.7	0.1	1.2	3.0
Uganda	2013	N	760	520	350	382	761	272	59	761	257	232	761
Uganda	2013	Average	82.1	6.1	7.0	6.1	50.2	17.2	9.2	22.2	0.1	2.0	11.7
Uganda	2013	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Uganda	2013	N	127	81	51	73	127	44	10	127	37	24	127
Uganda	2013	Average	81.4	6.3	10.7	12.4	52.6	17.7	20.2	27.7	0.4	2.0	16.5
Uganda	2013	SE	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Uganda	2013	N	633	439	299	309	634	228	49	634	220	208	634