Challenges and opportunities for implementation of inclusive sustainable energy transition policies in Eastern Africa

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Summary

This policy report aims to support policymakers and practitioners in understanding and advancing the nexus between sustainable energy transitions and social inclusion in Eastern Africa, focusing on Ethiopia, Kenya, Rwanda, Tanzania, and Uganda. This report is grounded in existing research and enriched by the experiences of policymakers and practitioners working in diverse local contexts. It identifies critical barriers to inclusive energy transitions, e g, persistent gaps in providing high-quality electricity and other infrastructure, affordability constraints, biomass dependency, and energy poverty's disproportionate impacts on women. The report also highlights emerging opportunities such as the expansion of renewable energy, decentralized and hybrid systems, and growing regional commitment to gender-responsive energy governance. It outlines key recommendations, including investing in decentralized infrastructure, improving financing for households and small enterprises, gender equality in energy planning, and strengthening community-based and labor-market linkages. This report is designed to guide and stimulate policy conversations and provides regionally grounded assessment and actionable recommendations that can be adapted to other settings. The goal is to inform and shape more inclusive, gender-responsive, and context-sensitive energy policies, validated by key stakeholders.

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Preface

This report, *Challenges and Opportunities for Implementation of Inclusive Sustainable Energy Transition Policies in Eastern Africa*, has been developed to strengthen the dialogue and collaboration between researchers, civil servants, and policymakers working toward more inclusive energy policies and practices in Eastern Africa. It examines the nexus between sustainable energy transitions and social inclusion in Ethiopia, Kenya, Rwanda, Tanzania, and Uganda, offering a regionally grounded assessment of the barriers and opportunities in these countries.

The report is the result of a co-creation process between the Sustainable Energy Transitions Initiative (SETI) and the Inclusive Green Economy (IGE) Program during 2024–2025. It forms part of the IGE program's thematic work on sustainable energy transitions and biomass dependency. The analysis combines insights from existing research with the experiences of policymakers and practitioners operating across diverse local contexts.

Our aim for this report is to guide, inform, and stimulate policy conversations within the five countries and beyond. We hope it contributes to the development of inclusive, gender-responsive, and context-sensitive energy policies that leave no one behind.

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List of Contents

List of Figures and Tables

Challenges for a socially inclusive sustainable energy transition

Economic development and many other positive social outcomes are highly correlated with increased energy consumption (Jeuland et al. 2021). Traditionally, fossil fuels have provided the energy supply that meets economic demand, but at the cost of climate and other health and environmental damage, many of which are borne by vulnerable local populations (Greenstone et al., 2015; Jacobson, 2015; WHO, 2016). Today, much of the future growth in energy consumption is expected to occur in low- and middle-income countries (LMIC), especially in Sub-Saharan Africa (SSA), where high-tier[9] energy access is imperative to alleviate poverty (Wolfram et al., 2012; Falchetta et al., 2020; Burgess et al., 2020). It is a challenge for energy policy to address growth, inclusion, and environmental sustainability objectives simultaneously, because what is regarded as the "right" policy largely depends on a country's socioeconomic, cultural, and political position.

The green energy transition approach (i.e., minimizing pollution while decarbonizing energy systems) is at the core of climate change mitigation and reducing impacts of local and regional pollution. Yet, this concept disregards the fact that energy transition is a complex affair that simultaneously impacts environmental, economic, and social systems (Ghorbani et al., 2024), all of which are mediated by a country's cultural and political realities. For example, decarbonization may increase competition for materials needed for deployment of renewable energy technologies, whose availability is complicated by local geographic and social conditions, reducing incentives for global collaboration (Ghorbani et al., 2024). The literature on this issue also argues that a Net Zero (NZ) approach, despite being the prevailing logic governing the development of countries' Nationally Determined Contributions (NDCs), will not be sustainable if it creates or deteriorates social inequalities (Abram et al., 2020; Middlemiss et al., 2023). These challenges call for a beyond-decarbonization approach that is both comprehensive and globally inclusive (Ghorbani et al., 2024; Middlemiss et al., 2023).

Prior work has been devoted to understanding which individuals, households, and communities will bear the costs and benefits of decarbonization policy, and how these intersect with existing economic and social vulnerabilities. Yet, there is limited evidence on how to advance this objective while promoting a democratic and inclusive sustainable energy transition process (Campos et al., 2022). This is especially relevant in low and middle-income countries, which require balancing development and environmental goals. A review by Middlemiss et al. (2023) indicates that, in the absence of suitable complementary policies, a Net Zero approach will both maintain existing inequalities and possibly generate new ones. Two factors are especially relevant in determining the potential risks. First, there are significant gaps in knowledge and thinking arising from the separate nature of research and policy. For instance, while considerable literature focuses on employment losses in carbon-intensive enterprises (Hanna et al., 2024; Zhang et al., 2024; Magacho et al., 2023; Hanto et al., 2021; Koh et al., 2021; Garcia-Garcia et al., 2020;), potentially relevant aspects such as double-energy vulnerabilities (i.e., energy poverty and mobility) are often disregarded, despite

[9] "High-tier" refers to Tiers 4–5 in the World Bank's Multi-Tier Framework (MTF) for measuring energy access. These tiers represent reliable, affordable, and high-quality energy services that support productive and modern uses beyond basic lighting, such as powering appliances, machinery, and communication technologies.

being more likely to arise in locations with multiple socio-demographic vulnerabilities and relative spatial peripheralization (Simcock et al., 2021). Second, there are gaps associated with the failure to integrate different agents' justice concerns into NZ policy planning processes. Because agents show different responses to policy interventions, overlooking these differences may prevent successful policy implementation. Though Middlemiss et al. (2023) discussed these gaps in a developed economic setting, we might expect similar or perhaps even larger trade-offs in less developed nations such as those in SSA, giving rise to a dilemma over how to pursue sustainable transition and social inclusion.

This report is grounded in the work by Middlemiss et al. (2023). It aims to address the main research on policy gaps for socially inclusive energy transitions, with a special focus on Eastern Africa, a region where socio-environmental dilemmas are urgent policy issues. We argue that a more complete understanding of the social risk of energy transition policy requires a person-centered approach, which takes account of the local setting, identifies subpopulations most vulnerable when interventions are pursued, and then identifies specific potential social risks. Such an approach must bring together relevant stakeholders such as policymakers, practitioners, and the academic community, so that they may contribute their perspectives on tackling various policy dilemmas holistically. Thus, relevant inputs can be collected to drive a more socially inclusive energy transition policy.

A regional perspective on Eastern Africa's sustainable and inclusive energy transition challenge

To understand the impediments to, and potential of, socially inclusive and sustainable energy transition policy, we focus on a sample of countries in Eastern Africa. The study was conducted in five countries: Ethiopia, Kenya, Rwanda, Tanzania, and Uganda. An overview of the economic and energy transition setting in these countries is displayed in Table 1.

Table 1: Overview of developmental and energy indicators of the sample of countries

	Kenya	Tanzania	Rwanda	Ethiopia	Uganda
GDP per capita PPP [*USD*]	5,883	4,019	3,396	3,058	3,098
Income group classification	Lower-middle	Lower-middle	Low	Low	Low
Rural population [*%*]	70	63	82	77	73
Access to electricity [*% population*]	76	46	51	55	47
Access to clean cooking [*% population*]	30	9	8	9	1
Renewable energy [*% final energy consumption*]	68	78	79	91	91
Renewable energy capacity [*Watts per capita*]	49	10	11	45	26
Energy efficiency [MJ/USD 2017 PPP][10]	4.8	6.4	3.6	6.8	10.2

[10] According to the OECD, the Purchasing Power Parities (PPPs) is a currency conversion rates that equalize purchasing power by removing price level differences. It is measured in national currency per US dollar.

Source: Own elaboration based on the World Bank country database. Note: GDP, income group, and rural population figures correspond to 2023. The remaining figures correspond to 2022.

We designed and implemented a **survey** instrument to gather knowledge and perceptions of policymakers in the region. The survey covered the barriers to sustainable transition and asked respondents to consider how existing policies and policy processes did or did not consider gender, as well as social vulnerabilities. Data was gathered during the period August-December 2024, and 37 policymakers and practitioners submitted valid responses.

To contextualize the perspectives gathered in this survey, respondents were classified into two broad occupational categories: Policymakers and practitioners. This distinction is important for interpreting the results, as it reflects both the level and nature of influence each group typically holds in shaping energy-related decisions. This distinction reflects differences in institutional roles and influence. Policymakers—comprising 84% of respondents—are affiliated with government ministries, national planning bodies, or regulatory agencies responsible for designing and steering public energy policy. Practitioners, who make up the remaining 16%, are primarily engaged in implementation, research, and advisory roles. This group includes academic researchers, consultants, and specialists from universities, think tanks, and non-governmental institutions. The sample also reflects geographic diversity: 35% of respondents were from Ethiopia, 22% from Uganda, 19% from Rwanda, 16% from Kenya, and 8% from Tanzania.

East Africa's energy landscape is shaped by a set of specific, and often common, challenges that affect the region's ability to pursue sustainable and socially inclusive energy transition. Common regional challenges include **limited electricity access**, outdated and insufficient **infrastructure**, **affordability** and **financial constraints**, and widespread **biomass dependency**. These challenges are especially acute in rural areas.

Although these challenges are common across the region, there are country-specific nuances that are reflected in relative rankings and in additional concerns. Ethiopian respondents prioritized infrastructure deficits, energy supply limitations, and the need to expand renewable energy sources. The Kenya sample's primary concerns centered around financial and affordability barriers, coupled with infrastructure weaknesses and persistent information and knowledge gaps that impede coordinated planning. Rwandan participants listed similar challenges but notably highlighted biomass dependency and governance-related issues. Tanzanian respondents focused on financial barriers, the slow pace of renewable energy development, and limited access to clean energy technologies, while the Ugandan sample placed additional emphasis on the environmental degradation linked to high biomass dependency.

The mapping of energy challenges against systemic barriers shows that problems such as biomass dependency, limited electricity access, and renewable energy development are consistently tied to broader financial, infrastructure, governance, and data deficits (Figure 4, Appendix). These connections highlight that energy poverty in the region is not caused by isolated factors but emerges from **overlapping and mutually reinforcing constraints**. For instance, access to electricity is limited not only by infrastructure but also by financial barriers and gaps in policy coordination, while biomass reliance is compounded by cultural practices, weak data systems, and health impacts. Thus, advancing a sustainable and inclusive energy transition requires integrated

solutions that cut across technical, financial, governance, and social dimensions. A disaggregated version of this analysis is presented by country in Figure 4 in the Appendix.

A critical cross-cutting issue is the **need to strengthen data systems** and build a more robust evidence base to inform energy policymaking. While general awareness of energy transition challenges exists, persistent gaps in localized and disaggregated data continue to hinder effective decision-making. Policymakers in the region identified several information shortfalls, including the absence of reliable national and subnational data on energy consumption patterns, particularly for firewood, charcoal, and even electricity connections. They also highlighted the lack of geospatial and demographic data, limited access to modern analytical tools and empirical studies, and insufficient life cycle analyses of energy technologies.

Additionally, there is a clear need for targeted research that aligns national policies with the needs of local communities, as well as evidence on socio-cultural factors that could drive the adoption of clean energy solutions among stakeholders. Notably, some respondents emphasized that issues often framed at the national level—such as financial barriers, biomass dependency, and electricity access and infrastructure—are also experienced in highly local ways, underscoring the importance of designing solutions that address both scales simultaneously. Constraints related to communication and limited capacity for data modeling, access, and interpretation were also noted as skills-related barriers. Addressing these gaps and human capacity deficits is essential to devising data-grounded policies that **reflect local realities**.

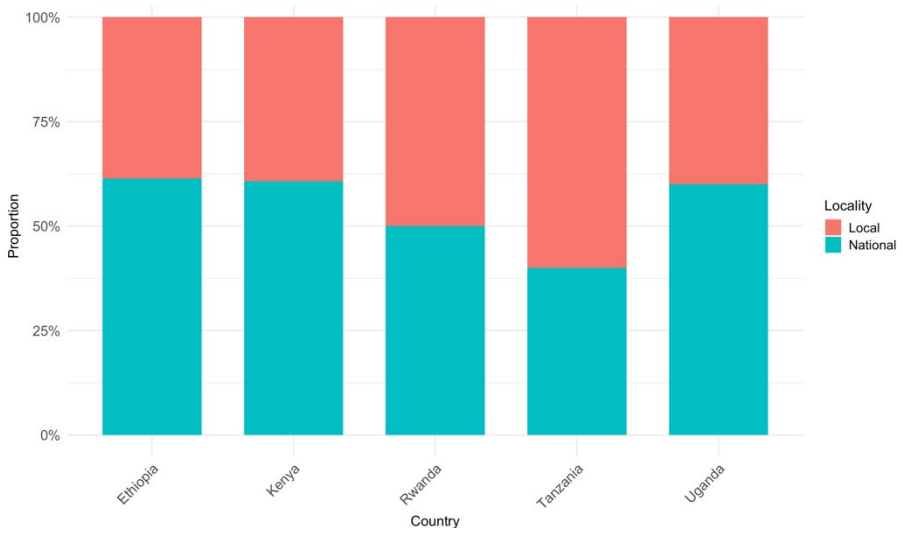

Figure 1: Appropriate scope of energy transitions policies.

Notes: From the survey of energy-sector policymakers and practitioners answering whether energy challenges should be addressed through local or national-level interventions. Categories are mutually exclusive.
Source: Own elaboration.

While many of the energy challenges identified in the survey are similar across countries, there is variation in opinions over the most appropriate scope – national versus more localized – for intervention (Figure 1). A larger share of policymakers in Ethiopia, Kenya, and Uganda consider that energy poverty should be addressed with national, system-wide intervention, while the preference for national versus local approaches was relatively even in Rwanda, and tilted towards

more local approaches in Tanzania. In the latter countries, respondents highlighted greater subnational disparities in energy access and affordability.

Policy instruments commonly recommended include **subsidies** and **tariff** reforms, **legal and regulatory framework** reforms, **awareness and education campaigns**, and the establishment of **quality standards** and **prohibitions**. While these tools are broadly recommended, beliefs about their feasibility vary across countries and energy challenges. More broadly, evidence suggests that policy interventions should be both adaptive and context sensitive (Mirzania et al., 2023; Ahmed & Bruns, 2024; Kaze et al., 2025). Centralized, national-level reforms are necessary but must be complemented by decentralized, tailored approaches that address regional disparities and the distinct needs of vulnerable groups.

Urgent need for gender-responsive clean energy policies

Energy poverty in East Africa has clear gendered dimensions. Common regional challenges for women include heightened exposure to the negative impacts of limited energy access, for example, health risks from traditional biomass use, time and labor burdens related to unpaid manual care work that could be alleviated somewhat with technology (e.g., labor-saving appliances such as washing machines, or refrigeration that eases food preparation burdens), and barriers to participation in education and the formal economy.

The most urgent gendered challenges highlighted by energy sector policymakers vary across countries but share common themes (Figure 2). Physical health impacts—primarily from exposure to indoor air pollution and the hard work of collecting biomass fuels from the environment—and associated time burdens, are recurrent issues. In both Ethiopia and Uganda, nearly one-fifth of respondents emphasized restricted access to education as a major consequence of energy poverty for women. Mental health stressors, security risks, and exclusion from energy-sector employment were cited as problems in multiple countries, underscoring how energy poverty exacerbates social and economic inequalities for women.

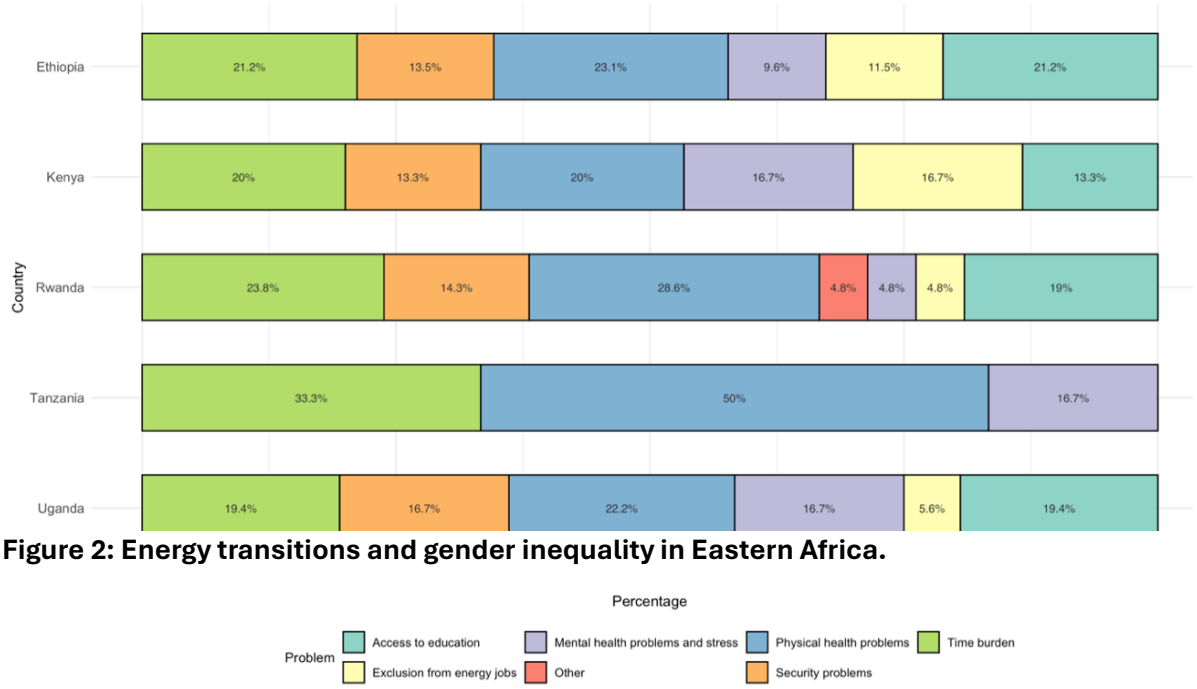

Figure 2: Energy transitions and gender inequality in Eastern Africa.

Note: From the survey of energy-sector policymakers and practitioners.
Source: Own elaboration.

Respondents from Tanzania, notably, identified fewer distinct challenges compared to other countries but emphasized physical health risks more heavily, with half of the responses emphasizing this issue. Conversely, Rwandan policymakers surfaced a wider range of issues, including an "Other" category recognized by policymakers as social inequality for women, arising from exclusion and lack of empowerment. Prior work has found that the nature of women's empowerment in Rwanda, and its relationship with energy, is somewhat different from the other countries (Chandrasekaran et al., 2023). The broader set of challenges identified in Rwanda may reflect socio-cultural factors particular to this context, or a more comprehensive recognition of how energy poverty intersects with social inequities, suggesting a need for multidimensional policy solutions.

These multiple dimensions of inequality point to an urgent need for gender-responsive clean energy policies across Sub-Saharan Africa, with particular attention to the unequal health, education, and labor burdens that women face.

In Ethiopia, women's access to clean energy – electricity, cooking solutions, and solar technologies—is the most urgent priority. This is compounded by systemic financial barriers, knowledge gaps, and rural-urban disparities. Kenya identifies cultural constraints, affordability issues, and the limited diffusion of clean energy solutions as key challenges for women's empowerment. Rwanda stresses financial exclusion, a lack of clean cooking technologies, and women's heightened vulnerability to climate-related risks. In Tanzania and Uganda, financial barriers and energy costs are the leading concerns, coupled with gaps in social inclusion and access to clean technologies. Specific country challenges emerge in each context as indicated by Figure 6 in the Appendix.

Figure 3 highlights key areas where respondents thought gender-sensitive energy policies were needed. Household-level dimensions emerge as the most frequently cited areas requiring gender-sensitive attention in energy policymaking. For instance, household cooking and lighting technology choices, decision-making over energy uses, and the adoption of energy-efficient appliances were consistently identified as domains where a gendered approach was needed, with percentages ranging from 10% to 25% in most countries. Thus, there is a strong and consistent perception, throughout the region, that women are particularly affected by household-level energy decisions, reinforcing the need for targeted interventions at this level.

Two other categories were stressed by respondents. Production and labor issues – such as employment in the energy sector, firms' decisions on energy sources, and agricultural energy use (both in SMEs and large firms) – were emphasized especially by respondents from Ethiopia, Kenya, and Rwanda, collectively representing around one-third of all mentions. Meanwhile, community-level dimensions, particularly related to management of forest and biomass resources, were more often mentioned by respondents from Ethiopia, Kenya, Rwanda, and Tanzania (representing between 11% and 25% of responses). Thus, the broader community and labor spheres require gender-responsive energy policymaking, in addition to the needed focus on households. Moreover, national differences illustrate how local contexts shape energy-gender linkages, again highlighting the need for tailored policy responses across the region.

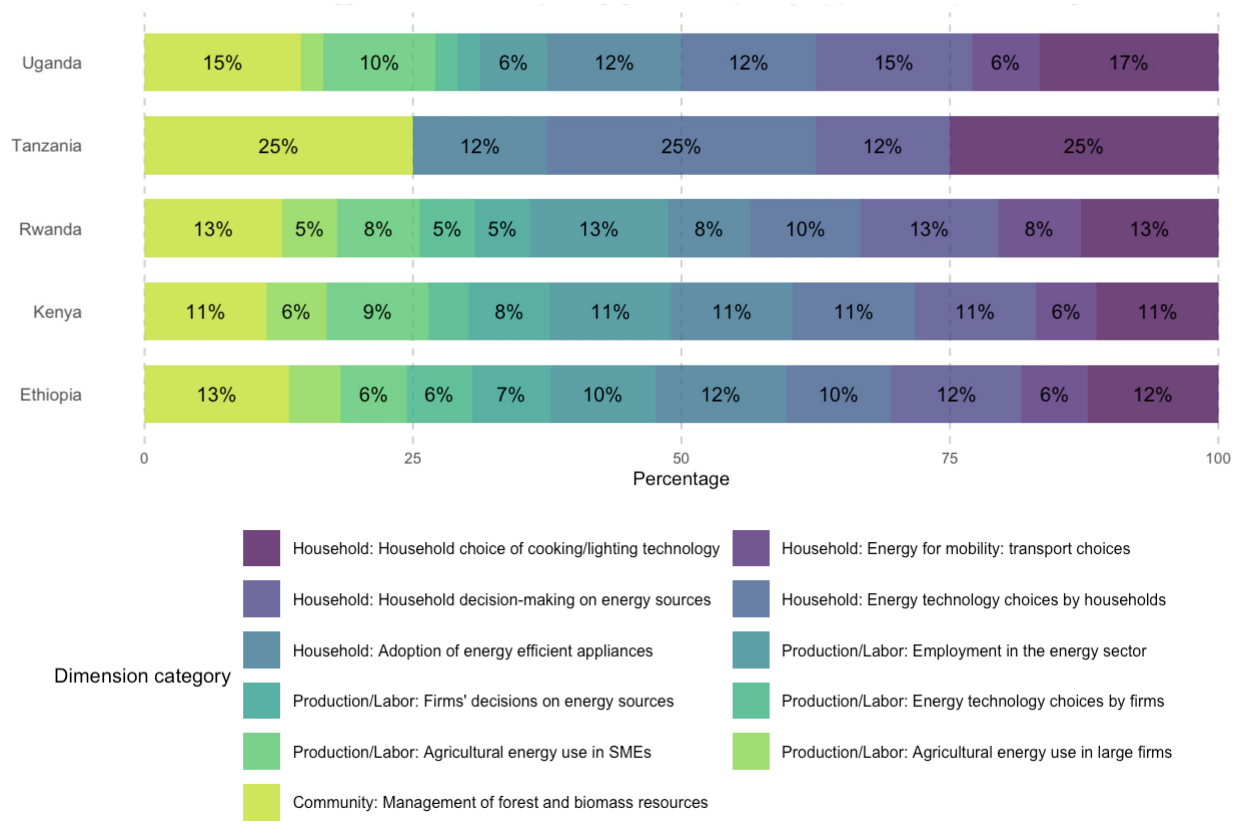

Figure 3: Key policy areas for a gendered sustainable energy approach

Note: Based on a survey of energy-sector policymakers who identified all dimensions where gender should be considered. Multiple responses allowed; percentages reflect the share of total selections.
Source: Own elaboration.

Country-specific dynamics highlight the limitations of a "one-size-fits-all" approach

While the countries represented in this Eastern African survey share many common energy poverty and energy transition challenges—such as limited energy access, affordability barriers, and

persistent gender inequalities—country-specific dynamics highlight the limitations of a "one-size-fits-all" approach. Differences in the nature and severity of the challenges, in economic development, and in local institutional contexts, shape how energy and gender issues manifest in each country. For instance, policymakers in Kenya and Tanzania, which are relatively more advanced economies in the region, tended to emphasize affordability and modernization gaps, whereas countries like Rwanda and Uganda emphasized deeper vulnerabilities linked to persistent biomass dependency and unequal labor burdens. Ethiopian respondents, by comparison, prioritized basic access and health-related risks associated with energy poverty, in the context of conflict and the recent humanitarian crisis.

The differentiated challenges described above translate into distinct policy priorities across countries. Table 2 synthesizes these insights into a concise regional roadmap, summarizing cross-cutting recommendations and country-specific actions for advancing gender-inclusive and sustainable energy transitions in Eastern Africa.

Table 2: Regional roadmap for gender-inclusive and sustainable energy transitions

Policy area	Regional recommendations (All countries)	Kenya	Tanzania	Rwanda	Ethiopia	Uganda
Energy access and infrastructure	Prioritize investment in electricity infrastructure and decentralized systems.	Continue to expand the grid and offer off-grid hybrid solutions.	Focus on rural mini-grids and urban infrastructure gaps.	Expand rural electrification in biomass-reliant areas.	Strengthen infrastructure resilience and emergency services.	Prioritize rural grid expansion and localized solutions.
Affordability and financing	Design subsidy reforms and inclusive financing mechanisms for delivering clean energy to those left behind.	Develop energy financing tools for SMEs and households.	Subsidize rural clean cooking technology and renewables.	Expand microfinance for household-level energy access.	Scale up pro-poor subsidies and safety nets.	Integrate energy access into broader poverty-reduction plans.
Gender-sensitive energy policy	Embed gender-responsive approaches into energy planning and governance.	Support women-led SMEs in clean energy value chains.	Promote gender-inclusive clean cooking programs.	Expand women's access to energy employment and leadership.	Focus on reducing time and health burdens for rural women.	Enhance women's access to clean energy technologies and finance.
Community and labor market linkages	Strengthen community-based initiatives and address labor-related energy gaps.	Support green jobs and energy entrepreneurship.	Address social, cultural, and institutional barriers to women's participation in the energy sector.	Address labor gaps in energy-sector employment for women.	Expand forestry management and fuelwood alternatives.	Support women in agricultural energy use and rural enterprises.

Source: Own elaboration. Note: This table provides a synthesized roadmap derived from policymakers' insights on key barriers and opportunities for inclusive energy transitions across Eastern Africa.

These recommendations are grounded in the insights shared by policymakers during the survey. Respondents were asked to rank the most pressing energy and social inclusion challenges for their institutions and to identify the key areas where they lacked sufficient evidence to act effectively. Their responses highlighted recurring priorities such as limited access to electricity infrastructure, persistent reliance on biomass, affordability constraints, and gendered inequities in energy access and labor burdens. They also emphasized critical evidence gaps, including the absence of localized

data on energy use, limited knowledge on financing models, and insufficient analysis of social and cultural barriers to women's participation in the energy sector.

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Appendix: Additional figures

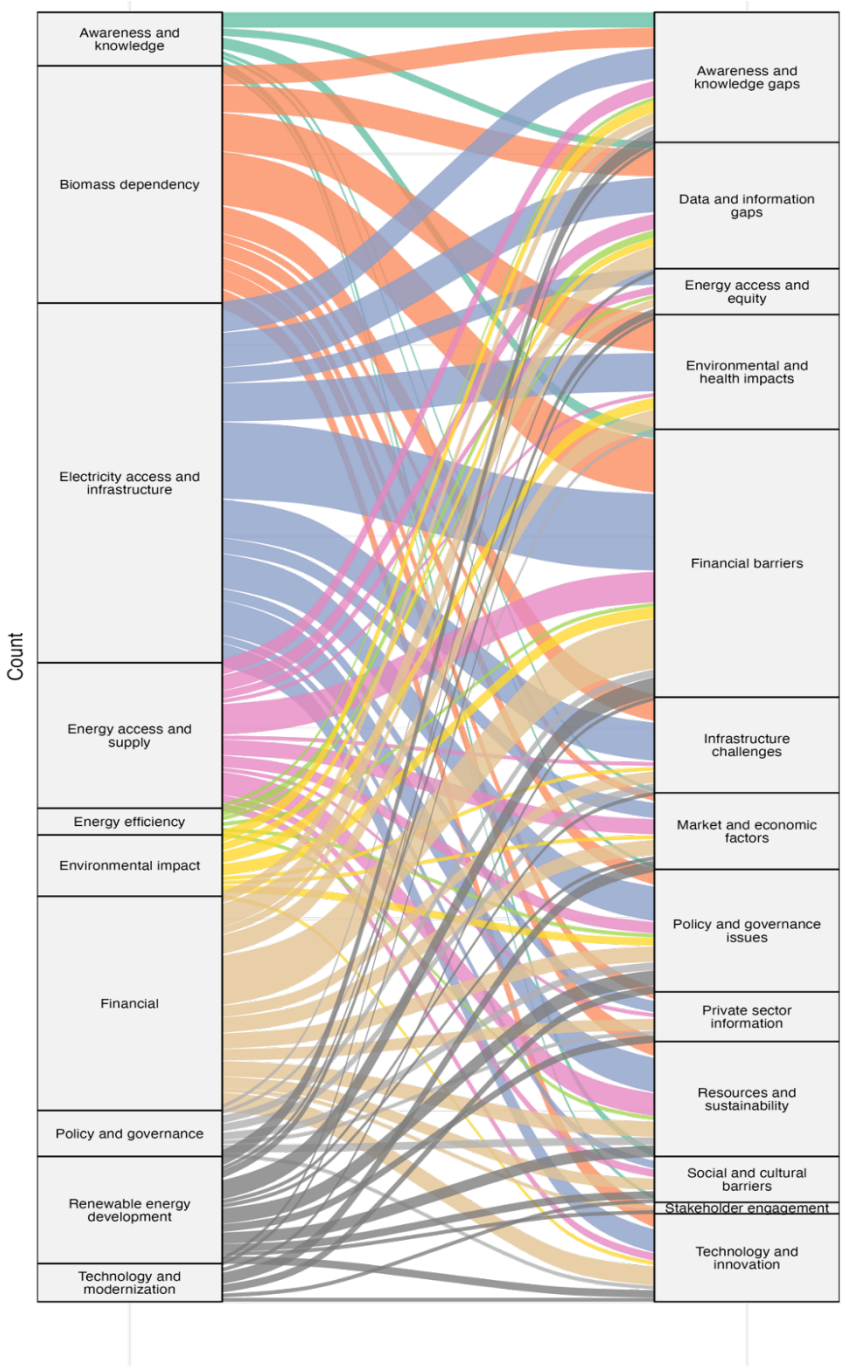

Figure 4: Linkages between key energy issues and knowledge gaps in Eastern Africa

Notes: From the survey of energy-sector policymakers and practitioners who identified the three most pressing energy challenges in their respective countries and the knowledge gaps that must be addressed to overcome them.
Source: Own elaboration.

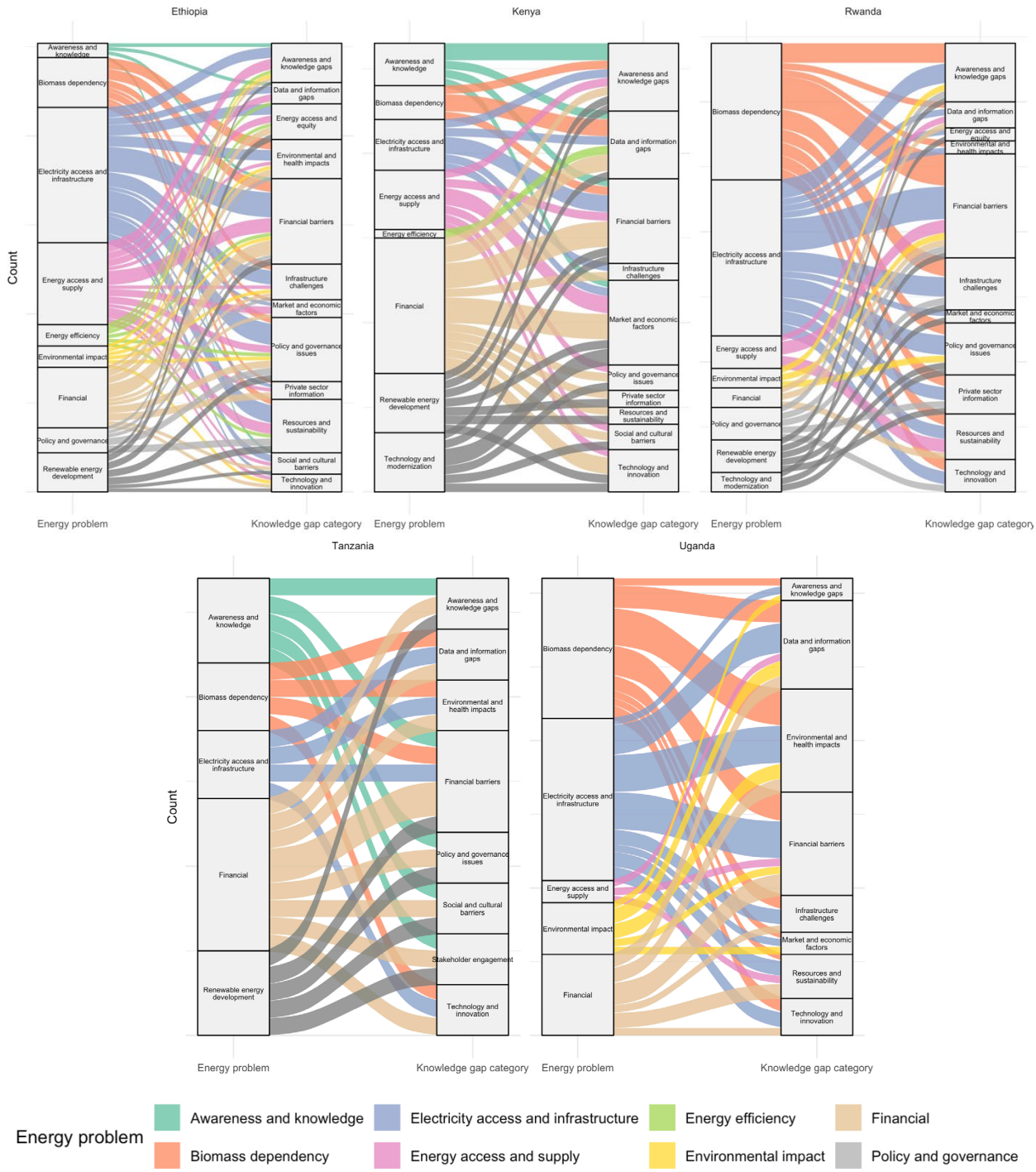

Figure 5: Linkages between key energy issues and knowledge gaps in Eastern Africa, per country

Notes: From the survey of energy-sector policymakers and practitioners who identified the three most pressing energy challenges in their respective countries and the knowledge gaps that must be addressed to overcome them.
Source: Own elaboration.

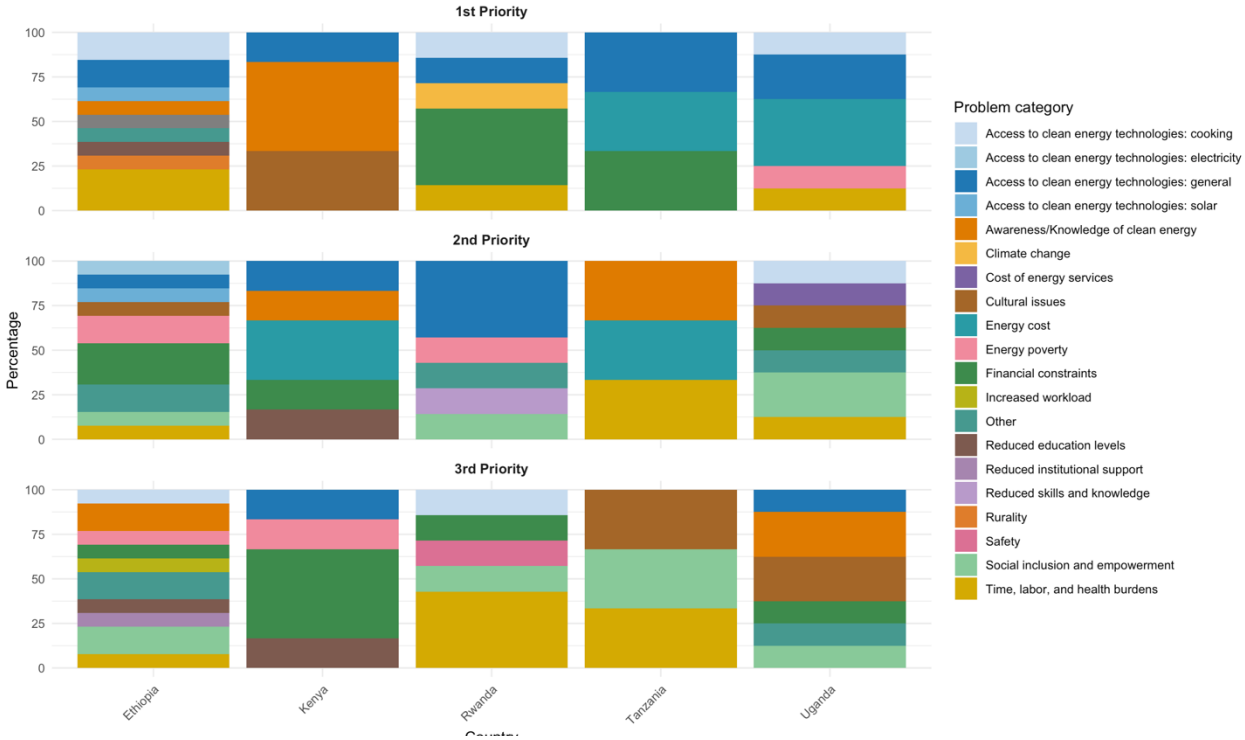

Figure 6: Problems faced by women in terms of sustainable energy transitions in Eastern African countries, by priority.

Note: Based on a survey of energy-sector policymakers and practitioners. Respondents were asked to identify the three most pressing energy policy challenges for women in their country, ranked by order of priority.
Source: Own elaboration.