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Gendering green transition in Africa: Implications of transformative policies

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Abstract—This paper examines the gender implications of the green energy transition in Africa, and the role of transformative policies. Based on a comprehensive review of the energy–gender literature, we find that the energy transition present substantial opportunities for women’s employment and entrepreneurship. However, these opportunities are systematically constrained by entrenched structural inequalities. Overcoming these barriers requires policies that do not only accommodate existing structures but actively transform them. To assess whether current frameworks meet this challenge, the paper conducts qualitative policy mapping of green-transition related policies in Ghana and South Africa, complemented by key informant interviews. Findings reveal that, despite inclusive rhetoric, existing policies largely reproduce the status quo and are insufficient to deliver equitable employment outcomes. In response, the paper proposes a Gender-Transformative Industrial Policy (G-TRIP) framework to guide policy shifts that align green energy transitions with gender-inclusive structural transformation.

Keywords: Gender equality; Green transition; Engendering Policy; Gender-Transformative Industrial Policy (G-TRIP); Africa

JEL Code: O14; O55; O57; J16

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1. Introduction

The green energy transition, primarily driven by the imperatives of climate change mitigation and energy security, is increasingly recognized as a process of industrial and socio-economic transformation (Lehr et al., 2012; Van der Zwaan, 2013; Arvanitopoulos & Agnolucci, 2020; IEA, 2023). The transition is reorganizing production structures, reshaping global value chains and creating new demand for skills, infrastructure, and natural resources. Reflecting this shift, investments in and deployment of green energy technologies, such as solar and wind power, fuel cells, and green hydrogen, have grown exponentially in recent years (IEA, 2023; Ndubuisi et al., 2025), reaching a stage where deployment dynamics have become increasingly self-reinforcing (Sprecher & Kleijn (2021).

As the green energy transition accelerates, attention is gradually shifting to its distributional and inclusionary consequences, particularly for gender equality (Sovacool et al., 2013; Winther et al., 2019; Costa & Veiga, 2021). The significance and co-benefits of the green energy transition thus lie not only in the scale of investment, industrial transformation, or the aggregate employment it promises, but in how it interacts with and potentially reshapes pre-existing structural inequalities in labour markets, especially in developing economies where deep segmentation still persist. While these interactions have been the focus of few studies in the literature (Tsagkari, 2022; Johnson et al., 2019; Chandrasekaran et al., 2023; Dumga & Goswami, 2024), they have largely been examined it at the household or micro level with far less attention to how large-scale energy transitions reshape gendered employment structures at the macro level. Yet the green energy transition has the capacity to engender an economy-wide structural transformation that favors women.

Conventional fossil fuel-based energy systems, have historically reinforced male-dominated employment structures while simultaneously constraining women's economic participation through unpaid care burdens, limited mobility, health externalities, and unequal access to productive energy services. Conversely, access to modern energy has long been associated with women's empowerment via time savings, improved health outcomes, enhanced productivity, and expanded opportunities for income generation (Clancy et al. 2012; Pueyo & Maestre, 2019; Njoh et al., 2022; Chandrasekaran et al., 2023). The green energy transition opens a potentially distinct pathway as several segments of the green energy sector—particularly solar, wind, decentralized mini-grids, clean cookstoves, and off-grid energy services—exhibit lower capital intensity, greater occupational diversity, and more flexible employment structures, characteristics that may reduce barriers to women's participation (Allison et al., 2019). The promise of the green energy transition, therefore, lies not only in decarbonization and energy access, but in its potential to reshape gendered patterns of economic participation, particularly in contexts where women have historically been excluded from both energy production and formal employment.

However, such outcomes are not automatic. Energy systems are not gender-neutral: they are embedded within social structures that shape access to resources, labour market participation, and decision-making power. A growing body of evidence points to the persistence of gender-blind energy and industrial policies, which assume neutral labour markets and overlook how entrenched norms, care responsibilities, skills segmentation, and unequal access to finance systematically disadvantage women (Feenstra, 2021; Gbolonyo et al., 2025; Raman et al., 2025). In contexts characterized by deep structural inequalities, such policy blind spots risk reproducing exclusionary employment patterns even within ostensibly progressive green sectors. This raises a central question: under what conditions

can the green energy transition function as a gender-inclusive pathway of structural transformation rather than a reproduction of inherited inequalities in Africa?

Africa provides a particularly salient context in which to interrogate this question. The continent faces a dual challenge of persistent gender inequality and widespread energy poverty: more than 600 million people lack access to electricity, and close to 900 million lack access to clean cooking solutions (Dagnachew et al., 2020; Ndubuisi et al., 2023). Women and girls disproportionately bear the burden of energy poverty, particularly in rural and peri-urban areas, where they spend hours collecting fuelwood or cooking with polluting biomass fuels. At the same time, several African countries are actively formulating green-oriented industrial strategies, including South Africa's Just Energy Transition Framework and Renewable Energy Master Plan, Nigeria's Renewable Energy Master Plan, and similar initiatives elsewhere, creating a critical policy window to embed gender considerations into emerging green development pathways. Yet the extent to which these emerging policies are explicitly being leveraged to address gender inequality remains unclear.

Against this backdrop, this paper pursues three interrelated objectives. First, it identifies the pathways through which the green energy transition can contribute to gender-inclusive labour market outcomes. Second, it identifies and maps the “*genderedness*” of green energy policies, with South Africa and Ghana as case studies, examining the role of policy in translating green energy expansion into gender-inclusive labour market outcomes. Third it articulates the policy adjustments required to translate green energy expansion into gender-inclusive labor market outcomes. To ground this thinking, the paper proposes a Gender-Transformative Industrial Policy (G-TRIP) framework to guide policy shifts that align green energy transitions with gender-inclusive structural transformation in Africa. In doing so, the article moves beyond aspirational inclusion narratives toward a more grounded and actionable framework for gender-equitable structural change.

Methodologically, the article combines a structured review of the green energy–gender literature with qualitative policy mapping and key informant interviews, enabling a multi-level analysis that connects macro-level policy ambitions to meso- and micro-level institutional and implementation dynamics. This approach responds to calls within development economics for more context-sensitive, politically grounded analyses of green industrialization and inclusive growth, particularly in regions navigating simultaneous energy, employment, and equality transitions.

The rest of this paper is structured as follows. The next section provides a comprehensive survey of how green energy transition affects women's economic opportunities. Section 3 maps the green energy policies for Ghana and South Africa, to determine their genderedness. This is followed by section 4 that develops the G-TRIP framework. The section also uses key informant interviews conducted in Ghana and South Africa to provide a reflection on the G-TRIP framework. Finally, Section 5 concludes.

2. Literature Review: Green Energy Transition and Gender-Inclusive Labor Market Outcomes

The green energy transition is increasingly conceptualized in contemporary scholarship not merely as a technological fix or process of fuel substitution but as a far-reaching structural transformation. This reframing situates the transition within a socio-technical system wherein gender, among other things, emerges not as a peripheral concern but as a structuring axis through which both the processes and outcomes of the green energy transition are mediated.

On the one hand, a growing body of literature demonstrates that the green energy transition has differentiated gendered impacts, shaping access to employment, income opportunities, time allocation, and welfare outcomes (Glemarec et al., 2016; Heuer, 2017; Verma & Imeda, 2023; Inglesi-Lotz et al., 2025). On the other hand, gender relations themselves actively shape the trajectory and effectiveness of decarbonization processes, say, through intensifying green energy transition as a means to an end (Baruah, 2017; Tornel-Vazquez et al., 2024; Volodzkiene & Balezentis, 2025). This bidirectional relationship underscores the importance of gender in understanding the political economy of energy transitions, rather than treating it as an ex post distributive concern.

As is obvious by now, this study focuses on the first dimension of this relationship—namely, how the green energy transition can catalyze an economy-wide gender-inclusive labour market outcomes. Drawing on existing scholarship, three interrelated and mutually reinforcing pathways are identified through which such gender-inclusive labour market outcomes can occur. The first, is that it expands and diversifies women employment opportunities in the energy sector. The second is that it stimulates new forms of women-led entrepreneurship across energy value chains. Thirdly, it reduces women's time poverty by alleviating the burdens associated with unpaid care work and energy provisioning, thereby enabling greater participation in education, wage employment, and entrepreneurial activities.¹ The sections that follow examine each of these mechanisms in greater detail.

2.1. Green Energy Transition, Job Creation, and Gender Inclusion

A commonly shared view in the literature is that the green energy transition will significantly drive employment growth (Ram et al., 2020; IEA, 2023a). The job creation potential of green energy transition is specific to both green energy sectors (e.g., solar, wind and hydro energy) and the wider economy (Ravillard et al., 2021). Arvanitopoulos and Agnolucci (2020) note that there are three categories of jobs induced by the green energy transition: the direct jobs created by the green sectors' core activities, indirect jobs related to their supply chains, and induced jobs generated by an increase in the aggregate demand stimulated by the renewable sector.

Evidence of the job creation potential green energy transition is strongly supported by global assessments from several international organizations. For instance, the ILO (2018) estimates that the transition to a greener economy could generate approximately 24 million new jobs globally by 2030, significantly outweighing the projected job losses in carbon-intensive sectors. Model-based projections by the IEA (2021) show that the energy transition will generate 14 million new jobs in the RE sector by 2030, while employment in oil, gas and coal fuel supply and energy generation declines by around 5 million, leading to a net increase of nearly 9 million jobs. The International Renewable Energy Agency reports that renewable energy employment has grown steadily over the past decade, reaching over 13.7 million jobs globally in recent years, with solar photovoltaics alone accounting for a substantial share of this growth (IRENA, 2023).

Beyond aggregate projections, a growing empirical literature provides more rigorous evidence linking green energy transition to employment outcomes. Several studies relying on input-output (IO) models estimates sizeable positive employment effects at the national or global level (Markandya et al., 2016;

¹ Green energy transition can also indirectly drive gender-inclusive outcome through its effect on health. Traditional biomass-based cooking systems generate significant indoor air pollution, exposing women (who spend disproportionate amounts of time near household cooking spaces) to harmful particulate matter and toxic emissions. The transition to clean cooking technologies significantly reduces these health risks, thereby reducing lost workdays, enhancing physical well-being, and improving women's ability to participate in economic and social activities.

Garrett-Peltier, 2017; Bulavskaya & Reynès, 2018; Fragkos & Paroussos, 2018). Studies have also documented a (net) positive effect of green energy transition on employment under different scenarios (Lehr et al., 2012; Van der Zwaan, 2013; Arvanitopoulos & Agnolucci, 2020). Curtis and Marinescu (2023), in a study focused on US, found that the growth of renewable energy leads to the creation of relatively high-paying jobs, which are more often than not located in areas that stand to lose from a decline in fossil fuel extraction jobs. Evidence from studies relying on causal inference also largely support the job creation potentials of green energy transition (Brown et al., 2012; Costa & Veiga, 2021; Cappa et al., 2024; Ortubai et al., 2026). A meta-analysis study by Stavropoulos and Burger (2020), further confirm that the direct and indirect employment effects are generally positive, while the induced effects can be either positive or negative.

While the preceding argument focuses on the aggregate job creation potential of green energy transition, its potential to reshape labour markets in ways that promote gender inclusion have also been extensively discussed. The scale and distribution of jobs associated with the green energy transition offers a causal explanation in this regard. Traditional energy industries are largely centralized and have long exhibited deeply masculinized labour regimes, often shaped by heavy engineering norms, extractive-site cultures, and occupational pathways that privilege male workers through both formal recruitment systems and informal networks. By contrast, green energy sectors combine technical, managerial, administrative, service, and entrepreneurial roles, thereby widening the spectrum of possible entry points for women (Pearl-Martinez & Stephens, 2016; Nelson & Kuriakose, 2017; Allison et al., 2019; IRENA, 2020; Tsagkari, 2022).

Empirical evidence supports the claim that this diversification can facilitate greater female participation. For instance, IRENA (Clancy et al., 2012) finds that women account for approximately 32% of the renewable energy workforce, compared to significantly lower shares in oil and gas sectors. While still far from parity, this suggests that renewable energy sectors may offer relatively more inclusive employment opportunities. Inglesi-Lotz et al. (2025) confirms this using panel data across 139 countries; their results showed that renewable energy deployment is positively associated with female employment. This, nevertheless, the literature also argues and shows that women's employment within green energy sectors remains highly segmented, with females being disproportionately concentrated in lower-paid position than males (Pearl-Martinez & Stephens, 2016; Allison et al., 2019). Thus, the challenge is not simply increasing women's numerical participation but improving the quality, remuneration, and upward mobility of the jobs they access.

2.2. Green Energy Transition and Women's Entrepreneurship

Another crucial channel through which the green energy transition affects gender-inclusive labour market outcomes through women entrepreneurship in decentralized renewable energy (DRE) value chains (Glemarec et al., 2016; de Groot et al., 2017; Clancy et al., 2019; Osunmuyiwa & Ahlborg, 2019). This is particularly in developing-country contexts where energy transitions are unfolding through off-grid and distributed systems rather than centralized infrastructure. Unlike capital-intensive, centralized energy systems—historically dominated by male labor, large firms, and characterized by technical exclusivity and institutional closure—DRE value chains (e.g., solar home systems, mini-grids, clean cooking technologies, and battery-based solutions) are inherently modular and disaggregated. They span distribution, installation, maintenance, financing, and customer engagement.

This fragmentation is not merely a technical feature; it is economically and institutionally transformative. By breaking down vertically integrated energy systems into discrete, service-oriented

activities, DRE reduces capital intensity, lowers skill barriers at entry points, and weakens the importance of exclusionary industrial networks. As a result, participation becomes feasible through microenterprises, last-mile distribution models, and community-based service provision. Other things equal, these shifts open spaces for women's entrepreneurship, as they collectively relax some of the structural constraints that have historically excluded women from the energy sector. Empirical evidence corroborates this claim across multiple contexts.

In East and West Africa, women have been documented as key actors in the sale and distribution of solar home systems and pico-solar products, often operating through last-mile networks that reach underserved rural populations (Heuer, 2017; Winther et al., 2019; Gray et al., 2019; Barron et al., 2020). Programmatic evidence from initiatives such as Solar Sister in Africa further demonstrates how women-led distribution models can scale clean energy access through decentralized sales networks (Heuer et al., 2015; ICRW, 2015). In Mali, women have successfully owned and managed multifunctional energy platform that support agro-processing, water pumping, and small-scale manufacturing—illustrating women's capacity to engage beyond retail into productive energy use and local economic transformation (Sovacool et al., 2013). There is also indication of similar patterns in Asia (Baruah, 2015; Mininni, 2022).

The entrepreneurial opportunities green energy transition via DRE confers on women are not incidental; they are structurally embedded in how these markets function. Decentralized energy markets rely heavily on trust-based, localized service delivery models, which align closely with women's socially embedded roles in many rural and peri-urban settings. This alignment is not merely complementary; it is constitutive of how these markets scale. Women's close involvement in household energy management, combined with their deep integration in community social networks, positions them as highly effective intermediaries in the diffusion of new energy technologies. This proximity enhances not only technology adoption, but also customer trust, sustained engagement, and long-term retention. Within this evolving landscape, women are increasingly emerging as “last-mile” energy entrepreneurs—serving as distributors, installers, sales agents, and service providers at the critical interface between technology suppliers and end users (Heuer, 2017; Alliance for Rural Electrification, 2020; Dumga & Goswami, 2024).²

Women entrepreneurs also bring distinct commercial advantages. As Glemarec et al. (2016) argued, women entrepreneurs are particularly effective in identifying and onboarding new, creditworthy customers in underserved rural markets, thereby reducing customer acquisition costs and lowering repayment risks. Their ability to assess demand and market energy services to other women, who are often the primary users of household energy technologies, further strengthens their role as catalysts of market expansion. Their access to female clients is also often less constrained by prevailing social and cultural norms, enabling them to penetrate segments of the market that remain largely inaccessible to male-dominated distribution channels. These dynamics, taken together, reduce information asymmetries, build trust in unfamiliar technologies, and facilitate behavioral change, factors that are indispensable for the success and sustainability of energy transitions in developing contexts.

² These shifts are significant not only economically but socially. By repositioning women as producers and providers of energy services, the transition can contribute to gradual transformations in household bargaining power, community status, and gender norms.

2.3. Green Energy Transition, Energy Access, and Time Poverty

Besides expanding women's employment opportunities in the energy sectors, the green energy transition generates gender-inclusive labour market outcomes indirectly through the reallocation of time resources. The transformative effects of this process are especially visible in rural and low-income settings across the Global South, where women continue to bear primary responsibility for household energy provision (Johnson et al., 2019; Das et al., 2019; Petrokofsky et al., 2021). In many such contexts, energy poverty manifests in the daily necessity of collecting fuelwood, producing charcoal, or managing inefficient cooking systems. These activities are highly time-intensive and deeply embedded in women's unpaid care responsibilities, the sphere of unpaid labour that sustains households and reproduces labour power.

Time spent on energy-related domestic tasks represents a substantial opportunity cost. It reinforces gendered divisions of labour and limits women's participation in markets and public life. In this sense, energy poverty and time poverty are mutually reinforcing, forming a structural barrier to gender equality.³ This view strongly aligns with the Development economics literature that has long argued and empirically shown that time poverty is both a cause and a consequence of gender inequality because it restricts women's ability to participate in paid employment, education, entrepreneurship, political engagement, and rest (Blackden & Wodon, 2006; Ferrant et al., 2014; Verheul *et al.*, 2006; Marphatia & Moussie, 2013; Balde, 2020).

The green energy transition directly intervenes in this dynamic by reducing the time intensity of domestic labour through three important ways. First, electrification, whether through grid expansion or DRE, reduces reliance on biomass fuels, thereby eliminating or significantly shortening time spent on fuel collection. Second, access to electric or clean cooking technologies reduces cooking time due to higher thermal efficiency and ease of use compared to traditional stoves. Third, energy access enables the substitution of unpaid labour with labour-saving technologies or market-based services. In all cases, they create the conditions for women to reallocate time toward education, entrepreneurship, or formal employment. In this context, the mechanisms collectively illustrate that the green energy transition is not merely a technical service; it is a critical input into the organization of social reproduction. In this context, the green energy transition has the potential to transform gender relations not only through labour market inclusion but through a deeper restructuring of the conditions under which women allocate time, exercise agency, and participate in economic and social life. Several evidence in the literature confirms these dynamics.

For instance, micro-level evidence from Nepal demonstrates that reliance on traditional biomass fuels imposes substantial time and physical burdens on women, who bear primary responsibility for fuel collection and cooking, thereby constraining their participation in productive activities (Das et al., 2019). Systematic evidence further confirms that these time burdens are not incidental but structurally embedded, with transitions to modern cooking energy yielding significant time savings across multiple stages of household energy use (Petrokofsky et al., 2021). Pajaron (2019) found that access to electricity and more efficient source of energy allows women more time to be engaged in the labor force, including in micro enterprises. Verma and Imeda (2023) found that access to clean cooking fuel led to an improvement in women's health and an increase in their work hours. Nag (2024) found that better electricity reliability reduces the time spent by women in fuel collection substantially which could potentially increase labor supply.

³ Time poverty refers to the condition in which individuals—disproportionately women—have insufficient discretionary time due to excessive unpaid domestic and care responsibilities.

Taken together, this evidence shows that gender-inclusive outcomes arise not only when women are integrated into green sectors as workers or entrepreneurs, but when the transition reduces the unpaid labour burdens that historically constrain their economic and social participation.

2.4. Beyond Technological Determinism: The Need for Gender-Responsive Policy

The discussion thus far largely assumed a deterministic relationship wherein the green energy transition will unambiguously lead to gendered transformative outcome. Although this is intuitively appealing, several empirical and anecdotal evidence tell somewhat nuanced and different story.

Consider the case of the employment opportunities in the energy sector. Although the literature is broadly optimistic about the women employment potential of the green energy transition, it simultaneously raises critical concerns regarding the quality, structure, and hierarchy of these employment gains. A central issue is that aggregate employment growth may mask persistent patterns of gendered occupational segregation. Notably, extant studies also note that women employed in the green energy sectors mostly occupy low-paid and non-technical jobs (Pearl-Martinez & Stephens, 2016; Allison et al., 2019; Arias et al., 2023). Arias et al. (2023), in their detailed analysis of renewable energy firms in Latin America, show that women are disproportionately concentrated in non-technical and lower-skilled roles, while their representation declines sharply in engineering, technical, and leadership positions. This finding is consistent with broader labour market research, which shows that gender segregation tends to persist even in emerging industries (Anker, 1997; Blau & Kahn, 2017). Study by Santero-Sánchez et al. (2025) found that women have a lower probability of being employed in energy transition, in Spain.

One of the plausible explanations of women underrepresentation in green energy sector, including high paid position in the sector, despite, is the lack requisite skills formation. Women are underrepresented in STEM education globally (Baruah, 2017; Allison et al., 2019), thereby limiting their participation in green energy sectors that rely on this STEM as key inputs. At the same time, because many of the most productive and well-paid jobs in renewable energy require advanced technical and digital skills, they are less likely to access these high-value roles. This exclusion is further reinforced by deeply entrenched structural factors including biased stereotypes that question women's technical competence in STEM and engineering fields, gendered sociocultural norms that shape educational and career choices, and women's heightened expectations of workplace sexual harassment (Baruah, 2017; Santero-Sánchez et al., 2025). Operating in combination, these forces systematically channel women away from technical and higher-quality jobs, thereby reproducing unequal patterns of participation across GETT-related sectors.

Empirical evidence linking electricity access to women's empowerment and improved labour-market outcomes remains mixed and, in many cases, inconclusive. A growing body of research finds limited or context-dependent effects of electrification on women's economic empowerment (Cecelski, 2000; Fernández-Baldor et al., 2014; de Groot et al., 2017; Winther et al., 2018; Johnson et al., 2019; Stock & Birkenholtz, 2020). In some instances, electrification has even reinforced existing gender hierarchies by increasing women's domestic responsibilities or enabling men to capture the most productive uses of electricity (Standal & Winther, 2016; Johnson et al., 2019).

One plausible explanation is that women are frequently treated in policy design as a homogenous vulnerable group, rather than as differentiated economic agents embedded within specific social and institutional contexts. Within this context, most often than not, the implicit assumption that expanded

access to electricity will automatically translate into improved well-being and labour-market participation. Such a simplistic and technocratic framing overlooks the deeply embedded structural and cultural factors that shape gendered patterns of energy production, consumption, and work. Energy systems are not socially neutral; they are embedded in power relations and carry cultural meanings that reflect and reproduce existing inequalities. When technological change, such as the green energy transition, is pursued without parallel interventions in the social, institutional, and normative domains, it risks entrenching the very gendered divisions it purports to address. In this sense, realizing the gendered benefits of the green energy transition calls for explicit gender transformative policies, a view that is widely referenced in the literature (Baruah, 2015; de Groot et al., 2017; Johnson et al., 2020; Tornel-Vazquez et al., 2024; Sánchez et al., 2025). Importantly, such policy must go beyond female employment headline targets and/or addressing only energy technology access. They must be deliberately designed to confront and dismantle the long-standing structural barriers—and, critically, to ensure they are not inadvertently reinforced. Only through this can the transition become a genuine vehicle for inclusive structural transformation.

3. Gendering green policies in Africa: Insights from Ghana and South Africa

The previous section foregrounds the importance of carefully designed policies in addressing preexisting gender social inequalities that can undermine the gender-based employment opportunities GETT-related sectors present. Against this backdrop, this section examines the “*genderedness*” of GETT related policies in Africa, using South Africa and Ghana as case studies. The focus on these countries is not trivial: whereas South Africa is ahead on the global green transition agenda, Ghana is still nascent and taking off. Hence, a comparative study focused on both countries on the continent helps provide rich insights into how the two countries are incorporating gender issues and concerns in green energy related policy design and implementation.

3.1. Analytical Approach

We employed a two-step approach to examining the “*genderedness*” of GETT related policies. First, we identify relevant GETT related policies across the countries of interest. Second, we assess and map the “*genderedness*” of these identified policies by applying the feminist critical policy framework. The feminist critical policy framework was developed by UNIDO and originally applied to assess policies aimed at women’s economic empowerment in green industries in Cambodia, Peru, Senegal, and South Africa.⁴ The framework provides a structured approach to analysing the “*genderedness*” of policy instruments, moving beyond the presence of gender language to assess whether policies engage with gender as a structural and relational dimension of economic transformation. The framework sets the criteria for assessing each policy, and allows one to rank the gendered levels of policies based on the following 7 quality criteria categories:⁵

- (1) Gendering of the policy;
- (2) Structural understanding of gender equality;
- (3) Intersectionality;
- (4) Women’s empowerment;
- (5) Incremental transformation; and
- (6) Gender responsiveness.

⁴ For South Africa, UNIDO (2021a) approach is sector-based and focused on three sectors: Renewable energy (Wind and solar); Waste management (Plastics); Land transport (Road transport). Our selected policies are not sector-specific with our mapping cutting across different sectors.

⁵ Table B in appendix presents the definition of the 7 quality criteria categories.

(7) International and regional contextualisation.

These criteria capture complementary dimensions of policy design and intent as follows:

- Criteria 1-3 focus on policy content, assessing whether gender equality is explicitly articulated, structurally understood, and intersectionally framed;
- Criteria 4-5 focus on the process to ensure women's participation, agency and empowerment in the policy-making process; and
- Criteria 6-7 focus on the alignment of green energy policies with gender objectives, including coherence with regional and international gender and development frameworks.

Each criterion is scored on a 0–1 scale, where 1 indicates that the criterion is fully met, 0.5 indicates partial fulfilment, and 0 indicates weak or absent consideration. While the scoring exercise is not intended to produce a mechanistic ranking, it provides a transparent and comparable basis for identifying strengths, gaps, and patterns across policies.

We applied the framework to map selected, green-related energy policies in two key countries: Ghana (6 policies) and South Africa (8 policies). Table 1 shows the list of policies reviewed analysed. The choice of countries is based on accessibility and completeness of policies. As is obvious from the identified policies, both countries have put in place a range of policies to transition to low-carbon economy.

Table 1: Selected green-related energy policies in Ghana and South Africa.

Country	Green-related Policy
South Africa	White Paper on the Energy Policy of the Republic of South Africa 1998
	Integrated Energy Plan
	Hydrogen Society RoadMap 2021
	Renewable Energy Independent Power Producer Procurement Programme 2021
	National Energy Efficiency Strategy 2005
	Climate Change Gender Action Plan 2022
	Integrated Resource Plan 2019
	South African Biofuels Regulatory Framework 2019
Ghana	National Energy Policy 2021
	Ghana's National Energy Transition Framework (2022-2070)
	Ghana's Renewable Energy Master Plan 2019
	Ghana Integrated Power Sector Master Plan 2023
	Gas Master Plan 2015
	Strategic National Energy Plan (2006-2020)

Source: Compiled by authors.

3.2. Results and Discussions

3.2.1. “Genderedness” of selected green energy-related policies

Table 2 shows the selected GETT-related policies in South Africa and Ghana, as well as the total score of each policy with its associated heatmap across the 7 criteria identified in the feminist critical policy framework by UNIDO. In all, we observe heterogeneity in the degree to which the selected green energy policies are mainstreaming gender in both countries.

For South Africa, our analyses shows that the most ‘gendered’ energy policy document is 1998 White Paper on the Energy Policy of the Republic of South Africa followed by the 2022 Climate Change Gender Action Plan and the 2021 Hydrogen Society RoadMap. Key transition policies such as the 2021 Renewable Energy Independent Power Producer Procurement Programme are moderately gendered. The least *gendered* policies include the 2019 South African Biofuels Regulatory Framework and the 2005 National Energy Efficiency Strategy.

Table 2: Total “genderedness” of selected GETT-related policies in South Africa and Ghana.

Country	Green-related Policy	Total score	Heatmap
South Africa	White Paper on the Energy Policy of the Republic of South Africa 1998	13.5/16	0.84375
	Integrated Energy Plan	6.5/16	0.40625
	Hydrogen Society RoadMap 2021	12/16	0.750
	Renewable Energy Independent Power Producer Procurement Programme 2021	5/16	0.313
	National Energy Efficiency Strategy 2005	0/16	0.000
	Climate Change Gender Action Plan 2022	12/16	0.750
	Integrated Resource Plan 2019	4.5/16	0.28125
	South African Biofuels Regulatory Framework 2019	0/16	0.000
Ghana	National Energy Policy 2021	11/16	0.69
	Ghana’s National Energy Transition Framework (2022-2070)	8/16	0.50
	Ghana’s Renewable Energy Master Plan 2019	13/16	0.81
	Ghana Integrated Power Sector Master Plan 2023	0/16	0.00
	Gas Master Plan 2015	0/16	0.00
	Strategic National Energy Plan (2006-2020)	13/16	0.81

Legend: Red – least gendered (0); Yellow: Moderately gendered (0.5); Green: most gendered (1)



This emerging evidence is interesting given the nature of these energy-related policies in South Africa. For instance, the 1998 White Paper on the Energy Policy of the Republic of South Africa aimed to increase access to affordable energy services, managing energy-related environmental and health impacts, stimulating economic development, and improving energy governance in South Africa. There is widespread mention of women in the policy, both in terms of the important role that women play in the energy economy in utilizing these services, and the need to improve energy governance in terms of more representative membership, particularly in terms of participation by blacks and women within the energy sector generally. The policy recognizes and highlights women as core household consumers, however, energy policies have largely ignored their needs. This gendered division of labour traditionally means that women are a ‘disempowered’ class. As part of the efforts to correct the imbalances of the past, the policy noted that the Department of Minerals and Energy will develop an employment equity plan that aims to increase the number of women and black people on all policy development structures, forums, parastatal boards and similar structures. The target is at least 30% women, 2% people with disabilities and 50% black participants by the year 2000. The policy mandates the Department to ensure increased support and access for black and women businesses providing services or contracting with the Department and energy parastatals.

The 2022 Climate Change Gender Action Plan and the 2021 Hydrogen Society RoadMap also recognize and highlights the essential role of women. The Hydrogen Society Roadmap, one of government’s strategies and policy direction on how to use and deploy hydrogen and hydrogen related technologies, has a section on gender equality and social inclusion. The policy acknowledges that to realise the goal of a “just and inclusive net-zero carbon economic growth for societal wellbeing by 2050”, the implementation of the HSRM needs to integrate the element of gender equality whereby women’s potential in green industry needs to be realised, and women need to be empowered to take leadership roles in green industries as entrepreneurs or industry professionals. These issues are also highlighted in the Gender Action Plan (GAP) undertaken for the UNDP Climate Promise programme in South Africa, on behalf of the Department of Forestry, Fisheries and Environmental Affairs (DFFE). The policy proposes a work plan for gender-climate mainstreaming that affects transformative change across selected sectors which cut across the climate change landscape. The GAP also builds on the outcomes of the National Dialogue for Gender-Climate Mainstreaming of July 2022. The UNDP is supporting gender mainstreaming in the Nationally Determined Contributions (NDCs) of countries to help ensure that gender equality and women's empowerment are prominent objectives of climate change-related development investments and activities in South Africa. The GAP policy acknowledges the urgency in advancing the rights of women, strengthening their representation in decision-making positions and developing gender-responsive policies and legislation especially in the face of climate change and the disproportionately negative impacts, which women and other vulnerable groups are facing. These gaps must be addressed through policy and institutional frameworks, and particularly through implementation.

However, our analyses also shows that policies such as the 2019 South African Biofuels Regulatory Framework and the 2005 National Energy Efficiency Strategy are performing poorly in terms of gender mainstreaming. Our critical review of the 2019 South African Biofuels Regulatory Framework, a policy that focuses on the development of a biofuels industry/ national biofuels programme does not at the least mention women nor gender in the document. This applies to the 2005 National Energy Efficiency Strategy.

We observe similar disparities in terms of “*genderedness*” across energy-related policies in Ghana. Our analyses shows that the 2019 Ghana’s Renewable Energy Master Plan 2019 and the Strategic National Energy Plan (2006-2020) are the most gendered policies while the 2023 Ghana Integrated Power Sector Master Plan and the 2015 Gas Master Plan are some of the least gendered energy-related policies in Ghana. The 2021 National Energy Policy is an example of a moderately gendered policy.

Ghana’s Renewable Energy Master Plan 2019 provides investment-focused framework for the promotion and development of the country’s renewable energy resources for sustainable economic growth, improved social life and reduced adverse climate change effects. The policy seeks to ensure equity in participation and delivery of energy services to men, women, children and the vulnerable. Like the National Energy Policy 2021, the Renewable Energy Master Plan cites the lack of energy sector gender-based data and the challenges of establishing the active role of gender in the development of policy support for the energy value chain. The policy proposes mainstreaming gender into its implementation through building a gender-based database within the energy sector, providing equal employment opportunities, and creating financing opportunities for women entrepreneurs.

Ghana’s National Energy Transition Framework (2022-2070) lays out a framework for decarbonising the energy sector and reaching net-zero emissions by 2070 while ensuring socioeconomic growth and the use of Ghana’s natural resources. Mainstreaming gender in the implementation of the energy transition framework is included as part of the cross-cutting issues. In particular, the policy points out the disproportionate effects of extensive use of biomass especially for cooking on women and children in terms of health effects and the time spent on foraging for wood, which inhibits participation in education. To improve access to energy both for cooking and for lighting, the policy aims to upscale adoption of clean cooking fuels and technologies. The transition framework targets over 70% rural access to LPG by 2070. In addition to improving energy access for household purposes, the policy points out women’s key role in small scale agro-processing entrepreneurs and how the energy transition through improvement in access to clean energy will have a positive impact on women owned businesses and farms.

Ghana’s Strategic National Energy Plan (2006-2020) contributes to the development of a sound energy market that can provide energy services for the country. The policy formulates a comprehensive plan that identifies the optimal path for the development, utilisation and efficient management of energy resources available to the country. Like the National Energy Transition Framework (2022-2070), the policy highlights the gender imbalances in human resource development

for the energy sector, the different demands on energy between men and women and the associated health effects, low participation of women in decision making on fuel use. The policy proposes to implement education and training for women in all energy aspects, include women in decision making processes in the energy sector as well as encourage women to participate in energy programmes, conferences and workshops.

Ghana's National Energy Policy 2021 seeks to increase the energy supply and expand the energy infrastructure in line with the global energy transition. Not only is gender mentioned widely in the document, but the policy provides clear directions on how to address several issues around low participation of women in the energy sector, low awareness of gender issues in the energy sector, and inadequate gender-disaggregated energy data. Policy outlines several measures to address the latter including through capacity development; encouragement of female enrolment to STEM education and skills training programmes; building of gender sensitive capacity of decision makers and technical officers in all energy sector institutions, facilitating gender mainstreaming into energy related interventions; enhancement of gender-disaggregated energy data collection, management and publication.

3.2.2. *“Genderedness” of selected green energy-related policies by criteria*

To further understand the specific criteria driving the “genderedness” of the selected policies in South Africa and Ghana, we present the scores for each policy across the 7 criteria. Table 3 shows the heatmap of the performance of each policy across the 7 criteria while Table C in appendix shows the raw scores for each policy across the 7 criteria. We observe most of the energy policies are engendered in South Africa, except the National Energy Efficiency Strategy 2005. These engendered policies mention women in terms of them being core household consumers of energy and as the most vulnerable group bearing most of the negative impacts of the long-term, persistent use of solid and unsafe fuels. Also, these policies outline the need to promote energy access to cleaner forms of energy to minimise the negative impacts. For instance, the 2021 Renewable Energy Independent Power Producer Procurement Programme (REIPPP), aims to bring additional megawatts onto the country's electricity system through private sector investment in wind, biomass, and small hydro, among others. At an entrepreneurial level, REIPPPP introduced in 2021 a target of 5 percent ownership by black women in projects to promote women ownership in renewable energy projects.

In Ghana, our analysis shows that except for the 2023 Ghana Integrated Power Sector Master Plan and the 2015 Gas Master Plan, the four other reviewed policies are engendered. The engendered policies recognise the difference between men and women in terms of demand for energy due to the existing socio-cultural and traditional roles. For example, policies such as the National Energy Policy 2021 and the Renewable Energy Master Plan 2019 highlight the issue around inadequate or lack of gender-disaggregated energy data which creates difficulties for proper planning of gender issues in the energy sector and for establishing the active role of gender in the development of policy support for the energy value chain.

Table 3: Summary figure assessing the ‘genderedness’ of green-related policies in South Africa and Ghana by criteria

Country	Criteria	Engendering of the policy	Structural understanding of gender equality	Intersectionality	Women’s empowerment	Incremental transformation	Gender responsiveness	Regional/international contextualization	Total score
	Green-related Policy								
South Africa	White Paper on the Energy Policy of the Republic of South Africa 1998	1.000	1.000	0.500	0.750	1.000	0.667	1.000	0.843
	Integrated Energy Plan	0.400	1.000	0.500	0.500	0.000	0.000	1.000	0.406
	Hydrogen Society RoadMap 2021	0.800	1.000	0.000	0.750	0.000	1.000	1.000	0.750
	Renewable Energy Independent Power Producer Procurement Programme 2021	0.600	0.000	0.000	0.250	0.000	0.000	1.000	0.313
	National Energy Efficiency Strategy 2005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Climate Change Gender Action Plan 2022	0.600	1.000	0.000	0.750	1.000	1.000	1.000	0.750
	Integrated Resource Plan 2019	0.400	0.000	0.000	0.125	1.000	0.000	1.000	0.28125
	South African Biofuels Regulatory Framework 2019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ghana	National Energy Policy 2021	0.80	1.00	0.00	0.50	0.00	1.00	1.00	0.69
	Ghana’s National Energy Transition Framework (2022-2070)	0.60	1.00	0.00	0.33	0.00	0.67	1.00	0.50
	Ghana’s Renewable Energy Master Plan 2019	0.80	1.00	0.00	1.00	0.00	1.00	1.00	0.81
	Ghana Integrated Power Sector Master Plan 2023	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Gas Master Plan 2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Strategic National Energy Plan (2006-2020)	0.80	1.00	0.00	0.60	1.00	1.00	1.00	0.81

Legend: Red – Least gendered (0); Yellow: Moderately gendered (0.5); Green: Most gendered (1)



Concerning structural understanding of gender equality in policy across the two countries, we find that for South Africa, half of the reviewed policies consider largely socio-cultural structural factors as impacting gender equality. A commonly cited example is how the gendered division of labour in households traditionally means that women are a ‘disempowered’ class. These policies are the 1998 White Paper on the Energy Policy of the Republic of South Africa, Integrated Energy Plan, Hydrogen Society RoadMap and 2022 Climate Change Gender Action Plan. For Ghana, we identified the 2021 National Energy Policy, Ghana’s National Energy Transition Framework (2022-2070), the 2019 Ghana’s Renewable Energy Master Plan and Strategic National Energy Plan (2006-2020) all have structural understanding of gender equality in policy. These policies highlight how gender division of labour and environmental degradation are increasing women’s time burdens.

Policies across the two countries generally fail to recognise intersectionality. While there is mention of women in the context of racial lines in South Africa (largely as part of the previously disadvantaged black community), there is limited consideration given to the intersection of gender with other factors such as education, youth, and rurality. The 1998 White Paper on the Energy Policy of the Republic of South Africa and Integrated Energy Plan moderately recognized these issues. The case in Ghana regarding the intersectionality criteria is much worse. Our analysis shows that none of the reviewed policies consider the intersection of gender with other factors such as education, youth, and rurality although they put forward policy recommendations around education and training for women in all energy aspects.

Several policies across the two countries moderately emphasise women empowerment. Notable policies in South Africa including the White Paper on the Energy Policy of the Republic of South Africa 1998, Hydrogen Society RoadMap 2021, and Climate Change Gender Action Plan 2022 consider women’s empowerment. In Ghana, policies such as the 2019 Ghana Renewable Energy Master Plan consider women’s empowerment. The policy, for instance, emphasises the need to improve access to cleaner energy and ensuring that women are involved at all levels of the decision-making process in the energy sector.

The performance of reviewed policies in both countries across the Incremental transformation criteria is poor. Generally, the policies do not build on previous national gender-equality achievements and policies. Exemptions to this rule include the White Paper on the Energy Policy of the Republic of South Africa 1998, Climate Change Gender Action Plan 2022, and the Integrated Resource Plan 2019 in the case of South Africa and only the Strategic National Energy Plan (2006-2020) in the case of Ghana.

Surprisingly, only a few policies in South Africa touch on gender responsiveness: White Paper on the Energy Policy of the Republic of South Africa 1998, Hydrogen Society Road Map 2021, and the Climate Change Gender Action Plan 2022. The remaining majority of policies are not

specifically gender responsive but push to achieve the broader mandate and goal of the broader policy. In Ghana, we observe a higher degree of gender responsiveness across the energy policies with the policies making specific recommendations and actions to address the needs and issues of women in the energy sector. These policies are the 2021 National Energy Policy, the 2019 Ghana Renewable Energy Master Plan and the Strategic National Energy Plan (2006-2020).

Lastly, we observe a strong support of the Regional/international contextualisation criteria in both countries. In exception of the 2005 National Energy Efficiency Strategy and the 2019 South African Biofuels Regulatory Framework as well as the 2023 Ghana Integrated Power Sector Master Plan and the 2023 Ghana Gas Master Plan, all other policies comply and are well aligned with both the regional and international conventions on gender.

4. Towards transformative policy for gendering green transition in Africa

4.1. *A new integrated gendered-transformative policy (G-TRIP) framework*

Figure 1 visualizes the newly proposed G-TRIP framework. It identifies three gender related dimensions including blind spots, bottlenecks, and external environment, and then calls for blended policy for a gendered transformative change. While we frame each gender spaces to be distinct, in principle, they interact such that policies that fail to integrate all gender spaces will inadvertently fail to achieve the much-desired gendered transformative change. This interaction highlights the systems approach of the framework. At the same time, it provides a gender lens to both the substructures (e.g. culture and norms) that produce unfavorable gender outcomes and the superstructures (e.g. socio-material structures, practices, and institutions) that can either perpetuate or subvert unfavorable gender outcomes induced by the substructure. This way, the framework allows stakeholders to observe and recognise the policy shifts that are requisite for a gendered transformative change.

In the G-TRIP framework, **blind spots** are largely at the realms of substructure, capturing the gender bias that are embedded in the culture and norms which are at the fabrics of the entity of interest vi-a-vis community, society, or polity. While these culture and norms may be gender-biased, they are people's way of life of "viewing things and doing things" that are reproduced through habits and routines. These can form sources of entrenched resistance to change either due to the gendered power dynamics or the social identity (such as deep sense of ancestral heritage) they embody.

In general, several studies have highlighted the importance of culture and norms to the green transition and in driving the benefit thereof (see Johnson et al., 2019; Jüroso et al., 2019; Klaniecki et al., 2020; Sovacool & Griffiths, 2020; Goggins et al., 2022). Some of the notable examples include the energy related traditions and technology culture, and the burden of household chores. Jüroso et al. (2019), for instance, highlights a situation in Zambia where there is a resistance to change from mbaula—a traditional cooking stove that relies on charcoal—to

modern alternatives that rely on electricity, with several interviewees stressing the cultural importance of mbaula in Zambia.

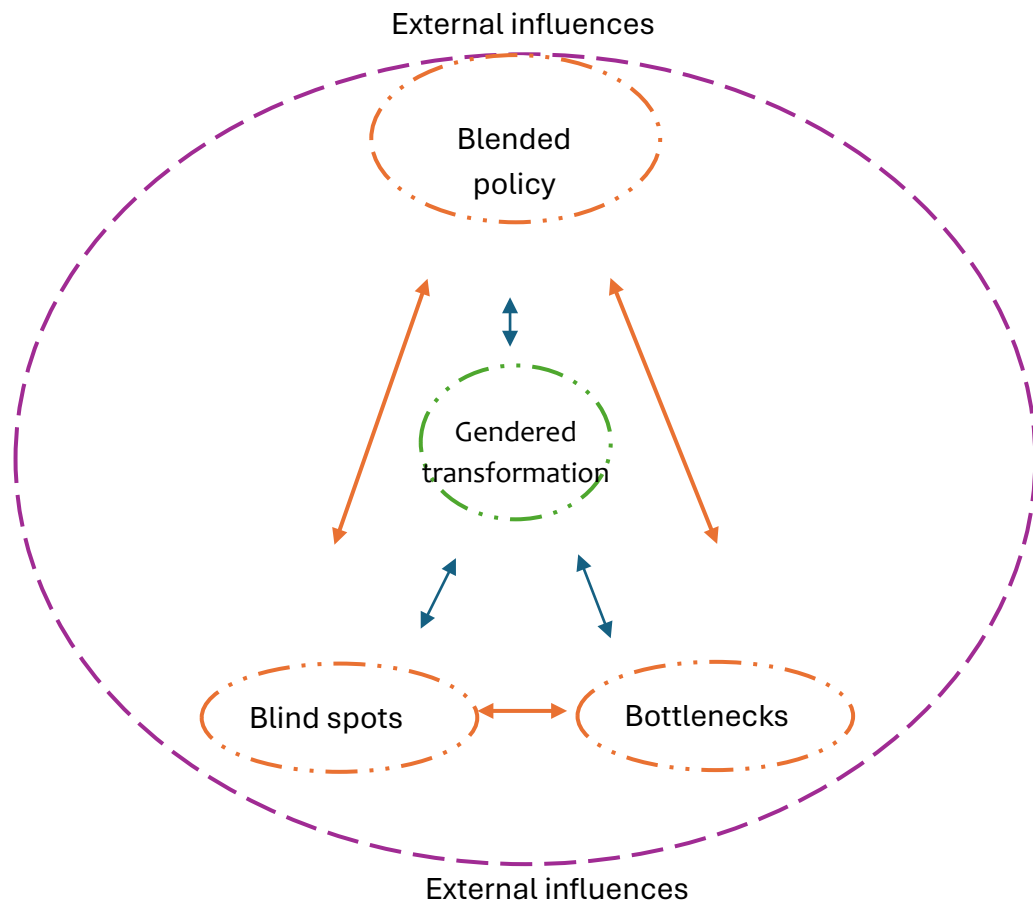


Figure 1: Gendered-transformative policy (G-TRIP) framework.

Source: Authors elaboration based on the triple B framework (Marcelle, 2021)

Also, socially constructed roles that are attributed to characteristics associated with masculinity or femininity discussed in section 3 result in differences in energy needs and priorities. This constitutes an example of a blind spot. Such cultural and normative preconditions can undermine the potency of women empowerment through electricity access, and by extension through modern energy systems. Energy policies often (un-)consciously assume a position of neutrality despite their good intent. Hence, energy policy is noted to be gender blind (Lieu et al., 2020). We posit that green energy transition without corresponding changes at the substructure will self-reinforce and perpetuate social relations that produce gender imbalance post-transition.

However, addressing these blind spots may not achieve the much-desired gendered transformative change if the socio-material structures that often perpetuate unfavorable gender outcomes are not reconstructed. We refer to this as **bottlenecks**, defined as a set of constraining and

countervailing factors that inhibit or distract policy objectives.⁶ These bottlenecks are at the realms of the superstructure, and they shape the nature of gender relation thereof. Ultimately, they determine how much value women can extract from the green energy transition as prosumers to better their lots. We classify bottlenecks into three: structural, cognitive, and procedural.

Two crucial elements of *structural bottlenecks* are material resources and decision-making power. Material resources are a strong determinant of women's entrepreneurship and agency. Shankar et al (2020) identified five types of resources including, economic, time, social, cultural, and symbolic resources that are important in this regard. We argue that the lack of these resources serves as a structural bottleneck. Concerning the decision-making power, while they are also important for women's entrepreneurship and agency, they are more crucial for women as end users. Ultimately, the bottlenecks we speak of here concerns decisions over the household energy technology choice, bearing in mind that modern energy services could directly alter gender norms and relations, as well as enable women to efficiently do their reproductive and unpaid care duties. Other aspects of structural bottlenecks include energy prices, upfront fixed costs associated with adopting the modern energy services or becoming such service provider, and the technology design which can be gendered.

Cognitive bottlenecks result from gender stereotypes, prejudices and lack of awareness and expertise, which could impede opportunities of women. In general, women's participation in the job opportunities in GETT related sectors can be constrained by prejudice and stereotypes about suitable employment for women. Osunmuyiwa and Ahlborg (2019) suggest that this could be related to technology being seen as a 'male' area, leading to mistrust from customers and business partners and difficulties for women to compete with male technicians. It could also derive from a perceived prejudice that women lack the requisite capability. Baruah (2017), for instance, suggests that biased stereotypes about women's competency in STEM vis-à-vis technical fields, gendered sociocultural norms, and women's expectations of sexual harassment could be blamed for underrepresentation of women in the GETT related sector. The *procedural bottlenecks*, on the other hand, emanates from laws or policies that could be either absent or underdeveloped, resulting in exclusion and inequality in access to resources and decision making. Notable among these are regulations that undermine women mobility, asset ownership such as land rights, and women's equal rights to work.⁷

The third dimension in the framework is the **external environment**, and it is more at the realms of a suprastructure and therefore is catalytic in nature. It shapes the policy discourse, at the same time affecting the blind spots and bottlenecks. We define the external environment as all external

⁶ Put differently, they refer to factors unrelated to blind spots that influence access to and use of clean energy.

⁷ E.g. parental leave that are gender exclusionary, or regulation that promote early marriage can also affect women agency.

factors or actors that are outside a policy ecosystem but can exert any form of influence (directly or indirectly) on local actors, be it at the levels of the individual, community, region, or country. For instance, at the macro-level, external influencers such as international development organisations (e.g., United Nations) and non-governmental organisations (NGOs) may influence local actors in a policy ecosystem to maintain or change the status quo but also influence policies to be developed and implemented in a way that suits specific interests. A notable example here is the case of gender equality as enshrined in the UN SDG which has been adopted by several countries resulting to diverse national strategies to achieve this goal. At the meso and micro level, on the other hand, national policies and regulations could serve as sources of external influence. The latter argument is consistent with Jüroso et al. (2019) who found that external factors such as national policy regulation drive the transition towards clean energy systems in urban Zambia.

The discussion so far highlights the three dimensions of the G-TRIP framework that are integral to the policy process. However, an inspection of the gender-energy research suggests that efforts to increase access to affordable, reliable, sustainable, and modern energy services and associated technologies can only support and catalyse improvements in gender equity and women's empowerment if the bottlenecks, blind spots, and negative external influences are addressed (Johnson et al., 2020). This suggests the need for parallel targeted interventions. For instance, to reverse the biased stereotypes in STEM, the framework calls for a carefully designed policies that address long-existing resource material cultures and norms, education policies that promote STEM education of women as well as labour market policies that punish sexual harassment.

The multidimension nature of gender issues underpins the fourth and final dimension of our framework. That is, there is need for a **blended policy**. In the framework, we argue that blended policies provide a mechanism through which multiple strategies/policies can be combined, adapted, and interpreted in different ways to fit specific contexts and to solve specific local problems. This process is multifaceted, complex, context specific, and involves an innovative strategy and policy process that deploys various policy mixes that aim to remove bottlenecks and blind spots, while considering the external environment. Different challenges require different blend of policies. Blended policy is therefore considered as a lever of change to foster gender-inclusive green transition in the G-TRIP framework.

4.2. Reflection on the integrated gendered-transformative policy (G-TRIP) framework

To further illuminate the G-TRIP framework in the context of the green energy transition, we conducted a series of high-level consultations and engagements with senior government officials, policy advisors, and industry leaders in Ghana and South Africa to ascertain the extent to which gender is mainstreamed in green energy policy design and implementation. Appendix D reports the interview guide used in the data collection process. We conducted a total of 9 interviews in both countries between January and March 2024. These are listed in Table 4 below. The interviews

followed a hybrid format (face-to-face and virtual) depending on the availability of the key informant. The Stakeholders that were interviewed were identified through a purposive sampling technique capturing a variety of stakeholders with expertise on industrial and gender-related issues.

Table 4: Distribution of stakeholder interviews conducted in Ghana and South Africa

Country	Interviewee code	Sector/Department	Gender
Ghana	GH01	Ministry of Energy	M
	GH02	Ministry of Environment, Science, Technology and Innovation (MESTI)	M
	GH03	CSIR-Science and Technology Policy Research Institute (STEPRI)	M
	GH04	Ministry of Environment, Science, Technology and Innovation (MESTI)	M, F, F
South Africa	SA01	Department of Trade, Industry and Competition	M
	SA02	GenderCC Southern Africa	F
	SA03	Department of Trade, Industry and Competition	F
	SA04	Trade and Industrial Policy Strategies	F
	SA05	Department of Trade, Industry and Competition	M

Through the interviews, we gathered in-depth qualitative insights on government’s policy efforts to foster inclusion and participation of women in GETT sectors including the progress and challenges to date. This information is important for identifying policy gaps and opportunities for continuous and incremental improvements in the existing and GETT-related policy frameworks. In the subsequent sections below, we provide techno-systemic analyses of the interviews and thematised the findings in line with the four dimensions of the G-TRIP framework. The country case studies reveal key similarities and differences in gender mainstreaming in policy design and implementation in the green energy sectors, which allows for key important policy insights. Overall, the emerging evidence shows that there is diverse degree of gender mainstreaming and consciousness in the transition to green energy and just energy systems in our selected countries. In addition, the findings suggest that there is an over-focus on resolving structural bottlenecks in the green transition, neglecting other key dimensions of blind spots, blended policies, and external influence in the achievement of gendered transformation. We highlight the key findings across the four dimensions of the G-TRIP.

Bottlenecks

In general, our selected countries have made progress in mainstreaming gender in green energy policies and programmes. This is reflected in core green energy policy strategies and programmes as discussed in section 3. However, several bottlenecks were cited as limiting the inclusion and participation of women in green energy sectors beyond these policy documents. The main bottleneck is inadequate and/or lack of sex-disaggregated energy data for planning gender issues in the green energy transition and tracking progress on women’s participation. For example, several interviewees in both countries highlighted the general challenges surrounding the collection and storage of gender disaggregated data for assessing policy outcomes and strategies coupled with the lack of targets in policies aimed at increasing women's participation in the green

energy transition.⁸ Limited resources allocated for women in national budgets is another important bottleneck, which constrains efforts to implement women's needs and interests, particularly in the green energy economy given that it is still underdeveloped and not yet fully established into the conventional systems of government. For example, interviewees cited how the South African economic challenges and the limited progress towards green energy systems restricts their incorporation of gender issues into opportunities such as tenders in the green economy – an area that is still struggling to find its space in the conventional systems.⁹

The above bottlenecks have important implications for designing policies that are women-centric given that the energy sector continues to be dominated by men. This means that the beneficiaries of the green energy transition may be most likely men, reinforcing traditional biases. This confirms previous research which points out the need for gender mainstreaming in green energy systems given that the traditional fossil-based energy sector is historically male-dominated (IRENA, 2020). The foregoing also collaborates existing research that emphasises the inequalities that exist between men and women in the energy sector (Tsagkari, 2022) and noted how key bottlenecks, including energy-related traditions, and limited decision-making power of women exacerbate and entrench gender inequality (Sadiqa et al., 2023; Feenstra & Özerol, 2020).

Blind spots

While policymakers are aware of the gender disparities that exist and the need to increasingly incorporate gender issues more strongly when designing policy, key blind spots in policymaking persist. Policymakers in both countries cited challenges such as lack of experience and expertise working on gender issues, which limits their ability to effectively incorporate women's needs and interests into policy design and implementation. As such, policies are designed in such a way that at the very least they do not discriminate against women. Hence, in some cases, policymakers do not understand the necessity of policies that specifically target women. For example, interviewees cited that it is not always possible to integrate gender issues in policy design but in cases where there are opportunities to include women, policymakers ensure that the policy promotes access for women.¹⁰ The existing literature recognizes these fundamental gender-blind issues (Lieu, 2020), and highlights that gender blindness perpetuates gender inequality in energy access as well as access to the opportunities that emerge from the transition (Sadiqa et al., 2023).

Alongside policymakers' blind spots, there are also blind spots in terms of the role that women must play in the green energy economy. There was emphasis on the need for women to come forward as willing participants irrespective of whether they are included in policy or not. Policymakers cited the tendency for women to look down and underestimate their capabilities, leaving certain activities to only men. As such, they emphasised that taking advantage of the opportunities in GETT required a shift in mentality amongst women.¹¹

However, the foregoing disregards the specific bottlenecks women face in accessing these opportunities. The limited participation may also speak to the failure of policies to clearly define

⁸ Interviews with GH02, GH03, SA02, SA04.

⁹ Interviews with SA01, SA03, SA05.

¹⁰ Interviews with SA01, SA05.

¹¹ Interview with SA03.

the role of women in the green energy transition and the associated opportunities for women.¹² Policies need to be designed to ensure that women are aware of the opportunities, know when and how to apply. Previous research also shows that there are biased stereotypes about women's competency in STEM vis-à-vis technical fields (Baruah, 2017). As a result, efforts to increase the population of women in science, technology, engineering, and mathematics education in some of Ghana's policies through the Ministry of Education may be less effective in facilitating entry of women into the energy space if the biased stereotypes and norms in the sector are not recognized and challenged. Other studies also show that women employed in the GETT-related sectors mostly occupy low-paid and non-technical jobs (Pearl-Martinez & Stephens, 2016; Allison *et al.*, 2019). The foregoing reiterates the evidence that removing bottlenecks may not necessarily empower all members of the community equally due to differences in social roles and norms (Tsagkari, 2022, Jüriso *et al.*, 2019). These gender roles, norms and cultural practices, especially as it concerns the production and consumption of energy and, more generally, women's participation in productive work, are also found to reinforce gender inequality in policy outcomes (Jüriso *et al.*, 2019). It is therefore highlighted that the policy process engages with a range of opinions from diverse voices and backgrounds to capture these blind spots.¹³

Furthermore, enabling women to participate in the green transition means addressing some of the barriers to entry and participation in economic activities such as the burden of care work. In some cases, women are not able to get into employment, not because of lack of employment opportunities but the burden of care work. As such, the position of women in society fundamentally affects their ability to enter and participate in the green energy transition.¹⁴ In addition, the patriarchal systems reinforced by colonialism exclude women from decision-making processes. Addressing these challenges requires capacitated women leadership at the centre of gender mainstreaming debates.¹⁵

External environment

While the majority of energy policies have a local focus, there is influence from external factors and actors on the design and implementation of local policies in green energy transition. For example, both Ghana and South Africa are signatories to the United Nations Framework Convention on Climate Change (UNFCCC) as part of global efforts to transition to a low carbon economy. As member countries, they are required to report on progress at addressing climate change through specific policies to curb emissions including mitigation and adaptation efforts.

The reliance of African governments on funding from international organisations also exerts influence on local policies. Interviewees across the two countries cited the challenges around limited resources to fund the green energy transition and gender programmes. As such, departments and ministries resort to seeking money from international organisations. Access to such funding streams requires that they comply with requirements on gender equity, diversity and

¹² Policies need to be designed to ensure that women are aware of the opportunities, know when and how to apply. Interview with SA03.

¹³ Interviews with SA04.

¹⁴ Interviews with SA04.

¹⁵ Interview with SA02.

inclusion.¹⁶ Furthermore, funding institutions also exert influence on core elements of the policy design and implementation.¹⁷

Blended policy

While there is progress in terms of the energy policies and different government departments in integrating gender aspects into their policy domains, the country case studies exhibit key differences in this regard. In South Africa, government departments seem to be working in silos, with no clear integration of gender mainstreaming as a policy priority in their departmental mandates. The Department of Women, Youth and Persons with Disabilities (DWYPD) has the core mandate to lead on the empowerment and participation of women. The department is expected to have specific programmes for women including conducting policy advocacy with other government departments to ensure gender mainstreaming in the other departments' policies and programmes.¹⁸ General awareness within government on the importance of incorporating women issues and concerns in policy making and implementation is somewhat limited in those departments that are not directly involved with women empowerment and participation.

Like South Africa, Ghana also has a core ministry leading on the empowerment and participation of women. However, it has an overarching national gender policy that led to the establishment of gender desks in all ministries to contribute to the objectives of the national gender policy through sector specific policies. While a noble initiative, one of the interviewees pointed out that the gender desks are not functioning effectively partly due to lack of expertise in gender issues.¹⁹

To mainstream gender issues in policy, and to adequately implement the goals and objectives of gender equality, capacity has to be built. This will ensure that the policies formulated will adequately address women issues and concerns. Further, it is important that the available skills and competencies within government are efficiently harnessed. Officials in other departments, within all spheres of government, often do not view gender mainstreaming as a priority and some even see it as working against departmental priorities. Departments are concerned with delivering on their mandates where the performance of each department is measured by how effective and efficient they are on meeting their targets and objectives which often do not include gender targets. Therefore, gender mainstreaming needs to be addressed in such a way as to assist these departments to achieve their mandates and objectives i.e. through so-called “win-win” or “no regrets” measures.

To do this, there is a need to integrate different policies to ensure achievement of different objectives including gender mainstreaming.²⁰ The country's strategies to successfully transition to clean energy economies is fundamentally linked to addressing issues of gender inequality and being able to clearly define programs that can support women.²¹ The importance of parallel targeted interventions and policies is emphasized in the literature (see Johnson et al., 2020). Recognising the need for green energy policies or strategies that blend different policies cutting

¹⁶ Interviews with SA04.

¹⁷ Interviews with SA04 and GH02.

¹⁸ Interview with SA01; SA05.

¹⁹ Interview with GH03.

²⁰ Interview with SA04.

²¹ Interview with SA04.

across long-existing resource material cultures and norms, education policies in STEM and labor market policies is fundamental for achieving a gendered transformation post transition.

5. Conclusion

This paper examines the economic opportunities the accelerating green energy transition offers women and the national policy adjustments required to realize them. Through a comprehensive literature review, we identify three pathways through which the green energy transition can enhance women's economic participation. First, it generates employment opportunities in emerging industries such as wind and solar energy. Second, it fosters entrepreneurship, particularly in off-grid and rural energy services, where decentralized, small-scale, and bottom-up models create accessible entry points for women. Third, by expanding access to clean and alternative energy, the transition can empower women to engage more actively in education, income-generating activities, and formal employment.

Despite these opportunities, entrenched structural inequalities constrain women's participation and limit the transformative potential of green energy transitions. Technological change alone cannot overcome social norms, labor market segmentation, limited access to finance, or barriers in STEM education; without deliberate intervention, the transition risks reproducing existing gendered inequities. Our policy analysis of Ghana and South Africa demonstrates that, despite inclusive rhetoric, existing green energy transition policies largely maintain the status quo and are insufficient to deliver gender-equitable outcomes.

In response, we propose an innovative Gender-Transformative Industrial Policy (G-TRIP) framework to guide the design and implementation of green policies that actively address and challenge structural inequalities. G-TRIP identifies three interrelated dimensions—blind spots, bottlenecks, and external enabling environments—and emphasizes blended, multi-level policy interventions. Based on consultations with key stakeholders in Ghana and South Africa, we showed that the G-TRIP framework provides a practical toolkit for policymakers to align green energy strategies with gender-equitable structural transformation and achieve gender-inclusive transformation post-transition in Africa.

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Appendices

Table A: Definitions of quality criteria

Criteria	Definition
Engendering of the policy	Refers to the incorporation of gender issues and concerns into a policy’s content.
Structural understanding of gender equality	Consideration of structural factors impacting gender equality including historical, legal, socio-cultural, economic and political factors.
Intersectionality	“a prism for seeing the way in which various forms of inequality often operate together and exacerbate each other”. This includes social variables such as age, ability, indigeneity, ethnicity, language group, religion, education, etc., that typically cause marginalisation from voice and agency in any context (GWNET, 2019).
Women’s empowerment	‘is the process by which women who have been denied the ability to make strategic life choices acquire such an ability. The ability to exercise choice incorporates three interrelated dimensions: resources, agency and achievements” (Kabeer, 1999).
Incremental transformation	The process of policy to build on previous and existing gender-equality achievements, programmes and policies.
International and regional contextualisation	Refers to compliance of local policies with international and regional conventions, policies, laws and commitments to safeguard women’s rights.

Appendix B: Summary table assessing the ‘genderedness’ of green-related policies in South Africa and Ghana by criteria

Country	Green-related Policy	Criteria							Total score
		Engendering of the policy	Structural understanding of gender equality	Intersectionality	Women’s empowerment	Incremental transformation	Gender responsiveness	Regional/international contextualization	
South Africa	White Paper on the Energy Policy of the Republic of South Africa 1998	5/5	1/1	0.5/1	3/4	1/1	2/3	1/1	13.5/16
	Integrated Energy Plan ²²	2/5	1/1	0.5/1	2/4	0/1	0/3	1/1	6.5/16
	Hydrogen Society RoadMap 2021 ²³	4/5	1/1	0/1	3/4	0/1	3/3	1/1	12/16
	Renewable Energy Independent Power Producer Procurement Programme 2021	3/5	0/1	0/1	1/4	0/1	0/3	1/1	5/16
	National Energy Efficiency Strategy 2005	0/5	0/1	0/1	0/4	0/1	0/3	0/1	0/16
	Climate Change Gender Action Plan 2022	3/5	1/1	0/1	3/4	1/1	3/3	1/1	12/16
	Integrated Resource Plan 2019	2/5	0/1	0/1	0.5/4	1/1	0/3	1/1	4.5/16
	South African Biofuels Regulatory Framework 2019	0/5	0/1	0/1	0/4	0/1	0/3	0/1	0/16
Ghana	National Energy Policy 2021	4/5	1/1	0/1	2/4	0/1	3/3	1/1	11/16
	Ghana’s National Energy Transition Framework (2022-2070)	3/5	1/1	0/1	1/3	0/1	2/3	1/1	8/16
	Ghana’s Renewable Energy Master Plan 2019	4/5	1/1	0/1	4/4	0/1	3/3	1/1	13/16
	Ghana Integrated Power Sector Master Plan 2023	0/5	0/1	0/1	0/1	0/1	0/3	0/1	0/16
	Gas Master Plan 2015	0/5	0/1	0/1	0/1	0/1	0/3	0/1	0/16
	Strategic National Energy Plan (2006-2020)	4/5	1/1	0/1	3/4	1/1	3/3	1/1	13/16

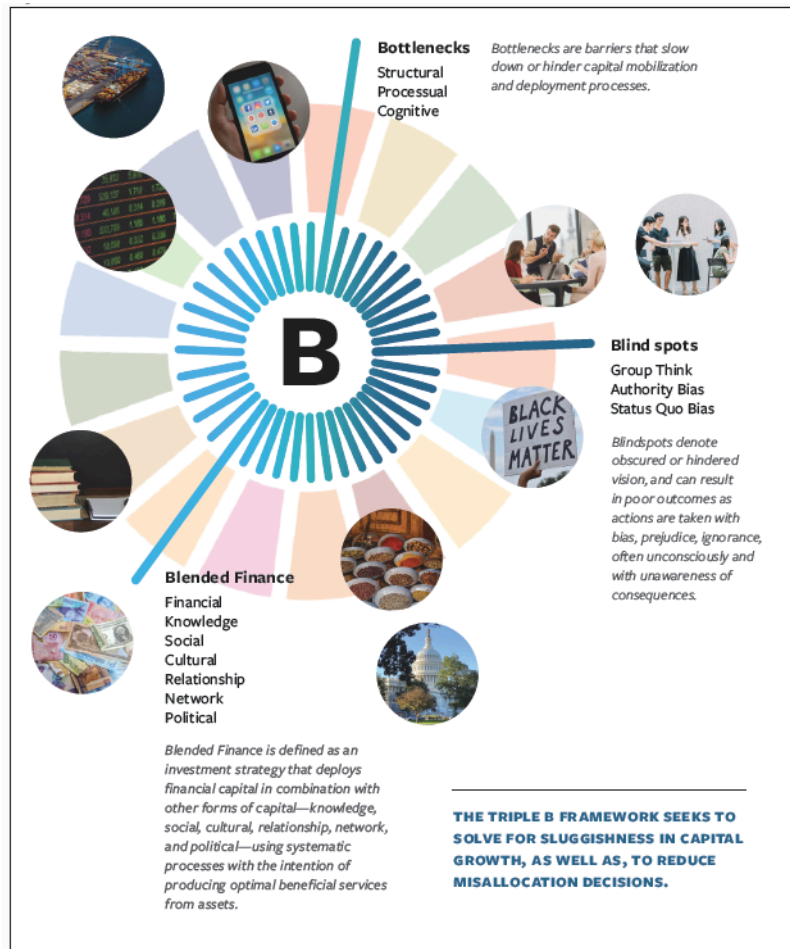
Table Keys: 1=The policy meets the criteria; 0.5= The policy meets the criteria to a certain extent; 0= The policy poorly meets the criteria

Source: Authors elaboration based on UNIDO (2021) criteria.

²² <https://www.energy.gov.za/files/iep/2016/integrated-energy-plan-report.pdf>

²³ https://www.dst.gov.za/images/South_African_Hydrogen_Society_RoadmapV1.pdf

Appendix C: Overview of the Triple B Framework



Source: Marcelle (2021).

Appendix D: Interview Instrument

Name of Stakeholder: _____

Position of Stakeholder: _____

Country: _____

PART I – Gender and structural transformation

1. How do you perceive the current patterns of structural change in your country, and what sectors do you believe are driving these changes?
2. How do the identified key patterns of structural change impact on gender roles and opportunities?
3. What are the main challenges the government seeks to address in relation to gender inequality broadly?
4. Can you describe key specific policies or initiatives that have been implemented to promote gender equality and address gender-specific issues in your region or sector? What have been the outcomes of these policies (successes and challenges)? How are you addressing these challenges and building on the successes?
5. What data and evidence do you rely on to monitor and evaluate the impact of these policies on gender equality and structural change?

PART II – Mainstreaming gender in GETT Policies: Blind spots

1. How are GETT policies aligned with the broader gender inclusion objectives in your country/sector?
2. What policies or initiatives have been implemented to identify and address gender disparities in your country's process of GETT and structural transformation, and what have been the outcome so far?
3. Can you provide examples of gender policy blind spots that have been observed during previous structural transformation efforts and GETT policies are addressing these?
4. Can you share examples of successful initiatives or best practices that have successfully removed gender policy blind spots in the context of GETT?
5. How can policymakers ensure that gender considerations are integrated into the planning and implementation of GETT initiatives from the outset?

PART III – Mainstreaming gender in GETT Policies: Bottlenecks

1. From your perspective, what are the major opportunities and challenges for improved numbers of women employed in key sectors and improved quality of women's employment in GETT sectors?

2. What are the specific challenges or barriers in terms of implementing the above gender-transformative policies within the new industrial age?
3. What is the government doing differently to realise the perceived opportunities and address the perceived or observed challenges?

PART IV – Mainstreaming gender in GETT Policies: Blended policies
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1. In your opinion, what are the necessary conditions for a successful gendered GETT policy?
2. What role can international/institutional collaborations play in promoting gender equality within the changing GETT landscape?

PART V – Mainstreaming gender in GETT Policies: Towards a gendered GETT structural transformation
--

1. Are there any successful case studies or best practices from other regions or countries that you believe could be adapted or implemented in your country to promote gender-transformative policies in GETT sectors?
2. In your opinion, what key partnerships or collaborations (government agencies, civil society organizations, and international partners) are essential for advancing gender equality in the evolving industrial landscape?
3. Are there specific tools or frameworks you recommend for assessing the gender implications of GETT policies and interventions?
4. In your experience, what role can research and gender-disaggregated data and impact assessments play in uncovering and addressing policy blind spots in the new policy era of GETT?

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