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GENDER INEQUALITY, GREEN TRANSITION AND ENERGY POVERTY: DECENT FUTURE FOR EVERYONE?

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Abstract

The global energy crisis, which began in September 2021 and was further exacerbated by the Russia-Ukraine conflict, has led many people to experience increasing financial difficulties. Under the threat of energy shortages, this conflict has intensified inflationary pressures during the post-COVID-19 recovery and caused a cost-of-living crisis. Energy poverty has hit the most vulnerable groups the hardest, including women which are the largest energy consumers in households and have lower incomes than men. In addition, energy poverty deepens existing inequalities between men and women, as it further widens the gender pay gap, the gender pension gap, and limits women's employment opportunities compared to men due to their disproportionate caregiving responsibilities. Moreover, the energy crisis has brought to light the issue of women's position in energy policy, as it has a different impact on women and men.

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Keywords: energy transition, gender inequality, energy crisis, energy poverty, women

Introduction

The severe impacts of climate change have increased awareness of the urgent need for significant reforms, in particular in energy sector, in order to tackle global sustainability challenges. The ongoing energy crisis has called into question the ability of countries to achieve the goals set by global initiatives such as the Kyoto Protocol, Paris Agreement, United Nations Sustainable Development Goals (SDGs) and European Green Deal (EGD) as governments of many countries have been forced to revise their energy plans (Lobanov et al, 2023). While some have increased the share of renewable energy, most have continued to rely on fossil fuels out of concern for maintaining their energy security. For instance, the 2030 Agenda for Sustainable Development, endorsed by all member states of the United Nations, contains the SDG 7 which include the ‘access to to affordable, reliable, sustainable, and modern energy for all' (United Nations, 2015). The urgency of addressing energy crisis hindered the provision of renewable energy at reasonable prices for all, energy efficiency enhacement, and the financial support to developing nations for clean technologies adoption.

The challenges in the global energy domain also exacerbated gender inequalities whose importance is emphasized across all the SDGs, including a specific goal—SDG 5: Achieve gender equality and empower all women and girls. According to the UN, it is of crucial importance to take actions to increase women emporwerment and participation in decision-making/politics, in order not to call into the questions the SDGs (Opoku et al. 2021). Women make up a large share of energy consumers, making them more sensitive to the effects of energy poverty. Additionally, due to lower incomes, women are at a greater risk of energy poverty. Unfortunately, women frequently occupy positions that offer lower wages compared to male-dominated fields or similar roles held by men. This wage gap can be attributed to factors like discrimination, undervaluation of work typically performed by women, and the concentration of women in lower-paying industries. A key dimension of gender economic inequalities in modern societies is the disparity in access to labor market participation, along with the inequalities reflected in various forms of labor market positioning and compensation (Babović, 2010).

The energy sector is characterized by a variety of ongoing gender inequalities. According to the International Energy Agency (2024), women make up just 16% of the traditional energy sector, with even fewer represented in management roles (higher-salary positions and leadership

opportunities). It should be pointed out that the obstacles, which women encounter in the energy sector, are more complex than in other areas of the economy since it is in the midst of a crucial and demanding transformation.

The links between climate change, green transition and gender equality

The implications of climate change are reshaping the roles of women and men worldwide, particularly in rural areas, where women are often strongly affected (United Nations, 2022). The climate crisis has an unequal impact on women and girls worldwide. The gender stereotypes and societal roles intensify the vulnerability of women and girls to the effects of climate change, both in daily life and during extreme weather-related crises (Castelo et al., 2024). The prevalent gender inequalities have potential to determine the impact of climate change and the effectiveness of responses to tackle these implications (Allwood, 2020). The effectiveness of measures to combat climate change, as well as their consequences on individuals, largerly depend upon determinants such as gender, socioeconomic status, income level, ethnicity, physical skills etc.

Gender equality, as a crucial factor for ensuring fairness both within and between generations, is vital for accomplishing the set goals of a green economy. Babugura (2017) point out that inter-generational equity implies that the present generation should maintain or enhance conditions for future generations while intra-generational equity means guaranteeing that everyone in the present generation can at least achieve their essential needs. The author demonstrate that individuals should have equal conditions for exercising their full human rights and for participating in and benefiting from economic, social, environmental, cultural, and political growth eithin green economy. Peng et al. (2024) argue that gender equality has a beneficial effect on green development via three possible pathways: the women's pro-environment psychology, the women's proenvironment behaviour and women's social power. The authors point out that enhancing gender equality can amplify the positive impact of women's pro-environmental attitudes and behaviors on green development, while promoting gender equality can boost women's social position and power.

Anderson et al. (2023) believe that a gender-just transition represent a opportunity to integrate the shift to low-carbon economies with meaningful progress toward gender equality. The authors demonstrate that supporting low-carbon sectors and generating green jobs can be approached through a gender equality and women’s economic empowerment lens, contributing to greater climate resilience. However, it should be noted that the prevalent opinion of the scientific community is that the policies of the low-carbon energy transition are more directed on greening the industry without

considering the underlying social dynamics and frameworks that calls into the questions the accomplishment of the defined goals (Lundström, 2018, Clarke et al., 2021). Johnson et al. (2020b) demonstrate that the adoption of low-carbon energy technologies into traditional energy systems produces gendered and social consequences that depend not only on institutional factors (the allocation of benefits and impacts, decision-making and execution) but also on the potential for gender impact assessments based on the effective participation of multiple stakeholders.

As pointed out by Johnson et al. (2020a), gender and social equity cannot be attained solely through renewable energy projects, as energy policy actions do not automatically resolve the structural issues rooted in socio-cultural and socio-economic settings. According to their opinion, green transition does not ensure that existing gender and social inequalities regarding the availability and allocation of resources will be mitigated or resolved. Women discrimination in the forms of the employment opportunities, work environment, wage equality, career selection etc., is is often aggravated by gender-specific patterns of employment segregation.

Pearl-Martinez and Stephens (2016) also express concerns that energy transition could even exacerbate gender inequality, rather than allevaiate it if the energy sector fails to overlooks the importance of gender diversity at this stage. The relationship between gender and energy remains largely overlooked by policymakers, partly due to limited awareness of how these two areas are linked. This lack of recognition stems from the common misconception that energy policies are gender-neutral and influence everyone equally, leading to insufficient consideration of gender aspects in energy policymaking (Hagenmaier, 2022). For instance, the energy sector in Europe is predominantly male-dominated. It is characterized by persistent “glass walls” and “glass ceilings” that hinder the progression of women's careers, resulting in both horizontal (the concentration of women in lower-level or less prestigious roles within the energy sector, often in non-technical or administrative positions) and vertical segregation (lack of women in higher-level or leadership positions) (Shatilova et al., 2021).

There is a notable gender disparity, with far fewer women holding positions that can affect the energy transition, whether in corporate roles, public energy bodies, or civil society initiatives (Clancy and Feenstra, 2019). Women are hit by energy injustice due to the fact that they face significant challenges in ensuring access to affordable, reliable and sustainable energy services (Feenstra and Ozerol, 2021). Buchy and Shakya (2023) point out that the access to clean energy services and green technologies for women continues to be limited by intersecting social factors and policies that overlook gender considerations. The authors make a distinguish between three interconnected obstacles, which lead to the development of gender-

blind policies and the insufficient advancement of policy development in the energy sector: pragmatic (scarce resources within government institutions), conceptual barriers (insufficient awareness of gender, intersectionality, and the power dynamics between men and women, as well as between privileged and marginalized groups) and political barriers (results from the combination of previouslu two mentioned barriers). Unfortunately, these gender-blind policies may sustain or even worsen existing gender disparities within green economies (Anderson et al. 2023).

The implications of energy poverty on gender equality

The energy crisis, further exacerbated by various extremely unfavorable internal factors, along with rising inflation and increasing energy prices, has led to the deepening of energy poverty, economic, and gender inequality. According to the recent empirical study by Min et al. (2024), at least 1.18 billion people are classified as energy poor without access to electrical power while 447 million individuals living in electrified areas who still do not use electricity. The position of the poor segments of the population has significantly worsened, as the share of food and energy in consumption is the highest among those with lower incomes. The World Economic Forum (2010) defines energy poverty as ‘the lack of access to modern energy services and products (sufficient heating, hot water, cooling, lighting, and the energy needed to operate appliances). Energy poverty can be also defined as "the result of a combination of low household income, high expenditure of disposable income on energy, and insufficient energy efficiency" (Zakon o energetskoj efikasnosti i racionalnoj upotrebi energije). The vulnerable categories of energy consumers are unable to cover the costs of essential energy sources or to provide sufficient warmth in their homes during the winter months. Unfortunately, energy poverty is accompanied by numerous negative health consequences such as colds, cardiovascular and respiratory diseases, mental health problems like anxiety, stress, and depression, as well as the higher rates or mortality during winter period (Zhang et al. 2021).

It should be mentioned that the energy poverty is exacerbated by pre-existing gender inequalities, especially in terms of income like the disparity in wages between genders; the difference in retirement benefits; and the more restricted employment opportunities for women compared to men due to their disproportionate caregiving responsibilities for children and other family members (European Parliament, 2023). Women have distinct energy needs and consumption habits compared to men, as well as among themselves. Factors such as marital status and employment play a role in shaping their energy usage (Feenstra and Clancy, 2020). Moreover, Petrova

and Simcock (2021) point out that women bear unequal responsibilities in addressing the impacts of energy poverty through various strategies and approaches which negatively affect on their well-being and demands additional emotional and physical effort. It has a multifaceted impact on the women's quality of life because it reduces the time available to them that could be used in other ways, may contribute to an increase in violence, and heightens the sense of discrimination.

Energy insecurity exacerbates the already significant caregiving burden on women as they strive to meet household energy needs. Women, particularly single parents and those over retirement age, are more prone than men to experience energy poverty at some point in their lives (Clancy and Feenstra, 2019). Unfortunately, this reflects on their access and availability of green energy resources and limit their involvement in the energy transition. For instance, Janikowska and Kulczycka (2021) explored the impact of energy transformation on energy poverty in Poland and found that unemployed women were particulary vulnerable to its consequences. The authors suggested the implementation of the Just Transition Mechanism, which will encompass a special hub for women as proactive measures against future challenges (support for transitioning from mining to other professions, training for re-entering the labor market and collaborating with educational organizations offering these cources).

Besides its negative side, the enegy poverty brings new opportunity for women empowerment and changes current gender dynamics du to the modification of the socio-technical role of women within the household. Women commonly undertook the task of controlling energy costs through modifications to home practices (tasks related to monitoring heating, lighting, and appliances), while male are seeing responsible for physical enhancements for energy efficiency.

Green transition and gender inequality

Due to the critical environmental and climate challenges, European Commision proposed European Green Deal (EGD) in 2019 and approved in 2020 as a set of strongly connected policy initiatives related to climate, the environment, energy resources, transport infrastructure, industry development, agriculture and sustainable finance with the aim of attainting net-zero carbon emissions by 2050 (European Council, 2024). This plan envisions that the EU will become climate-neutral by 2050 and implies a comprehensive transformation of society. The EGD represents a new growth strategy aimed at creating a modern, climate-neutral, and competitive economy characterized by the efficient use of available resources (European Commission, 2024).

The green economy is a model for achieving sustainable development and eradicating energy poverty, fostering vital links between the economy, society, and the environment. The green transition envisions the improvement of energy efficiency, increased energy production from renewable sources, along with a gradual phase-out of the use of fossil fuels in energy production by 2050. While this process is expected to bring numerous and diverse benefits for the economy, the environment, individuals, and society as a whole, there are legitimate concerns that the green transition will significantly impact industry and mining and fundamentally change the way the energy sector operates on both global and national levels (Zvezdanović Lobanova and Lobanov, 2023). Industries centered on renewable energy, eco-friendly agriculture, and green technologies are likely to see growth, while sectors with heavy fossil fuel dependence or significant environmental impact are expected to decline.

Table 1 provides scores and rankings for different countries across three metrics: Energy Transition Index (ETI) score, System Performance, and Transition Readiness, comparing data from 2024 and 2019. ETI represents a tool for assessing the countrys achievements in sustainable energy transition, including efforts to boost energy efficiency and reduce environmental damage. According to the World Economic Forum's Fostering Effective Energy Transition 2024 report, the best-positioned countries in the European region were Denmark and Finland, among 120 countries ranked by energy transition. These countries can be considered as frontrunners in the global effort to achieve a sustainable energy transition, showing strong system performance and readiness. Estonia recorded a notable improvement in rank from 20th in 2019 to 9th in 2024, with improved system performance (from 64 to 73.7) but a slight decline in transition readiness (from 64 to 59). Romania**,** Slovakia, and Italy rank lower, with Romania showing a drop in rank from 40th to 48th and decreased transition readiness.

Table 1. The Energy Transition Index for 2019 and 2024

Country	ETI score		Rank	System performance		Transition readiness	
	2024	2019		2024	2019	2024	2019
Denmark	75,2	72	2 (5)	72,0	72	80,1	73
Finland	74,5	73	3 (4)	70,7	72	80,1	74
France	71,1	69	5 (8)	74,7	77	65,6	60
Estonia	64,3	64	9 (20)	73,7	64	59,0	64
Netherlands	66,7	69	10 (9)	62,7	71	72,7	66
Germany	66,5	65	11 (17)	65,0	66	68,7	64
Portugal	65,4	65	14 (16)	67,0	71	62,9	59

Latvia	65,2	64	15 (23)	70,1	69	58,0	58
Spain	64,3	64	16 (25)	64,7	71	63,7	56
Hungary	62,1	59	28 (41)	68,5	66	52,4	52
Slovenia	61,9	64	29 (24)	68,2	69	52,5	58
Poland	61,3	51	31 (75)	66,0	57	54,2	46
Lithuania	63,2	65	31 (19)	61,6	72	59,6	57
Belgium	60,8	64	34 (22)	61,6	67	59,6	61
Bulgaria	60,6	51	36 (77)	66,9	54	51,2	48
Croatia	60,1	59	19 (42)	66,4	66	50,7	52
Italy	59,7	62	41 (29)	62,7	70	55,2	54
Czech Republic	59,2	57	44 (49)	67,3	61	47,2	53
Romania	58,3	59	48 (40)	69,0	68	42,2	50
Slovakia	57,5	61	49 (33)	64,6	68	46,9	54

Note: The System Performance Score evaluates how well the energy system supports economic growth, ensures energy security, and minimizes environmental impact, while transition readiness assess how conducive the environment is for implementing and supporting changes towards more sustainable energy practices. The red color indicates a deterioration, while the green color signifies an improvement in ranking compared to 2019. The numbers in parentheses in the column labeled 'rank' correspond to the year 2019.
Source: World Economic Forum (2024).

The green energy transition will reshape the labor market by opening new opportunities as well as new risks, creating new jobs while also extinguishing existing ones, making it crucial for all governments to ensure that no one is left behind. According to the International Labour Organization (2022), shifting to a green economy could create 25 million new jobs worldwide by 2030, though it might also result in the loss of up to 6 million jobs in industries reliant on resource consumption. Coal phase-out has significant gender impacts, as men predominantly occupy these roles. Consequently, the efforts to manage this transition often inadvertently center on the needs of male workers. Women are significantly underrepresented in that industry, which results in a much weaker negotiating power.

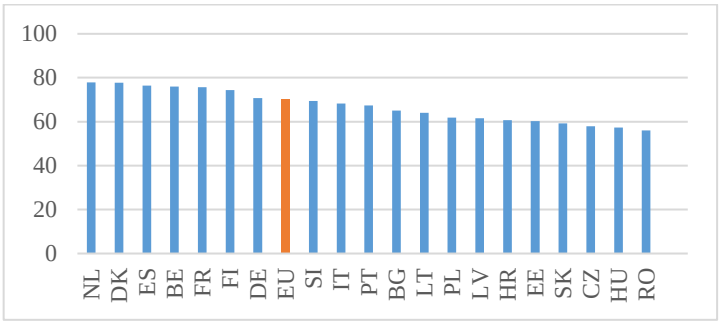
The Responsible Mining Foundation (2022) highlights that gender issues are frequently neglected, as legislative and regulatory frameworks in many mining companies often lack measures to address gender concerns. Therefore, increasing the representation of women in the energy sector is crucial for driving innovation and ensuring a more equitable green energy transition. Current and future transitions towards sustainable societies not only present opportunities for climate and environmental protection but also for strengthening gender equality.

Considering potential risks and dangers, the creators of the EGD have devised an approach so that this transition is not only 'green' and good for the environment, but also addresses and mitigates possible injustices that may

arise from its implementation. A significant shift in how humans relate to nature must also involve a corresponding transformation in social relationships. In particular, gender disparities interact dynamically with various other structural inequalities, such as age, geographical location, educational attainment, and income.

European Institute for Gender Equality published in 2023 the report titled Gender Equality Index which explores the intersection of gender inequalities with the green transition, offering a gender-focused analysis of key sectors vital to the Green Deal, including energy and transport. It also examines tools and practices designed to promote gender equality while addressing the challenges posed by climate change and the green transition. Gender Equality Index includes six core dimensions (work, money, knowledge, time, power, and health), as well as two supplementary dimensions (encounters of inequality and violence). The scale ranges from 1 to 100, where a value of 100 denotes total achievement of gender equality. Among European countries, the best position in the Gender Equality Index in 2023 was achieved by the Netherlands, with a total of 77.9 out of 100 (see Figure 1). This year's report concludes that the countries that joined the European Union under the fifth, sixth and seventh waves of enlargement are still in the group of member states that are still catching up with the others.

Figure 1. Gender Equality Index in 2023



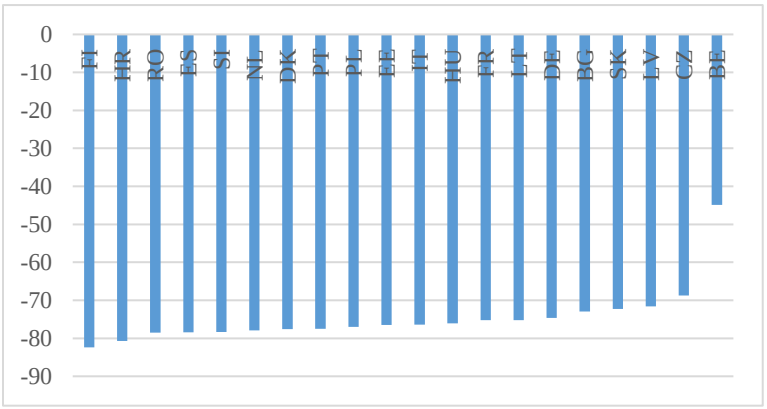
Notes: DK – Denmark; FI – Finland; FR – France; EE – Estonia; NL – Netherlands; DE – Germany; PT – Portugal; LV – Latvia; ES – Spain; HU – Hungary; SI – Slovenia; PL – Poland; LT – Lithuania; BE – Belgium; BG – Bulgaria; HR – Croatia; IT – Italy; CZ – Czech Republic; RO – Romania; SK – Slovakia.

Source: Authors work based on the data EIGE (2023)

For the energy transition to be truly effective, it must not only address gender equality but also transform gender relations, ensuring that the benefits of social changes are equally shared by men and women (Lahiri-Dutt, 2023). The aim of gender-just transitions is to harmonize advancements in gender equality, social justice promotion and fostering environmental resilience (UN

Women, 2021). Energy transition is an opportunity for the economic empowerment of women and the inclusion of marginalized groups, to encourage their leadership in the energy sector and to ensure that more women are in decision-making positions. According to the International Energy Agency (2024), Belgium ranks highest with the narrowest gender employment gap. The most significant gender employment gaps[2] in energy sector in Europe are recorded in Finland (-82,4%), Croatia (-80,7%) and Romania (-78,5%).

Figure 2. Gender employment gap (energy) based on the data from 2018



Notes: DK – Denmark; FI – Finland; FR – France; EE – Estonia; NL – Netherlands; DE – Germany; PT – Portugal; LV – Latvia; ES – Spain; HU – Hungary; SI – Slovenia; PL – Poland; LT – Lithuania; BE – Belgium; BG – Bulgaria; HR – Croatia; IT – Italy; CZ – Czech Republic; RO – Romania; SK – Slovakia.

Source: Authors work based on the International Energy Agency (2024).

The crucial steps to achieve gender balance in a sustainable green economy are eliminating legal obstacles and reforming discriminatory laws to promote gender equality, ensuring equitable distribution of caregiving responsibilities between men and women and encouraging role models and

[2] Ratio of female to male employees in a given sector/year/country within the working-age group (15-59).

targeting youth to challenge and change gender stereotypes in career choices (Kolovich and Newiak, 2024).

Conclusion

The green transition requires a holistic view of the interplay between environmental, economic and social processes in order to ensure the transition to a low-carbon economy. It requires fundamental change, not only in key industries, but also in infrastructure, social values and policies. By integrating the principles of gender equality into the just transition process, the specific challenges faced by women can be addressed. If gender equality is not explicitly included in policies, programs, and projects, gender inequalities, which are rooted in societal norms, practices, and institutions, will perpetuate.

The process of a just transition to affordable and clean energy has the potential to act as a catalyst for achieving gender equality and reducing structural inequalities between men and women. Therefore, it is necessary to implement it by looking at solutions to the root causes of energy poverty and the main energy consumers who take care of the household, which are women. The introduction of a gender perspective in energy policy is necessary in order to implement the 2030 Agenda for Sustainable Development, and solutions that should reduce energy poverty must be in line with the principle of "leaving no one behind". It is necessary to look at and explore all aspects of the gender dimension of energy poverty and develop mechanisms to support women in this area so that they become leaders in overcoming energy poverty and the energy transition in general.

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