Place-Based Solutions for Net Zero: Gender Considerations on 'Green' Skills

Giulia Mininni and Ralitsa Hiteva
University of Sussex, UK

g.mininni@sussex.ac.uk

Abstract: There is a global effort towards transitioning to a zero or low-carbon economy due to climate change and the current energy crises. This requires a shift in socio-technical systems and cross collaboration amidst sectors. The move to a clean energy-based economy also involves the creation of a broad range of skills, the upskilling and reskilling of the existing workforce, and providing opportunities for training. While many critical analyses of emerging decarbonisation or green skills, focus on issues of clean energy transition and the distribution of opportunities between fossil fuel-based and clean energy industries, there is limited critical analysis of justice and equality regarding the distribution of opportunities for developing key green skills for place-based decarbonisation. There is evidence of asymmetric power relations and gender inequalities regarding the acquisition of skills, employment opportunities, kinds of jobs and pay gap which disproportionately affect women. This paper presents compelling evidence of hegemonic masculinisation within the energy industry; this tendency is now mirrored in ecological industries and technologies, including within the renewable energy sector, leading to an 'eco-masculinisation' of the sector. Just transition principles promote a fair distribution of resources and the representation of vulnerable groups, including women and minorities. By relying on local assets and resources, including human resources, place-based approaches to green skills could address local communities' needs while strengthening their resilience. These processes are pivotal to a fair and equitable transition. By explicitly articulating the context of place in understanding the gender(ed) dynamics of decarbonisation and skills, the authors identify and reflect on an innovative way of understanding the intersections between infrastructures, skills, and masculinisation in the transition to low zero carbon.

Keywords: Place-based, Gender and energy, Just transition, Net Zero, Green skills

1. Introduction

The global energy crisis, exacerbated by Russia's invasion of Ukraine, is calling for a shift towards clean energy transition in different sectors and at different scales. This transition will require moving away from fossil fuel-based industries and technologies causing a transformation in the kinds and availability of jobs. Governments are currently developing decarbonisation agendas, which include planning for up-skilling and re-skilling schemes to prepare and support the workforce through such transitions (e.g., BEIS, 2021). However, there is evidence that the energy industry and technology fields are male dominated (Powerful Women, 2022). Questions arise about just processes of energy transitions and for whom. While studies centering on exploring the gender and energy nexus mainly focus on investigating gender inequality within social structures and access to resources (Kooijman et al., 2018), less evidence has been given to inequalities within material infrastructures such as within energy technologies and industries. Contributing to fill this research gap is particularly timely giving global endeavours to foster green energy transitions.

In 2019, the UK government has committed to become a Net Zero economy by 2050 (Institute for Government, 2020); this requires socio-technical systems shifts within and between several sectors, including transport, energy, construction, and the digital economy. Transitions to decarbonisation are calling for greater share of the costs and the benefits deriving from such processes to ensure the inclusion and recognition of marginalised and vulnerable communities and are aiming to defy environmental degradation and inequality (Kanger and Schot, 2019). Further, transition from a fossil fuel-based economy to a clean energy one also requires cross collaboration among sectors, users, and technologies, creating the need for a wide range of skills across emerging energy systems. This needs reskilling and upskilling of existent workforce, as well as creating opportunities for training.

A key element of energy transition is the move to green skills. However, there is evidence that the shift to green skills and the ramping up of low-carbon skills is easier in some places than others. Moreover, while there is mention of young people entering the workforce (Cole and Barras, 2022), there is no specific quota reserved to women and female young adults. The adoption of a whole system approach to just transitions, reveals that there is a historical and deeply embedded gap regarding women's participation in the energy technology job market. The masculinisation of the energy technology sector uncovers issues of inequality and asymmetric distribution of power and resources including regarding skills training and employment.

This paper argues that place-based approaches for Net Zero can support greater distribution of resources and benefits across the local communities, and the recognition of marginalised groups including vulnerable women

and minorities, for a just transition. Section two discusses the green skills for Net Zero landscape; section three, introduces a conceptualisation of a gender approach to place-based models for a just transition; section four, presents the research methods, followed by a gendered analysis of green skills; finally, section six provides a discussion and concluding remarks.

2. 'Green' skills for Net Zero Transition

There is a global effort to address climate change concerns and transitioning towards zero or low-carbon energy systems; this implies a shift from carbon-intensive and fossil fuel-based industries and economies to increased used of decentralised and renewable energy-based systems (Bray et al., 2022). This transition will affect around 20% of existing UK jobs (c. 6.3 million workers), with about 3 million workers needing upskilling and another 3 million with skills in high demand. Major sectors identified are construction, manufacturing, and transport. Significant transformation will also happen in the oil and gas sectors (Robins et al., 2019; Green Jobs Taskforce, 2021).

Although there is no universal definition of green skills, OEC/Cedefop (2014:16), define them as "the skills needed by the workforce, in all sectors and at all levels, in order to help the adaptation of the products, services and processes to the changes due to climate change and to environmental requirements and regulations". However, the lack of a clear definition constrains investment by local education providers and businesses. These kinds of skills are often associated with those required by technology, engineering, science and STEM jobs, and they are used interchangeably with other terms such as climate emergency skills and decarbonisation skills (Scottish Government, 2020).

Engineering UK (2022) report, for instance, indicates three different types of Net Zero jobs, new and direct jobs, and technical jobs. New and emerging jobs include carbon monitoring and hydrogen cells technicians, jobs that would need upskilling include architects and environmental consultants, while those that would be required in greater number, include insulation installers and energy designers (Scottish Government, 2020). The report stresses the need for greater disaggregated and specific data regarding the numbers needed for each of these categories. Forecasts of new jobs remain vague in skills strategies including distinguishing between direct or indirect jobs. The lack of accurate disaggregated data also limits an understanding of who is engaged in training and jobs opportunities, and whether more inclusive measures (e.g., flexibility), to ensure the participation of marginalised groups, such as vulnerable women and minorities, are adopted. Further, limited analysis of green skills is provided in relation to place-specific characteristics and placed-based value.

3. A Gendered Approach to Place-Based Models for a Just Transition

Just transition is defined as "a fair and equitable process of moving towards a post-carbon society" (McCauley and Heffron, 2018:2). Just transition in energy entails justice principles of fair distribution and representation. Distributional justice is concerned with issues related to the sharing of resources (including knowledge and skills), the benefits and costs regarding decarbonisation processes (Jenkins et al., 2016). Representative justice relates to the recognition of rights and participation in decision-making processes of marginalised groups, including vulnerable women and minorities (ibid.). Increased diversity, including gender, racial and ethnic, and the appreciation for diverse perspectives can contribute to greater innovation and resilience of local communities.

A gendered approach in unpacking skills for decarbonisation reveals strong asymmetries in relation to inclusion, (who is included in green skills transition, what would be meaningful inclusion, and how we can aim to have a more inclusive outcomes from developing local decarbonisation skills), and power (how power in embedded and represented in decarbonisation skills and its relationship to place). The recognition of the intersectionality of gender with other categories such as age, ethnicity and status, discloses hegemonic forms of interlinked oppressions within the energy industry (Bell et al., 2020). As Bell et al. (2020) point out, those embedded in these systems are structured hierarchically. There is a tendency of the renewable energy (RE) sector to mirror practices and masculinist identities of the fossil-fuel based energy industry. Hultman and Pulé (2019), discuss how this trend translated the conceptualisation of the 'industrial/breadwinner', which highlights the interlinks between male domination, power and privilege, and industrialisation with critical socio-environmental consequences, to an 'eco-masculinisation' of the RE sector (Dagget, 2018). Pursuing solutions to this trend, Hultman and Pulé (2019) call for ecological masculinities that rather align with feminist views of transforming the masculine hegemonisation and "domination of marginalised groups and individuals along with other-than-human nature" (Hedenqvist et al, 2021:209).

A just transition implies not only a transformation of technologic and technical aspects, but also of "social geographies, social meanings, and the political organization of energy production, distribution, and consumption" (Miller et al., 2015:30), while challenging societal constraints on equality and justice. Place-based approaches to decarbonisation could offer alternative solutions to issues of underrepresentation and uneven distribution of resources. A focus on place is important to supporting a just transition to a Net Zero economy for all. Each city, town and rural area faces a range of different skills challenges and has a different combination of assets with which to respond to the opportunities presented by the transition to Net Zero. This underlines the clear benefit in strengthening linkages and networks to allow for the sharing of learning and best practice across businesses, individuals, and place-based organisations. This perspective argues that a place-based approach is critical to achieving industrial decarbonisation (Devine-Wright, 2022). Building networks and collaborative practices for learning and action around shared social and environmental values can support the development of more sustainable and inclusive business models (Lüdeke-Freund et al. 2016; Roome and Louche, 2016; Dybdahl, 2019). Outcomes of such processes, include diminished transport emissions, development of local jobs, green recovery, extending product life cycles, encouraging consumer awareness/behaviour change and progressive cost reduction. Place, and geographical proximity are important aspects of decarbonisation as they can foster a recoupling between, people, resources, community, and environment, which enables more inclusive and just forms of value exchanges (Bocken et al. 2015). Yet, a discussion on place-based forms of value creation and exchange, and skills for Net Zero is lacking at policy and programmes levels.

4. Method

This paper is informed by a review of grey and peer-reviewed literature (November 2021 - January 2023) and participant observation (November 2021- February 2023) on 11 occasions. The desk-based review included national and regional reports; national and local level strategies, such as Local Skills Improvement Plans; and white papers for workforce resilience, achieving, and facilitating Net Zero; five-year utility business plans; papers on green recovery and growth. Participant observation was carried out through an involvement of the researchers in discussions and meetings with local stakeholders such as the Brighton and Hove City Council, the Local Enterprise Partnership, the South East Energy Hub; working groups of regional importance in the Sussex region, such as Hydrogen Sussex; and Sussex Chamber of Commerce.

Although the collected primary data is centred around observations and participation in discussions focused on Sussex, a broader search of existing secondary UK and international literature confirmed that the learnings from these regional observations are illustrative of broader trends and dynamics of skills development alongside a place-based agenda for Net Zero. For example, the secondary data collection involved the review of 11 national and 15 regional hydrogen strategies worldwide (Hiteva and Mininni, forthcoming). Detailed notes were taken from the participant observations, and they were used to identify some of the key terms used in the secondary data search and the codes used in the data analysis.

The analysis of place-based models for Net Zero was combined with a gender analysis of secondary data such as academic articles and reports on gender and energy, training and employment in energy technology and infrastructure. The European Institute for Gender Equality defines gender analysis as 'the study of differences in the conditions, needs, participation rates, access to resources and development, control of assets, decision-making powers, etc., between women and men in their assigned gender roles' (EIGE, 2019:3).

In particular, a gender lens in this paper was used to analyse decarbonisation skills policies, programmes and projects which can have different effects on women due to historical socio-structural inequalities faced by many women, in relation to their experiences, roles and responsibilities, and their level of access to resources and decision-making within the decarbonisation skills context. Gender analysis was particularly useful here in helping to understand the situatedness of gender in the place-based context of decarbonisation skills.

5. A Gendered Analysis of 'Green' Skills

While emphasis in transition to decarbonisation has been given to the technical and technology transfer, less attention has been paid to who participates in such processes and how. Critical analyses on skills and workforce gaps are scarce; this paper aims at filling this gap by analysing existing literature regarding gender equality and women's participation in green skills training and employment. Greater equality and inclusion are key to social justice and just transition, as gender diversity also contribute to more innovative and inclusive solutions. With 400,000 jobs needed (National Grid, 2020), for instance in the UK, in the energy sector to achieve Net Zero targets by 2050, the role of women and female young adults is often overlooked; they could be essential to the workforce.

The Green Jobs Taskforce (2021) recognises the need to address issues of unequal participation of underrepresented groups such as indigenous communities, minority groups and women; yet, the emphasis of 'green skills' is often STEM skills, with scarce consideration of the variety of green skills needed for "transformative business models for sustainable value creation" (Ward, 2018; Rosenberg et al., 2019:9). Skills for 'green jobs' also comprise transferable workplace skills like business skills, customer service, entrepreneurship, and sales and marketing skills (ILO, 2019). As Kwauk and Casey (2022) argue, often, the outcomes of investment in green skills are mainly centred on economic growth and poverty reduction albeit within remits of achieving sustainability. Indeed, organisations and institutions involved in skills for green jobs, pose different emphasis on social and ecological aspects, including issues of marginalisation of vulnerable groups, financial power asymmetries, extractivism, inequitable distribution of resources and critical industries across geographical contexts (Eberle et al., 2019; ibid.). Green growth ideologies are often entangled in neoliberal values and patriarchal norms that have fashioned current uneven and unsustainable systems of power across groups and geographies (Raworth, 2017; Hickel & Kallis, 2020; Kwauk and Casey, 2021). Scarce synergy between energy policy and planning with broader socio-ecological considerations and outcomes is often due to male domination of energy industries, with a majority of male energy engineers, economists and bureaucrats leading energy policy design and implementation (Healy and Barry, 2017). This results in what Cecelski (2004) refers to, the invisibility of women' needs and priorities (Mang-Benza, 2021).

Several gaps have been identified from our analysis. First, there is a lack of women's representation within green skills training and jobs. A review by Naoum et al. (2020), for instance, highlights that, although there have been efforts toward including women in the construction workforce, to address skills shortages and to diversify the workforce, the number of women employed in the sector has not substantially increased. The authors recognise "the omission of women as a disadvantage to the industry, making it impossible to obtain the best people when half the population is excluded" (2020:3). There is also tendency to employ women within lo lower-level and non-technical positions (Lieu et al., 2020).

Second, there is scarce women's representation in executive position within the existing workforce. PowerFul Women (2022) report indicates that women occupy only 27% of all board roles in the top (c. 80) UK energy companies. This implies a lack of leadership and participation in decision-making over companies' strategies, visions, and direction towards clean energy transition, as well as influencing who is included in processes and how. On the last point, the intersectionality of gender with other societal structures, such as age, ethnicity, and status, and socially defined roles and responsibilities see many women marginalised within the domestic sphere. Caring (for children and the elderly), and household responsibilities are gendered with the assumption that they are women's responsibilities. This long-lasting trend evident in both the Global South (Kooijman, et al., 2018) and the Global North (Van der Lippe et al., 2020), reflects femininity and masculinity discourses according to which domestic work is seen as 'women's work', while men are seen as breadwinners (West and Zimmerman, 1987). Time for household activities is unremunerated and taken for granted. Due to these activities, many women tend to follow a 'zig zag' career path; greater flexibility of jobs and training, including work reintegration training, and increased transparency regarding promotions are essential to increase gender equality in green jobs and training (Naoum, 2020).

Regarding training, the exclusion of women and female young adults from energy technology and decarbonisation training, also results in slower uptalking of new technologies and the masculinisation of technology design. Further, in relations to job reintegration according to Energy & Utility Skills over 75% of women who are willing to return to their engineering job after a career break or maternity leave, are discouraged by inflexible working hours and practices (EU Skills 2020). Greater flexibility should be accompanied by increased awareness of the opportunities within the sector, and organisational commitment to tackle main challenges of underrepresented groups (NUS et al., 2018; Green Jobs Taskforce, 2021). This includes dealing with "root causes of gender-based inequities in the green economy" and challenging gendered customs and policies (Kwauk and Casey, 2022:6).

Third, hegemonic masculinity of the energy industry is also evident regarding gendered pay gap, with women suffering from lower wages. The structural hierarchy of wage labour that operates against women also affects their personal worth (Weeks, 2011). Further, there are around 76% fewer women than men working in the energy sector; an important difference from the average 8% gap found in the total workforce "according to 2018 data from 29 countries (22 IEA members). The average gender wage gap conditional on skills in the energy sector among those countries is approximately -15%, meaning women working in the sector earn 15% less than men, even when controlling for skill level" (IEA, 2022). Innovative approaches that respond to local communities' needs are required also to challenge power asymmetries and the dominant masculine culture.

These aspects are further exacerbated by gender blindness in energy policy, which "breeds and entrenches socio-economic inequalities", and by the assumption of gender neutrality of energy according to which men and women equally benefit from energy technology access and services (Mang-Benza, 2021:2).

6. Discussion and Conclusions

Achieving Net Zero interlinks with creating green jobs that require a set of skills specific to critical infrastructure sectors, including energy, ICT, transport, waste and water management. However, the gendered analysis of green skills reveals underrepresentation and uneven distribution of resources, comprising skills, knowledge, and jobs, which operate against many women. Further, the RE sector seems to reproduce male-dominated practices of the fossil fuel industry (Boyd et al., 2019). This undermines meaningful changes. The acquisition of green skills contributes to gaining specific expertise needed to respond to the energy and climate crises and to women's participation within the RE sector, essential to greater gender equality in energy technology education and employment, as case studies (e.g., Mininni, 2023) show.

Yet, adding women into the green skills agenda, is only one piece of the puzzle. To achieve greater transformative transition, it is critical for governments, organisations and industries to support women in challenging socio-cultural structures and practices (IRENA, 2019), including redistribution of power. Women-led organisation, for instance, can foster greater women's participation in solar training and distribution of solar service (Allen, et al, 2019). While there is greater awareness and interest in the gender-energy nexus, also regarding skills and employment for green jobs, due to the scarcity of research into the correlation between gender equality and energy transition, it is difficult to evaluate the gender impact of energy transition policies (Clancy and Feenstra, 2019). Further, elements that could contribute to greater transformative action and empowerment of women are gender-responsive policies, and gender-inclusive training opportunities. For example, Gonzales et al., discuss cases of women's inclusion in the geothermal industry, through technical skills training; this was accompanied by regular gender sensitization and equal access for both men and women to employment benefits, including legally mandated maternity leave (2019).

Just transition is calling for fairer processes not only at the technical and technologic level, but also regarding greater inclusion of marginalised groups, and equality. For instance, Ofgem, the UK energy regulator, is pushing for greater inclusion and diversity in terms of the distribution of costs and benefits, and representation within the workforce according to population sets in zones where energy companies work (Ofgem, 2022). A key aspect of their strategy is to improve underrepresentation of women and minorities at management and executive level. Just energy transition could present opportunities for integrating women and other vulnerable groups to advance justice and equality as distributive and representative justice principles concern also how individuals relate to their surrounding environment including social, economic and environmental infrastructures, networks, and within nature. Hence, greater consideration should be given to the relationship between place, social and environmental targets, such as Net Zero, and the impacts that related policies and programmes have on the energy sector labour force. This implies a shift in the conceptualisation of place, not only as a physical or geographical area where energy companies operate or provide services, but also as the communities and environments which bear the consequences of climate change and await the benefit of Net Zero action.

Gendered dynamics in decarbonisation processes are embedded within socio-cultural practices and norms that are specific to different contexts. The focus of gender analysis in energy transition has been within industries; we posit that gendered distribution of resources and opportunities are embedded within a place. This perspective emphasises the importance of recognising the intersectionality of gender with other societal structures (e.g., ethnicity, age, economic and education status), and with women's gendered roles and responsibilities (e.g., as mothers) which are rooted within place. Future research should expand gendered primary analysis of skills for green jobs in diverse geographies and within broader RE industries and sectors.

Place-based approaches to training and jobs could be critical to accommodating the needs of local communities in a disaggregated and intersectional way also in consideration of people's status and gender. Discussing what skills are needed and recognised for decarbonisation; and who are these skills accessible to helps to unpack how skills for decarbonisation provide direct opportunities to participate in value creation. Greater gendered justice and equality are calling not only for women's inclusion in skills transfer and within the decarbonisation workforce, but also for shifting power relations and challenging socio-structural constraints on gender equality, such as hegemonic masculinity within the energy sector. This requires transformation in the education and employment systems towards more inclusive and representational of marginalised groups, together with more gender responsive decarbonisation policies.

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