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Meritocracy and inequality in the climate debate in Edinburgh, Scotland

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This paper underscores the role that structural barriers play in climate change research in Edinburgh, Scotland. By employing an intersectional gender analysis we stress how unequal power relations underly our understanding of climate change, influence the quality and nature of climate research and responses developed. Using semi-structured and unstructured interviews with women and men working in climate change, we identify the shared experiences of individuals who face gendered barriers in climate science and policy, examine their perception of privilege, and their consequent perceived success in climate change research. Our findings stress the relationship between the concept of meritocracy, the underrepresentation of women and marginalized groups in science, and the reproduction of systematic barriers to contribute to the climate debate. We stress the importance of relationships and networks in supporting and encouraging marginalized voices to succeed in participating in climate change research and science more broadly.

KEYWORDS

climate change knowledge production, gender and intersectional barriers, meritocracy, equity, diversity and representation, women in STEM

Introduction: climate change, inequality, and feminism

The level of carbon dioxide in the Earth's atmosphere has surpassed the critical threshold of 400 parts per million, reaching 425.5 parts per million in July 2024 (The 2 Degrees Institute, 2024). This is the highest concentration of carbon dioxide the Earth has seen in 3 million years and is a clear indication of the negative impact of human actions on our ecological systems. At the same time global economic inequality persists with the wealthiest 1% of the global population holding 43.4% of the world's wealth (Credit Suisse, 2020). This inequality crisis is felt unevenly amongst social strata and in 2020 Oxfam reported that men own 50% more of the world's wealth than women. Women across the globe carry out 12.5 billion hours of unpaid care work each day—a contribution to the global economy of more than three times the size of the global technological industry (Oxfam, 2020).

Scotland has set the ambitious target of achieving net zero emissions by 2045 (Scottish Government, 2020), and Edinburgh is a city heavily involved in reducing emissions and is home to organizations such as Adaptation Scotland and Zero Waste Scotland—organizations that provide support for businesses and communities to adapt to climate change. However, it is also heavily reliant on coal and gas. Edinburgh is a city categorized in our definition of the global North, as it is part of the United Kingdom, one of the most responsible countries for climate change. The United Kingdom is the second largest historical emitter of carbon dioxide per capita between 1850 and 2007 (Clark, 2011), with the United States a close third.

Those who are economically, socially, culturally, or politically marginalized are disproportionately affected by crises. In the context of the climate crisis, it is crucial that mitigative and adaptive efforts do not further exacerbate these current inequalities. The climate change arena is dominated at every level by men, from environmental economics to climate science, policy and action (MacGregor, 2010; Lau et al., 2021). Sonnert (1999) posits that gender and intersectional barriers range from active stereotyping and sexism to unconscious bias that leads to upbringing and socialization patterns that are gendered such as familial and domestic responsibilities and the structure of academic career paths.

This paper offers an intersectional gender analysis of personal experiences of working on climate change in professional and academic settings in Edinburgh, Scotland. While our interviews reveal gendered barriers that have already been documented in the literature, they underscore the persistence of these barriers and the accompanying value systems that continue to be internalized rather than understood as external by underrepresented groups in academia. Our findings stress the relationship between the concept of meritocracy, the underrepresentation of women and marginalized groups in science, and the reproduction of systematic barriers in the climate debate. The paper seeks to highlight how understandings of meritocracy impact the experiences of underrepresented groups working on climate change.

The literature surrounding gender and climate change and women in STEM (Science, Technology, Engineering, and Mathematics) informs our study and includes critiques of essentialization of gender to mean women; scientific masculinist and techno-managerial approaches; and barriers to access and participation in science. While these barriers are common across academia, these are especially important to understand as many disciplines that study climate change such as earth or atmospheric sciences are amongst the least diverse disciplines (in the United States) and notoriously biased against women and people of color (Marín-Spiotta et al., 2020; Morales et al., 2020; Hastings, 2021; Ranganathan et al., 2021). As these fields are unwelcoming to underrepresented groups, and have important gender gaps especially in more senior positions, the lack of role models and senior figures in these disciplines causes many female and people of color to not pursue these fields (Drury et al., 2011). Rather than perceiving this lack of diversity as structural, and identifying power imbalances and stereotypes associated with these disciplines, a culture of impunity remains that allows many to internalize unconscious bias and go on to pursue fields where underrepresented groups are better represented (Steele and Aronson, 1995; Morales et al., 2020). Unfortunately, the lack of diverse worldviews and perspectives around climate change limits what we know and can do about the crisis (Wennerás and Wold, 2008; Bian et al., 2017; Dennehy and Dasgupta, 2017).

In gender and climate change research, while the gender binary is increasingly being challenged it is still often studied as a binary between men and women where climate change impacts carry certain disadvantages for women, rather than as a collection of complex and intersecting power relations that include creating knowledge about climate change and accompanying solutions (Arora-Jonsson, 2011). This paper ascribes to a definition of gender as a social construct and an analytical tool rather than as a biological given to better understand the oppressive structures that limit opportunities for feminized bodies (women, people of color, gender-non-conforming) in a western and patriarchal society to participate in knowledge production around climate change.

To find out about personal opportunities and barriers to work to adapt and mitigate to climate change in Edinburgh, Nia Hunjan carried out semi-structured interviews with people working in climate change. This included academics based at the University of Edinburgh and at Scotland's Rural College (SRUC) and professionals based at Adaptation Scotland. Both SRUC and the University of Edinburgh have strong ties to sustainability practices and climate research, with the University of Edinburgh committing to become zero carbon by 2040 (University of Edinburgh, 2020) so it is important to study as it can provide important insight for other institutions working to reduce their carbon emissions.

By underscoring shared experiences of discrimination of underrepresented groups working on climate research, our aim is that underrepresented individuals will not internalize their feelings of inadequacy but look toward external structural causes of their negative experiences (Steele, 2011; Banchefsky and Park, 2018; Gay-Antaki and Liverman, 2018; Gay-Antaki, 2021). Identifying the structural causes of common experiences of discrimination can better inform actions to make climate research more welcoming and inclusive and thus produce better research and solutions to the climate crisis.

Intersectional gender analysis of climate change knowledge and solutions

Gender and Climate Change literature has problematized essentialist understandings of women and the environment that lead to essentialist ecofeminist thinking of the early 1980's of 2nd wave feminism reflecting interests and priorities of only those from the US, and Western Europe, white and middle class (Sturgeon, 1999; Gaard, 2015; Thompson and MacGregor, 2017). Although essentialist ecofeminism challenged the hegemony of androcentric and patriarchal structures of scientific knowledge, helping define a global women's environmental movement, several feminists believed its essentialist conceptualizations of men and women was detrimental to the feminist agenda (Sturgeon, 1999). Essentialist thinking lays ground to generalized claims which assume common characteristics within a group, for instance, by homogenizing women into a unitary category, we silence discussions around race or class.

Within the realm of gender and climate scholarship, the topic of climate change is still often limited to its impacts and concentrated on the global South (e.g., Sachs, 1997; Denton, 2002; Dey et al., 2018). Literature and initiatives in this field focus on women's vulnerability and virtuousness in relation to the environment and deflect attention from power relations and inequalities reproduced in institutions at every level (Arora-Jonsson, 2011; Onyango et al., 2023; Alonso-Epelde et al., 2024). While more recent research is focusing on gender as a political category rather than a biological

condition, some gender and climate change literature that focuses on the global North still essentializes gender as it posits that women are better equipped to help tackle climate change as they are more likely than men to change their behavior, adopt different technologies, or care more deeply about the environment (Loarne-Lemaire et al., 2021; Konadu et al., 2022). Even though research around gender and climate change is moving beyond impacts, studies that amplify women's virtuousness, rather than their vulnerability are still essentializing gender roles (Bell et al., 2020). This conceptualization does not question why women would act differently than men, or how knowledge around climate change is produced and by whom allowing climate science to remain the domain of men.

Gender stereotypes and conceptualizations of vulnerability or virtuousness around climate change silence the contextual differences between women, as gender is relegated to a "binary phenomena carrying certain disadvantages for women" rather than a "set of complex and intersecting power relations" (Arora-Jonsson, 2011, p. 750). Gender and climate change stereotypes also hide sexism in the global North as they assume that gender inequalities occur only in the global South. Even within each individual climate change discipline, there are problems with gender parity, gender stereotypes and unconscious bias. Non-conscious assumptions about gender characteristics, resulting from cultural socialization, create disadvantages for women working in academia by undervaluing their legitimacy, skills and performance, affecting attitudes toward women in academia, and more importantly dissuading women from cultivating their own interest in STEM subjects (Valian, 1999; Hill et al., 2010; Beasley and Fischer, 2012; Clancy et al., 2017).

Studies continue to document underrepresentation in earth, ecological, and climate sciences that find low percentages of women in these fields as family responsibilities, isolation, and discrimination remain as obstacles to their careers. These disciplines are notorious for being especially unwelcoming to women and people of color (Pearson and Schuldt, 2014; Glass, 2015; Lövbrand et al., 2015; Morales et al., 2020; Hastings, 2021; Ranganathan et al., 2021). Women climate scientists identify with a range of disciplines, especially geoscience, meteorology, ecology, and physical geography and likely share the interests, barriers, and opportunities facing women in science, technology, engineering, and mathematics more generally (Gay-Antaki and Liverman, 2018). For instance, the Royal Meteorological Society considers how within meteorology women have been historically depicted as "weather girls," whilst men are depicted as scientists (Akhter, 2015). Although this perception is changing, there remains the problem of women rising through the ranks to top positions within meteorology. MacPhee et al. (2015) concluded that reaching gender parity in atmospheric sciences, especially at higher levels "may be a distant-future proposition" as only 20% of women on completion of their doctorate, go on to pursue careers in academia. Similarly, Ranganathan finds that in the geosciences which includes Earth, ocean, atmospheric, and planetary sciences women make up only 27% of academics even though graduate programs seem to have reached gender parity (Ranganathan et al., 2021).

Although the historical dichotomy of science as being objective, impersonal and masculine, and "feminine" being everything but (Keller, 1987), seems outdated, it is worth noting that most climate scientists are still men with women underrepresented at all levels in the climate change arena, in particular in the more senior and leadership roles (Gay-Antaki and Liverman, 2018; Liverman et al., 2022). The metaphor of a "leaky pipeline" is often used to describe women in STEM subjects, with the problem being both progressive and persistent, and although the numbers have improved, women continue to be underrepresented specially further down the pipeline (Cronin and Roger, 1999; Shen, 2013). The problem of underrepresentation does not lie solely with the recruitment of women in STEM, but in retention (Beede et al., 2011; Drury et al., 2011). The persistent disparities in higher ranks of academia include smaller wages, less promotions and less grants contributing to women being more likely to leave their research than their male equivalent (Shen, 2013).

Although the IPCC is referred to as "one of the most inclusive and transparent exercises in international science" (Jasanoff, 2011, p. 130), recent studies reveal that many contributing women and people of color still feel marginalized and face intersecting barriers to full participation (Gay-Antaki and Liverman, 2018; Gay-Antaki, 2021; Liverman et al., 2022). This not only highlights the patriarchal and colonial nature of the climate change arena but also serves as an example of how within climate science, striving for participation parity is not sufficient if we fail to also consider other systems of oppression such as capitalism, colonialism or heteronormativism that perpetuate the global North's control over scientific knowledge (Chakrabarty, 2017).

Climate change and situated knowledges

Haraway's landmark essay, *Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective* (Haraway, 1988) identifies western science's tendency to offer its knowledge as objective, value-neutral and independent of social location, and labels it the "god trick" (Haraway, 1988, p. 581). The technical mediations of this ideology are celebrated and falsely presented as transparent (Haraway, 1988, p. 582). However, climate change has become exemplar of what philosophers of science, Funtowicz and Ravetz (1993) have termed "post-normal science:" the application of science to public issues where "facts are uncertain, values in dispute, stakes high, and decisions urgent" (Funtowicz and Ravetz, 1993, p. 744). The basis of post-normal science is that science has evolved from the normal science of "old dichotomies of facts and value, and of knowledge and ignorance" (Funtowicz and Ravetz, 1993, p. 739), into a social practice that addresses uncertainties faced and caused by modern society (Funtowicz and Ravetz, 1993; Saloranta, 2001). Instead of a focus on establishing objective facts, science must now pay closer attention to both establishing and communicating what is unknown, or uncertain (Hulme, 2009).

Grasswick (2014), applies the notion of situated knowledges to the climate change arena. They place an emphasis on how situated knowledge helps determine how certain individuals' positionality shapes understanding and trust in climate science. They focus on public perception of climate change knowledge, and stress that those who have benefitted the most from the uncontrolled burning

of fossil fuels, are those who achieved a privileged social location and will support a western patriarchal system supporting their position even if it means denying the science of 97% of climate scientists. Harding (1986) posits that to have a "strongly objective" form of knowledge, identifying one's own positionality is crucial. To follow good scientific practice, Scheman (2001) stresses the need to factor out the biasing effects of the kinds of injustices that characterize the scientific world. The recognition of privilege and social location of some climate researchers and their consequent research directions makes climate change a post-normal science and highly politicized.

The idea of situated knowledges uncovers the importance to recognize who produces certain knowledge, and who this will affect. Power structures result in the generation of particular types of knowledge which in turn influence the tone and content of research. Yet the framing of climate change as by experts—scientific/political/economic, obfuscates the power structures that underlie our knowledge. Popular solutions to climate change expose the post-normal and situated nature of climate change, as science, policy, economics and public opinion must come together.

Gaard (2015), highlights the need for feminist insights into the dominant techno-scientific solutions concerning climate solutions that are currently dominating responses to climate change, as without them, efforts to mitigate climate change will exacerbate gender equalities. Buckingham and Le Masson (2017) stress that efforts toward population control, as a form of mitigation, restricts women's rights by controlling women's bodies, exacerbating social and gender inequalities. Feminist literature on climate change underscores that power relations shape both our knowledge and ignorance over climate change issues (Moosa and Tuana, 2014). Scheman (2001) highlights the history of exclusion of marginalized people from scientific communities, and because of this the poor-quality research and solutions to climate change directly related to their lives, as research agendas tend to be oriented toward the production of knowledge that is significant for those who occupy privileged positions.

Several international climate organizations such as the IPCC or the Conference of the Parties (COPs) are seeking to learn about discriminatory factors to correct unequal participation in climate knowledge and solutions. When organizations interested in diversifying their base learn about gender bias and other discriminatory factors, it often leads to institutional changes that act upon inequalities, despite the strong conviction that meritocracy is already in place (Sonnert, 1999; Carnes et al., 2012, 2015). A first step to avoid further discrimination is to learn how positionality and social location of researchers influence climate change science and solutions detailed below.

Methodology

A feminist approach

Feminist methods challenge the historical order of academia by deviating from quantitative research methods, favoring qualitative research methods. The value of qualitative analysis lies in its ability to fill previously unknown knowledge gaps of those who have been typically left off the historical record and outside hegemonic research (Clifford et al., 2010). In the climate change arena, which is heavily dominated by western academic practice, there are gaps in information surrounding women and other marginalized groups in society. Feminist qualitative methods give voice to forms of knowledge that have been systematically silenced or misunderstood. We focus on interviewees lived experiences, perceptions and feelings that are often ignored and omitted in typical quantitative studies to provide further insights into the lived experiences of people working on climate change in the global North to shed light on how knowledge is generated in the climate debate, who by and for whom.

Nia Hunjan carried out 16 semi-structured interviews with women and men in line with an intersectional approach to compare experiences of similar events and institutions working in the climate change arena, based in Edinburgh during the summer of 2019. They interviewed mostly climate scientists (7) and social scientists in academia (3), but also climate activists (4), and professionals (2) working in climate change adaptation to compare intersectional experiences of similar events and institutions. They tried to include a range of disciplines, from physical scientists to social scientists and at various stages of their careers. To understand the experience of marginalized voices, they sought to interview those belonging to less represented social identities. The ratio of white and Global North interviewees (15) to non-white Global South (1) interviewees in our sample is representative of the people who work on climate change in Edinburgh. Because we were interested in marginalized experiences in the climate debate, and Nia Hunjan found very few people of color, our sample consisted mostly of white women (14) and one male from the global South who provided some insight into perceptions of race or origin within climate research. Since white western men still dominate the field, we included one interview to compare their experience with those who might not feel quite as home in academic and climate change spaces. We note the very important absence of people of color's experiences in this study, represented in the absence of people of color's contribution to climate change research in Edinburgh. The interviewees, far from being all-encompassing, are intended to illuminate examples and lived experiences of the intersectional barriers for those working on climate science and policy, the awareness and perception of privilege amongst the interviewees, and their consequent perceived success in climate change research. Most interviewees initially felt that their individual experiences of discrimination were based on their qualifications, career stage, or their publication repertoire, rather than gender, race, or origin. However, as the conversation evolved, it was hard to deny patterns of gendered and racialized barriers. It was easiest to identify gendered barriers that were blatant such as experiences in field work rather than those more subtle and structural that are many times internalized and that reinforce the myth of meritocracy in academia. Interviewees were asked if they identified with a particular gender, about their current research and how they became interested in climate change. Broader questions were asked on barriers and discrimination, from a personal level to a discussion on the global climate change arena. Interviews were audio recorded and the transcripts of these interviews were analyzed exploring concepts of meritocracy, gender, perceptions of objectivity in climate science, and academic success.

Results: challenging the myth of meritocracy in climate change research

Underqualified or discriminated?

In the ideal academic sphere, merit is regarded as the sole grounds for selection or discrimination (Au, 2013; Nielsen, 2016; Powell and Seema, 2022). Discriminatory factors cannot exist in a meritocracy (Benschop and Brouns, 2003); bias or unconscious bias invalidates the very essence of meritocracy rendering it a myth. The concept of meritocracy was conceived as a satirical concept by Young in 1958 as a system in which everyone stands a fair chance based on their individual merits yet has evolved into a system which encompasses formal routines, procedures, testing and criteria (Au, 2013). The concept of meritocracy holds central that everyone, regardless of race, class, gender, sexuality, or disability has the same opportunities to advance provided they are sufficiently intelligent and hardworking (Young et al., 1980). Meritocratic principles build on the assumption that objective evaluations are possible: inequalities are considered a natural outcome of people's abilities rather than because of oppressive structures (Heward, 1994).

Even though meritocratic systems appear to have undergone recent scrutiny, interviewees reveal that it still plays a central role in their understanding of academic success around climate change research. While age and career stage are independent from gender, female interviewees said that they often felt discriminated against because of how they were perceived, especially if they looked younger. For instance, a female scientist said, "I don't feel that I'm taken seriously. It is partly my age and it's probably because I look younger than I am." Another felt she was perceived as a "young female airhead;" another felt she wasn't taken seriously because she was a "young woman." These experiences caused some to have "imposter's syndrome" in a group full of what they perceived to be more established and legitimate (male) voices. Others who connected their experience to gendered barriers underscored that their treatment was unequal and unfair: "I felt marginalized, I felt patronized… do I think if I was a man with 2 years private sector experience, he would dismiss me as just an academic, I don't think so." Yet two female scientists, when asked about any barriers or challenges within academia, stated that gender parity, on a discussion panel for example, should be forgone in the name of merit, believing inequalities to be natural rather than structural outcomes.

Since experience was seen as a main barrier, and reinforces the myth of meritocracy, many interviewees believed that additional credentials would grant them the academic legitimacy that they were looking for. An interviewee initially believed that a PhD would help get rid of the feeling that she had to "continually prove herself" but expressed that even with a PhD this feeing continued. To be perceived as more legitimate, many women spent time thinking about how to present themselves. One female academic stated that she often "wore business clothes… to demonstrate legitimacy." Another said, "I think about my clothing, and I know my male colleagues don't." When asked about their clothing choices, the white male interviewee responded: "I can't say it's something I've ever thought about" and "why would I need to do that, I don't understand," indicating a sharp contrast to women's experience in climate research and academia as they have not had to think about how their appearance affects how they are perceived in an academic or professional setting.

Age and merit were brought up by every interviewee whereas race was only highlighted by three individuals and not all were directly connected to the production of climate science. While one stressed that "the bigger issue is around race" in terms of participation in climate science, another mentioned race in the context of her teaching and her privilege as a white lecturer to a class with a strong female Chinese contingent. The male interviewee from the global South highlighted his race as potential grounds for discrimination; however, throughout the interview he explained how his successful academic trajectory negated or erased this discrimination. He mentioned that he tends "not to take things personally" and tries not to think about race or origin. While extrapolating, tending "not to take things personally" might indicate some discrimination based on race or origin. The researcher still held that he was evaluated only by the criteria of skills or publication profile, and not extraneous characteristics (gender, age race) and thus that he's treated fairly. Sexuality was brought up by an interviewee who identified as gay. They maintained that sexuality was an often-overlooked social identity, even by their own accord "sexuality doesn't come up in the same way that being representative of female scientists' does."

All academics bar one, were based at the University of Edinburgh, which was described by one interviewee as a "highbrow" institution. A female scientist felt she had "to overemphasize [she] was a lecturer at a good university," demonstrating a sense of worth based on the regard of the institution one belongs to. The scientist based at SRUC felt her lack of confidence was due to her belief that SRUC is less prestigious than the University of Edinburgh—"it's a kind of inferiority complex about not being well-known." The interviews suggest that the myth of meritocracy is strong in academia as many rationalized their feelings of inadequacy by alluding to their appearance or career stage rather than to external barriers. Few examples were given of actual gender discrimination in the academic context for instance, one interviewee believed that as part of a panel that was interviewing PhD candidates, there was a clear preference for the male Ph. D. candidates by the other male committee members even though she believed the candidates were equally qualified. Those who identified sexist instances expressed that it takes a toll on their energy and that it takes important time away from their work: "It does get to you, and it takes your energy, men don't have to deal with this." This recognition is important as it underscores the additional time and energy that underrepresented groups must spend getting over negative experiences rather than doing research. One interviewee stressed how she still spends time thinking about an incident of sexism that occurred over 2 years ago. Several women also reported they often spent time being angry or frustrated at themselves for not being able to better handle a situation or incident of sexism.

Another clear gendered barrier is the negative connotations that academia associates with familial responsibilities, in particular with motherhood. A few interviewees stressed that having children "affects your ability to work." One female scientist recalled that

after becoming a mother, she applied for a higher position at the University of Edinburgh, but was not even considered for the interview, when researchers who were much less experienced than herself were considered. She stated that once she had children "it became really clear that [her] career would not progress," and she admitted that as a mother, she would "probably never be a professor." Another described time working in Sweden, where she was able to observe a system where childcare was not seen as solely a female issue, and where provisions were made at work for parents to bring their children with them. In accordance with Robinson (2011), this interviewee highlighted the need for a "change in perception of childcare." Discrimination and bias centered on children focuses not just on mothers but on women in general, so we still must ask why when a woman hasn't had children, she still might not get to professor.

On the importance of role models and networks

Female interviewees highlighted the importance of role models to succeed and remain in climate research, as one stated, "you can't be what you can't see." Interviewees emphasized the importance of relationships that provided support, built on common ground, and with female mentors and role models. One interviewee spoke very highly of her female colleagues, referring to one of them as "an incredibly impressive woman," whilst stating that she "was proud to have a woman's voice." Another detailed how many of her female bosses were very supportive toward her and "opened many doors" for her. In a similar fashion when posing new ideas, one academic said that "it's just easier to approach someone who looks like you slightly."

Many women detailed the importance of sharing stories with fellow women colleagues. By sharing incidents of sexism, even in other environments or institutions, interviewees stated how they became more aware of different types of sexism and of their own relative privilege. An interviewee said that she only became aware of the social specificity of gendered barriers from speaking to her Spanish colleagues who "faced gender issues every day at work" exclaiming "I never realized that." These networks validated women's emotions and experiences and highlighted the structural and institutional nature of these. The interviews stress that role models and support networks are crucial in promoting and supporting women against discrimination from conscious and unconscious bias.

Reproduction of oppressive structures and value systems

As climate change is male dominated, with more men in leadership and senior roles than women, directions of research and solutions reflect the priorities of white western males. Climate priorities underline the situated nature of climate knowledge and the ongoing reproduction of the interests, perspectives and needs of the already privileged.

Most of the interviewees felt that regarding participation parity, their fields were in the process of changing, demonstrated by the equal share of female students and early-career researchers. Yet many revealed that senior roles were often filled by men. Two interviewees highlighted that change at the top level was "slow," with others arguing that it was "generational" and "historical." As interviewees underscored the changes regarding gender parity in their fields, they also pointed to the now well-known gendered barriers that women and minorities face in STEM fields such as male dominated panels, travel, tokenism. For instance, one female scientist expressed that even when she sat on an interviewing panel with two other men, she felt her opinion was not as valid as theirs when selecting the successful candidate. She found that the male interviewers completely disregarded the female candidate for the role, and even said "I did tell the rest of the panel, this is unconscious bias." "Stressing bias did not change her colleagues" opinion as the female candidate "did not get the job in the end." Tokenism is another way to reinforce structural barriers. Interviewees commented on being invited to participate as females only for the sake of gender parity, and female representation. One recalled their experience as a "photo op" where she felt discriminated against as she was "obviously asked softer questions" than her male counterparts.

Sexism during field work in the geosciences has been well-documented in the literature and was no exception for interviewees in this study (Glass, 2015; Marín-Spiotta et al., 2020). One female scientist reported dealing with "very clear" sexism in the form of constant sexist remarks on board a research ship, from the crew not her peers, 20 years ago. However, she had just sent a female student on a research ship who returned remarking, "there is so much sexism!" Another female scientist highlighted how there are now "special consultations" for women going on research trips so that they are better prepared as to what to expect from blatant sexism to issues that might be overlooked such as the size of protective clothing, which could potentially impact their ability to conduct research impacting its quality.

Some popular climate change solutions were also perceived as reifying biased structures. One of the female professionals noted how she had noticed that climate adaptation was often a female dominated field, whilst mitigation was often male dominated, giving an example of being at low-carbon and energy events where "it's literally just men." She went on to develop this idea stating that men are stereotyped to think "we can build something, we can fix it," rather than to adapt to it. She also believes that males view adaptation as "giving up" and "for losers." Regarding geoengineering, it is often picked up in ecofeminist literature as being an inherently male desire to subjugate and control nature, as well as to oppress and dominate women (Moosa and Tuana, 2014). This was also brought up by a male interviewee who stated, "there's something quite macho about geoengineering."

That adaptation is seen in many cases as a more "feminine" pursuit whilst mitigation and geoengineering are dominated by men, elucidates the gender structures and norms at play in the climate change arena. This binary underscores the social location of their proponents and thus how structures and value systems are reproduced.

Conclusion: toward ungendering climate change knowledge and solutions

A meritocratic system can give scientists and academics an objective voice, as the system itself is believed to not impose gendered, and other barriers. Nevertheless, our interviewees indicate that this is not the case, women interviewees felt that they still had to prove themselves to be taken seriously and that there were apparent differences between their experiences and those of their male counterparts. Meritocratic dynamics perpetuate a western and male domination of the climate change arena with men having the loudest voices and control over research directions. Male dominance in the climate debate is reflected in the gendered nature of climate change solutions. When a system favors and promotes men, less women rise to senior positions, the lack of female role models makes this field unattractive for women influencing the recruitment, and the lack of retention of women. With less women, research is less diversified, men have the most influence and power in deciding how to adapt and mitigate climate change continuing the status quo, which promotes men in positions of power and more strongly reflects capitalist, colonial and patriarchal interests which are many times at odds with socioenvironmental justice.

Our results highlight that gendered stereotypes and norms influence who is considered merited and who is not. Men can do better in a meritocratic system as it is a "male" model which includes an in-build patriarchal support system (Bagilhole and Goode, 2001). This patriarchal support system, as a meritocratic system, makes invisible the barriers that disadvantage women and other underrepresented groups and contributes to believing in gender stereotypes, resulting in gendered discrimination in the workplace.

Women in STEM literature has highlighted the gender gap that exists in many academic disciplines, especially in physics and mathematics (Hill et al., 2010; Adams et al., 2016; Ahmed, 2016; Clancy et al., 2017). The feminist literature on women in STEM and climate change underscores that power relations shape both our knowledge and our ignorance over climate change issues (Moosa and Tuana, 2014; Bee et al., 2015; Nightingale, 2016; Gay-Antaki, 2022; Arora-Jonsson and Wahlström, 2023; Sultana, 2023). The history of the exclusion of marginalized people from western science has produced poor-quality research and solutions to climate change directly related to their lives, exacerbating their vulnerability to climate change as research agendas tend to be oriented toward the production of knowledge that is significant for those who occupy privileged positions.

Feminist approaches that emphasize situated knowledges in the climate change arena can illuminate how certain individuals' positionality shapes their contribution to climate knowledge. While it is well-documented that women experience more discrimination in STEM and in particular in fields directly connected to climate change such as geosciences and atmospheric science, the interviews qualitatively illuminate that women spend more time dealing with events and experiences that take energy and time away from doing climate research. Feminist approaches can better inform factoring out the biasing effects of the kinds of injustices that characterize the scientific world and climate change research in particular. The recognition of the privilege and social location of some climate researchers and their consequent research directions makes climate change research directions very dependent on a subject's position. Gay-Antaki (2021) posits that power structures result in the generation of particular types of knowledge, which in turn influence the tone and content of research. Yet the framing of climate change as framing by experts—scientific/political/economic—obfuscates the power structures that underlie our knowledge. Clearly if scientists from Small Island States lead climate change research our approach to climate understandings and solutions would be drastically different. The idea of situated knowledges uncovers the importance of recognizing who produces certain knowledge, and whom this will affect. Interpretative research in the climate change debate is useful as it allows the necessary engagement with climate change as a socially embedded science that is very much influenced by social, economic and political trajectories (Lövbrand et al., 2015; Mahony and Hulme, 2018).

It is of great importance to establish relationships and networks that support and encourage women and other marginalized voices to succeed in participating in climate change research and science more broadly. The literature finds that female role models are particularly important to young women (Robinson, 2011; Dennehy and Dasgupta, 2017), as they shatter the perception of STEM subjects being a male pursuit, almost removing the masculine stereotypes associated with this area (Marx and Roman, 2002; Drury et al., 2011; Stout et al., 2011). Jaqueline de Rojas cites female role models as aspirational figures, being the biggest driver of more women entering STEM disciplines (McDonald, 2016). Drury et al. (2011) propose that female role models are more important in the retention of women in STEM, rather than the recruitment, citing empirical studies showing that in the recruitment phase, both male and female role models are equally effective. However, problems occur with the lack of female role models in more senior positions, as this probably sends a signal to younger women that certain disciplines are unattractive to women (Clark Blickenstaff, 2005), therefore decreasing their confidence to enter and progress in these fields. Increasing the diversity of role models in STEM subjects, will inevitably increase dialogue amongst colleagues around shared or differing experiences (McDonald, 2016).

Interviews provide insight into power structures and value systems around the climate debate in academic institutions in global North. Interviewees illuminate connections between their perception of gendered barriers in climate science and policy, of privilege, and perceived success in climate change research. Rather than give an all-encompassing account of experiences of discrimination of underrepresented groups working on climate research, with our sample, we sought to accentuate the commonality of experiences by underscoring the structural barriers that underrepresented groups face when they participate in climate science. We note an important limitation to the study which was that we only interviewed one person of color. That the interviewee responded that they try not to think about how race or place of origin affects them as academics is telling

about the lack of understanding, studies and support systems for discrimination beyond gender and how some academics might deal (or not) with different barriers. As climate science stems from western science, and western science promotes and maintains white, masculine, and western structures, those who do not fit neatly within this mold will experience barriers and exclusions as scientists and climate scientists (Harding, 1986; Haraway, 1988; Merchant, 1990). By offering more lived experiences on barriers to participate in climate research, this paper contributes to continue to expose a meritocratic and patriarchal system and underscores the importance of contextual and intersectional understandings. As we move toward cultivating a more inclusive climate change knowledge base, it is important to acknowledge the very real barriers that women and people of color continue to face, this paper gives concrete examples of what these might look like. Via a heightened awareness of oppressive barriers in climate change research we can aim to build a more inclusive research base that cultivates just climate solutions.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by University of Edinburgh Research Ethics and Integrity Review Group (REIRG). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

NH: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Visualization, Writing – original draft, Writing – review & editing, Investigation. MG-A: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Visualization, Writing – original draft, Writing – review & editing, Supervision, Validation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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