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Climate action from a gender perspective: A systematic review of the impact of climate policies on inequality

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ABSTRACT

In 1992 the United Nations committed to promoting a gender perspective in all environmental and development programs and to establishing mechanisms for assessing the impact of environmental policies on women. However, 30 years later most countries acknowledge that they have not integrated that perspective into policy assessments. This paper provides the first systematic literature review (based on the PRISMA approach) of the impacts of climate policies on inequality from a gender perspective. The results show that although this is an emerging research area, the number of works is still very low: we find only 29 papers, most of them written in the last 4 years. There is also a clear lack of quantitative analysis; and only 5 studies provide an ex ante impact assessment. A more in depth-analysis shows that the existing analyses often use gender merely as an additional explanatory variable, but key aspects for a real gender-oriented analysis such as power relations, intersectionality and gender mainstreaming are missing. The gender perspective is typically more absent in studies led by men. If science wants to contribute to the generation of knowledge that is useful for tackling some of the greatest challenges of the 21st century, such as the transition to a socioeconomic model that is more respectful with the ecological limits of the planet and gender equality, it is important to expand knowledge in this area but also to reconnect with feminist theory.

1. Introduction

Since the 1970s there has been a debate about what are the links between gender¹ and environmental issues. This debate began to take shape in a context of environmental awareness after the publication of “The limits of growth”, a report commissioned by the Club of Rome, in which the women’s rights movement increased its presence in the debates on development and studies on the role of women in development emerged.

Research to date shows that climate change affects women more severely even though their consumption patterns mean that they have contributed to a lesser extent to the increase in greenhouse gas emissions [1]. Along these same lines, Mujere [2] highlights that “women and the poor are disproportionately affected by climate change due to cultural norms and their dependence on natural resources; to their responsibility for water, fuel, food purchases, and home care; to their greater exposure to risk in crises and severe climatic events; to the predominant presence

of low technology in agriculture; and to their lack of resources and power”.

In fact, women are more dependent on domestic energy, since they spend more time on care tasks within their homes, and on access to public transport, due to lower levels of private vehicle ownership [3,4,5]. In addition, they are more likely to suffer from energy poverty and have more difficulties in investing in more sustainable alternatives, such as renewable energy or energy efficiency, due to their lower income [6]. Likewise, according to Markkanen & Anger-Kraavi [7], the groups most exposed to the negative impacts of climate change, including women, are also the vulnerable to the negative effects of badly designed climate policies.

At the same time, the literature indicates that, although they can generate adverse secondary effects in a different way between men and women, climate policies also have the potential to drive social and economic benefits that contribute to poverty reduction and provide opportunities to address economic, health and gender inequalities

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¹ Appendix B conceptualizes this and other common terms in gender studies.

[7,8,9,10]. For example, energy policy analysis has recognized the risks that women face in terms of energy poverty, especially in rural and low-income households [11,12], but also the fact that well-designed policies can benefit them. Impact analyses that include the gender dimension can therefore contribute to the development of inclusive climate policies that keep existing inequalities from being exacerbated [13,14,15,16,17,18].

At international level, the United Nations has played a fundamental role in including the gender dimension in environmental policies. The first time that gender perspective was integrated in the promotion of sustainable development was in 1992 at the United Nations Conference on Environment and Development, also known as the Earth Summit, where it was decided that all environmental and development policies and programs should include a gender perspective. In 1995, during the Fourth World Conference on Women in Beijing, the gender-environment-sustainable development nexus was defined. Since gender dynamics play a key role in the access to and control of natural resources and in the goods and services derived from them [19], environmental issues were identified as one of the 12 critical areas for women. Thus, at the conference “Area K for Women and the Environment” identified the following strategic objectives²: “K.1) Involve women actively in environmental decision-making at all levels; K.2) Integrate gender concerns and perspectives in policies and programs for sustainable development; and K.3) Strengthen or establish mechanisms at the national, regional and international levels to assess the impact of development and environmental policies on women”.

At European level, numerous calls have also been made to integrate gender mainstreaming into all legislation, policies, and instruments related to climate action. The European Parliament has been playing a leading role in this area since 2011, having produced several resolutions addressing climate change from a gender perspective. In its Resolution of September 29, 2011 on the development of a common EU position before the United Nations Conference on Sustainable Development (Rio + 20) [20], Article 19 emphasizes that an integrated approach should be discussed to address multiple challenges including climate change, gender equality or energy supply. Also, in its Resolution of April 20, 2012 the European Parliament [21] urges the EU Commission and all Member States (MS) to collect gender-disaggregated data in the planning, implementation, and assessment of climate policies in order to assess and address the different impacts of climate change for each gender, so that empowering policies that protect women can be developed. That same year, given that the gender perspective was still not well integrated into sustainable development policies and programs, the EU Parliament again called on the EU Commission and all MS in a Resolution dated September 11 [22] to establish mechanisms for gender mainstreaming in environmental policy at all levels. The European Parliament’s report on women and climate change [23] also called on the Commission and the European Council to mainstream gender in all phases of climate policy to ensure that climate action does not increase gender inequalities.

However, despite the demands of the EU Parliament and the UN, the gender dimension of environmental policies has not been addressed in depth in the international and European policy until relatively recently. International and EU development policies have integrated gender equality and environmental sustainability issues in parallel processes [24], but not in an integrative or comprehensive way.

² <https://www.un.org/womenwatch/daw/beijing/platform/envIRON.htm#object1>

For all these reasons, there is a need to understand what the main impacts of different climate policies on gender are, and to determine whether there is sufficient evidence to understand the state of the art in this area, both in the academic and political framework. This paper tries to fill that gap by providing the first systematic review of the existing literature on the impacts of climate policies on inequality from a gender perspective.³ The aim of the study is to provide an analysis of the state of the art on this area, and to try to understand the gaps and barriers for the effective inclusion of gender mainstreaming⁴ in environmental policy assessments. The paper is structured as follows: Section 2 describes the methods used to carry out the academic literature review, Section 3 sets out the results and discusses the findings, and Section 4 presents the conclusions and lists recommendations for further research.

2. Methodology

This study provides a systematic literature review based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach [25]. A systematic review of literature is a specific method for analyzing the existing literature on a specific topic under predefined eligibility criteria [26,27]. Although this methodology was originally developed in health sciences, it has recently also been used in social sciences and climate policy research [28,29,30,31,32,33].

The PRISMA approach is characterized by its systematization, transparency, and reproducibility [27]. It is based on pre-established guidelines to facilitate the understanding of the review procedures. The use of this formal methodology enables credible and more robust information to be provided on topics of interest to researchers, politicians, and the general public. In addition, this method has been frequently complemented in the literature and in our article with techniques such as snowball sampling to include additional articles and to find out if any relevant articles had been missed [34,35]. Fig. 1 shows the 4 phases of the methodology, i.e. the identification, screening, eligibility, and inclusion phases, with the results of our analysis.

We used different inclusion criteria to identify potential papers for assessment. To cover as much literature as possible we searched for papers in English and Spanish on Scopus and the Web of Science, the two main scientific citation databases, which contain over 169 million records.⁵ We set 1992 as the first year for research, given that the 1992 UN Conference first established the need to include a gender perspective in the promotion of sustainable development. Our goal is to determine the main impacts of different climate policies from a gender perspective, so we searched for all papers focused on the socioeconomic impacts of climate policies that take gender-related aspects into account. Since the focus of the study is climate policies, the study adopts the IPCC definition, which defines climate policies as those that are proposed by a government (sometimes in collaboration with different political or economic agents) to accelerate mitigation and adaptation actions to climate change. Examples of climate policies are support mechanisms for renewable energy supplies, carbon or energy taxes, fuel efficiency standards for automobiles, etc. The 6 inclusion criteria used were the following:

³ We understand gender perspective as the conceptual tool that makes it possible to identify, question, and value the oppression, inequality, and exclusion of women when looking at any social phenomenon, policy or process, as well as the actions that must be taken to act on gender factors and create the conditions to advance towards a society free of discrimination against women and with equal opportunities for all.

⁴ Gender mainstreaming can be defined as a deliberate, systematic approach that enables a gender perspective to be factored into analyses, procedures, and policies.

⁵ Web of Science and Scopus

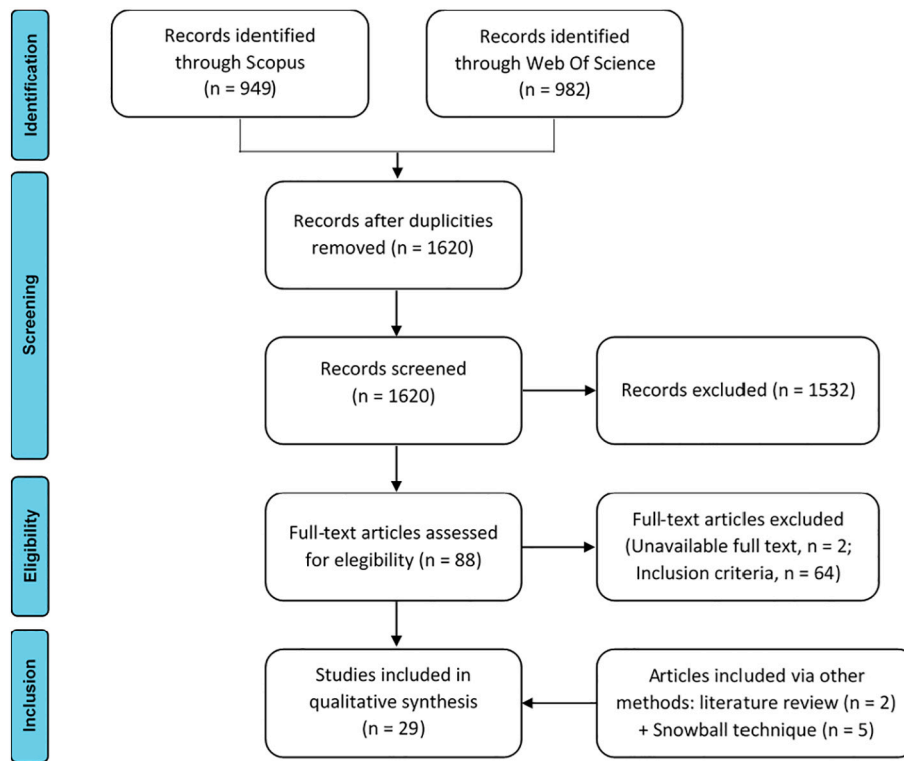


Fig. 1. PRISMA 4 phase flow diagram.

1. Papers must be published in English or Spanish.⁶
2. Papers must be published in the databases Scopus or Web of Science (WOS).
3. Papers must have been published between 1992 and March 2022.
4. The full text of the paper must be available online.
5. The paper must focus on the socioeconomic impacts of climate policy, that is, it must study or analyze the pros and cons of a specific climate policy for a whole community. Those papers whose main focus is not the one mentioned above are excluded.
6. Gender-related aspects must be taken into account. Those papers that only mention women to reinforce gender stereotypes⁷ are excluded.

Due to the different concepts used in the fields of climate policy and gender, to generate the desired results, and to try to cover almost all the relevant literature, the search syntax was designed to include terms that are often used as synonyms. In addition, to identify papers on the assessment of the impact of climate policies on inequality from a gender perspective, we set 4 themes for the search keywords: impacts, policy, inequality, and gender.

Table 1 shows the search terms applied to the titles, abstracts and keywords in both databases related to these four areas. Following prior tests with more restrictive search terms, this was the set of keywords that provided us with the most results and enabled us to ensure that we were identifying as much of the literature as possible. In fact, we conducted an

Table 1
Search terms used in the study.

Topic	Search terms
Impacts	"impact*" OR "effect*" OR "assessment" OR "analysis"
Policy ^a	"climate policy*" OR "energy policy*" OR "environmental policy*" OR "mitigation" OR "adaptation"
Inequality	"inequality*" OR "equality*" OR "equity" OR "economic*" OR "socioeconomic*" OR "distributional"
Gender	"gender" OR "gender mainstreaming" OR "gender perspective" OR "gender dimension" OR "women*" OR "girl*"

^aTo broaden the results of the literature review and prevent relevant papers from being left out, some expressions that are often used as synonyms in the literature are included in the search terms, for example, "environmental policy" or "energy policy".

initial review with more restrictive search terms, but after 4 filtering phases only 8 papers reached the inclusion phase, so we decided to broaden the terms to try to identify more papers. When we expanded the search terms, some filters were included in the search to try to narrow down the topic. In fact, papers on medicine, psychology, and nursing were excluded in Scopus and those categorized under "Health Care Science Services" and "Psychology" in the Web of Science because they include studies that were not related with the objective of the paper.

During the identification phase a total of 1.931 potential papers were identified in Scopus and WOS. Once duplicates were removed, 1620 papers were screened, assessing each title, abstract, and keywords to identify those relevant to the research objectives. At this stage 1532 papers were excluded because they did not fit the topic completely. The most common reasons for exclusion were the following:

1. The paper is not related to the field of climate change. In fact, many belong to other research disciplines and specifically to the area of medicine.
2. The paper is not related to the research objective:

⁶ Articles in Spanish are also included because since the authors understand both languages, it is considered a good way to broaden the range of analysis and the diversity of knowledge.

⁷ According to the OHCHR (Office of the High Commissioner for Human Rights of the United Nations), a gender stereotype refers to a widespread opinion or prejudice about attributes or characteristics that men and women possess or should possess or about the social roles that both perform or should play. Historically they have been harmful for women because they have limited their ability to develop their personal faculties, pursue a professional career or make decisions about their lives and vital projects.

- a. The paper analyzes the impacts, vulnerabilities or risks of climate change, not of climate policy.
- b. The paper analyzes preferences, perception or willingness to pay for some climate policies, not the objective impacts of the policies.
- c. The paper deals with the participation of women in decision-making or projects.
- d. The paper suggests integrating the gender perspective into climate policies but does not go into the impacts implementing them.

As a result, 88 papers were examined in the eligibility phase, two of which had to be excluded because the full text was not available online. After reading the full papers, we excluded 22 because they did not meet the inclusion criteria (specifically criteria 5 and 6). In an effort to identify more papers that might have been left out, a snowballing technique [36] was applied using the Inciteful platform.⁸ The Paper Discovery tool provided by the platform enabled us to identify similar or related items to those identified in the previous phase. Using this tool another 1000 papers were identified and assessed, again using the PRISMA methodology. After this process, 5 more papers were selected as meeting the aforementioned inclusion criteria. Two other papers identified in the previous review mentioned above (with more restrictive search terms, which was extended due to the limited number of papers identified) were also included.

At the end of the process 29 papers that met all the pre-defined inclusion criteria were identified and included in the study. Once the selection was completed, an in-depth analysis of the papers was carried out using a form previously designed to extract the information of interest (see Table 2). This form was designed to analyze how the gender perspective is integrated into the analyses and what research gaps exist.

Finally, we identified a limitation of our literature review: The study only focuses on academic publications. Grey literature was excluded from the search because it requires time-consuming manual searching. However, in future research it may be interesting to also include insights from work carried out by international bodies, NGOs, and civil society organizations (which are also an important source of knowledge) to increase the number of studies analyzed. Indeed, there are also some studies and reports that have been developed by such organizations [37,38].

3. Results and discussion

3.1. Main results and discussion

Fig. 2 shows the number of papers identified published per year from 1992. Our results clearly indicate that this research area is relatively new in scientific literature. Although our search dates back to 1992, all the papers included were published after 2009 and most are from the last 3 years (2019–2021) and the first 3 months of 2022. There is also a growing interest in gender analysis in recent years, as shown by the fact that we find an increase in every year from 2018 onwards in the number of papers that include gender in climate policy assessments.

Not all the papers included in the literature review can be said to integrate a gender perspective: many of them treat gender not as a social or cultural construct but rather as an analytical category [39,40,41,42,43,44,45,46,47,48]. Therefore, although there is a growing interest in including gender in research, the lack of a gender perspective could lead to misinterpretation and misguided recommendations for improving climate policies. In addition, it seems to be a topic that sparks more interest among female researchers: in 69 % of the papers found the first author is female (see Fig. 3). It should also be noted that most of the few papers whose first author is a man do not integrate a gender perspective. In fact, the only one that does so is the paper by

Table 2
Data extraction form.

Variable	Label
Title	Title of paper
Authors	Authors of paper
Gender of the first author	Female Male
Year	Year of publication of paper Literature review
Type of study	Case study Other
Methods	Quantitative Qualitative Mixed
Assessment	Ex ante: prior assessment or effects Ex post: assessment afterward or effects Both: Ex ante and ex post NA: Not applicable
Climate policy area	Mitigation Adaptation Mitigation and adaptation Africa Asia
Location	Europe North America South America World: the study has a universal focus Low
Income Level (World Bank classification 2022)	Lower-middle Upper-middle High
Intersectionality	Yes: intersectionality is mentioned or taken into account No: intersectionality is not mentioned or taken into account
Class/Income	Yes: class/income is mentioned or taken into account No: class/income is not mentioned or taken into account
Race/Ethnicity	Yes: race/ethnicity is mentioned or taken into account No: race/ethnicity is not mentioned or taken into account
Age	Yes: age is mentioned or taken into account No: age is not mentioned or taken into account
Sexual orientation/identity	Yes: sexual orientation/identity is mentioned or taken into account No: sexual orientation/identity is not mentioned or taken into account
Education/Occupation	Yes: education/profession is mentioned or taken into account No: education/profession is not mentioned or taken into account
Functional diversity	Yes: functional diversity is mentioned or taken into account No: functional diversity is not mentioned or taken into account
Power relations	Yes: power relations are mentioned or taken into account No: power relations are not mentioned or taken into account
Mainstreaming	Yes: gender mainstreaming is pointed out as necessary for improving gender equality No: gender mainstreaming is not mentioned
Degree of integration of gender in the analysis ^a	Low Medium High

^aSee Table A1 for detailed criteria for characterizing the degree of gender integration.

Sauer & Stieß [49].

Fig. 3 shows different variables that help to identify different paths in the selected literature and to understand the state of the art of the literature on climate policy analysis from a gender perspective. There is a greater trend towards mitigation studies, since 66 % of the papers study mitigation measures, 17 % adaptation measures, and 17 % both

⁸ <https://inciteful.xyz/>

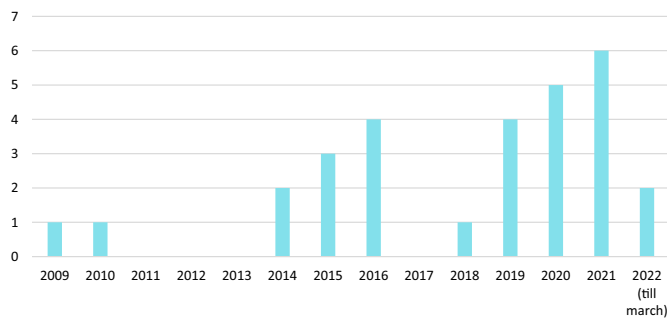


Fig. 2. Number of papers published per year from 1992.

mitigation and adaptation measures. Although in general there is more literature on climate policies involving adaptation, such studies tend to be more focused on vulnerability or perception analysis because adaptation goals are more qualitative. Moreover, Bryan et al. [50] identify the lack of staff capacity on gender and the lack of funding to support gender integration or socio-cultural constraints as the key barriers to the effective inclusion of gender in adaptation policies. This may explain why there is less research on the topic.

Our results also show a lack of variety in the types of study identified. 31 % of the papers are literature reviews and 66 % are case studies. In addition, one of the eight papers included is a descriptive study that includes both a brief review of the literature and two case studies to explain how a gender impact assessment tool has been adapted and how it can be used to better include gender aspects in climate policy advice [49]. In addition, most of the papers use qualitative methods (55 %) and mixed methods (24 %) that combine qualitative and quantitative techniques in their analyses. The lack of quantitative analysis in analyzing the socioeconomic impacts of climate policies with a gender perspective is worth highlighting, since these are necessary to complement the information collected in qualitative studies. This further confirms what has been identified in the literature as one of the shortcomings of this kind of analysis: the scarcity of and need for appropriate methodologies for gender-sensitive climate policy assessment and sex-disaggregated

data [51,52,53,54,55,56,57].

55 % of the papers included assess policies or strategies for mitigation and adaptation to climate change after they have been implemented, i.e. they give an ex-post assessment of policies. Only 5 of the case studies analyzed (17 %) provide an ex-ante assessment. Ex-post analysis is essential in assessing the effectiveness of policies already implemented and identifying areas for improvement, but it is also essential to carry out ex-ante impact analysis to identify and avoid potential adverse effects of policies before implementing them and to introduce direct policy recommendations. Thus, gender impact assessments are essential in designing inclusive climate policies that do not exacerbate existing inequalities. Historically, both in the design of policies and in the design of research, gender has not been considered. But in recent decades, efforts have begun to be made to include the gender perspective in all phases of the process (including the design phase) in both areas. However, the existing disconnection between both science and politics means that the potential to include gender in both areas is being limited (to deepen this reflection, see Section 3.2.7).

In this sense, the paper by Sauer & Stieß [49] is of particular interest, as they develop a tool that permits such analysis. Their impact assessment is carried out in two steps. First, a relevance test is used to examine whether or not a climate policy has gender equality impacts. If it has significant gender equality impacts, then the main assessment is carried out. Thus, the paper identifies 6 gender dimensions (care economy and care work, employment, configuration of public infrastructures, institutionalized rationalities, participation in decision-making, and physical integrity) and a seventh transversal dimension (symbolic order) to be analyzed during gender impact assessments. These are considered as the core areas of social structuring through which hierarchical gender relations are established, maintained, and reproduced [58]. This tool identifies the key issues to be addressed and the right questions to be asked. But the approach is qualitative and somewhat subjective, so its effectiveness depends on the approach of the person applying it. In other words, the mere use of the tool does not guarantee the quality of the analysis. Rather, the knowledge and vision of gender experts are required to carry out an effective gender impact assessment. In fact, as the authors themselves indicate, to avoid the tool being trivialized it

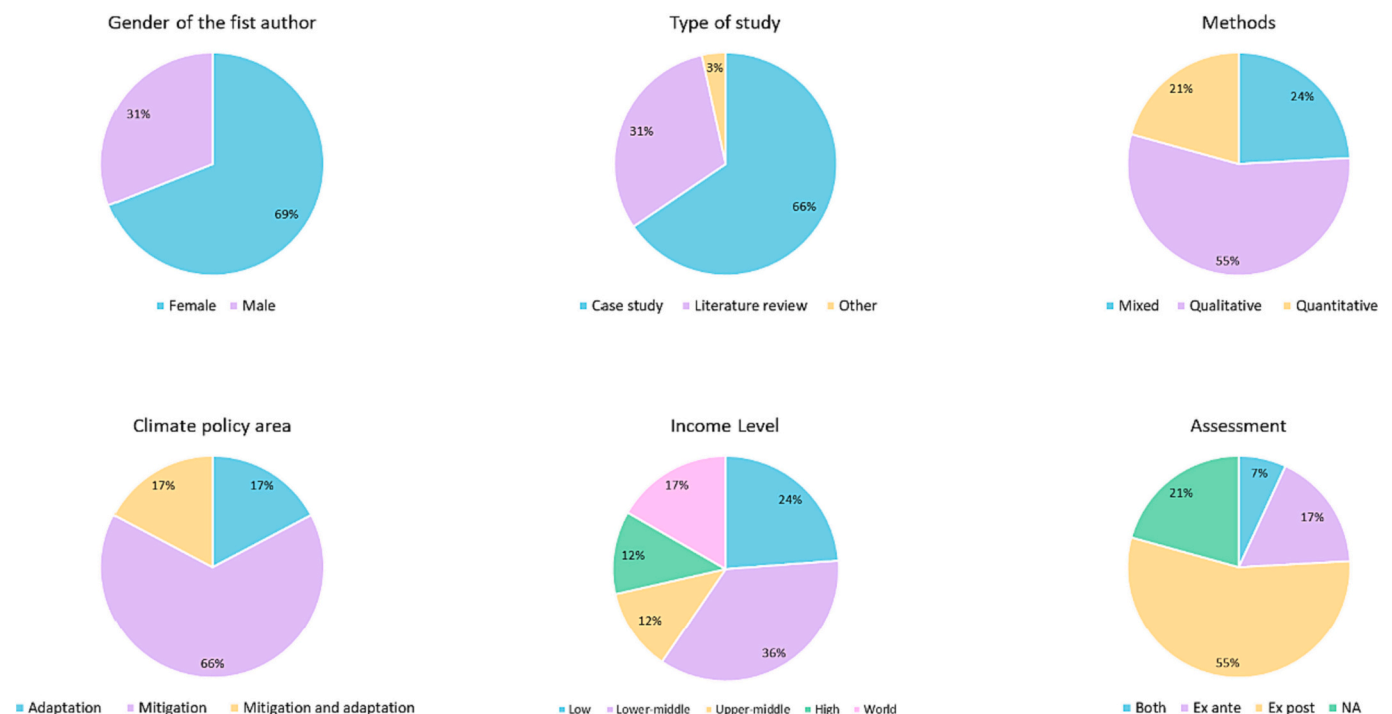


Fig. 3. Variables analyzed in the literature review.

should be used “under the auspices of gender experts and with strong deliberative elements, including the participation and consultation of women and gender associations committed to climate policy”. In addition, it should be noted that this tool is designed to be applied in high income countries. It would be interesting to replicate their study to create a similar tool that can be applied in the context of Low and Middle Income Countries⁹ (LMIC).

However, there are few studies (12 %) focused on high income countries¹⁰ [43,44,46,49,60]. 60 % of the literature reviewed focuses on low or lower-middle income countries, analyzing the socioeconomic implications of the different mitigation and adaptation strategies to climate change in this context. 12 % refer to upper-middle income countries and the remaining 17 % of the papers draw no distinction between countries, since they have a universal focus. This tendency to focus analyses of climate change and gender almost exclusively on LMIC has been pointed out as a shortcoming in research that seeks to be gender-sensitive (as also highlighted by Feenstra & Özerol [61], MacGregor [62] or Lahiri-Dutt [63]).

We have also sought to characterize the degree of integration of the intersectionality approach in the analyses. Intersectionality is defined as “the phenomenon whereby each individual suffers oppression or holds privileges based on their belonging to multiple social categories, which are constructed and dynamic” [64,65,66,67,68]. Most papers do not take an intersectional approach and few of those that do so mention the concept of intersectionality.

Fig. 4 shows the concepts identified as present and absent in the analysis. The socioeconomic categories most widely integrated into the analyses in the papers analyzed are the following: class/income (93 %), education/profession (72 %), age (59 %), and race/ethnicity (45 %). However, there is a lack of attention to certain categories associated with groups which are in a situation of discrimination, such as sexual orientation/identity and functional diversity (found in only 10 % of the papers). This bias may be related to a lack of data for these categories when secondary data is used, but this data gap could be corrected when primary data is generated through specific surveys, interviews or focus groups. These techniques are used in the papers analyzed, but none of them directly ask participants about these relevant characteristics. In this sense, it is worth highlighting the enormous conceptual effort made by Sauer & Stieß [49] to integrate the LGBTQ+ perspective into their gender impact assessment, although that effort does not show up in the case studies that they present. Additionally, in most papers these social categories are included as explanatory variables that interact with gender inequality, which is insufficient from an intersectionality viewpoint since a more complex approach is needed to address the system that creates power differentials [67,69,70].

In fact, although 41 % of the papers considered implicitly or explicitly mention or acknowledge the existence of power relations that place women at a disadvantage to men, none of them look in depth at the causes and consequences of gender inequality (see Fig. 5). According to Bretherton [71], this tendency to study women rather than gender

⁹ We refer to income when categorizing countries to simplify the analysis and avoid the use of dichotomous terms (such as “developed” versus “developing” countries) that have their origins in racism and colonialism. In fact, even some terms that were originally introduced without a connotation of hierarchy and with the aim of critically pointing out social, economic and political gaps and inequalities (such as the “Global North” versus the “Global South”) ended up creating a false hierarchy and division among nations based on access to wealth and political power [59].

¹⁰ The classification that refers to the income level of the countries in which the papers are focus is based on the categorization made by the World Bank in 2022 (<https://blogs.worldbank.org/opendata/new-world-bank-group-country-classifications-income-level-fy24>). Likewise, the “World” category is added to refer to those papers whose focus is universal, that is, papers that do not focus on the analysis of the impact of a specific measure applied in a specific country.

relations and power dynamics may be a consequence of the way in which gender was introduced onto the global environmental policy agenda (see Section 3.2.2. to broaden the discussion).

In addition, although the recommendation to include a gender perspective in all phases of climate policy has been continually repeated by international and national organizations since 1992, the concept of gender mainstreaming have not yet penetrated deeply into academia in this area. Gender mainstreaming can be defined as a deliberate, systematic approach that enables a gender perspective to be factored into analyses, procedures, and policies [69]. Its aim is to “make visible gendered aspects of the assumptions of policy-makers and differentiated outcomes of policy and policy-making for men and women” [72]. Only five of the papers analyzed explicitly indicate gender mainstreaming as necessary to enable efficient and inclusive mitigation and adaptation strategies [49,60,61,73,74]. In other papers, gender mainstreaming is not directly mentioned but it is implicitly present in the following ideas: 1) the lack of a gender perspective in responses to climate change is criticized [75]; 2) the need to develop policies or initiatives in an inclusive manner to avoid exacerbating existing inequalities is stressed [7]; and 3) there is a recommendation to the energy transition research community to place greater emphasis on gender and social equity considerations in their work to facilitate processes that permit the development of inclusive institutional arrangements for a just transition [76].

Finally, after an exhaustive review of the papers, the degree of integration of gender in the analyzes has been characterized (see Table A1 for more details on the characterization criteria and Section 3.2. for an in-depth analysis of gender inclusiveness). Table 3 shows how in almost half of the papers (48 %) the degree of gender integration is low, which indicates that they do not include a gender perspective in their analyses. Regarding the gender of the first author, it is men who integrate the gender perspective to a lesser extent in their studies, with the degree of gender integration being low in 67 % of the cases. Likewise, it should be noted that the degree of gender integration is mostly low in studies focused on mitigation policies (63 %) or in those located in both the Global North (60 %) and the Global South (53 %).

Only 31 % of the papers actually include the gender perspective in their analysis (high integration degree). In this sense, it should be noted that it is mainly women who include or are trying to include a gender perspective in their research: 35 % of the studies whose principal author is a woman have a high degree of integration, while 25 % have a medium degree. The percentage of studies with a high degree of integration is higher in those that study adaptation policies (40 %) or mitigation and adaptation policies together (40 %). It is also important to highlight that studies with a global focus tend to effectively integrate the gender perspective in most studies (71 %).

3.2. In-depth analysis and discussion from a gender perspective

3.2.1. Lack of gender perspective

As mentioned above, the papers analyzed show a lack of effective integration of the gender perspective. In most of them gender is used as an additional explanatory variable rather than being recognized as a social or cultural construct. In these papers the concepts of sex and gender are confused, because if the distinction between men and women is based on biological sex and not on the recognition of a system that generates inequalities that puts women in a situation of inferiority merely by dint of being women then we are not talking about gender but about sex. It should be noted that this research area has sparked more interest among female researchers (in 69 % of the papers the first author is a woman) and that the failure to factor in the gender perspective is more notable in papers led by men, although it is also an issue in those led by women. A clear example of persistent androcentrism and sexism in academia are those papers in which women are only mentioned in phrases that perpetuate and reinforce traditional gender roles, such as: “Women may also have more time available to do household chores like knitting and crafting.” [77]. This is precisely the opposite of including

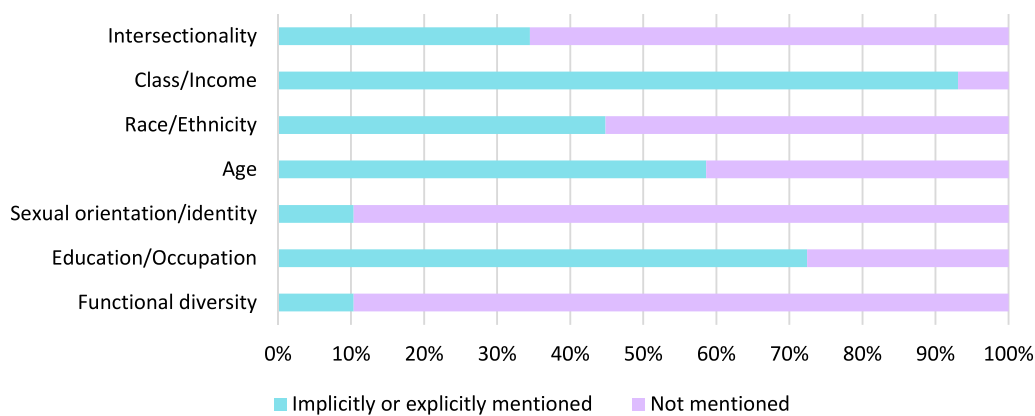


Fig. 4. Concepts identified as present and absent in the analysis.

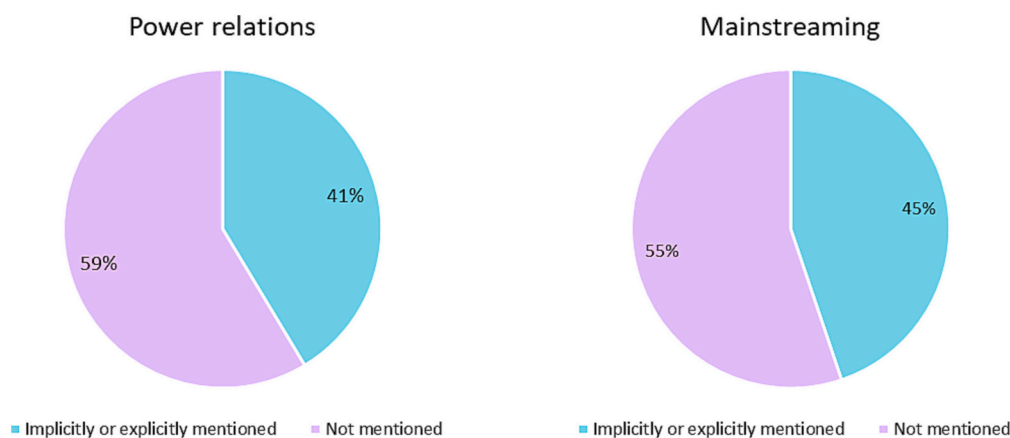


Fig. 5. Presence and absence of power relations and mainstreaming concepts.

Table 3

Degree of integration of gender in the analysis.

	Total	1st authors' gender		Climate policy area			Location		
		Female	Male	Adaptation	Mitigation	Mitigation and adaptation	Global North	Global South	World
Low	48 %	40 %	67 %	20 %	63 %	20 %	60 %	53 %	29 %
Medium	21 %	25 %	11 %	40 %	11 %	40 %	0 %	35 %	0 %
High	31 %	35 %	22 %	40 %	26 %	40 %	40 %	12 %	71 %

the gender perspective in the analyses.

3.2.2. Gender relations and power dynamics

Along these same lines, the papers analyzed rarely include gender relations and power dynamics in their narratives. Most of them do not even acknowledge the existence of power relations and none looks in depth into the causes and consequences of gendered power dynamics. This lack of analysis of power relations and gender roles may be closely related to the dominant discourses regarding the links between climate change (or the environment) and gender. In fact, the material manifestations of climate change are being shaped by sociocultural norms and discourses.¹¹ Thus, in the discourses that have conceptualized the links between women and the environment, both in the agenda of global

¹¹ According to Epstein [78], a discourse is “a cohesive set of ideas, concepts and categorizations about a specific object that frame that object in a certain way and, therefore, delimit the possibilities of acting in relation to it”, whose critical analysis helps us understand how humans “make sense of themselves, their interests and ways of behaving, and the world that surrounds them.”

environmental politics and in research on gender and climate change, women fall into three broad categories (women as “saviors”, “victims” and “the problem”) and Bretherton [71] explains how each of these perceptions has different political implications.

First, the notion of “women as saviors” holds that women have a special sensitivity and responsibility to the natural world as a result of sharing oppression and exploitation with the environment and their reproductive and care roles.¹² In practice, this discourse and the policies derived from it have placed women, once again, in a situation of subordination in which their work is not financially rewarded. Second, the notion of “women as victims” is closely related to the existing links between poverty and environmental impacts, especially in those contexts in which women’s well-being and survival stem from their links to the environment (for example in southern rural areas where women are responsible for gathering food or wood). In these contexts, policies have focused on helping women and their children, who are the object and not the subject of policies. Third, the notion of “women as the problem”

¹² This notion is consistent with the principles of ecological feminism [79].

highlights that everything that surrounds women has implications for the environment. A good example of this is the discourse that warns about the overpopulation of the planet and the need to control birth rates in LMIC countries, without focusing on the high rate of consumption in high income countries. Therefore, the way in which gender is introduced into research needs to be rethought in an attempt to move away from the discourse that classifies women as victims, saviors or “the problem” [62,71].

However, in addition to the way in which ideological constructions shape the material realities about gender inequality and the planetary crisis, there are other mechanisms that ensure that gender continues to be understood as women (losing its meaning as a relational process). One of them has been the inability of both scientists and policymakers to conceptualize the subtler operations of power. According to Lukes [80], the power that allows one to be decisive in setting the agenda depends on three dimensions: the ability to put issues on the agenda when a public debate is taking place; the ability to remove items from the agenda by creating the false belief that including them would be useless or counterproductive; and the ability to prevent problems from being noticed in the first place. Thus, structural power has been at the service of the exclusion of women, both in public and private spaces, ensuring their political subordination and economic exploitation (through the sexual division of labour) and, in turn, the way in which it operates has contributed to our inability to understand the full meaning and implications of gender [71].

All these discourses and mechanisms through which structural power operates are not alien to science and have also been reflected in academic work. Androcentrism has been (and continues to be) very present in science [81]. In fact, it was the criticism by feminists during the second wave of feminism that alerted of the presence of androcentrism in science [82]. Later on, the 5 ways in which androcentrism is present in science are identified: the low proportion of female researchers, research topics dominated by men, methods and interpretations restricted by sexism or male perspectives, the use of science to justify sexist social projects and distortion in the way scientists work [83,84,85].

Thus, at present, the masculine bias that persists in science, the subtle way in which structural power continues to operate and the discourses that categorize women as “saviors”, “victims” and “the problem” make the meaning of gender as a relational process is lost and reduced to the category “woman”. All this has led to the development of research and the implementation of policy measures that reinforce “traditional” gender roles. Because of that, it is necessary to re-think the debate, engage with the functioning of power, and address issues of transformation, justice, and democratic climate governance [86].

3.2.3. Intersectionality

Likewise, our study has identified a lack of integration of intersectionality, which not only refers to “the phenomenon by which each individual suffers oppression or holds privilege based on their belonging to multiple social categories” [63,64,65,66,67] but should also be understood as an analytical tool for analyzing the articulation of different socioeconomic categories (e.g. class, gender, race, etc.) instead of considering them as independent forms of power/gender relations [87]. Including this approach in climate policy research is thus a very useful way to analyze impacts on the most vulnerable groups from a gender perspective, as previous feminist scholars have also shown in the analysis of the impact of climate change and responses to it [64,67,88,89,90,91,92].

Intersectionality is “a prism for looking at complexity in the world” [65], so it is also valuable to describe how different impacts intersect dynamically with each other [93]. However, an intersectional approach means moving away from a cumulative perspective where impacts are treated as simple add-ons to existing inequalities: It requires a multidimensional, multi-scale impact assessment process that takes into account the specific impacts and forms of discrimination that have taken place and been reproduced historically [69]. However, as noted in

Section 3.1, the way in which social categories are integrated into analyses is not exhaustive in most papers, because they are usually included as explanatory variables that interact with gender inequality. But in an intersectional approach it is necessary to carry out an in-depth analysis of the interconnections between them and the power relations/structures that perpetuate inequality [94]. Therefore, as mentioned above, the degree to which social categories are integrated into the papers reviewed is not enough from an intersectionality viewpoint because a more complex approach is needed to address the system that creates power differentials [67,69,70].

3.2.4. Focus on low and middle income countries

Another relevant trend is that most of the papers analyzed focus almost exclusively on LMIC, but gender issues related to energy and climate policies are also found in high income countries. In fact, despite the fact that 17 % of the papers have a universal focus and do not distinguish between countries, more than 30 % refer to policies applied in African countries (categorized by the World Bank as low or lower-middle income), 12 % focus on Asian countries (such as Nepal, Bangladesh, India or Indonesia) and 10 % in countries located in South America (See Fig. 6).

This is recognized and the inclusion of such issues is recommended by international institutions such as the UN and the European Commission. In fact, it has been pointed out as a shortcoming in research that seeks to be gender sensitive, because it is common that the gender approach in such studies is limited to addressing the role of women in society, so that they are reduced to vulnerable consumers in a marginalized position, reproducing the victimizing discourse that many feminists are trying to deconstruct [61,62,63]. In this sense, it is important to move away from the assumption that vulnerable groups do not have the skills and capacities to drive social change [95].

3.2.5. Gender mainstreaming in impact assessment

As mentioned before, we observe that, despite continued recommendations to include a gender perspective in climate policy, the concept of gender mainstreaming has not yet penetrated deeply into academia in the field explored. In any case, it is necessary to point out that there has been a wide debate on the concept and practice of gender mainstreaming [72,96,97,98,99,100]. Thus, there are some doubts as to whether gender mainstreaming really places women on the political agenda or has the opposite effect. On the one hand, it has its roots in feminist theory,¹³ which proposes it as “an agenda-setting idea with radical feminist potential” to transform policy approaches to gender inequalities [96]. But on the other hand, there is widespread criticism of the integrationist form that the concept has taken in practice, since gender mainstreaming has been “incorporated as a policy tool into structures, processes, and norms that remain unchanged” [97,102,103,104,105].

Feminist scholars have referred to this inability of gender mainstreaming to bring about radical changes in gender and power relations as the “radical potential paradox”. Several mutually complementary explanations have been proposed to address this paradox [106]. The first is the difficulty of transferring a radical feminist framework that operates at a transnational level to a local level where the national context can collide with the feminist conceptualization [100]. There has also been a lack of understanding of its vision: Some have interpreted that the objective was to encourage women to integrate into a system where

¹³ The term “theory” refers to the construction of a set of interrelated statements about how some aspect of the world operates. When we speak about feminist theory, we refer to the perspectives that guide the search for answers to a central series of questions and dilemmas about sex and gender. Feminist theoretical frameworks address, above all, the question of the subordination of women to men (for example, how it is created, how and why it is perpetuated or how it could be overcome) [101].

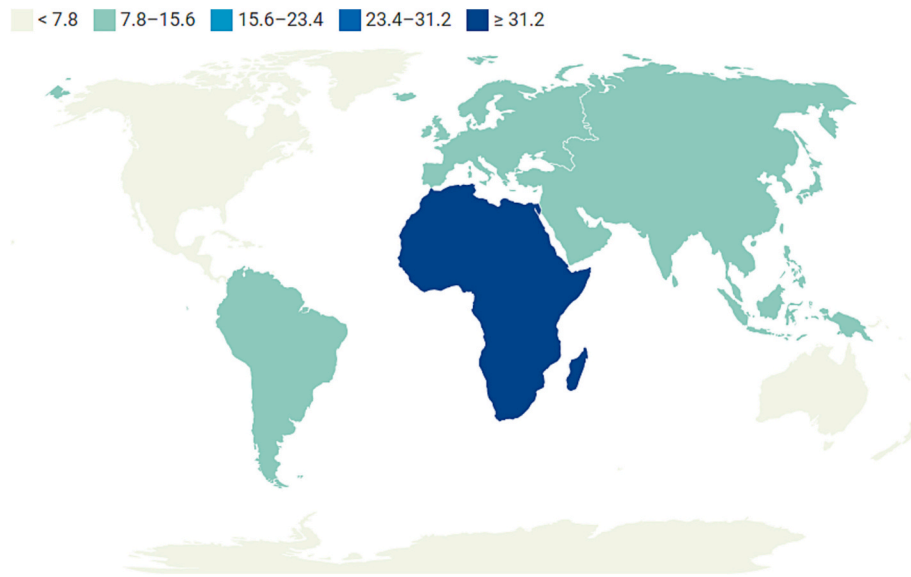


Fig. 6. Papers analyzed by region (%).

masculine norms prevail or to ensure that women's contributions are also valued in gendered societies, forgetting that the real goal is to carry out transformative actions that bring about a transformation of inequitable gender relations [100,107]. Another possible explanation of the failure of gender mainstreaming is the unwillingness of key actors to commit themselves to substantive gender equality goals and outcomes instead of integrating the gender perspective through bureaucratic processes [108]. Given that gender mainstreaming is incorporated into institutional structures that have traditionally supported male privilege and given that those bodies are themselves highly gendered, at this point the radical goals of gender mainstreaming end up becoming technocratic exercises [106]. However, despite all these criticisms, there is a certain reluctance to renounce the incorporation of gender mainstreaming due to its transformative, revolutionary potential [109] and understanding the barriers that have hindered its effectiveness is key to recommitting to radical social justice goals and the critical transformative potential of gender mainstreaming [106].

Given the concern of many feminists that mainstreaming in practice becomes a simple check box which does not favor a transformative approach that permits progress towards equality [97,100,103,104,105,110], Gains [72] suggests that to be effective in the political sphere gender impact assessment must: "i) Undertake an intersectional analysis and power analysis; ii) ensure capacity and capability in government to undertake gender impact assessment (otherwise it will become a 'tick-the-box' exercise); and iii) include expert views along with dialogue, formation of alliances, etc. to ensure that it does not become technocratic". Similarly, Hankivsky [99] argues that "gender mainstreaming should reconnect with feminist theory and intersectional understandings to move away from essentialist and technocratic tendencies in gender mainstreaming"; and Walby [100] suggests that "dialogue and deliberative democracy could be used to address gender in conjunction with other complex inequalities to move towards a more intersectional approach".

Impact assessments are a key tool to identify the potential impacts of proposed policies as well as a key component for gender mainstreaming [96], so to address the concerns of feminist scholars and harness the transformative potential of feminist theory it is important to expand knowledge and gender-sensitive quantitative tools that enable ex ante

assessments. This can open the doors to more informed decisions in the design phase of climate policies, so that they are inclusive and do not undermine social justice.¹⁴

3.2.6. Lack of integration of the feminist discourse

All this shows a lack of integration of the feminist discourse in climate policy research. Feminist theorists and academics have been theorizing for decades about the causes, consequences, and factors that have historically influenced the inequality suffered by women. It is quite remarkable that with the differences between sex and gender having been emphasized for so long, there are still studies in which the concepts are misused. It is equally striking that gender has not yet been fully integrated into analyses and that it continues to be treated as one more independent variable among many others.

Feminists have been pointing to factors, systems, experiences, and realities that perpetuate the oppression of women for centuries, but the androcentrism present in science seems to have prevented these theories and concepts from being deeply integrated into research for a long time [89,111]. This is the case, for example, of the concept of intersectionality. The concept was first coined by Crenshaw in 1990, but the foundations of intersectionality are marked in 1851 with Sojourner Truth's speech "Ain't I a Woman?" coinciding with the rise of black feminism in the United States [112]. But even so, our review shows that there are still very few papers that develop this concept and consciously apply this approach. Although some ideas based on these feminist theories are beginning to be introduced into academic literature and research, it is important to name them in gender-sensitive research, because naming typifies experiences and provides powerful, new language to describe components of identity for members of marginalized groups [113,114]. Therefore, one of the challenges in carrying out inclusive research is still the development of a deeper gender analysis where "empirical research is complemented by critical feminist theorizing of the discursive constructions and categories that shape climate politics today" [62]. The inclusion of the perspectives of gender advocates is also important to avoid stereotyped, paternalistic, Eurocentric ideas about gender equality and thus facilitate a context-based reflection on the quality of politics in terms of equality [115].

¹⁴ MacGregor [62] illustrates the problems which arise when policies are not informed by gender analysis.

3.2.7. Disconnect between political and academic discourse

There is also evidence of a disconnect between political and academic discourse in the field. For example, the universalization of gender mainstreaming as a concept and the continued recognition of the need to integrate it into policymaking in political organisms' contrasts with it's the absence of the concept in most of the academic studies analyzed. In addition, despite widespread criticism of the difficulty of integrating gender mainstreaming into policies in the transformative form proposed by feminists, academia has yet to provide an answer to this problem. Aware of the shortcomings in connecting science and politics, Gonda [86] highlights the need for scholars to "better engage in debates on climate change and gender, not only to draw attention to the urgent need for radical transformations in the way in which society faces climate change, but also to provide useful analytical tools that could feed into gender and climate change policy-making".

In this sense, a dynamic, sustainable relationship between science and policy is crucial if effective responses to climate change are to be developed [116,117,118,119]. There is an ongoing debate on how to design science-policy interfaces to develop knowledge-based policies that can transfer scientific outcomes to all phases of policymaking in the environmental governance field. However, recent studies have criticized the oversimplification of science-policy interactions in science-push and policy-pull models [120,121] and highlighted the potential of the co-production model as being "more likely to produce usable knowledge and develop effective policies through dynamic, interdependent relationships and collaborations between scientists and policymakers" [119,122,123,124,125,126].

4. Conclusions

This study provides the first systematic literature review to analyze the state of the art regarding the impacts of climate policies on inequality from a gender and equal opportunity perspective. The study confirms that this is an emerging area of research which has begun to generate interest in the academic field relatively recently. There is growing political and social interest that confirms the need to increase knowledge in the area.

The analysis of the papers included in the study has brought to light several knowledge and methodological gaps. First, there are few quantitative studies that seek to determine the scope of the impacts of climate policies from a gender perspective. This is closely linked to a lack of adequate methodologies and sex-disaggregated data. In future work it would be interesting to develop new methodologies that enable such quantitative studies to be conducted with a gender-sensitive approach. In addition, in those studies in which primary data is to be generated, that data should be disaggregated by gender and other social categories that help to integrate an intersectional approach in the analyses. Likewise, more studies should be developed on high income countries since there is a tendency to focus analyzes of climate change and gender almost exclusively on LMIC, which in the literature has been pointed out as a shortcoming in research that seeks to be gender-sensitive.

Second, there is a lack of integration of feminist theory and conceptualization into climate policy research. There is thus a need to include the feminist discourse and the gender perspective in an effective way in the analysis. To that end gender mainstreaming, in the transformative form proposed by radical feminists, must also break into academic circles, taking into account the intersections of different oppression and discriminations. It is also necessary to diversify the scope of studies and cease to contribute to the discourse that re-victimizes and highlights the vulnerability of women in the global south; research must be conducted in which all women have their own voice. In this sense, we agree with Gonda [86] that it is important to "leave behind the discourses behind the policies that reinforce gender roles and repoliticize the debate to challenge the power relations that oppress women and address issues of transformation, justice, and democratic climate governance".

Third, there is a lack of alignment between climate policy research and the needs of policymakers. International organizations have been emphasizing the need to introduce gender mainstreaming into environmental policy since the 1990s, but even today a lack of information and methodologies makes this task difficult. It is important for science to respond to political needs in a way that helps policymakers make well-informed decisions based on scientific knowledge, so as to continue moving towards a fair, inclusive net carbon economy. In this sense, it would be interesting to apply a co-production model in science-policy interactions in future research activities to generate more useful, more effective knowledge and methodologies for improving policy formulation processes.

In conclusion, if science wants to help generate knowledge that is useful in addressing some of the greatest challenges of the 21st century, such as the transition to a socioeconomic model that is more respectful with the ecological limits of the planet and gender equality, it is important to expand knowledge in the area studied here, reconnect with feminist theory, and correct the shortcomings and research gaps mentioned above in future work.

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CRediT authorship contribution statement

E. Alonso-Epelde: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **X. García-Muros:** Supervision, Validation. **M. González-Eguino:** Supervision, Validation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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Appendix A. Supplementary data

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References

- [1] I. Borza, *Review of the Implementation in the EU of Area K of the Beijing Platform for Action: Women and Environment*, 2012.
- [2] N. Mujere, Gendered Vulnerability and Adaptation to Climate Change, in: *Promoting Climate Change Awareness through Environmental Education*, 2016, pp. 171–184, <https://doi.org/10.4018/978-1-4666-8764-6.ch009>.
- [3] T. Cresswell, T.P. Uteng, *Gender Differences in the Influences of Urban Structure on Daily Travel*, Routledge, 2016, pp. 187–206.
- [4] F. Cristaldi, *Commuting and Gender in Italy: A Methodological Issue*, *The Professional Geographer* 57 (2005) 268–284, <https://doi.org/10.1111/j.0033-0124.2005.00477.x>.
- [5] V. Houillon, *Differences Between Men and Women in Commuting*, in: *The Case of the Nord-Pas-de-Calais Region (France)*, *Espace Populations Sociétés = Space Populations Societies*, 2004, pp. 143–149.

- [6] European Institute for Gender Equality (EU body or agency), Burkevica I. Review of the implementation in the EU of area K of the Beijing platform for action: women and the environment – gender equality and climate change: report, LU: Publications Office of the European Union, 2013.
- [7] S. Markkanen, A. Anger-Kraavi, Social impacts of climate change mitigation policies and their implications for inequality, *Climate Policy* 19 (2019) 827–844, <https://doi.org/10.1080/14693062.2019.1596873>.
- [8] S. Klinsky, H. Winkler, Correction to 'Building equity in: strategies for integrating equity into modelling for a 1.5 °C world', *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 376 (2018) 20180115 <https://doi.org/10.1098/rsta.2018.0115>.
- [9] D. Ürge-Vorsatz, S. Tirado-Herrero, N. Dubash, F. Lecocq, Measuring the Co-Benefits of Climate Change Mitigation, *Annual Review of Environment and Resources* 39 (2014) 549–582, <https://doi.org/10.1146/annurev-environ-031312-125456>.
- [10] C. von Stechow, D. McCollum, K. Riahi, J.C. Minx, E. Kriegler, D.P. van Vuuren, et al., Integrating Global Climate Change Mitigation Goals with Other Sustainability Objectives: A Synthesis, *Annual Review of Environment and Resources* 40 (2015) 363–394, <https://doi.org/10.1146/annurev-environ-021113-095626>.
- [11] J. Clancy, F. Ummer, I. Shakya, G. Kelkar, Appropriate gender-analysis tools for unpacking the gender-energy-poverty nexus, *Gender & Development* 15 (2007) 241–257, <https://doi.org/10.1080/13552070701391102>.
- [12] J.S. Clancy, M. Skutsch, S. Batchelor, Finding the energy to address gender concerns in development 24, 2003.
- [13] L. Bendlin, Women's human rights in a changing climate: highlighting the distributive effects of climate policies, *Cambridge Review of International Affairs* 27 (2014) 680–698, <https://doi.org/10.1080/09557571.2014.960507>.
- [14] B. Bhatta, A.K. Karna, O.P. Dev, O. Springate-Bagniski, Participatory Forest Management in the Nepalese Tarai: Policy, Practice and Impacts, Routledge, 2008, <https://doi.org/10.4324/9781849771399-18>.
- [15] L. Gomez-Echeverri, Climate and development: enhancing impact through stronger linkages in the implementation of the Paris Agreement and the Sustainable Development Goals (SDGs), *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 376 (2018) 20160444, <https://doi.org/10.1098/rsta.2016.0444>.
- [16] Isilda Nhandumbo MC. REDD+ for profit or for good? Review of private sector and NGO experience in REDD projects. International Institute for Environment and Development n.d. <https://www.iied.org/17570iied> (accessed March 20, 2023).
- [17] S. Klinsky, T. Roberts, S. Huq, C. Okereke, P. Newell, P. Dauvergne, et al., Why equity is fundamental in climate change policy research, *Global Environmental Change* 44 (2017) 170–173, <https://doi.org/10.1016/j.gloenvcha.2016.08.002>.
- [18] J. Rosenow, R. Platt, B. Flanagan, Fuel poverty and energy efficiency obligations – A critical assessment of the supplier obligation in the UK, *Energy Policy* 62 (2013) 1194–1203, <https://doi.org/10.1016/j.enpol.2013.07.103>.
- [19] D. Rocheleau, B. Thomas-Slayer, E. Wangari (Eds.), *Feminist Political Ecology: Global Issues and Local Experience*, Routledge, London, 1996, <https://doi.org/10.4324/9780203352205>.
- [20] European Parliament, Rio + 20 earth summit European Parliament resolution of 29 September 2011 on developing a common EU position ahead of the United Nations Conference on Sustainable Development (Rio + 20), 2011.
- [21] European Parliament, Women and climate change European Parliament resolution of 20 April 2012 on women and climate change (2011/2197(INI)), 2012.
- [22] European Parliament, Role of women in the green economy European Parliament resolution of 11 September 2012 on the role of women in the green economy (2012/2035(INI)), 2012.
- [23] EIGE, *Gender in environment and climate change*, 2017.
- [24] G. Allwood, *Gender Mainstreaming and EU Climate Change Policy*, Rowman & Littlefield, 2017.
- [25] D. Moher, A. Liberati, J. Tetzlaff, D.G. Altman, T.P. Group, Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement, *PLOS Medicine* 6 (2009) e1000097, <https://doi.org/10.1371/journal.pmed.1000097>.
- [26] H. Cooper, L.V. Hedges, *The Handbook of Research Synthesis*, Russell Sage Foundation, 1993.
- [27] D. Gough, J. Thomas, S. Oliver, Clarifying differences between review designs and methods, *Systematic Reviews* 1 (2012) 28, <https://doi.org/10.1186/2046-4053-1-28>.
- [28] K.A. Babatunde, R.A. Begum, F.F. Said, Application of computable general equilibrium (CGE) to climate change mitigation policy: A systematic review, *Renewable and Sustainable Energy Reviews* 78 (2017) 61–71, <https://doi.org/10.1016/j.rser.2017.04.064>.
- [29] L. Berrang-Ford, T. Pearce, J.D. Ford, Systematic review approaches for climate change adaptation research, *Regional Environmental Change* 15 (2015) 755–769, <https://doi.org/10.1007/s10113-014-0708-7>.
- [30] D. Medina Hidalgo, P.D. Nunn, H. Beazley, Challenges and opportunities for food systems in a changing climate: A systematic review of climate policy integration, *Environmental Science & Policy* 124 (2021) 485–495, <https://doi.org/10.1016/j.envsci.2021.07.017>.
- [31] C. Peñasco, L.D. Anadón, E. Verdolini, Systematic review of the outcomes and trade-offs of ten types of decarbonization policy instruments, *Nature Climate Change* 11 (2021) 257–265, <https://doi.org/10.1038/s41558-020-00971-x>.
- [32] T.N. Sequeira, M.S. Santos, Renewable energy and politics: A systematic review and new evidence, *Journal of Cleaner Production* 192 (2018) 553–568, <https://doi.org/10.1016/j.jclepro.2018.04.190>.
- [33] R. Sud, A. Mishra, N. Varma, S. Bhadwal, Adaptation policy and practice in densely populated glacier-fed river basins of South Asia: a systematic review, *Regional Environmental Change* 15 (2015) 825–836, <https://doi.org/10.1007/s10113-014-0711-z>.
- [34] S. Kundu, M.E. Kabir, E.A. Morgan, P. Davey, M. Hossain, Building Coastal Agricultural Resilience in Bangladesh: A Systematic Review of Progress, Gaps and Implications, *Climate* 8 (2020) 98, <https://doi.org/10.3390/cli8090098>.
- [35] R.M. Sahahiri, A.L. Griffin, Q. Sun, (Chayn), Investigating Ecotourism Opportunities Measurements in a Complex Adaptive System: A Systematic Literature Review, *Sustainability* 15 (2023) 2678, <https://doi.org/10.3390/su15032678>.
- [36] C. Wohlin, Guidelines for snowballing in systematic literature studies and a replication in software engineering, in: Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering, Association for Computing Machinery, New York, NY, USA, 2014, pp. 1–10, <https://doi.org/10.1145/2601248.2601268>.
- [37] OXFAM Australia, *Balancing the Scales: Using Gender Impact Assessment in Hydropower Development*, 2013.
- [38] A.G. Powell, M. Chitanava, N. Tsikvadze, N. Gaprindashvili, D. Keshelava, M. Lobjanidze, Gender impact assessment of the state programme Plant the Future, 2020.
- [39] F. Adusah-Poku, K. Takeuchi, Determinants and welfare impacts of rural electrification in Ghana, *Energy for Sustainable Development* 52 (2019) 52–62, <https://doi.org/10.1016/j.esd.2019.07.004>.
- [40] I. Fofana, Gender analysis of the policy responses to high oil prices: a case study of South Africa, *Fem. Econ.* 21 (2015) 216–240, <https://doi.org/10.1080/13545701.2015.1023330>.
- [41] T. Kabera, H. Nishimwe, I. Imanantirenganya, M.K. Mbonyi, Impact and effectiveness of Rwanda's National Domestic Biogas programme, *International Journal of Environmental Studies* 73 (2016) 402–421, <https://doi.org/10.1080/00207233.2016.1165480>.
- [42] J. Lee, A. Martin, P. Kristjanson, E. Wollenberg, Implications on equity in agricultural carbon market projects: a gendered analysis of access, decision making, and outcomes, *Environment and Planning A* 47 (2015) 2080–2096, <https://doi.org/10.1177/0308518X15595897>.
- [43] C. Miyoshi, P. Rietveld, Measuring the equity effects of a carbon charge on car commuters: A case study of Manchester Airport, *Transportation Research Part D: Transport and Environment* 35 (2015) 23–39, <https://doi.org/10.1016/j.trd.2014.11.016>.
- [44] A. Owen, J. Barrett, Reducing inequality resulting from UK low-carbon policy, *Climate Policy* 20 (2020) 1193–1208, <https://doi.org/10.1080/14693062.2020.1773754>.
- [45] D. Raha, P. Mahanta, M.L. Clarke, The implementation of decentralised biogas plants in Assam, NE India: The impact and effectiveness of the National Biogas and Manure Management Programme, *Energy Policy* 68 (2014) 80–91, <https://doi.org/10.1016/j.enpol.2013.12.048>.
- [46] L. Schweitzer, *The Empirical Research on the Social Equity of Gas Taxes, Emissions Fees, and Congestion Charges*, Transportation Research Board Special Report 303 (2009) 1–26.
- [47] G. Sime, G. Tilahun, M. Kebede, Assessment of biomass energy use pattern and biogas technology domestication programme in Ethiopia, *African Journal of Science, Technology, Innovation and Development* 12 (2020) 747–757, <https://doi.org/10.1080/20421338.2020.1732595>.
- [48] S. Akter, C. Pratap, Impact of clean cooking fuel adoption on women's welfare in India: the mediating role of women's autonomy, *Sustainability Science* 17 (2022) 243–257, <https://doi.org/10.1007/s11625-021-01069-9>.
- [49] A. Sauer, I. Stieß, Accounting for gender in climate policy advice: adapting a gender impact assessment tool to issues of climate change, *Impact Assessment and Project Appraisal* 39 (2021) 262–273, <https://doi.org/10.1080/14615517.2021.1904710>.
- [50] E. Bryan, Q. Bernier, M. Espinal, C. Ringler, Making climate change adaptation programmes in sub-Saharan Africa more gender responsive: insights from implementing organizations on the barriers and opportunities, *Climate and Development* 10 (2018) 417–431, <https://doi.org/10.1080/17565529.2017.1301870>.
- [51] E.L. Ampaire, M. Acosta, S. Huyer, R. Kigonya, P. Muchunguzi, R. Muna, et al., Gender in climate change, agriculture, and natural resource policies: insights from East Africa, *Climatic Change* 158 (2020) 43–60, <https://doi.org/10.1007/s10584-019-02447-0>.
- [52] C. Doss, Collecting Sex Disaggregated Data to Improve Development Policies, *Journal of African Economies* 23 (2014) i62–i86, <https://doi.org/10.1093/jae/ejt023>.
- [53] S. Huyer, V. Chao, A. Towle, J. Baumwoll, Gender Equality in National Climate Action: Planning for Gender-Responsive Nationally Determined Contributions, 2016.
- [54] F. Jing, A challenge in addressing gender inequalities - the lack of gender-disaggregated data, *Sustainable Mountain Development* (2010) 23–25.
- [55] G. Johnson-Latham, A. Kronsell, Promoting a gender agenda in climate and sustainable development: A civil servant's narrative, in: *Gender, Intersectionality and Climate Institutions in Industrialised States*, Routledge, 2021, pp. 69–85.
- [56] C. Jost, F. Kyazze, J. Naab, S. Neelormi, J. Kinyangi, R. Zougmore, et al., Understanding gender dimensions of agriculture and climate change in smallholder farming communities, *Climate and Development* 8 (2016) 133–144, <https://doi.org/10.1080/17565529.2015.1050978>.

- [57] J.K. Musango, A.M. Bassi, Towards a Systemic Assessment of Gendered Energy Transition in Urban Households, *Energies* 14 (2021) 7251, <https://doi.org/10.3390/en14217251>.
- [58] M. Verloo, E. Lombardo, Contested Gender Equality and Policy Variety in Europe: Introducing a Critical Frame Analysis Approach, in: M. Verloo (Ed.), *Multiple Meanings of Gender Equality*, Central European University Press, 2007, pp. 19–50, <https://doi.org/10.1515/9786155211393-005>.
- [59] T. Khan, S. Abimbola, C. Kyobutungi, M. Pai, How we classify countries and people—and why it matters, *BMJ Global Health* 7 (2022) e009704, <https://doi.org/10.1136/bmjgh-2022-009704>.
- [60] N.J. Chalifour, A Feminist Perspective on Carbon Taxes, *Canadian Journal of Women and the Law* 22 (2010) 169–212, <https://doi.org/10.3138/cjwl.22.1.169>.
- [61] M. Feenstra, G. Özerol, Energy justice as a search light for gender-energy nexus: Towards a conceptual framework, *Renewable and Sustainable Energy Reviews* 138 (2021) 110668, <https://doi.org/10.1016/j.rser.2020.110668>.
- [62] S. MacGregor, 'Gender and climate change': from impacts to discourses, *Journal of the Indian Ocean Region* 6 (2010) 223–238, <https://doi.org/10.1080/19480881.2010.536669>.
- [63] K. Lahiri-Dutt, Digging women: towards a new agenda for feminist critiques of mining, *Gender, Place & Culture* 19 (2012) 193–212, <https://doi.org/10.1080/0966369X.2011.572433>.
- [64] S. Cho, K.W. Crenshaw, L. McCall, Towards a Field of Intersectionality Studies: Theory, Applications, and Praxis, *Signs: Journal of Women in Culture and Society* 38 (2013) 785–810, <https://doi.org/10.1086/669608>.
- [65] K.W. Crenshaw, Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color, in: *The Public Nature of Private Violence*, Routledge, 1994.
- [66] K. Davis, Intersectionality as buzzword: A sociology of science perspective on what makes a feminist theory successful, *Feminist Theory* 9 (2008) 67–85, <https://doi.org/10.1177/1464700108086364>.
- [67] H. Djoudi, B. Locatelli, C. Vaast, K. Asher, M. Brockhaus, Sijapati B. Basnett, Beyond dichotomies: Gender and intersecting inequalities in climate change studies, *Ambio* 45 (2016) 248–262, <https://doi.org/10.1007/s13280-016-0825-2>.
- [68] A. Kaijser, A. Kronsell, Climate change through the lens of intersectionality, *Environmental Politics* 23 (2014) 417–433, <https://doi.org/10.1080/09644016.2013.835203>.
- [69] N. Götzmann, N. Bainton, Embedding gender-responsive approaches in impact assessment and management, *Impact Assessment and Project Appraisal* 39 (2021) 171–182, <https://doi.org/10.1080/14615517.2021.1904721>.
- [70] A.-M. Hancock, Intersectionality as a Normative and Empirical Paradigm, *Politics & Gender* 3 (2007) 248–254, <https://doi.org/10.1017/S1743923X07000062>.
- [71] C. Bretherton, Global environmental politics: putting gender on the agenda? *Review of International Studies* 24 (1998) 85–100, <https://doi.org/10.1017/S026210598000850>.
- [72] F. Gains, Gender and regulatory impact assessment, in: *Handbook of Regulatory Impact Assessment*, 2016, pp. 142–154.
- [73] M. Gay-Antaki, "Now We Have Equality": A Feminist Political Ecology Analysis of Carbon Markets in Oaxaca, Mexico, *Journal of Latin American Geography* 15 (2016) 49–66, <https://doi.org/10.1353/lag.2016.0030>.
- [74] O.I. Nnadi, J.G. Lyimo, E.T. Liwenga, M.C. Madukwe, Equity and implications of response strategies on gender relations: Identifying ways of mainstreaming gender into response strategies in Southeast Nigeria, *Environmental Development* 39 (2021) 100618, <https://doi.org/10.1016/j.envdev.2021.100618>.
- [75] M. Khadka, S. Karki, B.S. Karki, R. Kotru, K.B. Darjee, Gender Equality Challenges to the REDD Initiative in Nepal, *Mred* 34 (2014) 197–207, <https://doi.org/10.1659/MRD-JOURNAL-D-13-00081.1>.
- [76] O.W. Johnson, J.Y.-C. Han, A.-L. Knight, S. Mortensen, M.T. Aung, M. Boyland, et al., Intersectionality and energy transitions: A review of gender, social equity and low-carbon energy, *Energy Research & Social Science* 70 (2020) 101774, <https://doi.org/10.1016/j.erss.2020.101774>.
- [77] Y. Huang, B. Huang, J. Song, X. Xu, X. Chen, Z. Zhang, et al., Social impact assessment of photovoltaic poverty alleviation program in China, *Journal of Cleaner Production* 290 (2021) 125208, <https://doi.org/10.1016/j.jclepro.2020.125208>.
- [78] C. Epstein, *The Power of Words in International Relations: Birth of an Anti-Whaling Discourse*, MIT Press, 2008.
- [79] K.J. Warren, *Ecological Feminism*, 1994.
- [80] S. Lukes, *Power: A Radical View*, London, 1974.
- [81] A. Kelly, The Construction of Masculine Science, *British Journal of Sociology of Education* 6 (1985) 133–154, <https://doi.org/10.1080/0142569850060201>.
- [82] T.S. Kuhn, *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago, IL, 1962.
- [83] S.G. Harding, *The Science Question in Feminism*, Cornell University Press, 1986.
- [84] E.F. Keller, Feminism and Science, *Signs: Journal of Women in Culture and Society* 7 (1982) 589–602, <https://doi.org/10.1086/493901>.
- [85] R. Bleier, *The Cultural Price of Social Exclusion: Gender and Science*, *NWSA Journal* 1 (1988) 7–19.
- [86] N. Gonda, Re-politicizing the gender and climate change debate: The potential of feminist political ecology to engage with power in action in adaptation policies and projects in Nicaragua, *Geoforum* 106 (2019) 87–96, <https://doi.org/10.1016/j.geoforum.2019.07.020>.
- [87] E. Colombo, P. Rebughini, Intersectionality and beyond, *Rassegna Italiana di Sociologia* (2016), <https://doi.org/10.1423/84373>.
- [88] S. MacGregor, Only Resist: Feminist Ecological Citizenship and the Post-politics of Climate Change, *Hypatia* 29 (2014) 617–633, <https://doi.org/10.1111/hypa.12065>.
- [89] J. Nagel, Intersecting identities and global climate change, *Identities* 19 (2012) 467–476, <https://doi.org/10.1080/1070289X.2012.710550>.
- [90] J. Nagel, *Gender and Climate Change: Impacts, Science, Policy*, Routledge, 2015.
- [91] Sultana F. Gendering, Climate Change, Geographical Insights, *The Professional Geographer* 66 (2014) 372–381, <https://doi.org/10.1080/00330124.2013.821730>.
- [92] P. Tschakert, M. Machado, Gender Justice and Rights in Climate Change Adaptation: Opportunities and Pitfalls, *Ethics Soc. Welf.* 6 (2012) 275–289, <https://doi.org/10.1080/17496535.2012.704929>.
- [93] N. Bainton, D. McDougall, Unequal lives in the Western Pacific. *Unequal lives: Gender, race and class in the Western Pacific*, 2021, pp. 1–46.
- [94] G. Alber (Ed.), *Gender and climate change policy. Population dynamics and climate change*, United Nations Population Fund [u.a.], New York, NY, 2010, p. 149.
- [95] K. O'Brien, Global environmental change II: From adaptation to deliberate transformation, *Progress in Human Geography* 36 (2012) 667–676, <https://doi.org/10.1177/0309132511425767>.
- [96] G. Allwood, Mainstreaming Gender and Climate Change to Achieve a Just Transition to a Climate-Neutral Europe, *JCMS: Journal of Common Market Studies* 58 (2020) 173–186, <https://doi.org/10.1111/jcms.13082>.
- [97] S. Arora-Jonsson, Forty years of gender research and environmental policy: Where do we stand? *Women's Studies International Forum* 47 (2014) 295–308, <https://doi.org/10.1016/j.wsif.2014.02.009>.
- [98] T. Davids, F. van Driel, F. Parren, Feminist Change Revisited: Gender Mainstreaming as Slow Revolution, *Journal of International Development* 26 (2014) 396–408, <https://doi.org/10.1002/jid.2945>.
- [99] O. Hankivsky, Gender vs., Diversity Mainstreaming: A Preliminary Examination of the Role and Transformative Potential of Feminist Theory, *Canadian Journal of Political Science/Revue Canadienne de Science Politique* 38 (2005) 977–1001, <https://doi.org/10.1017/S0008423905040783>.
- [100] S. Walby, Gender Mainstreaming: Productive Tensions in Theory and Practice, *Social Politics: International Studies in Gender, State & Society* 12 (2005) 321–343, <https://doi.org/10.1093/sp/jxi018>.
- [101] S. Acker, Feminist theory and the study of gender and education, *International Review of Education* 33 (1987) 419–435, <https://doi.org/10.1007/BF00615157>.
- [102] S. Arora-Jonsson, B.B. Sijapati, Disciplining Gender in Environmental Organizations: The Texts and Practices of Gender Mainstreaming, *Gender, Work & Organization* 25 (2018) 309–325, <https://doi.org/10.1111/gwao.12195>.
- [103] L. Chappell, R. Guerrina, Understanding the gender regime in the European External Action Service, *Cooperation and Conflict* 55 (2020) 261–280, <https://doi.org/10.1177/0010836719895296>.
- [104] F. Porter, C. Sweetman, *Mainstreaming Gender in Development: A Critical Review*, Oxfam, 2005.
- [105] M. Zalewski, 'I don't even know what gender is': a discussion of the connections between gender, gender mainstreaming and feminist theory, *Review of International Studies* 36 (2010) 3–27, <https://doi.org/10.1017/S026210509990489>.
- [106] M. Alston, Gender mainstreaming and climate change, *Women's Studies International Forum* 47 (2014) 287–294, <https://doi.org/10.1016/j.wsif.2013.01.016>.
- [107] M. Daly, Gender Mainstreaming in Theory and Practice, *Social Politics: International Studies in Gender, State & Society* 12 (2005) 433–450, <https://doi.org/10.1093/sp/jxi023>.
- [108] P. Meier, K. Celis, Sowing the Seeds of Its Own Failure: Implementing the Concept of Gender Mainstreaming, *Social Politics: International Studies in Gender, State & Society* 18 (2011) 469–489, <https://doi.org/10.1093/sp/jxr020>.
- [109] I. Lessa, C. Rocha, Food security and gender mainstreaming: Possibilities for social transformation in Brazil, *International Social Work* 55 (2012) 337–352, <https://doi.org/10.1177/0020872811418994>.
- [110] A. Rao, J. Sandler, D. Kelleher, C. Miller, *Gender at Work: Theory and Practice for 21st Century Organizations*, Routledge, 2015.
- [111] U. Röhr, M. Spitzner, E. Stiefel, U. Winterfeld, v., Gender justice as the basis for sustainable climate policies. In *A feminist background paper*, German NGO Forum Environment and Development, Bonn, 2008.
- [112] A. Brah, A. Phoenix, Ain't I A Woman? Revisiting Intersectionality, *Journal of International Women's Studies* 5 (2013) 75–86.
- [113] S. Harding, Subjectivity, Experience and Knowledge: An Epistemology from/for Rainbow Coalition Politics, *Development and Change* 23 (1992) 175–193, <https://doi.org/10.1111/j.1467-7660.1992.tb00461.x>.
- [114] J. Moore, Reconsidering Childfreedom: A Feminist Exploration of Discursive Identity Construction in Childfree LiveJournal Communities, *Women's Studies in Communication* 37 (2014) 159–180, <https://doi.org/10.1080/07491409.2014.909375>.
- [115] P. Debusscher, Analyzing European gender equality policies abroad: A reflection on methodology, *European Journal of Women's Studies* 23 (2016) 265–280, <https://doi.org/10.1177/1350506815593960>.
- [116] A.T. Bednarek, C. Wyborn, C. Cvitanovic, R. Meyer, R.M. Colvin, P.F.E. Addison, et al., Boundary spanning at the science-policy interface: the practitioners' perspectives, *Sustainability Science* 13 (2018) 1175–1183, <https://doi.org/10.1007/s11625-018-0550-9>.
- [117] J.G. Hering, Do we need "more research" or better implementation through knowledge brokering? *Sustainability Science* 11 (2016) 363–369, <https://doi.org/10.1007/s11625-015-0314-8>.

- [118] P. Quevauviller, P. Balabanis, C. Fragakis, M. Weydert, M. Oliver, A. Kaschl, et al., Science-policy integration needs in support of the implementation of the EU Water Framework Directive, *Environmental Science & Policy* 8 (2005) 203–211, <https://doi.org/10.1016/j.envsci.2005.02.003>.
- [119] L.E. van Kerkhoff, L. Lebel, Coproductive capacities: rethinking science-governance relations in a diverse world, *Ecology and Society* 20 (2015).
- [120] C.J. Kirchoff, M. Carmen Lemos, S. Dessai, Actionable Knowledge for Environmental Decision Making: Broadening the Usability of Climate Science, *Annual Review of Environment and Resources* 38 (2013) 393–414, <https://doi.org/10.1146/annurev-environ-022112-112828>.
- [121] R. van Stigt, P.P.J. Driessen, T.J.M. Spit, A user perspective on the gap between science and decision-making. Local administrators' views on expert knowledge in urban planning, *Environmental Science & Policy* 47 (2015) 167–176, <https://doi.org/10.1016/j.envsci.2014.12.002>.
- [122] M. Eroğlu, A.Ö. Erbil, Appraising science-policy interfaces in local climate change policymaking: Revealing policymakers' insights from Izmir Development Agency, Turkey, *Environmental Science & Policy* 127 (2022) 48–56, <https://doi.org/10.1016/j.envsci.2021.09.022>.
- [123] M.C. Lemos, B.J. Morehouse, The co-production of science and policy in integrated climate assessments, *Global Environmental Change* 15 (2005) 57–68, <https://doi.org/10.1016/j.gloenvcha.2004.09.004>.
- [124] A.M. Meadow, D.B. Ferguson, Z. Guido, A. Horangic, G. Owen, T. Wall, Moving towards the Deliberate Coproduction of Climate Science Knowledge, *Weather, Climate, and Society* 7 (2015) 179–191, <https://doi.org/10.1175/WCAS-D-14-00050.1>.
- [125] T.U. Wall, A.M. Meadow, A. Horganic, Developing Evaluation Indicators to Improve the Process of Coproducing Usable Climate Science, *Weather, Climate, and Society* 9 (2017) 95–107, <https://doi.org/10.1175/WCAS-D-16-0008.1>.
- [126] K. Wan, S. Shackley, R.M. Doherty, Z. Shi, P. Zhang, N. Golding, Science-policy interplay on air pollution governance in China, *Environmental Science & Policy* 107 (2020) 150–157, <https://doi.org/10.1016/j.envsci.2020.03.003>.