



## Review

## Critical mapping of the energy-gender nexus: From “sex disaggregation” to “doing gender equality”

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## ABSTRACT

Existing energy research is frequently criticised for its lack of gender sensitivity and for reproducing masculine biases. While literature exploring energy and gender is growing, there remains a significant gap in understanding how these fields precisely interact. Exploring this intersection is important to advance the agenda for gender equality in energy research, policy and practice. This article presents a systematic review of papers published on the topic from 1991 to 2021, employing a novel two-stage interdisciplinary approach: a quantitative bibliometric mapping of literature, concepts, and methods, followed by a qualitative analysis of selected studies through a critical gender lens.

The results reveal that while publications are increasing, the field is dominated by quantitative methods and often treats gender as synonymous with biological sex, failing to engage with critical gender theories. Importantly, the review highlights that energy-gender research is often conducted by scholars with limited engagement with gender theory, leading to research that frequently reinforces, rather than challenges, gender stereotypes. A small number of studies adopting feminist or queer perspectives illustrate how alternative theories of gender can enrich energy research. Considering these limitations, we argue for the advancement of a transformative energy agenda by shifting from analyzing sex-disaggregated data to “doing gender equality”. We conclude with eight procedural and thematic recommendations, including the necessity of interdisciplinary teams that include gender scholars, the adoption of qualitative methods to capture lived experiences, and a commitment to challenging gender stereotypes and incorporating alternative gender theories within energy research.

## 1. Introduction

The call to achieve gender equality *in* and *through* energy policy, practice, and research is increasingly being acknowledged globally [1]. International organisations have called for the inclusion of women and girls in various domains of energy related decision-making [2,3] and this

is often supported by arguments that access to clean energy empowers these individuals [4]. However, this discourse often constructs women as “vulnerable and virtuous in relation to the environment”, being simultaneously presented as both the victims of climate change and the protectors of the planet [4]. Such stereotypical constructions of women stem not only from a lack of gendered knowledge and research in the

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energy sector [5], but also, and importantly, from the nature of the research that does exist. Both will be a focus of this paper.

In terms of the existing knowledge base, to date scholars have explored the gendered nature of energy poverty [6,7], energy transitions [8], energy systems [9], and energy justice [5], among other topics. Ryan's [10] review of gender and energy literature shows four emerging research agendas: eliminating indoor air pollution; strengthening community resource management; developing feminist energy jurisprudence; and increasing women's representation in STEM and energy fields. In terms of the nature of the research, Cannon and Chu's [11] review highlights the limitations, and the need for a transversal approach through: engendering an epistemic community; using innovative methodological approaches; and calling for radical societal visions through mobilization and activism.

More recently, Caretta and Vela-Almeida [12] review feminist research on just energy transitions and call for explicit attention to structural issues around labour and social reproduction. A review by Cellini et al. [13] further argues that gender issues cut across multiple dimensions of energy transitions — not just access or employment, but also perceptions, knowledge/awareness, health, empowerment, social behaviour, and transitions to modern energy. Frank et al. [14] also identify the need to go beyond binary conceptualisation of gender, moving towards normative or transformative knowledges, and tackling other Sustainable Development Goals along with SDG 5 on gender equality. Similarly, Üstündağlı Erten et al. [15] argue that interventions in energy systems (SDG 7) affecting gender concerns can sometimes produce adverse effects on existing gender structures or modify structures without immediate benefits.

This article contributes to this literature by reviewing various ways of “doing gender” in energy research through a critical gender lens. Conventionally, gendered energy research has often gone little further than analysis of data disaggregated by (biological) sex. While such disaggregation is an important initial step to understand any differential impact, or the *who*, without a gender analysis exploring *why* these differences exist and *how* they might be addressed, research can serve to reinforce gender stereotypes rather than challenge them [1,11].

Literature around fuel for cookstoves provides a clear example. Research has highlighted the disproportionate health impacts on women as the ones who spend most time in the kitchen and are thus most exposed to harms. Yet rather than questioning why women are the ones doing all the cooking or are confined to the house, the focus has been to develop cleaner energy technologies, enabling women to perform their socially assigned role more efficiently. In this way, both research and related policy and practice risk reinforcing gender roles without advancing gender equality that interventions such as clean cookstoves are meant to achieve.

Bradshaw [1] has thus argued the need to move past data disaggregation, to “doing gender equality” in energy policy, practice, and research. This means exploring gendered differences rather than merely noting them and undertaking gendered analysis rather than just disaggregating data; and this demands gendered knowledge. Gender is both an academic field of inquiry, a learnt discipline like any other, and a lived reality. However, it is often assumed that, as we are all gendered beings, we can all undertake gendered analysis. Bradshaw [1] emphasizes the importance of considering who is, and as importantly, who is not involved in constructing gendered knowledge. Without a gender scholar involved in research collaborations the nuances of a gendered analysis may be lost.

In responding to the call for “doing gender” in energy research, this review investigates the literature at the nexus of energy, sex, and gender through a novel, interdisciplinary approach. First, it adopts a bibliometric method as opposed to narrative [16,17] or scientometric [18] review. By searching across multiple databases and disciplines [19], the review maps the variety of ideas, concepts, and methods explored in both energy and gender literature. Second, it applies a critical gender lens to the research that does exist, and through including gender

scholars in the analysis of the literature, it explores the nature of the existing knowledge. By way of contributing to both gender studies and energy studies, this research is guided by the following questions:

- How does the established energy literature report on gender, and what are the connections and key concepts within it? How have terms and ideas propagated/established themselves over time within energy literature?
- How does the established gender literature address energy, and what are the connections and key concepts within it? How have terms and ideas propagated/established themselves over time in gender literature?

The article proceeds by first presenting the methodology used for conducting this literature review (Section 2), providing a background of the existing knowledge base on the topic by presenting statistical summary analysis of the metadata (Section 3.1), analyzing gender-related concepts and methodological content (Section 3.2), and showing how gender and energy studies intersect with one another (Section 3.3). We then investigate various topics explored in the existing literature (Section 4). Finally, this review summarises key findings (Section 5) and provides suggestions for further procedural and thematic avenues for doing gender equality *in* and *through* energy research (Section 6).

## 2. Methodology

This project took a novel two stage approach to the review of literature. The first stage was undertaken by the scientists on the team and involved a bibliometric review [20,21] of the literature at the intersection of energy, sex, and gender, involving quantitative analysis to explore the statistics related to publication source (i.e. journals, authors and geographic regions), and qualitative analysis focused on gender terms, methods applied, and whether the papers relate to how energy sees gender or vice versa. This analysis focussed on the *where* and the *what* of gender inclusion in existing studies. The second stage saw the gender scholars on the team analyse the findings from the bibliometric review and undertake further analysis of key publications with a critical gender lens, to explore *how* gender has been included in existing studies and what that tells us about the existing gendered knowledge base. Based on the cluster maps generated in the first stage of analysis and a review of all paper titles and abstracts, publications that explored core concepts and were highly cited were identified. We chose the top two most cited papers within each cluster for in-depth analysis to identify and signpost trends in the literature. Additionally, we included publications that explicitly used a critical gender lens, even though they were not the most cited papers within the database, to ensure developments in the field were examined through a critical gender lens.

We now explain the review process which employed bibliometric mapping techniques, rather than evaluative techniques, to represent “the dynamic and structural features of scientific works and development” [21]. The detailed protocol followed to undertake the systematic review is elaborated in the following sections, also available on OSF projects [19]. By publishing protocol and databases on OSF projects, we aim to make the review process transparent and resultant data openly accessible.

### 2.1. Information sources

The literature search was carried out in three electronic databases: Web of Science (WoS), Scopus and International Bibliography of Social Sciences (IBSS). While WoS and Scopus cover both social and natural sciences, IBSS provided additional publications within social studies — including the grey literature published in magazines, conference proceedings, research reports, and policy briefs. We searched for literature published from 1991 until 2021, to keep the focus on developments in the field in recent decades.

## 2.2. Search strategy

To identify literature at the nexus of energy, sex, and gender, across a variety of disciplines, this review aimed to avoid discipline-specific language in the search strategy. To include multiple intersecting social identities, we used multiple sex-based and gender-based identity categories. Likewise, given that energy is a multidisciplinary field of studies, we used various sources of energy, and energy-related terminology to capture varied literature. Table 1 shows the search terms used and an example search strategy.

## 2.3. Selection process

The datasets resulting from the WoS, Scopus, and IBSS search engines were combined into a single comma separated file. Only common metadata entries were retained – including ‘Title, Abstract, Authors, Affiliations, Author Keywords, Cited by, Volume, Issue, Year, Publisher, Link, DOI, Index Keywords, Document Type, and Source Title’. Duplicates were removed from the combined comma separated file. To further narrow the dataset, we removed papers published from 1991 to 2017 that have been cited less than two times, keeping with the aim of this research to draw out larger trends in literature than identify specific examples of good or bad studies. We chose to keep papers published from 2018 onwards, but cited less than two times, to account for citation lag. Since the IBSS export function does not provide meta-data related to the number of times the paper has been cited, we included all papers irrespective of how many times they have been cited. Lastly, we removed non-relevant papers, such as those related to insects and animals, from the resulting database by manually reading the titles and abstracts. A total of 2949 final data entries were retained.

## 2.4. Data synthesis

The data was analysed using quantitative methods, word search and clustering techniques using R and VOS (“visualisation of similarities”) Viewer [22]. For quantitative analysis, graphs were produced to rank

journals and authors as per the number of publications across years, the regional focus explored in the literature, and the changing use of gender-related terms throughout the last three decades. We used R & Excel to generate graphs for quantitative synthesis.

Word cluster analysis was done using VOS Viewer, which produces a network map of terms appearing in titles and abstracts, and clusters them with respect to how many times they appear with each other in a single document. A generic network map of all 2949 papers was generated using terms from titles and abstracts. The overall database of literature was divided into nine subgroups using gender and energy glossary as described in Table 2 and Table 3. Each of the resulting clusters were analysed separately. Subsequently, we produced VOS Viewer maps for subgroups of the literature. The detailed protocols and resulting databases are available on OSF projects [19].

## 2.5. Review and analysis

While metrics matter, that an article has been highly cited does not, in itself, make it ‘good’ research. It is important to explore not just *if* gender has been considered, but *how* gendered approaches are incorporated into research.

Recognising the subjectivity of any one person or team of people undertaking a gendered analysis of published research in this way, this study used an established research approach to guide the process. It utilised a study commissioned to explore the gendered outputs/outcomes of research generated by a UKRI funding scheme [23]. The Systematic review/Evidence synthesis of the outputs generated under this scheme was used to construct a typology of gender inclusion in research projects.

Before discussing the typology of where and how gender was included in the scheme, it is important to note that the Systematic review also revealed gendered aspects that were not included, and also, importantly, *who* was not included, highlighting the importance of recognising silences [24]. The Systematic review found that some key gender scholars had not received funding under the scheme. Their omission was not due to their proposals not being funded but due to

**Table 1**  
Search terms and strategy.

|         | Sex and gender                                                                                                                                                | Energy                                                                         |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Concept | Sex and gender                                                                                                                                                | Sources of energy and social dimensions of energy                              |
| Search  | “Sex” OR “Female*” OR “Male*” OR “Intersex” OR “*Gender*” OR “Man” OR                                                                                         | “Renewable Energy” OR “Clean energy” OR “Wind Power” OR “Eolic Energy” OR      |
| items   | “Men” OR “Woman” OR “Women” OR “Boy” OR “Boys” OR “Girl” OR “Girls” OR                                                                                        | “Wind Energy” OR “Wind Turbine” OR “Solar Energy” OR “Photovoltaic*” OR        |
|         | “Queer” OR “Non-binary” OR “Two spirit” OR “Bigender” OR “Transgender” OR                                                                                     | “PV system” OR “Solar Thermal” OR “Solar Generation” OR “Solar Concentrat*”    |
|         | “Agender” OR “Gender fluid” OR “Gender Nonconforming”                                                                                                         | OR “Solar Heater*” OR “Solar cool*” OR “Solar dry*” OR “Solar drie*” OR “Solar |
|         |                                                                                                                                                               | dehyd*” OR “Solar desal*” OR “Hydropower” OR “Hydroenergy” OR “Hydraulic       |
|         |                                                                                                                                                               | Generation” OR “Hydraulic Energy” OR “Geothermal Energy” OR “Geotherm*”        |
|         |                                                                                                                                                               | OR “Minihydr*” OR “Bioenergy” OR “Biofuel” OR “Biogas” OR “Biodiesel” OR       |
|         |                                                                                                                                                               | “Bioethanol” OR “Bio alcohol” OR “Oceanic Energy” OR “Marine Energy” OR        |
|         |                                                                                                                                                               | “Tidal energy” OR “Coal” OR “Firewood” OR “Peat” OR “Natural Gas” OR           |
|         |                                                                                                                                                               | “Electricity” OR “LPG” OR “Charcoal” OR “Crude Oil” OR “Carbon” OR             |
|         |                                                                                                                                                               | “Kerosene” OR “Fuelwood” OR “Petroleum” OR “Gasoline” OR “Hydrogen”            |
|         |                                                                                                                                                               | OR “Energy Justice” OR “Energy Poverty” OR “Fuel Poverty” OR “Energy           |
|         |                                                                                                                                                               | Deprivation” OR “Energy Vulnerab*” OR “Energy Resilien*” OR “Energy            |
|         |                                                                                                                                                               | Precarity” OR “Energy Access” OR “Energy Use” OR “Energy Transition” OR        |
|         |                                                                                                                                                               | “Energy Demand” OR “Energy Service*” OR “Energy Communit*” OR “Energy          |
|         |                                                                                                                                                               | Solidarity” OR “Energy Sovereignty” OR “Energy Efficiency” OR “Energy          |
|         |                                                                                                                                                               | Consumption”                                                                   |
| Scopus  | (TITLE-ABS-KEY (“Sex” OR “Female*” OR “Male*” OR “Intersex” OR “*Gender*” OR “Man” OR “Men” OR “Woman” OR “Women” OR “Boy” OR “Boys” OR “Girl” OR             |                                                                                |
| example | “Girls” OR “Queer” OR “Nonbinary” OR “Two spirit” OR “Bigender” OR “Transgender” OR “Agender” OR “Gender fluid” OR “Gender Nonconforming”) AND TITLE-         |                                                                                |
|         | ABS-KEY (“Renewable Energy” OR “Clean energy” OR “Wind Power” OR “Eolic Energy” OR “Wind Energy” OR “Wind Turbine” OR “Solar Energy” OR “Photovoltaic*”       |                                                                                |
|         | OR “PV system” OR “Solar Thermal” OR “Solar Generation” OR “Solar Concentrat*” OR “Solar Heater*” OR “solar cool*” OR “Solar dry*” OR “Solar drie*” OR “Solar |                                                                                |
|         | dehyd*” OR “Solar desal*” OR “Hydropower” OR “Hydroenergy” OR “Hydraulic Generation” OR “Hydraulic Energy” OR “Geothermal Energy” OR “Geotherm*”              |                                                                                |
|         | OR “Minihydr*” OR “Bioenergy” OR “Biofuel” OR “Biogas” OR “Biodiesel” OR “Bioethanol” OR “Bio alcohol” OR “Oceanic Energy” OR “Marine Energy” OR “Tidal       |                                                                                |
|         | energy” OR “Coal” OR “Firewood” OR “Peat” OR “Natural Gas” OR “Electricity” OR “LPG” OR “Charcoal” OR “Crude Oil” OR “Carbon” OR “Kerosene” OR “Fuelwood”     |                                                                                |
|         | OR “Petroleum” OR “Gasoline” OR “Hydrogen” OR “Energy Justice” OR “Energy Poverty” OR “Fuel Poverty” OR “Energy Deprivation” OR “Energy Vulnerab*” OR “Energy |                                                                                |
|         | Resilien*” OR “Energy Precarity” OR “Energy Access” OR “Energy Use” OR “Energy Transition” OR “Energy Demand” OR “Energy Service*” OR “Energy Communit*” OR   |                                                                                |
|         | “Energy Solidarity” OR “Energy Sovereignty” OR “Energy Efficiency” OR “Energy Consumption”) AND (LIMIT-TO (LANGUAGE, “English”)) AND (LIMIT-TO                |                                                                                |
|         | (PUBYEAR, 2022) OR ... OR (PUBYEAR, 1991)) AND (EXCLUDE (EXACTSRCTITLE, “Motor Ship”) OR ... OR EXCLUDE (SUBJAREA, “MATH”) OR ... OR EXCLUDE                  |                                                                                |
|         | (EXACTKEYWORD, “Animal”))                                                                                                                                     |                                                                                |

**Table 2**  
Energy subgroups.

| Energy generation  | Energy systems and governance | Employment | Education and training | Household activities | Exposures to environmental change |
|--------------------|-------------------------------|------------|------------------------|----------------------|-----------------------------------|
| Intensity          | Carrier                       | Job        | School                 | Cook                 | Climate change                    |
| <b>Efficiency</b>  | Generation                    | Employ     | Perception             | Heat                 | Greenhouse gas                    |
| <b>Conversion</b>  | <b>Security</b>               | Labour     | Evaluate               | Light                | Particulate                       |
| Harvesting devices | Grid                          | Work       | Teach                  | Cool                 | Matter                            |
| Batteries          | Network                       | Pay        | Train                  | Wash                 | Smog                              |
| Supercapacitors    | Access                        |            | Educate                |                      | Decarbonisation                   |
| Electrocatalysis   | Infrastructure                |            |                        |                      | Net zero                          |
| Photocatalysis     | Renewables                    |            |                        |                      | Mitigation                        |
| Capture            | <i>Production</i>             |            |                        |                      | Adaptation                        |
| Storage            | <b>Diffusion</b>              |            |                        |                      |                                   |
| Fuel cells         | <b>Innovation</b>             |            |                        |                      |                                   |
| Sequestration      | <b>Technology</b>             |            |                        |                      |                                   |
| Fracturing         | Economics                     |            |                        |                      |                                   |
| Fracking           | Finance                       |            |                        |                      |                                   |
| Mining             | <b>Policy</b>                 |            |                        |                      |                                   |
|                    | Justice                       |            |                        |                      |                                   |
|                    | <b>Govern</b>                 |            |                        |                      |                                   |
|                    | <i>Institution</i>            |            |                        |                      |                                   |
|                    | <i>Planning</i>               |            |                        |                      |                                   |
|                    | <b>Regulate</b>               |            |                        |                      |                                   |
|                    | Cap                           |            |                        |                      |                                   |
|                    | <b>Trade</b>                  |            |                        |                      |                                   |
|                    | <b>Tax</b>                    |            |                        |                      |                                   |
|                    | State                         |            |                        |                      |                                   |
|                    | <b>Market</b>                 |            |                        |                      |                                   |
|                    | Services                      |            |                        |                      |                                   |
|                    | Transitions                   |            |                        |                      |                                   |
|                    | <b>Forecast</b>               |            |                        |                      |                                   |
|                    | <b>Development</b>            |            |                        |                      |                                   |

Source: Aims & Scope of Energy Journals: Nature Energy, **Energy Policy**, **Energy Economics**, *Energy Research and Social Sciences*.

**Table 3**  
Gender subgroups.

| Gender-based violence     | Sex/gender/sexuality | (In)justice and (in)equity |
|---------------------------|----------------------|----------------------------|
| <b>Genital mutilation</b> | Bisexual             | <b>Equality</b>            |
| <b>Discrimination</b>     | <b>Lesbian</b>       | Equity                     |
| <b>Honour</b>             | <b>Gay</b>           | <b>Democracy</b>           |
| Infanticide               | <b>Cis-gender</b>    | Justice                    |
| Femicide                  | <b>Intersex</b>      | <b>Parity</b>              |
| <b>Trafficking</b>        | <b>Transgender</b>   | <b>Empowerment</b>         |
| <b>Violence</b>           | Transsexuality       | <b>Human rights</b>        |
| Hegemony                  | Queer                | Work pay                   |
| Prejudice                 | Heteronormative      | Redistribution             |
| Exploitation              | Heterosexual         | Recognition                |
| Assault                   | Homosexual           | <b>Participation</b>       |
| <b>Harassment</b>         | <b>Homophobia</b>    | Epistemic justice          |
| <b>Rape</b>               | <b>Biphobia</b>      | Solidarity                 |
| Refugee                   | <b>Transphobia</b>   | Resilience                 |
| <b>Stalking</b>           | <b>Interphobia</b>   |                            |
| <b>Crime</b>              | <i>Masculinity</i>   |                            |
| Deprivation               | Femininity           |                            |
| Precarity                 | Hypermasculinity     |                            |
| Poverty                   | Phallocentric        |                            |
| Vulnerability             | Polygamy             |                            |

Sources:

Christodoulou, J. and Zobnina, A. (2009). Glossary of Gender-related Terms. Nicosia.

**Council of Europe (2022). Gender Equality Glossary.** Geneva.

**Council of Europe (2022). because words matter. Glossary of Sexual Orientation, Gender Identity or Expression and Sex Characteristics.** Geneva.

University of Essex (2021). *Thematic guide: gender studies (using qualitative data).* Essex.

them not applying for funding. This was because they perceived a bias (rightly or wrongly) towards funding large scale quantitative studies and a bias against funding studies with gender as the main focus, rather than gender as an element of, or ‘add on’ to, a study. The Systematic review also found that the awards that did ‘add on’ gender often did not ‘add on’ a gender expert, highlighting this as a potential concern for the nature of the gendered knowledge created. The typology constructed from the Systematic review/Evidence synthesis defined the ‘gender’ approaches

adopted [25] (see Table 4).

### 3. Results

In each section, the quantitative or scientific findings will be presented to highlight the *who* and *what* of gender inclusion, followed by the application of a critical lens to explore the *how* of the gender approach adopted, and consider what this means for future research. As we discuss

**Table 4**  
Gender research typology.

| Type of 'gender' research                                                                                                  | Gender research attributes                                                                                                                                                                                                                                                            | Potential policy and practice recommendations                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disaggregates data by sex                                                                                                  | <ul style="list-style-type: none"> <li>Assumes sex as binary (male/female) and investigates differences between sexes, without discussing reasons behind such differences.</li> </ul>                                                                                                 | Focuses on differences between men and women — e.g. targeting sustainable energy initiatives to women.                                                                                                                                                                       |
| Includes women, not because of their sex but because of their socially ascribed roles                                      | <ul style="list-style-type: none"> <li>Women as the objects of the study but gendered nature of women is not recognised.</li> <li>Accepts socially ascribed roles as they are (e.g. women as mothers, or as responsible for cooking), without contesting them.</li> </ul>             | Focuses on 'practical gender needs' — i.e. helping women perform their socially ascribed roles (e.g. as mothers, or as responsible for cooking) more efficiently or easily.                                                                                                  |
| Includes women, not to improve their wellbeing but because their socially ascribed roles contribute to the collective good | <ul style="list-style-type: none"> <li>Women included as efficient deliverers of services and/or included as mothers, not gendered beings.</li> </ul>                                                                                                                                 | Instrumental approach — e.g. targeting resources at women as the more efficient provider of services to others or for the benefit of the wider economy.                                                                                                                      |
| Presents itself as 'gender' research, but focuses exclusively on women                                                     | <ul style="list-style-type: none"> <li>Acknowledges the categories of 'women' and 'men' as socially ascribed, and seeks to address (certain) gender inequalities, but fails to acknowledge the power dynamics underpinning those categories and the relations between them</li> </ul> | Takes an 'add women in' approach — e.g. affirmative action initiatives to increase the number of women in certain professions — without engaging with the underlying reasons why women have been excluded in the past, or the social/cultural obstacles faced by inclusion   |
| Critical gender research                                                                                                   | <ul style="list-style-type: none"> <li>Explicitly considers gender roles, relations and identities</li> <li>Intentionally considers, and seeks to challenge, unequal power dynamics</li> </ul>                                                                                        | Focuses on 'strategic gender interests' (transformative approach) — i.e. seeks to effect the transformations necessary to change the unequal situation between men, women and non-binary people. This includes acknowledging and changing unequal and unfair power dynamics. |

This article utilised this established approach and typology to frame the current analysis of how gender has been included in the energy publications reviewed.

each analysis/cluster, we will highlight the gendered limitations of the research to date. It is important to note that, in so doing, we may highlight specific articles. The articles highlighted are not chosen because they are problematic in themselves, but rather because they are indicative of wider issues and trends.

### 3.1. Source analysis

#### 3.1.1. Publications and journals

The overall number of publications at the nexus of energy, sex and gender has increased substantially over time, with a steady rate of growth as shown in Fig. 1.

Fig. 2 identifies the journals that have published the most articles on this topic over the past three decades. Notably, these are all energy- or environment-focused journals rather than gender-focused ones. Fig. 3 further shows that the gender-focused journal with the highest number of energy-related publications has published only twelve such papers in the past thirty years, compared with ninety-seven sex/gender-related papers published by the leading energy-focused journal.

There is, then, a greater appetite for energy scholars to embrace gender than for gender scholars to consider energy as a topic of interest. This imbalance is important if the research produced differs substantially in its topics and approaches, and particularly if teams publishing on gender lack gender expertise. Such dynamics raise concerns about the nature of the gendered knowledge base being constructed — especially given the potential for this research to inform policy and practice.

#### 3.1.2. Authorship in gender and energy research

As recently as a decade ago, fewer than 16% of authors publishing in energy journals were women, and more broadly, among those publishing in the energy sector, academic training or expertise in women's studies, feminism, gender studies, or related disciplines was found to be very low [26]. In our current review, only 17% of the authors, whose work is cited in the gendered analysis that follows, mentioned gender in

their biographical information. This indicates a notable lack of gender-specific expertise among those producing the gendered scholarship currently being published, raising important questions about the validity and robustness of this knowledge base.

A review of authors' institutional affiliations further shows that institutions based in the Global North continue to dominate research on countries in the Global South, thereby reinforcing historical trends in energy research [27] rather than contributing to its decolonisation. It is also business as usual when we consider how new knowledge is being constructed, as the review of methodological approaches demonstrates.

### 3.2. Methodological approaches

Fig. 4 shows the most commonly used methods and analytical tools in the publications reviewed. There is a clear methodological preference for quantitative methods, such as surveys and questionnaires, followed by some form of testing or experimentation. Modelling and regression are the most frequently used tools to analyse the collected data. For example, econometric regressions based on survey data are used to show the negative effects of energy poverty on women's health [28].

Qualitative methods are far less prevalent. Among these, interviews and analytical reviews are the most frequently used [29,30]. Although qualitative methods are increasingly employed in both energy and science [31] as well as gender and social science [32], they continue to appear more often in gender-focused than in energy-focused publications. Data gathering methods such as focus group discussions and ethnographic observation, and analytical approaches like discourse analysis remain the least utilised.

Gender and feminist researchers, while not rejecting quantitative research tools, have long questioned the positivist epistemology and the notion of objectivity that underpin them. Many also doubt whether quantitative methods can adequately capture the lived experiences of women and men, and therefore often favour qualitative approaches. Feminist epistemology emphasizes that it is the *approach*, rather than the

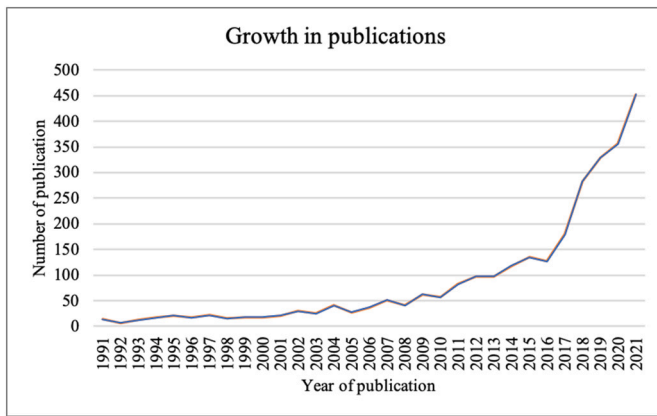


Fig. 1. Growth in publications between 1991 and 2021.

*method*, that defines gendered research. This includes explicitly recognising the positionality of researchers and acknowledging the subjectivity of all knowledge production [33]. Because the dominant positivist paradigm privileges scientific objectivity in determining what counts as valid evidence, feminist and decolonial forms of knowledge – which do not claim objectivity or neutrality – are often excluded from what is recognised as ‘evidence’. Such publications are therefore less cited and remain marginal within the broader knowledge base.

### 3.3. Existing knowledge base

#### 3.3.1. Intersections of energy and gender studies

Fig. 5.1 maps how energy research intersects with sex and gender, while Fig. 6.1 maps how gender research has engaged with energy-related issues. The analysis suggests that, whereas energy studies tend to focus on women's stereotypical and often feminized roles within the private sphere/the home, gender studies problematise gendered identities, roles, and relations in masculinised public spaces, particularly the workplace.

More recent developments are shown in Fig. 5.2 (energy) and Fig. 6.2 (gender). In energy journals, we observe emerging topic areas such as thermal comfort, energy transitions, sustainable development and energy justice. Instead, there is increasingly an intersectional approach in gender journals – such as analyses of gender and age, or gender and race. There is a growing attention to place in gender studies (e.g. on nation or community), and a more sustained engagement with justice-related issues, including corruption and finance. While there are some overlaps within the two fields, there are evident differences in future directions.

Overall, our analysis indicates that most articles situated at the nexus of energy and sex/gender are published in energy journals, are driven by an energy-centric agenda, and predominantly employ quantitative methods, with research conducted largely by scholars without an explicit gender focus. We suggest that this *who* and *what* of the research may shape *how* gender is incorporated.

#### 3.3.2. Gender or sex?

In the word search, we included searches for both sex and gender, “masculin\*” and “femini\*”, as well as terms such as “sexuality” and “queer”. Sex refers to biological characteristics. Although the authors of this article understand gender as a spectrum rather than a binary, energy

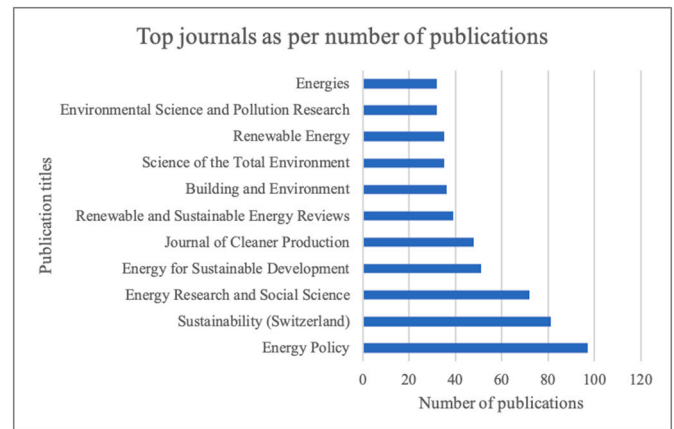


Fig. 2. Top journals per number of publications.

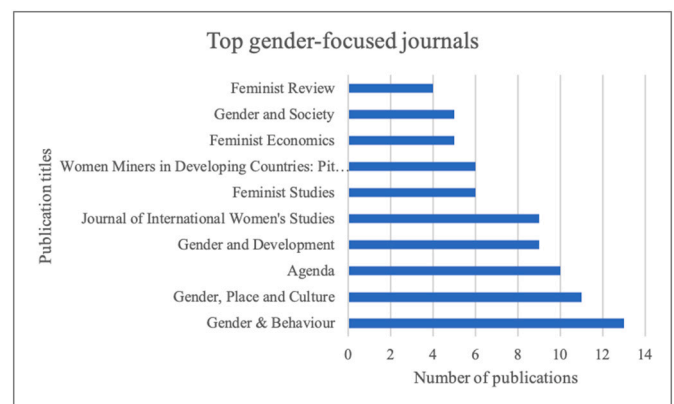


Fig. 3. Top gender focused journals per publications.

research is still mostly limited to disaggregating by sex. Therefore, we use the woman/man distinction in this review. Gender as a concept recognises that what it means to be a woman, or a man, is socially constructed. For research, this means studies should be concerned not only with describing differences by sex but also with analyzing the associated, differentially and socially constructed gender roles, relations, and identities.

As Fig. 7 shows, the most used term in the literature is gender, followed by sex. In the sections below, we interrogate how gender is being used and the gendered approach adopted, using the typology described in the methods section.

In many of the articles reviewed, the focus is on disaggregation of data by dichotomous sex categories of man/woman. This suggests the term gender is being used – erroneously – as synonymous with sex, failing to recognise the diversity of gendered identities, which can lead towards reifying gender binaries.

Like Bell et al. [34], we find that gender-related energy research has tended to focus too narrowly on women's issues and would benefit from incorporating feminist theoretical insights. Not drawing on gender or feminist theory can result in research inadvertently supporting what gender or feminist scholars would identify as problematic. For example, research highlighting women working in the energy sector accepting

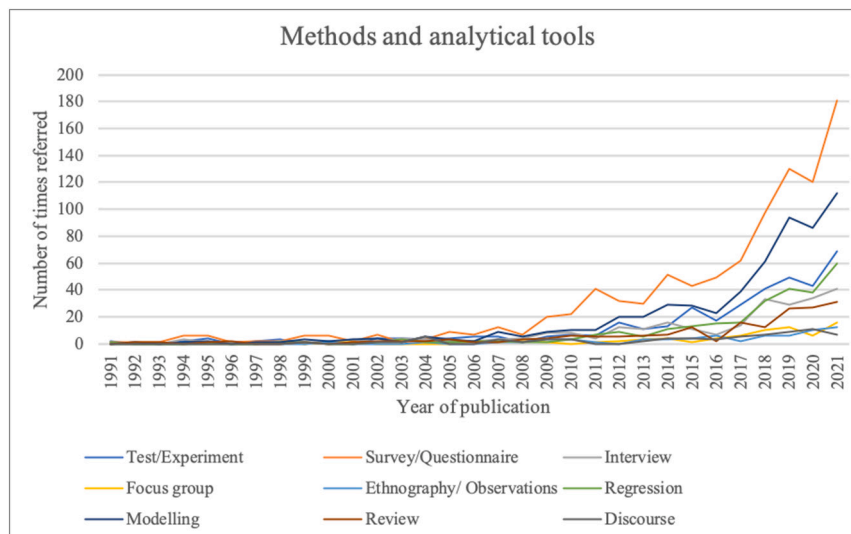


Fig. 4. Methods and analytical tools.

sexualised ‘banter’ as good-natured joking [35] would be problematised by gender scholars. Rather than portraying this as a means for women to ‘assimilate’ into the sector’s masculine culture, gender scholars would interrogate and challenge such dynamics.

Some papers do use the term feminist and/or adopt an explicit feminist analytical stance, but these are limited in number. Importantly, the search also picked up the notion of ‘feminisation’ – the process by which a phenomenon becomes focussed on women – for example, the ‘feminisation of energy poverty’ [36]. The concept of ‘masculinity’ also features in a small number of papers, particularly in discussions of hyper-masculinity – a concept often associated with the extractives sector [37]. Rarer still is the exploration of the relationship between energy and sexuality (broadly defined) or a queer analysis of energy research, policy, or practice; notably, when considered, sexuality in energy research tends to focus on women’s sexual activities [34].

We now explore in greater depth the topics covered in the gender/sex and energy literature, outlining key areas of focus before applying a critical lens to examine how gender has been incorporated and what this means for our gendered knowledge.

#### 4. Cluster analysis

This section presents cluster maps generated from the titles and abstracts of all papers. These maps illustrate the broad themes and topic areas covered in the literature in an easy-to-interpret ways [22], helping to identify both areas of concentration and gaps. To analyse trends within each colour-coded cluster, we draw on selected papers from those clusters and examine them through a critical gender lens. We begin by presenting a cluster map of the entire dataset and proceed to examine subclusters derived from the overall database.

The co-word network map above represents the entire dataset of 2949 papers. Fig. 8 shows four distinct co-word clusters, namely: (1) household-level activities and relationships with the environment (blue cluster); (2) effects of the indoor environment on the health and well-being of women and children (green cluster); (3) demand-side characteristics of energy use and its correlation to emissions and climate change (yellow cluster); (4) social, economic and political studies on energy systems and transitions (red cluster).

In each cluster, valuable gendered knowledge has been generated around the situation of women; however, significant limitations remain in the gendered analysis generated. At times, gender is included as one of many variables in the analysis – such as to explain pro-environmental behaviour (43, yellow cluster) – rather than as a focus of the research. Where women are the focus, for example in studies highlighting the negative impacts of indoor air pollution [38], research often focusses on potential technological solutions rather than interrogating the root causes of why women are the ones most exposed or impacted. The focus tends to be on the *outcomes* of gender inequalities and differential roles and relations, and not on the *root causes*. This can inadvertently reinforce stereotypes and reproduce gender inequality.

Similarly, in studies highlighting the important role women play in fuelwood collection (blue cluster), including mitigation measures during times of fuelwood crisis [39], women’s socially ascribed roles are rarely challenged. Studies promoting alternative and more sustainable options often use instrumentalist arguments, that is, for example, they note such alternatives can free up time for women, highlighting how women will then have time to further contribute to income-generating work for their families and the local community or economy [40].

However, there is also some good gender practice, especially where an ‘intersectional’ approach is taken [41]. The red cluster also includes papers on methodological innovations in energy research influenced by feminist activism. For instance, Bell [42] develops a feminist activist methodology of ethnographic ‘photovoice’ so that those with political power can simultaneously listen to the most disenfranchised people and act upon their concerns.

These broad thematic clusters were analysed further by dividing the total database of 2949 literature entries into additional subgroups, to facilitate greater depth of analysis. The literature was sub-divided into six energy-related and three gender-related subgroups using energy- and gender-related glossaries from the Aims and Scopes of journals and gender glossaries elaborated in the study protocols [19]. In the subsequent sections, we analyse each subgroup as represented in Figs. 9 to 17.

##### 4.1. Energy subgroup 1: energy generation

Fig. 9 depicts the first energy sub-group and includes papers at the







Fig. 7. Distribution of gender terms between 1991 and 2021.

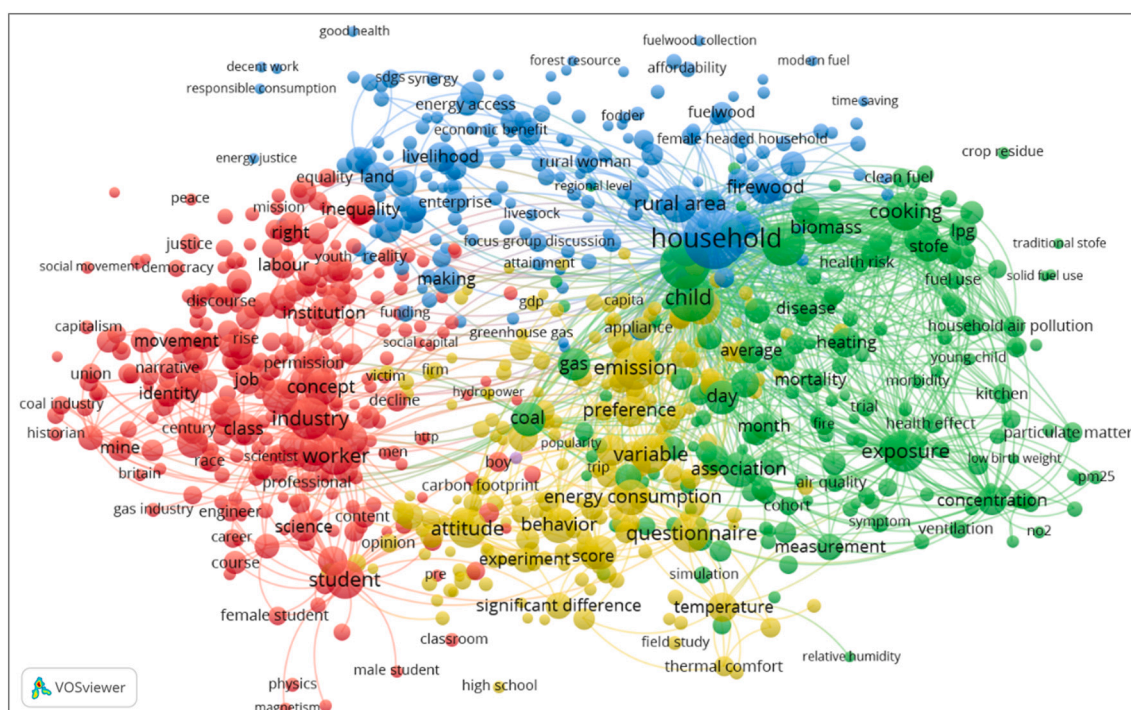


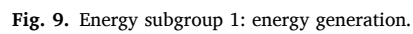
Fig. 8. Co-word network map of the entire dataset.

intersection of the topics of sex, gender, and energy generation.<sup>1</sup> The red cluster refers to the effects of energy generation on household-level activities, e.g. highlighting negative impacts of air pollution generated by fuelwood use on pregnancy outcomes [43].

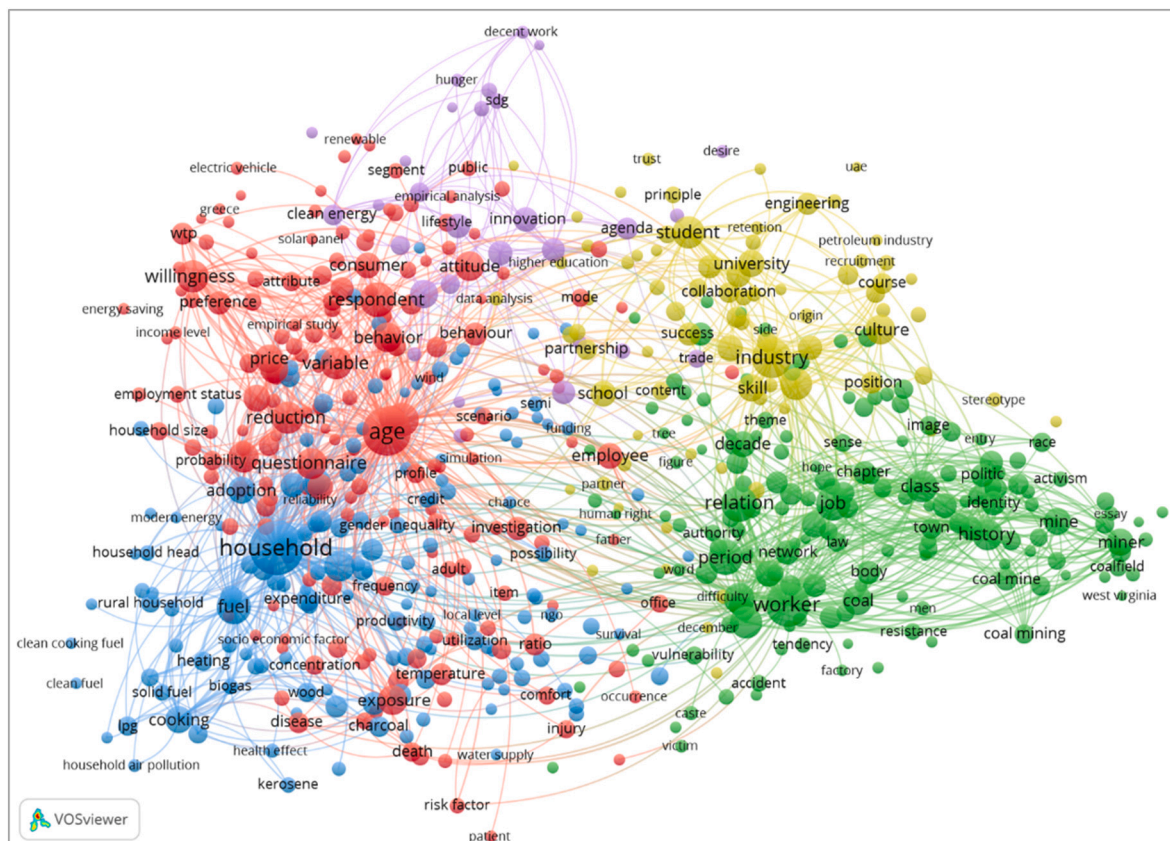
The green cluster represents studies related to social movements, class conflicts, and power struggles within the energy generation sector, particularly the coal mining sector, and includes consideration of impact on men and notions of masculinity [44], including the use of 'mining masculinities' to organise nonviolent strike action [45].

The yellow cluster represents studies that relate gender to the negative effects of exposure to hazardous conditions during energy generation, such as acute respiratory infections among women and children [46]. Notably, while providing new data around the differential impacts of energy generation, many of the articles focus on women not because of their gender, but because of socially constructed gender roles. For example, in one study [46] as 98% of cooks in the sample were female, the authors note how they use "the terms 'women' and 'cooks' synonymously" without questioning this. A critical gender lens would

<sup>1</sup> The blue cluster relates education to energy, discussed in 'Energy subgroup 5'.







**Fig. 11. Energy subgroup 3: employment.**

and dowry practices [51]. It highlights the importance of consideration of the ‘strategic gender interests’ that underpin women’s oppressions, not just the practical outcomes that arise from these.

#### 4.4. Energy subgroup 4: education and training

Within this subgroup (Fig. 12), the yellow cluster represents studies that analyse gendered attitudes and behaviours towards energy, including challenging ideas of gender differences in pro-environmental attitudes [54]. In the blue cluster, economic growth is a theme and linked to women as an ‘underutilized source of human capital’ [55]. This is not uncommon in many disciplines and areas of research. However, a focus on women as a resource for wider economic gain, rather than gender equality as an aspiration, is problematic and needs challenging.

The violet cluster demonstrates linkages between educational levels and renewable and clean energy adoption [56], but also the importance of agency, e.g. that female-headed households are more likely to choose cleaner fuels [57]. The red cluster includes papers that demonstrate the effects of educational levels among women and men on energy systems, highlighting schoolgirls' positive attitudes towards a STEM career being influenced by the desire to make the world a better place [58].

Once again, a critical gender lens would note that girls look to fulfil their roles as carers for people and planet even in education choices, while women will adopt technologies that support their roles when they know about them (via education [56]), or have the freedom to make decisions (via female headship [57]). Good environmental choices are then reflective of current gendered social norms and, if equality is the aspiration, the inequalities that underpin these good choices need to be recognised and unpacked.

#### 4.5. Energy subgroup 5: household activities

The subgroup focusses on ‘Household Activities’.<sup>3</sup> The red and green clusters appear to overshadow the blue and yellow clusters in Fig. 13. The studies in the red cluster tend to have a focus on stereotypes of women and the home. However, while social constructions of gender roles and relations across time and space have tended to confine women to the home, roles in the household can lead to wider engagement outside the household, e.g. women's concerns about food contamination after the Fukushima nuclear accident was the rationale for their involvement in the highly masculinized space of citizen science and activism [59].

<sup>3</sup> The blue cluster interrogates the effects of using cleaner fuels - see 'Energy subgroup 7'. The green cluster incorporates studies on the negative effects of indoor environment on women and children — see 'Energy subgroup 6'.

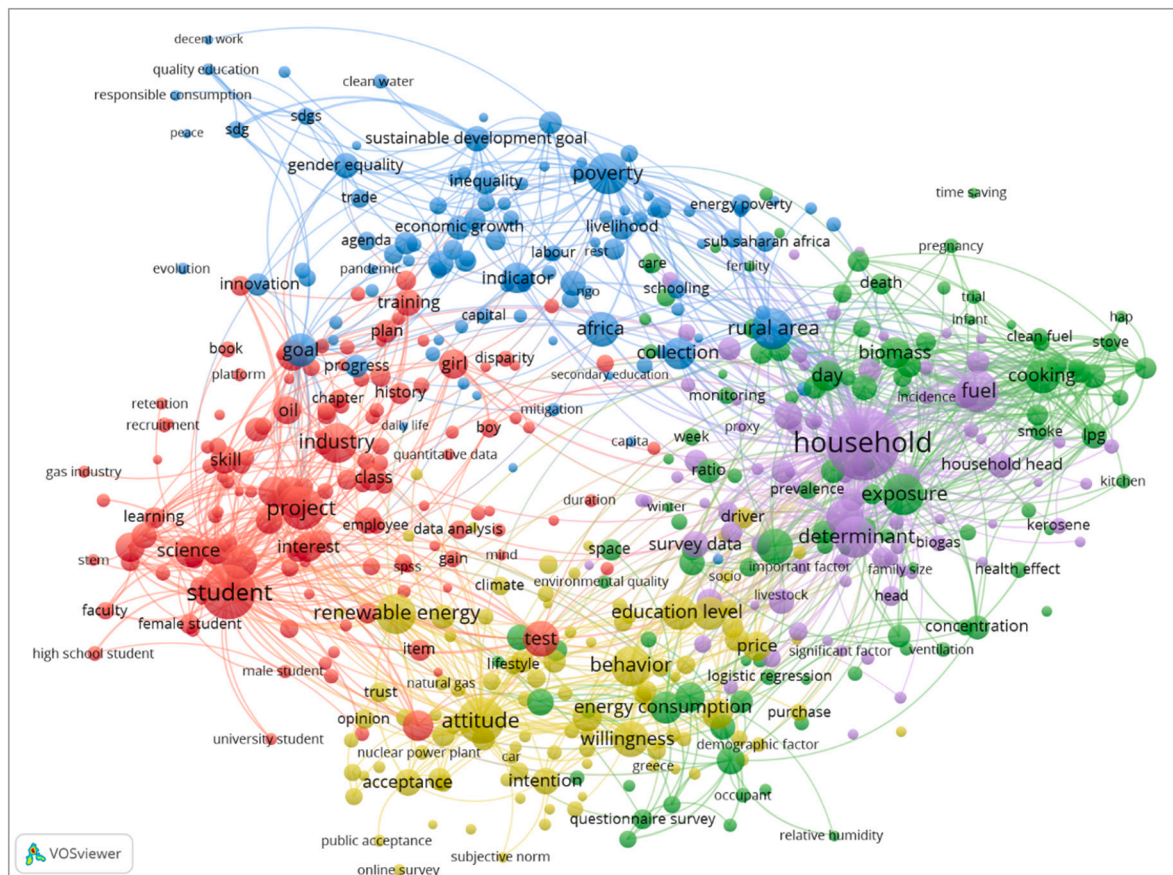


Fig. 12. Energy subgroup 4: education and training.

The yellow cluster is a smaller subset of the literature that has as a focus the gendered nature of energy consumption for lighting, heating, and cooling activities within a household, but thus far the studies have not progressed past finding differences in perceptions between women and men in the same thermal environment [60] to explore the reasons behind these or any potential implications.

Reporting differences is an important first step, but the next and more important step is to critically engage with the differences found.

#### 4.6. Energy subgroup 6: exposure to environmental change

Environmental change is intricately related to fuel extraction, use and the resulting carbon emissions. Fig. 14 relates various domains of energy systems to environmental change. The green cluster represents studies on the effects of air pollution, including demonstrating the negative health effects of exposure to indoor pollution on women, young children and the elderly [38,40,61].

The red cluster relates climate change to gendered behaviour and beliefs. Studies highlight women as more open to pro-environment transport choices, such as electric vehicles [62] and in aviation [63] but once again, analysis of why and the implications of these findings is missing.

The blue cluster explores the links between climate change and the SDGs through studies on poverty, gender equality, energy access and governance. Studies in this cluster highlight the role women may play in policy addressing major concerns of the day, such as forest management [64], energy poverty [65], up to greater gender diversity in board rooms as a means to improve carbon emission performance of companies [66].

A critical gender lens would acknowledge the additional demands on time and energy for women to engage in these spaces and recognise the costs for individual and groups of women for bringing good change to

the sector.

#### 4.7. Gender subgroup 1: gendered insecurity and violence

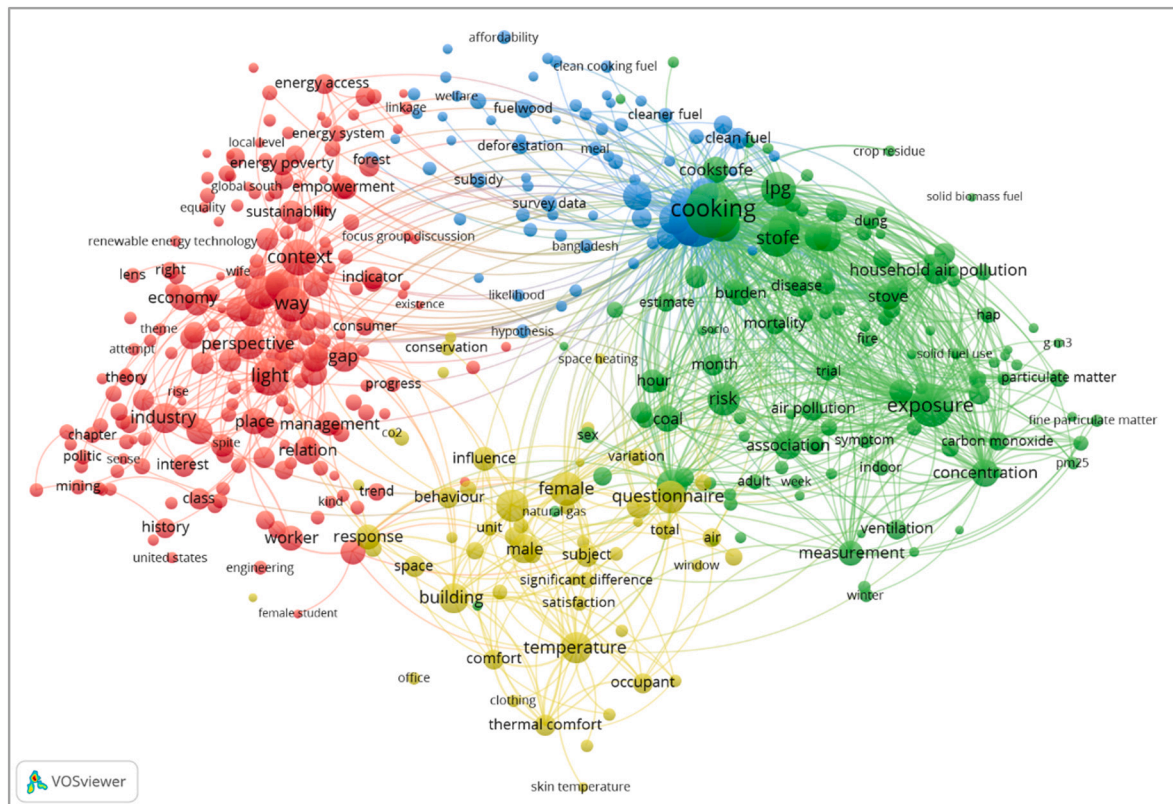
The six clusters in Fig. 15 focus on various forms of gendered insecurity, including gender-based violence in relation to energy. The light blue and the red clusters indicate studies that focus on industrial and commercial activities, including importantly highlighting workers as gendered beings [67].

The green cluster notes gender dynamics within the household, while the blue cluster refers to issues of gendered insecurities and violence beyond the household, and the violet cluster links this to the SDGs. These studies link to wider issues such as energy poverty as an ‘unfreedom’ and a deprivation of capabilities [68,69]. However, care must be taken when suggesting that the introduction of cleaner modern energy services, such as electricity, will result in the ‘empowerment’ of women and children [70], as this negates both the structural barriers to women’s advancement and women’s own agency. The violet cluster represents studies that investigate gender equality and violence within different sectors and importantly some studies challenge the stereotyping and essentializing of women as passive victims [71].

A critical gender lens brings recognition of the structural rather than individual barriers that underpin violence and insecurity, while at the same recognising women’s agency in overcoming these.

#### 4.8. Gender subgroup 2: justice and equity

Within this subgroup, the green cluster represents the topics of energy use and access within households, while the blue cluster identifies topics of energy demand and behaviour and its links to emissions, and the yellow cluster explores the association of gender equality in



**Fig. 13.** Energy subgroup 5: household activities.

sustainable development practice and climate action (Fig. 16).

The red cluster represents topics related to issues of justice and equity within resource extraction. Importantly, they note how technological solutions including to ‘protect’ the planet related to climate action, such as e-waste related to solar panels, may increase the burdens on disadvantaged groups, not necessarily alleviate them [72]. Studies highlight how extractive practice such as oil exploration can mean some become more powerful and have power over others, including exacerbating gender related power inequalities [73].

The issue of power is central to gender studies, yet few studies reviewed mentioned it explicitly. Inequalities of power at all levels and across characteristics need to be made visible as a first step to redressing the balance of power.

#### 4.9. Gender subgroup 3: gender identities and sexualities

In Fig. 17, the green cluster represents studies that bring a gendered perspective on energy research, including extractive sites as sites where hierarchies and inequalities based on gender are produced, performed and reproduced [74]. Within the blue cluster, there is a focus on organisations and sites of extraction, including noting these as discursively constituted. Sites where the idea of professional engineering and masculinity leads to a professional/alternative distinction which is gendered, may mean with ‘the alternative’ becomes feminized and thus devaluated [75].

The red cluster relates ideas of sexuality to ecological transformation. This includes studies that bring conceptual innovation; for example, the concept of ‘pyrosexual desire’ is suggested, which draws a link between the Western ecological disdain for uncontained, free-burning fire and unmanaged sexual desire [76].

Within the yellow cluster, mines and mining are a focus for exploring ideas of masculinity and gendered identities more broadly. Studies focus on the loss of the coal-mining industry and its impacts, such as the development of a culture that undermines hegemonic male

heterosexuality's exclusive claim to vulnerability and includes female and queer trauma in collective suffering [77], and a reimagining of gender identities in a socio-cultural context that impedes women from performing normative femininity [78]. These findings reinforce the importance of including feelings and emotions in energy research [79,80] with a gendered perspective.

Together, this cluster demonstrates how gendered energy research can challenge stereotypical ideas and has the potential to bring gender transformative change.

## 5. Discussion

This systematic literature review demonstrates that the topics of energy, sex, and gender intersect through multiple themes. However, while the literature is growing in the energy sector and, to a lesser extent, in the gender sector, it remains insufficiently collaborative and inadequately connected across disciplines and actors within disciplines. Research is largely published in energy-focused and environment-focused journals, authorship is dominated by Northern academics and by males. Moreover, the gender expertise of those publishing on gender is unclear. Such imbalance creates limitations in research findings, allowing certain voices and perspectives to dominate the field while silencing others. More collaborative and regionally distributed research at the nexus of energy, sex and gender would enrich the field and make it more representative of realities experienced by various groups of people globally.

The lack of gender expertise in producing gendered research is apparent in the nature of the research produced. From a gendered perspective, collaborative research must include gender expertise which would bring to the table the range of gender and feminist perspectives, the overlaps and contradictions among them, and their contextual specificity.

This review validates Bradshaw's [1] claim that energy research is dominated by studies limited to sex-disaggregation of data and that

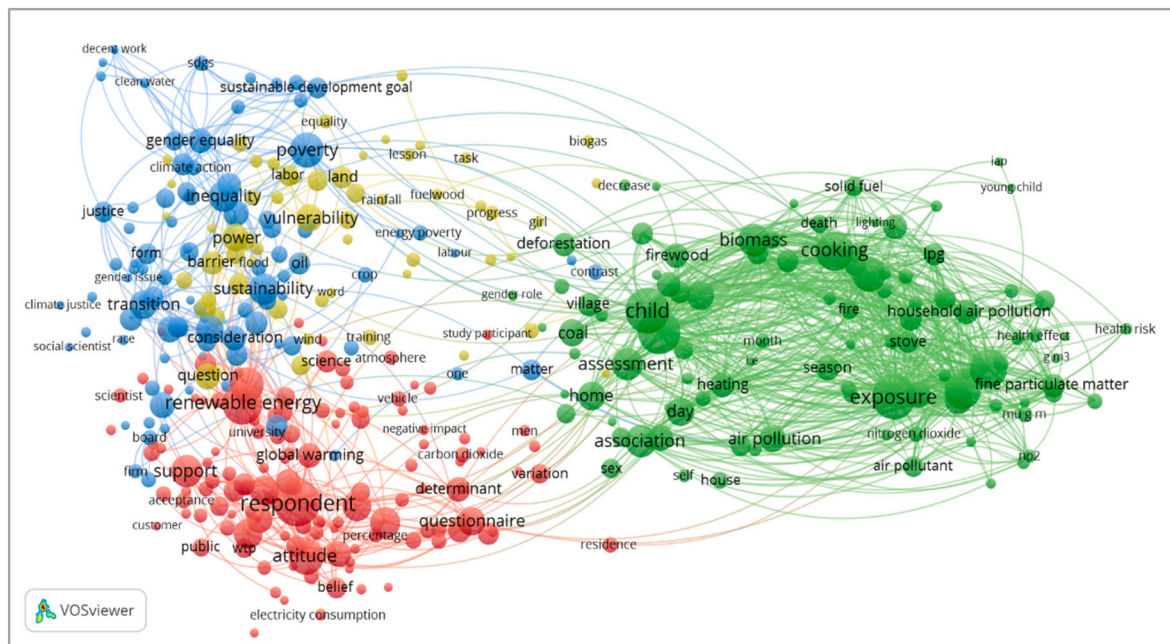


Fig. 14. Energy subgroup 6: exposure to environmental change.

relatively few studies use gender-theoretical lenses [37,81–83], feminist theory [34], sexuality [84] or queer theory [85] to analyse energy policies and practices. The literature is also dominated by quantitative research methods and analytical techniques, which produce findings and constructs a knowledge base that again helps promote some voices while silencing others and other ways of knowing. Using qualitative approaches, either exclusively or through mixed methods, could enhance the analytical rigour and provide insights into lived experiences. Moreover, regardless of the choice of research methods, a more gender-theory-informed research design is needed to ensure that gender stereotypes and inequalities are not reproduced.

Gendered energy research has focused on coal mining, oil extraction, and renewable energy. Thematically, the literature is dominated by studies on the effects of indoor air quality on the health of women and children in the Global South. The topic of indoor air quality and health remains dominant. Likewise, household-level energy activities – especially cooking – appears well researched, although women's roles are simply accepted rather than challenged in these studies. An explicitly feminist analysis of the historical and contemporary role of women in varied domains of society outside the home that relate to energy could enhance the still limited gendered knowledge base.

## 6. Conclusions and recommendations

While calls to incorporate sex and gender in energy research, policy, and practice are growing [1,86,87], and although the number of publications that consider gender is increasing, this review suggests there remains a lack of awareness of how to *do* gender. Here, we suggest a number of ways forward to begin to address this shortcoming.

The article is co-authored by a multidisciplinary team with expertise in energy, gender, and their intersection, as well as a shared commitment to challenging entrenched power structures and advancing inclusive, reflexive scholarship. Our team's diverse methodological and analytical expertise – which includes distinct specialisms in quantitative approaches, qualitative research, and critical gender analysis – shaped the questions we asked, the methods we used, and the interpretations we offer. By embedding one of the article's recommendations – collaborative, cross-disciplinary approaches that involve those with gendered knowledge in the creation of new gender knowledge – we aimed to

model the practices we advocate. Therefore, the following recommendations arise from the critical review of literature presented in this article as well as from the gendered expertise of our research team.

- (1) Many have called for more women researchers in the energy sector and STEM more generally [58]. This is important, as all areas of scientific inquiry should have a gender balance. However, we would expand that call beyond 'women' to specifically include all those who identify as a woman, those who do not have a fixed gender identity, and non-binary people. Moreover, we would highlight the need to understand gender as intersectional (Section 4.2) [25,88], and gendered identities as plural, since class and caste, race and ethnicity, nationality, age, sexuality, and disability all intersect with gender to construct who we are in our diversity. We then support affirmative action to ensure a more diverse research pool. Including diverse perspectives is not only a concern of equality of opportunity, but also important for generating more robust science that is representative of differing social realities.
- (2) However, being or identifying as a woman does not automatically imply expertise in gender, nor does it make someone a feminist, or someone interested in gender equality issues. As the review of authorship showed (Section 3.1.2), current literature base lacks gender expertise. Therefore, there is a need to move beyond promoting gender balance within research teams towards promoting the need for gender expertise within teams (Section 2.5). It is important that this gendered and feminist expertise, in the form of theoretical understanding of gender issues, shapes the research from the beginning and informs the formulation of research questions and strategies, rather than be 'added on' at the data analysis and interpretation stages.
- (3) Generating new gendered knowledge requires the involvement of those with gendered knowledge. This raises a question around where this expertise can be found. The review highlights that gender scholars seem less inclined to engage with energy than energy scholars are to engage with gender (Section 3.3). It is important to consider why this might be the case, and our critical analysis has highlighted some areas that could be addressed to bridge the divide – including the fact that scientific

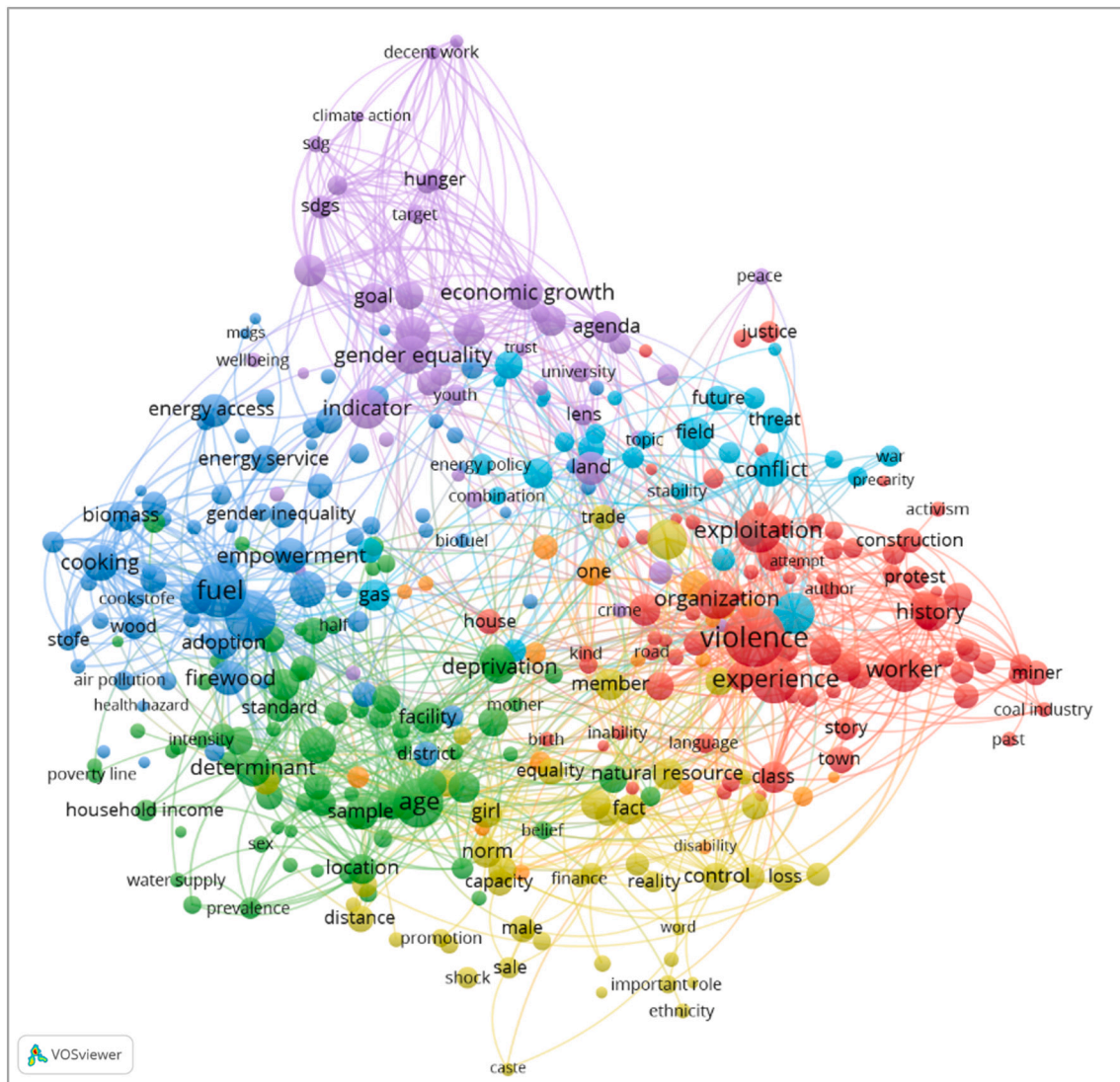


Fig. 15. Gender subgroup 1: gender-based insecurity and violence.

understandings of what makes good research still tend to focus on quantitative methodologies (Section 3.2). There is a need to embrace other ways of knowing and accept ontological, epistemological, and methodological differences, recognising these as creating legitimate knowledges that enhance what is known and how we know it.

- (4) A key issue is that those currently undertaking research need to make space for, and, more importantly, listen to, gender experts. At present, the biggest barrier to gender crossing to energy may be the tendency for researchers without formal training in gender studies to undertake gender analysis (Section 3.1.2). Therefore, gender scholars must be accepted as experts, and “doing gender equality” must be seen as challenging existing and entrenched power structures, rather than merely inviting a gender expert.
- (5) The review also highlights persistent geographical inequalities in knowledge production, particularly where research on the Global South is predominantly carried out by institutions and researchers based elsewhere (Section 3.1.2). A first step is recognising that these inequalities constitute race- and ethnicity-based discriminations. It is important to note the ‘answer’ to this is not to simply ‘add in’ an organisation or researcher from the Global South to a research bid or existing team without working through the power issues involved. Processes to decolonise academia are

not only about curriculum or past knowledge, but also about how we construct the knowledge of the future and ensure a more inclusive ‘we’ going forward (Section 3.3.1).

The other key issue raised by the review is that as well as considering *how* we construct new knowledge, *who* is involved and *which* knowledges are prioritised, we also need to be cognisant of *what* is the focus of this knowledge, including noting the silences and seeking to address them.

- (6) Gendered energy research has tended to focus on stereotypically ‘feminine’ spaces and roles, such as cooking and cookstoves, and sought to make them more efficient and/or safer (Sections 3.3.1 and 4.1). It has, like society, confined women to the home. There is a need to move past this to explore gender relations, roles and identities across energy’s full life cycle — from its generation, governance, use, to the end-of-life of energy fuel. Energy research should actively avoid reproducing women’s societal exclusions through its research, working towards exposing, examining, and challenging them. Researchers also need to recognise gender stereotypes and the social norms behind them, so they can start to change them and support real social change.

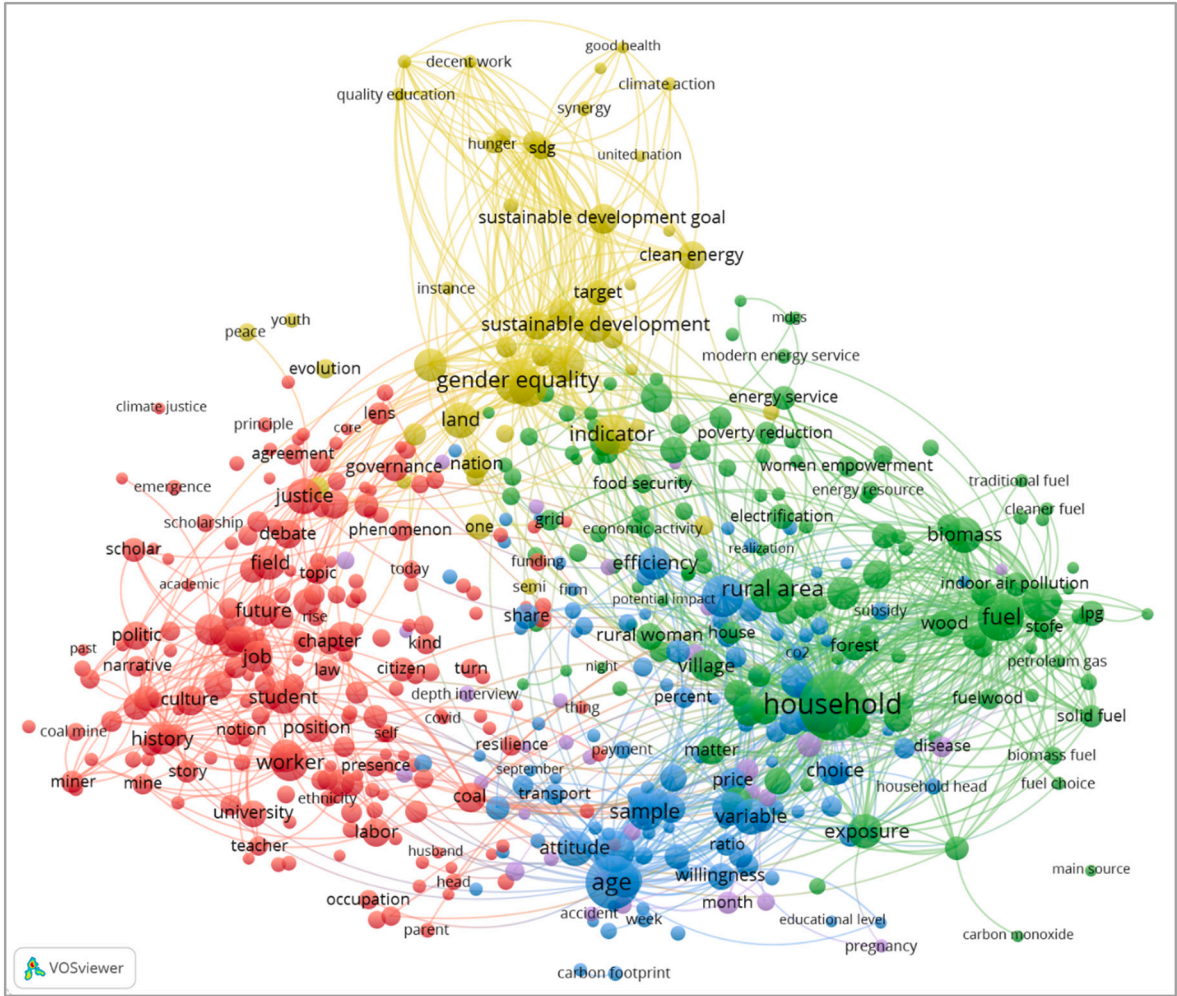


Fig. 16. Gender subgroup 2: justice and equity.

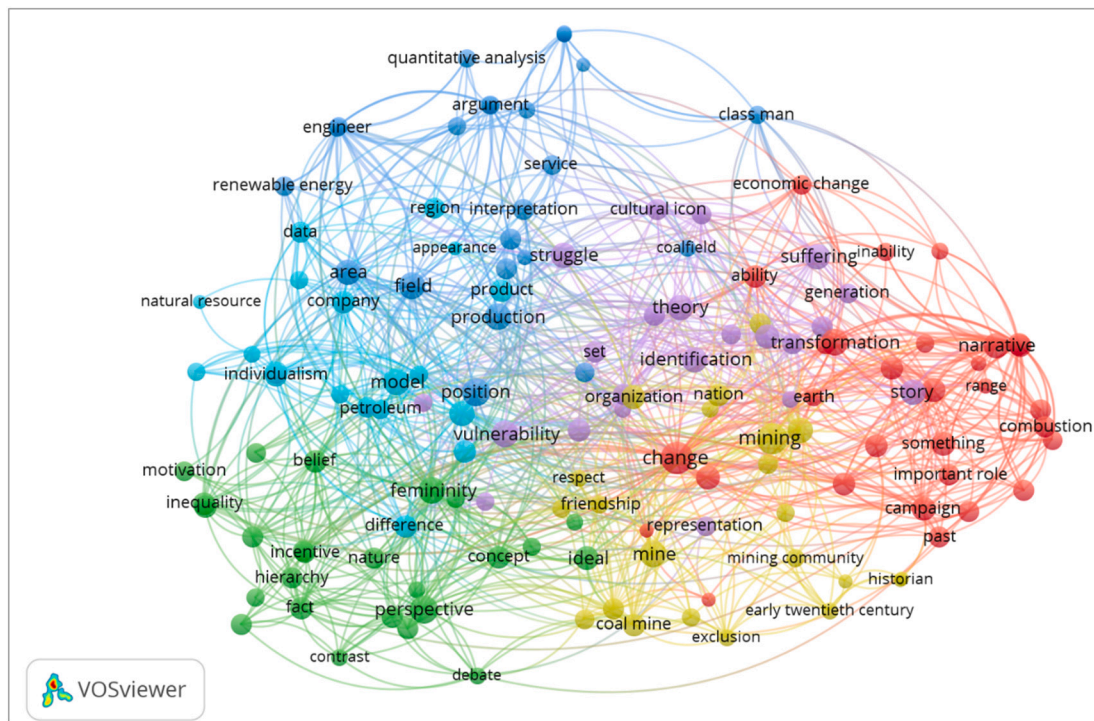


Fig. 17. Gender subgroup 3: gender identities and sexualities.

- (7) Energy research should push the boundaries of where and how women are considered, questioning stereotypical understandings and challenging social norms. However, there is also space to strategically reclaim stereotypical characteristics of women that have been constructed as ‘problems’ or ‘weaknesses’ in order to redefine them (Section 4.5). For example, studies should take into consideration the heavily gendered emotional component of women’s roles in households, in communities and in relation to energy, and while taking care to avoid reinforcing stereotypes, bring these emotional components the recognition they deserve [80].
- (8) Currently, gendered energy research is largely being conducted with little recognition of, and very little challenge to, the dominant patriarchal, capitalist, and exploitative energy regimes that frame it (Section 4). Gendered resistance to exploitative extractive systems has been the focus of some research (Section 4.2), which is welcome, but in the status quo of energy research there is often passive acceptance of current extractivist global systems within which gendered (and racialised, ageist, ableist and heteronormative) oppressions are produced and reproduced. These wider systems of oppression need to be recognised and challenged.

To “do gender” in energy research, therefore, means making improved gender equality an explicit aim of the research, built into the study design from the outset, and supported by appropriate expertise. More importantly, it requires challenging gender stereotypes and the wider systems of oppression that create unequal gender outcomes, so that real progress on gender equality can be made.

#### CRedit authorship contribution statement

**Harshavardhan Jatkar:** Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sarah Bradshaw:** Writing – original draft, Validation, Methodology, Formal analysis. **Karla Cedano:** Writing – review & editing, Validation, Funding acquisition, Formal analysis,

Conceptualization. **Rebeca Cruz:** Writing – original draft, Validation, Formal analysis. **Harry Kennard:** Software, Methodology, Formal analysis, Data curation, Conceptualization. **Manuel Martinez:** Methodology, Conceptualization. **Karla Ricalde:** Validation, Resources, Methodology, Formal analysis, Conceptualization. **Harriet Thomson:** Methodology, Funding acquisition, Conceptualization. **Julia Tomei:** Writing – review & editing, Formal analysis, Conceptualization. **Ian Hamilton:** Writing – review & editing, Visualization, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization.

#### 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.

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#### Data availability

Data is available in OSF projects and is cited in the manuscript.

## References

- [1] S. Bradshaw, Sex disaggregation alone will not energize equality, *Nat. Energy* 3 (2018) 813–815, <https://doi.org/10.1038/s41560-018-0247-4>.
- [2] ENERGIA, Gender in the Transition to Sustainable Energy for All: From Evidence to Inclusive Policies, The Hague, 2019.
- [3] R. Rewald, Energy and Women and Girls Analyzing the Needs, Uses, and Impacts of Energy on Women and Girls in the Developing World, Boston, 2017.
- [4] UNDP, Gender and Sustainable Energy, New York, 2016.
- [5] M. Feenstra, G. Özerol, Energy justice as a search light for gender-energy nexus: towards a conceptual framework, *Renew. Sust. Energ. Rev.* 138 (2021) 110668, <https://doi.org/10.1016/J.RSER.2020.110668>.
- [6] B.K. Sovacool, The political economy of energy poverty: a review of key challenges, *Energy Sustain. Dev.* 16 (2012) 272–282, <https://doi.org/10.1016/J.ESD.2012.05.006>.
- [7] S. Pachauri, N.D. Rao, Gender impacts and determinants of energy poverty: are we asking the right questions? *Curr. Opin. Environ. Sustain.* 5 (2013) 205–215, <https://doi.org/10.1016/J.COSUST.2013.04.006>.
- [8] O.W. Johnson, V. Gerber, C. Muhoza, Gender, culture and energy transitions in rural Africa, *Energy Res. Soc. Sci.* 49 (2019) 169–179, <https://doi.org/10.1016/J.ERSS.2018.11.004>.
- [9] R. Pearl-Martinez, J.C. Stephens, Toward a gender diverse workforce in the renewable energy transition, sustainability: science, practice and policy 12 (2017) 8–15, <https://doi.org/10.1080/15487733.2016.11908149>.
- [10] S.E. Ryan, Rethinking gender and identity in energy studies, *Energy Res. Soc. Sci.* 1 (2014) 96–105, <https://doi.org/10.1016/J.ERSS.2014.02.008>.
- [11] C.E.B. Cannon, E.K. Chu, Gender, sexuality, and feminist critiques in energy research: a review and call for transversal thinking, *Energy Res. Soc. Sci.* 75 (2021) 102005, <https://doi.org/10.1016/J.ERSS.2021.102005>.
- [12] M.A. Caretta, D. Vela-Almeida, Just energy transition and gender. A systematic review for feminist research, *Energy Res. Soc. Sci.* 126 (2025) 104138, <https://doi.org/10.1016/J.ERSS.2025.104138>.
- [13] M. Cellini, S. Loos, C. Mirenda, L. Pisacane, C. Striebing, S. Tagliacozzo, Exploring the nexus of gender and energy transitions: a systematic literature review, *Energy Res. Soc. Sci.* 119 (2025) 103887, <https://doi.org/10.1016/J.ERSS.2024.103887>.
- [14] E. Frank, R. Mühlhaus, K.M. Mustelin, E.L. Trilken, N.K. Kreuz, L.C. Bowes, L. M. Backer, H. von Wehrden, A systematic review of peer-reviewed gender literature in sustainability science, *Sustain. Sci.* 19 (2024) 1459–1480, <https://doi.org/10.1007/S11625-024-01514-5>.
- [15] E. Üstündağlı Erten, E.B. Güzelöglü, P. Ifaei, K. Khalilpour, P. Ifaei, C.K. Yoo, Decoding intersectionality: a systematic review of gender and energy dynamics under the structural and situational effects of contexts, *Energy Res. Soc. Sci.* 110 (2024) 103432, <https://doi.org/10.1016/J.ERSS.2024.103432>.
- [16] N. Jahan, S. Naveed, M. Zeshan, M.A. Tahir, How to conduct a systematic review: a narrative literature review, *Cureus* 8 (2016), <https://doi.org/10.7759/CUREUS.864>.
- [17] B.N. Green, C.D. Johnson, A. Adams, Writing narrative literature reviews for peer-reviewed journals: secrets of the trade, *J. Chiropr. Med.* 5 (2006) 101–117, [https://doi.org/10.1016/S0899-3467\(07\)60142-6](https://doi.org/10.1016/S0899-3467(07)60142-6).
- [18] I.N. Sengupta, Bibliometrics, informetrics, scientometrics and librmetrics: an overview, *Libri* 42 (1992) 75–98, <https://doi.org/10.1515/libr.1992.42.2.75>.
- [19] H. Jatar, K. Cedano, I. Hamilton, H. Kennard, M.M. Fernandez, K. Ricalde, H. Thomson, J. Tomei, Energy, sex and gender: protocols for investigating the research nexus, *OSF Prepr.* (2022) 1–8, <https://doi.org/10.31219/OSF.IO/X3GDS>.
- [20] M.J. Cobo, A.G. López-Herrera, E. Herrera-Viedma, F. Herrera, SciMAT: a new science mapping analysis software tool, *J. Am. Soc. Inf. Sci. Technol.* 63 (2012) 1609–1630, <https://doi.org/10.1002/ASI.22688>.
- [21] M. Mishra, D. Sudarsan, C. Augusto Guimarães Santos, S. Kumar Mishra, D. Kar, K. Baral, N. Pattnaik, An overview of research on natural resources and indigenous communities: a bibliometric analysis based on Scopus database (1979–2020), *Environ. Monit. Assess.* 193 (2021) 1–17, <https://doi.org/10.1007/s10661-020-08793-2>.
- [22] N.J. van Eck, L. Waltman, Software survey: VOSviewer, a computer program for bibliometric mapping, *Scientometrics* 84 (2009) 523–538, <https://doi.org/10.1007/S11192-009-0146-3>.
- [23] S. Bradshaw, B. Linneker, E. Sanders-McDonagh, It's gender Jim, but not as we know it ... a critical review of constructions of gendered knowledge of the Global South, *Eur. J. Womens Stud.* 27 (2020) 128–144, <https://doi.org/10.1177/1350506819847233>.
- [24] R.B. Briner, D. Denyer, Systematic review and evidence synthesis as a practice and scholarship tool, in: D.M. Rousseau (Ed.), *The Oxford Handbook of Evidence-based Management*, Oxford Academic, 2012, pp. 112–129, <https://doi.org/10.1093/oxfordhb/9780199763986.001.0001>.
- [25] S. Bradshaw, Engendering development and disasters, *Disasters* 39 (2014) 54–75, <https://doi.org/10.1111/DISA.12111>.
- [26] B.K. Sovacool, What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda, *Energy Res. Soc. Sci.* 1 (2014) 1–29, <https://doi.org/10.1016/J.ERSS.2014.02.003>.
- [27] M. Ali, L.C. Couto, S. Unsworth, R. Debnath, Citations, Funding and Influence in Energy-Policy Research on Developing Economies, Cambridge, [www.econ.cam.ac.uk/cwpwww.janeway.econ.cam.ac.uk/working-papers](http://www.econ.cam.ac.uk/cwpwww.janeway.econ.cam.ac.uk/working-papers), 2022.
- [28] N.P. Bakehe, Energy poverty: consequences for respiratory health and labour force participation in Cameroon, *J. Environ. Econ. Policy* 11 (2021) 235–247, <https://doi.org/10.1080/21606544.2021.1962412>.
- [29] S. van der Merwe, I. de Kock, J.K. Musango, The state of the art of gendered energy innovations: a structured literature review, *South Afr. J. Ind. Eng.* 31 (2020) 144–155, <https://doi.org/10.1766/31-3-2427>.
- [30] O.M. Longe, A Review of Energy and Gender Poverty Nexus in South Africa, IEEE PES/IAS PowerAfrica, Institute of Electrical and Electronics Engineers Inc., 2020, <https://doi.org/10.1109/POWERAFRICA49420.2020.9219885>.
- [31] M. De Wilde, “A heat pump needs a bit of care”: on maintainability and repairing gender-technology relations, *Technol. Human Val.* 46 (2021) 1261–1285, <https://doi.org/10.1177/0162243920978301>.
- [32] S.E. Tallichet, Barriers to women's advancement in underground coal mining, *Rural. Sociol.* 65 (2000) 234–252, <https://doi.org/10.1111/j.1549-0831.2000.tb00027.x>.
- [33] L. Code, Taking subjectivity into account, in: L. Alcoff, E. Potter (Eds.), *Feminist Epistemologies*, 1st ed., Routledge, New York, 1993, pp. 15–48.
- [34] S.E. Bell, C. Daggett, C. Labuski, Toward feminist energy systems: why adding women and solar panels is not enough, *Energy Res. Soc. Sci.* 68 (2020), <https://doi.org/10.1016/j.erss.2020.101557>.
- [35] J.M. Smith, Approaching industrial democracy in nonunion mines: lessons from Wyoming's Powder River Basin, in: E.P. Durrenberger, K.S. Reichart (Eds.), *The Anthropology of Labor Unions*, University Press of Colorado, 2010, p. 239.
- [36] C. Sánchez-Guevara Sánchez, A. Sanz Fernández, M. Núñez Peiró, G. Gómez Muñoz, Feminisation of energy poverty in the city of Madrid, *Energy Buildings* 223 (2020), <https://doi.org/10.1016/J.ENBUILD.2020.110157>.
- [37] C. Daggett, Petro-masculinity: fossil fuels and authoritarian desire, *Millennium J. Int. Stud.* 47 (2018) 25–44, <https://doi.org/10.1177/0305829818775817>.
- [38] Y. Deepthi, S.M. Shiva Nagendra, S.N. Gummadi, Characteristics of indoor air pollution and estimation of respiratory dosage under varied fuel-type and kitchen-type in the rural areas of Telangana state in India, *Sci. Total Environ.* 650 (2019) 616–625, <https://doi.org/10.1016/J.SCITOTENV.2018.08.381>.
- [39] R. Heltberg, T.C. Arndt, N.U. Sekhar, Fuelwood consumption and forest degradation: a household model for domestic energy substitution in rural India, *Land Econ.* 76 (2000) 213–232, <https://doi.org/10.2307/3147225>.
- [40] M.I. Howells, T. Alfstad, D.G. Victor, G. Goldstein, U. Remme, A model of household energy services in a low-income rural African village, *Energy Policy* 33 (2005) 1833–1851, <https://doi.org/10.1016/J.ENPOL.2004.02.019>.
- [41] C. Brown, Race and the construction of working-class masculinity in the Nigerian coal industry: the initial phase, 1914–1930, *Int. Labor Work. Class Hist.* 69 (2006) 35–56, <https://doi.org/10.1017/S0147547906000032>.
- [42] S.E. Bell, Bridging activism and the academy: exposing environmental injustices through the feminist ethnographic method of photovoice, *Hum. Ecol. Rev.* 21 (2015) 27–58, <http://www.jstor.org/stable/24875119> (accessed August 31, 2022).
- [43] D.A. Alexander, A. Northcross, T. Karrison, O. Morhasson-Bello, N. Wilson, O. M. Atalabi, A. Dutta, D. Adu, T. Ibigbami, J. Olamijulo, D. Adepoju, O. Ojengbade, C.O. Olopade, Pregnancy outcomes and ethanol cook stove intervention: a randomized-controlled trial in Ibadan, Nigeria, *Environ. Int.* 111 (2018) 152–163, <https://doi.org/10.1016/j.envint.2017.11.021>.
- [44] A. Perchard, “Broken men” and “Thatcher's children”: memory and legacy in Scotland's coalfields, *Int. Labor Working-Class Hist.* 84 (2013) 78–98, <http://www.jstor.org/stable/43302728> (accessed October 6, 2022).
- [45] K. Beckwith, Gender frames and collective action: configurations of masculinity in the Pittston coal strike, *Polit. Soc.* 29 (2001) 297–330, <https://doi.org/10.1177/0032329201029002006>.
- [46] P. Jagger, G. Shively, Land use change, fuel use and respiratory health in Uganda, *Energy Policy* 67 (2014) 713–726, <https://doi.org/10.1016/j.enpol.2013.11.068>.
- [47] T.E. Turner, L.S. Brownhill, Why women are at war with Chevron: Nigerian subsistence struggles against the International Oil Industry, *J. Asian Afr. Stud.* 39 (2004) 63–93, <https://doi.org/10.1177/0021909604048251>.
- [48] A.K. Kosenius, M. Ollikainen, Valuation of environmental and societal trade-offs of renewable energy sources, *Energy Policy* 62 (2013) 1148–1156, <https://doi.org/10.1016/j.enpol.2013.07.020>.
- [49] M. Khandelwal, M.E. Hill, P. Greenough, J. Anthony, M. Quill, M. Linderman, H. S. Udaykumar, Why have improved cook-stove initiatives in India failed? *World Dev.* 92 (2017) 13–27, <https://doi.org/10.1016/j.worlddev.2016.11.006>.
- [50] I.D. Brouwer, J.C. Hoorweg, M.J. van Liere, When households run out of fuel: responses of rural households to decreasing fuelwood availability, Ntcheu District, Malawi, *World Dev.* 25 (1997) 255–266, [https://doi.org/10.1016/S0305-750X\(96\)00100-3](https://doi.org/10.1016/S0305-750X(96)00100-3).
- [51] A.M. Omer, Renewable energy resources for electricity generation in Sudan, *Renew. Sust. Energ. Rev.* 11 (2007) 1481–1497, <https://doi.org/10.1016/j.rser.2005.12.001>.
- [52] T. Yue, R. Long, H. Chen, Factors influencing energy-saving behavior of urban households in Jiangsu Province, *Energy Policy* 62 (2013) 665–675, <https://doi.org/10.1016/j.enpol.2013.07.051>.
- [53] K. Standal, T. Winther, Empowerment through energy? Impact of electricity on care work practices and gender relations, *Forum Dev. Stud.* 43 (2016) 27–45, <https://doi.org/10.1080/08039410.2015.1134642>.
- [54] G. Arabatzis, C. Malesios, Pro-environmental attitudes of users and non-users of fuelwood in a rural area of Greece, *Renew. Sust. Energ. Rev.* 22 (2013) 621–630, <https://doi.org/10.1016/j.rser.2013.02.026>.
- [55] H.L. Lim, Recruitment and retention of Emirati gen Y in the petroleum industry: a gender comparative study, in: The Abu Dhabi International Petroleum Exhibition and Conference, Abu Dhabi, UAE, 2014, <https://doi.org/10.2118/171995-MS>.
- [56] S.E.T. Muneer, E.W.M. Mohamed, Adoption of biomass improved cookstoves in a patriarchal society: an example from Sudan, *Sci. Total Environ.* 307 (2003) 259–266, [https://doi.org/10.1016/S0048-9697\(02\)00541-7](https://doi.org/10.1016/S0048-9697(02)00541-7).

- [57] D.B. Rahut, B. Behera, A. Ali, Household energy choice and consumption intensity: empirical evidence from Bhutan, *Renew. Sust. Energ. Rev.* 53 (2016) 993–1009, <https://doi.org/10.1016/j.rser.2015.09.019>.
- [58] K. Peterman, R. Kermish-Allen, G. Knezek, R. Christensen, T. Tyler-Wood, Measuring student career interest within the context of technology-enhanced STEM projects: a cross-project comparison study based on the career interest questionnaire, *J. Sci. Educ. Technol.* 25 (2016) 833–845, <https://doi.org/10.1007/s10956-016-9617-5>.
- [59] A.H. Kimura, Citizen science in post-Fukushima Japan: the gendered scientization of radiation measurement, *Sci. Cult. (Lond.)* 28 (2017) 327–350, <https://doi.org/10.1080/09505431.2017.1347154>.
- [60] T. Shao, H. Jin, A field investigation on the winter thermal comfort of residents in rural houses at different latitudes of northeast severe cold regions, China, *J. Build. Eng.* 32 (2020) 101476, <https://doi.org/10.1016/j.jobe.2020.101476>.
- [61] A.R. Siddiqui, K. Lee, D. Bennett, X. Yang, K.H. Brown, Z.A. Bhutta, E.B. Gold, Indoor carbon monoxide and PM 2.5 concentrations by cooking fuels in Pakistan, *Indoor Air* 19 (2009) 75–82, <https://doi.org/10.1111/j.1600-0668.2008.00563.x>.
- [62] S.C. Ma, J.H. Xu, Y. Fan, Willingness to pay and preferences for alternative incentives to EV purchase subsidies: an empirical study in China, *Energy Econ.* 81 (2019) 197–215, <https://doi.org/10.1016/j.eneco.2019.03.012>.
- [63] L. Rotaris, M. Giansoldati, M. Scorrano, Are air travellers willing to pay for reducing or offsetting carbon emissions? Evidence from Italy, *Transp. Res. Pt. A Policy Pract.* 142 (2020) 71–84, <https://doi.org/10.1016/j.tra.2020.10.014>.
- [64] M. Khadka, S. Karki, B.S. Karki, R. Kotru, K.B. Darjee, Gender equality challenges to the REDD initiative in Nepal, *Mt. Res. Dev.* 34 (2014) 197–207, <https://doi.org/10.1659/MRD-JOURNAL-D-13-00081.1>.
- [65] I. Bhallamudi, L. Lingam, Swaying between saving the environment and mitigating women's domestic drudgery: India's efforts at addressing clean cooking fuels, *Gend. Technol. Dev.* 23 (2019) 36–54, <https://doi.org/10.1080/09718524.2019.1587888>.
- [66] J. Elsayih, R. Datt, Q. Tang, Corporate governance and carbon emissions performance: empirical evidence from Australia, *Aust. J. Environ. Manag.* 28 (2021) 433–459, <https://doi.org/10.1080/14486563.2021.1989066>.
- [67] K. Lahiri-Dutt, The shifting gender of coal: feminist musings on women's work in Indian collieries, *South Asia J. South Asian Stud.* 35 (2012) 456–476, <https://doi.org/10.1080/00856401.2011.633984>.
- [68] A.C. Sadath, R.H. Acharya, Assessing the extent and intensity of energy poverty using Multidimensional Energy Poverty Index: empirical evidence from households in India, *Energy Policy* 102 (2017) 540–550, <https://doi.org/10.1016/j.enpol.2016.12.056>.
- [69] A. Sen, *Development as Freedom*, Alfred Knopf, New York, 1999.
- [70] B.C. Chikulo, Gender, climate change and energy in South Africa: a review, *Gend. Behav.* 12 (2014).
- [71] M.A. Caretta, Homosocial stewardship: the opposed and unpaid care work of women water stewards in West Virginia, USA, *Ecol. Soc.* 25 (2020) 1–7, <https://doi.org/10.5751/ES-11555-250229>.
- [72] L. McAllister, A. Magee, B. Hale, Women, e-waste, and technological solutions to climate change, *Health Hum. Rights.* 16 (2014) 166–178.
- [73] I. Udoh, Oil, migration, and the political economy of HIV/AIDS prevention in Nigeria's Niger Delta, *Int. J. Health Serv.* 43 (2013) 681–697, <https://doi.org/10.2190/HS.43.4.F>.
- [74] G. Shrestha, D. Joshi, F. Clément, Masculinities and hydropower in India: a feminist political ecology perspective, *Int. J. Commons* 13 (2019) 130, <https://doi.org/10.18352/ijc.920>.
- [75] B. Priel, Technology change = gender change? Androcentric construction of engineering as symbolic resource in the German-speaking area of renewable energies, *Eng. Stud.* 9 (2017) 3–23, <https://doi.org/10.1080/19378629.2017.1306066>.
- [76] N. Clark, K. Yusoff, Queer fire: ecology, combustion and pyrosexual desire, *Fem. Rev.* 118 (2018) 7–24, <https://doi.org/10.1057/s41305-018-0101-3>.
- [77] S. Vassileva-Karagoyzova, Body, sexuality, and passive victimhood in the post-1989 reimagining of the Polish city of Wałbrzych, *East Eur. Polit. Soc.* 34 (2020) 783–801, <https://doi.org/10.1177/0888325420902253>.
- [78] K. Smeraldo Schell, J.M. Silva, Resisting despair narratives of disruption and transformation among white working-class women in a declining coal-mining community, *Gend. Soc.* 34 (2020) 736–759, <https://doi.org/10.1177/0891243220948218>.
- [79] M. Martiskainen, B.K. Sovacool, Mixed feelings: a review and research agenda for emotions in sustainability transitions, *Environ. Innov. Soc. Transit.* 40 (2021) 609–624, <https://doi.org/10.1016/j.eist.2021.10.023>.
- [80] A.G. Rincón-Rubio, K.G. Cedano-Villavicencio, Emotional energy communities: centering emotions and feelings within energy transitions in southern Mexico, *Energy Res. Soc. Sci.* 98 (2023) 103014, <https://doi.org/10.1016/j.erss.2023.103014>.
- [81] D.J. Davidson, W.R. Freudenburg, Gender and environmental risk concerns: a review and analysis of available research, *Environ. Behav.* 28 (1996) 302–339, <https://doi.org/10.1177/0013916596283003>.
- [82] S. Dockstader, S.E. Bell, Ecomodern masculinity, energy security, and green consumerism: the rise of biofuels in the United States, *Crit. Sociol. (Eugene)* 46 (2019) 643–660, <https://doi.org/10.1177/0896920519885010>.
- [83] S.L. Cutter, J. Tiefenbacher, W.D. Solecki, En-gendered fears: femininity and technological risk perception, *Ind. Crisis Quart.* 6 (1992) 5–22, <http://www.jstor.org/stable/26162693> (accessed September 1, 2022).
- [84] F.I. Omorodion, Sexuality, lifestyles, and the lures of modernity: participatory rural appraisal (PRA) of female adolescents in the Niger Delta Region of Nigeria, *Sex. Cult.* 10 (2006) 96–113, <https://doi.org/10.1007/s12119-006-1017-1>.
- [85] N. Al-Qasimi, Queer than queer: anti-ancestry, disavowal, and the Emirati post-oil generation, *J. Lesbian Gay Stud.* 26 (2020) 63–101, <https://doi.org/10.1215/10642684-7929111>.
- [86] Nature Portfolio, Research ethics: sex, gender (identity/presentation), and sexual orientation, in: Editorial Policies, 2023, <https://www.nature.com/nature-portfolio/editorial-policies/ethics-and-biosecurity> (accessed June 9, 2023).
- [87] S. Heidari, T.F. Babor, P. De Castro, S. Tort, M. Curno, Sex and Gender Equity in Research: rationale for the SAGER guidelines and recommended use, *Res. Integr. Peer Rev.* 1 (2016) 1–9, <https://doi.org/10.1186/S41073-016-0007-6/TABLES/2>.
- [88] K.W. Crenshaw, Mapping the margins: intersectionality, identity politics, and violence against women of color, *Stanford Law Rev.* 43 (1993) 1241–1299, <https://doi.org/10.2307/1229039>.